DublinArray
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EIAR Volume 3: Offshore Infrastructure Assessment Chapters
Chapter 8: Nature Conservation

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Dublin Array Offshore Wind Farm

Environmental Impact Assessment Report

Volume 3, Chapter 8: Nature Conservation

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Glossary

Term	Definition
Benthic	Relating to or occurring on the seabed.
Far field	For the purposes of this chapter, far-field has been defined as extending beyond the boundaries of the array area, Offshore ECC and temporary occupation area
Intertidal	The area of the shoreline which is covered at high tide and uncovered at low tide.
Natura Impact Statement (NIS)	This means a report comprising the scientific examination of a plan or project and the relevant European Site or European Sites, to identify whether the project will adversely affect the integrity of a European site(s) either individually or in combination with other plans and projects in view of the site's conservation objectives, and to characterise any such adverse effects.
Near-field	defined as within the temporary occupation area, array area or offshore ECC
MHWS	MHWS is the highest level that spring tides reach on average over a period of time (often 19 years). The height of MHWS is the average throughout the year (when the average maximum declination of the moon is 23.5°) of two successive high waters during those periods of 24 hours when the range of the tide is at its greatest.
Ornithology	The study of birds.
Qualifying interest (QIs)	The habitats and species for which each European site is selected are the QI for SACs and special conservation interests (SCI) for SPAs of each site.
Shellfish	Shell-bearing aquatic invertebrates used as food; includes various species of crustaceans, bivalves and gastropods.
Subtidal	The region where the seabed is below the lowest tide.
Tidal Excursion	Tidal excursion length is the net horizontal distance travelled by a water particle from LWS to HWS or vice versa. It can be used to describe the movement

Term	Definition
	of pollutants in estuaries during a tidal cycle (Zhen-Gang, 2008).

Acronyms

Term	Definition
AA	Appropriate Assessment
ABP	An Bord Pleanála
ADD	Acoustic Deterrent Device
ADO	Alternative Design Option
AEOS	Agri Environmental Options Scheme
AFS	Anti-fouling System
CBRA	Cable Burial Risk Assessment
CCUS	Carbon Capture and Storage
CEA	Cumulative Effects Assessment
CGS	County Geological Sites
CIP	Cable Installation Plan
CIEEM	Chartered Institute of Ecology and Environmental Management
DAS	Digital Aerial Survey
DCC	Dublin City Council
DCCAE	Department of Communications, Climate Action and Environment
DECC	Department of Energy and Climate Change
DHLGH	Department of Housing, Local Government and Heritage
Dublin Array	Dublin Array Offshore Wind Farm
ECC	Export Cable Corridor
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EPA	Environmental Protection Agency
GSI	Geological Survey Ireland
HDD	Horizontal Directional Drilling
IAC	Inter Array Cable
ICC	International Coordinating Council
ICMMPA	International Committee on Marine Mammal Protected Areas
IRCG	Irish Coast Guard
IUCN	International Union for the Conservation of Nature
IMMA	Important Marine Mammal Areas

Term	Definition
IMO	International Maritime Organisation
LNR	Local Nature Reserve
MAB	Man and the Biosphere
MARPOL	International Convention for the Prevention of Pollution from Ships
mCRM	Migratory Collision Risk Modelling
MDS	Maximum Design Scenario
MDO	Maximum Design Option
MI	Marine Institute
MHW	Marine High Water
MHWM	Marine High Water Mark
MHWS	Mean High Water Springs
MLW	Mean Low Water
MMO	Marine Mammal Observer
MMMP	Marine Megafauna Mitigation Plan
MMPATF	Marine Mammal Protected Areas Task Force
MPA	Marine Protected Area
MW&SQ	Marine Water and Sediment Quality
NBAP	National Biodiversity Plan
NHA	Natural Heritage Area
NIS	Natura Impact Statement
NPWS	National Parks and Wildlife Service
NR	Nature Reserves
OSP	Offshore Substation Platform
OSPAR	Convention for the Protection of the Marine Environment of the Northeast Atlantic
O&M	Operation and Maintenance
OWF	Offshore Wind Farm
PAM	Passive Acoustic Monitoring
PEMP	Project Environmental Management Plan
pNHA	Proposed Natural Heritage Area
SAAO	Special Amenity Area Orders
SAC	Special Area of Conservation
SISAA	Supporting Information to Screening of Appropriate Assessment

Term	Definition
SNR	Statutory Nature Reserve
SLVIA	Seascape, Landscape and Visual Impact Assessment
SPA	Special Protection Area
SPMP	Scour Protection Management Plan
SSC	Suspended Sediment Concentration
TSHD	Trailing Suction Hopper Dredger
TTS	Temporary Threshold Shift
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UXO	Unexploded Ordnance
WCPA	World Commission on Protected Areas
WFD	Water Framework Directive
WTG	Wind Turbine Generator
ZoI	Zone of Influence

8 Nature Conservation Designations

8.1 Introduction

8.1.1 This chapter presents the results of the Environmental Impact Assessment (EIA) for the potential impacts of the construction, operation and maintenance (O&M), and decommissioning phases within the array area and offshore Export Cable Corridor (the latter referred to as the offshore ECC) on nature conservation designations.

8.1.2 The aim of this chapter is to identify and assess nature conservation sites that are designated for ecological and physical features/receptors. In many cases, the receptors/features identified (i.e. fish, benthic features, birds, geological features etc.) which qualify a site for a nature conservation designation are assessed fully within the other technical EIAR chapters (see chapters listed below). As such, this chapter aims to avoid repetition of the assessments contained within those technical chapters, but does draw upon information contained therein. Where this is the case, it is made clear within this chapter and cross reference is provided where applicable. This EIAR chapter should therefore be read in conjunction with the following chapters of the EIAR, due to the inherent interactions of the assessment on nature conservation designations:

- Volume 3, Chapter 1: Marine Geology, Oceanography and Physical Processes (hereafter referred to as the Physical Processes chapter): *to be referenced for an overview on the surficial sediment properties, suspended sediments and seabed features. This chapter also provides an assessment of the potential impacts of the project upon the marine geology, oceanography and physical processes;*
- Volume 3, Chapter 2: Marine Water and Sediment Quality (MW&SQ) (hereafter referred to as the MW&SQ chapter): *to be referenced for a review of the MW&SQ of the receiving environment. This chapter also provides an assessment of the potential impacts of the project upon MW&SQ;*
- Volume 3, Chapter 3: Benthic Subtidal and Intertidal Ecology (hereafter referred to as the Benthic Ecology chapter): *to be referenced for an overview on the features of the benthic subtidal and intertidal ecology. This chapter also provides an assessment of the potential impacts of the project upon the benthic subtidal and intertidal ecology;*
- Volume 3, Chapter 4: Fish and Shellfish Ecology (hereafter referred to as the Fish and Shellfish chapter): *to be referenced for a detailed characterisation of the fish, shellfish and turtle populations within and surrounding the offshore infrastructure . This chapter also provides an assessment of the potential impacts of the project upon fish and shellfish populations;*
- Volume 3, Chapter 5: Marine Mammals (hereafter referred to as the Marine Mammal chapter): *to be referenced for a detailed characterisation of the marine mammal populations within and surrounding the offshore infrastructure . This chapter also provides an assessment of the potential impacts of the project upon marine mammal receptors.*

- Volume 3, Chapter 6: Offshore and Intertidal Ornithology (hereafter referred to as the Ornithology chapter): *to be referenced for a detailed characterisation of the bird populations within and surrounding the offshore infrastructure. This chapter also provides an assessment of the potential impacts of the project upon bird populations;*
- Volume 4, Appendix 4.3.1-1: Technical Baseline Report - Physical Processes (hereafter referred to the Physical Processes technical baseline): *to be referenced for a detailed description of the surficial sediment properties, suspended sediments and seabed features;* and
- Volume 4, Appendix 4.3.1-2: Physical Process Modelling for Dublin Array Offshore Wind Farm (hereafter referred to as the Physical Processes Modelling Report): *to be referenced for detailed information on the project specific numerical modelling undertaken to support the assessment of the project upon the baseline sedimentological and metocean regimes. This includes a presentation of plume modelling and tidal excursions*.

8.1.3 In addition, reference is made to the Supporting Information to Screening of Appropriate Assessment (Part 4: Habitats Directive Assessments, Volume 3: SISAA) which considers the likely significant effects on European sites identified by the screening process and the Natura Impact Statement (NIS) (Part 4: Habitats Directive Assessments, Volume 4: NIS) which assesses the potential for adverse effect on integrity of the European sites and qualifying features.

- Part 4: Habitats Directive Assessments, Volume 3: Supporting Information for Screening of the Appropriate Assessment (hereafter referred to as the SISAA); and
- Part 4: Habitats Directive Assessment, Volume 4: Natura Impact Statement (hereafter referred to as the NIS).

8.1.4 Water Framework Directive (WFD) sites have been considered within Volume 4, Appendix 4.3.2-1: Water Framework Directive and Marine Strategy Framework Directive Summary, which demonstrates that the potential effects of the offshore infrastructure will not cause or contribute to deterioration of status or jeopardise any waterbodies from achieving Good status.

8.2 Regulatory background

8.2.1 The legislation, policy and guidance relevant to the whole planning application is set out in Consents, Legislation, Policy & Guidance (Volume 2, Chapter 2). The principal legislation, policy and guidance relevant to this chapter is set out in Annex A.

8.2.2 The assessment of potential impacts upon Nature Conservation has been made with specific reference to the relevant regulations, guidelines and guidance, which include:

- Statutory Instruments:
  - Wildlife Act, 1976 (S.I. No. 485/2022) & Wildlife (Amendment) Act 2000 (S.I. No. 176/2023) as amended;

- Bonn Convention;
- Bern Convention;
- OSPAR Convention to Protect the Marine Environment of the North East Atlantic;
- Whale Fisheries Act, 1937;
- Marine Protected Areas Bill (pending)[1];
- Ireland's 4th National Biodiversity Plan (NBAP) 2023-2030 (Department of Housing, Local Government and Heritage (DHLGH), 2023); and
- Guidance on Environmental Considerations for Offshore Wind Farm (OWF) Development (Convention for the Protection of the Marine Environment of the Northeast Atlantic (OSPAR), 2008).

8.2.3 Consideration of designated European sites is required under The European Communities (Birds and Natural Habitats Regulations 2011 (S.I. No. 477 of 2011)), as amended, which transpose the EU Habitat and Birds Directives. An assessment of the impact of the offshore infrastructure on European sites and their supporting species and habitat qualifying interests is presented in the NIS (Part 4: Habitats Directive Assessments, Volume 4: NIS).

8.2.4 Where specific Irish guidance is not available given the infancy of offshore wind in Ireland, a number of other guidance documents are considered, specific to the consideration of nature conservation sites. Such guidance documents are available from jurisdictions/countries with established offshore renewable energy sectors where comprehensive guidance has been developed.

- Policy, guidance and guidelines:
  - Ireland's 4th National Biodiversity Plan (NBAP) 2023-2030 (Department of Housing, Local Government and Heritage (DHLGH), 2023); and
  - Guidance on Environmental Considerations for Offshore Wind Farm (OWF) Development (Convention for the Protection of the Marine Environment of the Northeast Atlantic (OSPAR), 2008).

8.2.5 The relevance of specific policies or guidance and their key provisions with regards to nature conservation and how these have been addressed within this assessment are presented in Annex A.

[1] The general scheme for a Bill to provide for the designation, implementation, and management of nationally designated MPAs in Ireland to fulfil provisions in the MSFD was approved in 2022. As of November 2024, the enactment of the bill is still pending and no MPAs have been formally designated and to date, marine protection in Ireland has only been made up of SACs and SPAs (i.e. EU Natura 2000 sites).

8.3 Consultation

8.3.1 As part of the EIA for Dublin Array, non-statutory consultation has been undertaken with various statutory and non-statutory bodies. A Scoping report (RWE, 2020) was made publicly available and issued to statutory consultees on 9th October 2020. Table 1 provides a summary of the consultation undertaken for Nature Conservation to date for Dublin Array.

8.3.2 In accordance with recommendations outlined in the DCCAE guidance[2] "the Applicant sought to consult during the scoping stage with the Environmental Protection Agency (EPA), Dublin City Council (DCC), Marine Institute (MI), Geological Survey Ireland (GSI), the Irish Wildlife Trust and Coastwatch: Environmental Pillar.

8.3.3 As detailed in section 8.1, this chapter draws upon other EIAR chapters, therefore any statutory consultation of specific relation to a technical aspect (and of no specific relevance to nature conservation sites) is provided in the relevant chapters of this EIAR, as listed in section 8.1.2.

[2] Guidance on Environmental Impact Statement (EIS) and Natura Impact Statement (NIS) Preparation for Offshore Renewable Energy Projects (Environmental Working Group of the Offshore Renewable Energy Steering Group and the DCCAE, 2017)

Table 1 Summary of consultation relating to Nature conservation sites

Date	Consultation type	Consultation and key issues raised	Section where provision is addressed
November 2020	Dublin City Council (DCC)	DCC suggest that reference should be made to the "Dublin Bay Biosphere, a United Nations Educational, Scientific and Cultural Organisation (UNESCO) designation". Additionally, page 162 of the City Development Plan written statement should be reviewed in this regard.	A review of the suggested reports has been undertaken. This information has informed the characterisation of the receiving environment, see Section 8.6. In addition, consideration of the Dublin Bay Biosphere Reserve has been undertaken and presented in Section 8.6.
November 2020	Marine Institute (MI)	MI would like confirmation that the full set of environmental conservation designations are being considered, e.g., the Dublin Bay Biosphere Reserve.	A review of all relevant environmental conservation designations including consideration of the Dublin Bay Biosphere reserve has been undertaken and presented in Section 8.6. An assessment of potential impacts on the site has been undertaken in Sections 8.14, 8.15 and 8.16.
November 2020	Geological Survey Ireland (GSI)	County Geological Sites (CGS), as adopted under the National Heritage Plan, include additional sites that may also be of national importance, but which were not selected as the very best examples for [National Heritage Areas] NHA designation. All geological heritage sites identified by GSI are categorised as CGS pending any further NHA designation by NPWS.	A review of all relevant environmental conservation designations including consideration of CGSs' has been undertaken and presented within Sections 8.14, 8.15 and 8.16. Impacts to coastal processes and coastal erosion have been assessed within the Physical Processes chapter with references provided throughout this chapter.
November 2020	Geological Survey Ireland (GSI)	The GSI considered that the project details may present potential impacts for exposures and access to sites should these sites not be assessed as constraints. They raise that there is a risk of impact to the CGS – Killiney Bay CGS, within the vicinity of the proposed potential export cable landfall zone.	A review of all relevant environmental conservation designations including consideration of CGSs' including Killiney Bay CGS which is in the vicinity of the proposed export cable landfall zone, has been undertaken and presented within Sections 8.14, 8.15 and 8.16.

8.4 Methodology

Study area

8.4.1 For a full description of the methodology as to how this EIAR was prepared, see Volume 2, Chapter 3: EIA Methodology (hereafter referred to as the EIA Methodology Chapter). The methodology that follows below is specific to this chapter.

8.4.2 The DCCAE guidelines (DCCAE, 2017) recommend that the Zone of Influence (ZoI) and study area for consideration in an EIA are established at the scoping stage. It is acknowledged that the ZoI may differ depending upon the pressure or ecosystem component under consideration. Identification of features of interest within the ZoI that might be impacted by an offshore renewable energy project are required so that a source – pathway – receptor risk assessment can be carried out and the subsequent evaluation of effects can be undertaken for key features.

8.4.3 As stated in section 8.1, this chapter aims to identify and assess nature conservation sites that are designated for ecological and physical features/receptors. However, this chapter avoids repetition of receptor specific assessments conducted within other technical chapters (i.e. fish, benthic features, birds, geological features etc.) but focuses on the nature conservation sites themselves, with due regard to their qualifying interests, if and where required. Whilst repetition of assessments for specific features/receptors of the nature conservation sites is avoided, this chapter makes clear where the assessment of the feature/receptor is conducted, with cross references provided to the relevant EIAR chapters.

8.4.4 For the purposes of the EIAR, the study area for nature conservation is determined by the Zone of Influence (ZoI) from direct and indirect effects of the offshore infrastructure of Dublin Array that generates the largest footprint and pathway to designated sites. The ZoI for nature conservation sites has been defined as 17[3] km based on a spring tidal excursion based on the project specific hydrodynamic modelling which indicated a spring tidal excursion as being 16 km (Physical Processes Modelling Report: Volume 4, Appendix 4.3.1-2). Therefore, a study area in this chapter of a 17 km buffer around the offshore infrastructure[4] is considered to be appropriately precautionary to encapsulate all reasonably foreseeable direct and indirect effects on Nature Conservation receptors. The study area is limited to the marine and coastal environment below Mean High Water Springs (MHWS).

8.4.5 The study area encompasses the array area as well as the offshore ECC, up to and including the intertidal zone at the landfall, below the MHWM. The array area and offshore ECC and the modelled tidal ellipse buffer area effectively characterise the predicted zone of potential primary (direct) and secondary (indirect) impacts of the development on nature conservation receptors respectively.

[3] All distances are taken from the outer boundary of all offshore works incorporating the offshore infrastructure and temporary occupation area. Distances provided are straight line (geodesic) as calculated using GIS and as such are precautionary in nature

[4] Activities undertaken within the temporary occupation area, namely the use of jack-up vessels and anchors during the construction, O&M, and decommissioning phases have been screened out within the physical processes chapter for suspended sediment and deposition with their use not resulting in notable changes in SSC and associated sediment deposition, however the use of a buffer ensures a precautionary approach is taken.

Baseline data

8.4.6 Information on nature conservation sites within the study area was collected through a detailed desktop review and interrogation of existing studies and datasets to characterise the baseline. The data sources considered are provided in Table 2 below.

Table 2 Baseline Data Sources

Data Source Title	Data Location	Data Purpose
Conserve Ireland	https://www.conserveireland.com/	Information on designation types, protected species, and designated habitats in Ireland.
Dublin Bay Biosphere Partnership	https://www.dublinbaybiosphere.ie/	Information on the Dublin Bay Biosphere.
Marine Irish Digital Atlas	https://atlas.marine.ie/#?c=53.9000:-15.9000:6	Data showing the locations of nature conservation sites within the Dublin Bay area.
National Parks & Wildlife Service	https://www.npws.ie/	Information and data on National Parks and Nature Reserves.
Ramsar Sites Information Service.	https://rsis.ramsar.org/	Information and maps on all designated Ramsar sites.
Dublin City Council, City Development Plan (2022-2028) written statement	https://dublincitydevelopmentplan.ie/downloads/Written%20Statement%20Volume%201.pdf	Information on Dublin city's strategic approach to implementing 'green infrastructure'.
OSPAR (Convention for the Protection of the Marine Environment of the Northeast Atlantic) Marine Protected Area (MPA) database	https://www.ospar.org/work-areas/bdc/marine-protected-areas/mpa-webtool	Information on designated Marine Protected Areas.
Geological Survey Ireland	https://www.gsi.ie/en-ie/Pages/default.aspx	Information on sites of geological importance within Ireland (namely CGS).

Assessment methodology

8.4.7 As described above the baseline was established through a detailed desktop review and the compilation of best available evidence from desk-based studies and databases.

8.4.8 This assessment also draws upon other EIAR chapters for assessment of effects on ecological and physical features/receptors, which are qualifying interests of sites designated for nature conservation purposes. The relevant technical chapters are listed in section 8.1 of this chapter.

8.4.9 The assessment of potential impacts on nature conservation sites will consider the magnitude and duration of the impact, the reversibility of the impact and the timing and frequency of the activity. The sensitivity assessment of the nature conservation sites will take into account the tolerance and recoverability of the sites, as well as their value/importance (locally, regionally, nationally or internationally). When considering the tolerance and recoverability of the sites, primary consideration is given to the features of the site sensitive to the specific impact, which therefore ensures that a precautionary approach is utilised to determine the sensitivity of the nature conservation site. The sensitivity of individual features to impacts are assessed on a species-by-species basis in their representative chapters.

8.5 Assessment criteria

8.5.1 As stated above, this assessment draws upon other chapters for various technical aspects (as listed in section 8.1).

8.5.2 This assessment of potential impacts on nature conservation sites is consistent with the EIA Methodology Chapter. The criteria for determining the sensitivity of the receiving environment and the magnitude of impacts for the nature conservation sites assessment are defined in Table 3 and Table 4 respectively. A matrix was used for the determination of significance in EIA terms (see Table 5). The combination of the magnitude of the impact with the sensitivity of the receptor determines the assessment of significance of effect.

Sensitivity of nature conservation site criteria

8.5.3 As set out in the EIA Methodology Chapter, the sensitivity of a receptor or site is a function of its capacity to accommodate change and reflects its ability to recover if it is affected. Sensitivity is quantified via a consideration of its context (the receptors adaptability, tolerance and recoverability) and value.

8.5.4 Table 3 sets out the criteria used in defining the sensitivity of the identified nature conservation sites. All definitions of time periods have been defined from the Environmental Protection Agency Guidance (EPA, 2022). Four defined levels of sensitivity have been determined (High, Medium, Low or Negligible) and where one of the definitions, for a given level, is met then this will determine the level of sensitivity assigned. Where a site could reasonably be assigned more than one level of sensitivity, professional judgement has been used to determine which level is applicable.

Table 3 Sensitivity of Nature conservation sites

Receptor sensitivity	Definition
High	**Adaptability:** The site and its qualifying features cannot avoid or adapt to an impact. **Tolerance:** The site and its qualifying features have no or very low capacity to accommodate the proposed form of change. **Recoverability:** The effect on the site and its qualifying features is anticipated to be permanent (i.e. over 60 years) and recovery is not anticipated. **Value:** The nature conservation site is of international importance.
Medium	**Adaptability:** The site and its qualifying features have a limited capacity to avoid or adapt to an impact. **Tolerance:** The site and its qualifying features have a moderate to low capacity to accommodate the proposed form of change. **Recoverability:** The site and its qualifying features are anticipated to recover fully within the medium-term (i.e. seven to 15 years) to long-term (15 – 60 years). **Value:** The nature conservation site is of European importance.
Low	**Adaptability:** The site and its qualifying features have a reasonable capacity to avoid or adapt to an impact. **Tolerance:** The site and its qualifying features have a high capacity to accommodate the proposed form of change. **Recoverability:** The site and its qualifying features are anticipated to recover fully within the short-term (i.e. one to seven years). **Value:** The nature conservation site is of local to national importance.
Negligible	**Adaptability:** The site and its qualifying features have a high capacity to avoid or adapt to an impact. **Tolerance:** The site and its qualifying features have a high capacity to accommodate the proposed form of change. **Recoverability:** The site and its qualifying features are anticipated to recover fully and will be temporary (i.e. lasting less than one year). **Value:** The nature conservation site is of local importance.

Magnitude of Impact Criteria

8.5.5 It is noted here that a distinction is made throughout the assessment between the magnitude of the impact (as defined by the extent, duration[5], frequency, probability[6] and consequences) and the resulting significance of the 'effects' upon nature conservation sites. The descriptions of magnitude are specific to the assessment of impacts on nature conservation sites and are presented in Table 4. Potential impacts have been considered in terms of whether they are adverse or beneficial effects.

[5] Note: this is the duration of the impact and not the time taken for the receptor to recover. Recoverability is considered within the sensitivity determination.
[6] All impacts assessed within this EIAR Chapter are considered reasonably likely to occur, and so the probability of the impact has not been a consideration in defining the magnitude of the impact.

8.5.6 Where an impact could reasonably be assigned more than one level of magnitude, professional judgement has been used to determine which level is most appropriate for the impact. The magnitude has been assigned based on the most appropriate potential consequences of the impact. For example, whilst an impact may occur constantly throughout the O&M period it may be indiscernible and immeasurable in practice. Therefore, it would be concluded to be of a Negligible magnitude despite the frequency of the impact.

8.5.7 For the purposes of this chapter, the definitions of terms used in Table 4 below, near-field has been defined as within the temporary occupation area, array area or offshore ECC. Far-field has been defined as extending beyond these boundaries.

Table 4 Magnitude of the impact

Magnitude	Definition
High	**Extent:** Impact across the near-field and far-field areas beyond the study area. **Duration:** The impact is anticipated to be permanent (i.e. over 60 years). **Frequency:** The impact will occur constantly throughout the relevant project phase. **Consequences: Permanent changes to key characteristics or features of the nature conservation site's character or distinctiveness.**
Medium	**Extent:** The maximum extent of the impact is restricted to the far-field (i.e. outside the defined study area). **Duration:** The impact is anticipated to be medium-term (i.e. seven to 15 years) to long-term (15 – 60 years). **Frequency:** The impact will occur constantly throughout a relevant project phase. **Consequences: Noticeable change to key characteristics or features of the nature conservation site's character or distinctiveness.**
Low	**Extent:** The maximum extent of the impact is restricted to the near-field and adjacent far-field areas. **Duration:** The impact is anticipated to be temporary (i.e. lasting less than one year) to short-term (i.e. one to seven years). **Frequency:** The impact will occur frequently throughout a relevant project phase. **Consequences: Barely discernible to noticeable change to key characteristics or features of the nature conservation site's character or distinctiveness.**
Negligible	**Extent:** The maximum extent of the impact is restricted to the near-field and immediately adjacent far-field areas. **Duration:** The impact is anticipated to be momentary (seconds to minutes) to brief (lasting less than one day). **Frequency:** The impact will occur once or infrequently throughout a relevant project phase. **Consequences: No discernible to barely discernible change to key characteristics or features of the nature conservation site's character or distinctiveness.**

Defining the significance of effect

8.5.8 The significance of effect associated with the impact will be dependent upon the sensitivity of the receptor and the magnitude of the effect. The assessment methodology of the significance of potential effects is described in Table 5. Effects defined as Significant, Very Significant or Profound are considered significant in EIA terms. For the purposes of this assessment, a level of effect of moderate or less will be considered 'not significant' in terms of the EIA Regulations, in line with the EPA Guidelines (2022).

Table 5 Significance of potential effects

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

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

8.6 Receiving environment

8.6.1 A summary of the key findings from the baseline study is provided in the following sections below.

8.6.2 The nature conservation sites listed within this section are typically designated for various ecological and physical features which are assessed within the other technical chapters and baseline reports that accompany this EIAR. As such, the following reports provide supporting information detailing characterisations of the receiving baseline within the ZoI for nature conservation, and provide regional context:

- Volume 4, Appendix 4.3.1-1: Technical Baseline Report - Physical Processes;
- Volume 4, Appendix 4.3.3-1: Technical Baseline Report – Benthic Subtidal and Intertidal Ecology;
- Volume 4, Appendix 4.3.4-1: Technical Baseline Report – Fish and Shellfish Ecology; and
- Volume 4, Appendix 4.3.6-1 - Technical Baseline Report – Ornithology.

8.6.3 In Ireland, marine mammals, (cetaceans and seal species) are listed as protected species in the Fifth Schedule of the Wildlife Act 1976 (as amended). Under the Wildlife Act (Amendment) Act 2000, Natural Heritage Areas (NHAs) may be established to protect habitats or species. Whilst some terrestrial and coastal NHAs may encompass adjacent marine areas, no NHAs have been established for marine mammals in Ireland to date.

8.6.4 The nature conservation sites which are located within the ZoI (see Section 8.1) are identified below. The sites are grouped according to the type of conservation designation, with references made to designation-specific policy where applicable.

International designations

8.6.5 There are several designations in Ireland governed by international legislation, including OSPAR MPAs, Ramsar Sites, the UNESCO Biosphere Reserve and Important Marine Mammal Areas (IMMAs).

Marine protected areas

8.6.6 Internationally, MPAs designated under the OSPAR convention are areas for which protective, conservation, restorative or precautionary measures have been instituted for the purpose of protecting and conserving species, habitats, ecosystems or ecological processes of the marine environment. At present, there are no statutorily designated MPAs within Irish territorial waters[7]. The Irish government is currently in the process of developing comprehensive legislation for the identification, designation, and management of Marine Protected Areas (MPAs) in Irish territorial waters. In 2022 the General Scheme of Marine Protected Areas Bill (2022)[8] was published to provide for the designation and effective management of Marine Protected Areas. To facilitate the identification of MPAs, in May 2023 the DHLGH published a report titled 'the ecological sensitivity analysis of the western Irish Sea'[9] to inform future designation of Marine Protected Area (MPAS) based on criteria aligned with international approaches and the provisions of the General Scheme of the MPA Bill. As a result, forty biological and environmental features were identified therein (see Section 3.1.2[10]) as potentially suitable areas for future protection as MPAs, once the Marine Protected Areas Bill is enacted.

[7] https://www.npws.ie/protected-sites/ospar-sites
[8] https://www.gov.ie/ga/foilsiuchan/2fd71-general-scheme-of-marine-protected-areas-bill-2022/?trk=public_post_comment-text
[9] https://www.gov.ie/en/publication/4bc80-ecological-sensitivity-analysis-of-irish-sea-main-report/
[10] https://www.gov.ie/en/publication/4bc80-ecological-sensitivity-analysis-of-irish-sea-main-report/

8.6.7 No legislation is currently used in Ireland to legally underpin MPAs established to fulfil commitments under international conventions. Therefore, since the creation of OSPAR MPAs would not afford any legal protection to the relevant areas on their own at present, Ireland established a number of its SACs as OSPAR MPAs for marine habitats11. As such, these sites are granted legal protection under the Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, as amended (EU Habitats Directive). The Irish Government is in the process of developing stand-alone legislation to enable the identification, designation and management of MPAs in accordance with Ireland's national and international commitments[12], however at present MPA sites are not granted any additional management measures as a result of their establishment as MPAs. The only proposed OSPAR MPA local to the offshore infrastructure (i.e. within 17km of the development) is North Dublin Bay SAC. However, as this MPA is also an SAC it is protected under the EU Habitats Directive, it is fully assessed in the NIS (Part 4: Habitats Directive Assessments, Volume 4: NIS).

Ramsar Sites

8.6.8 The Ramsar Convention is the intergovernmental treaty that provides the framework for the conservation and wise use of wetlands and their resources. The Convention was adopted in the Iranian city of Ramsar in 1971 and came into force in 1975 (coming into force in Ireland in 1985). Since then, almost 90% of UN member states have become "Contracting Parties". There are 45 Ramsar sites in Ireland, with a surface area of 66,994 hectares[13]. Three Ramsar sites are located within the study area for the proposed development, namely Baldoyle Bay Ramsar site, North Bull Island Ramsar site, and Sandymount Strand / Tolka Estuary Ramsar site, each of which are also designated within the Dublin Bay Biosphere (refer to paragraph 8.6.9) , and as both SACs and SPAs, and thus are protected as part of the Natura 2000 network. All Natura 2000 sites are addressed fully within the NIS (Part 4: Habitats Directive Assessments, Volume 4: NIS)

[11] https://www.npws.ie/marine/marine-habitats accessed May 2024
[12] As of January 2024, the Marine Protected Areas Bill has not yet been published in full nor enacted.
[13] https://www.irishwetlands.ie/irish-sites/

Biosphere Reserves

8.6.9 Biosphere reserves are regions nominated by national governments and are designated under the intergovernmental 'Man and the Biosphere Programme (MAB)' by the Director-General of UNESCO following the decisions of the MAB International Coordinating Council (MAB ICC). The legal basis for biosphere reserves is the UNESCO Statutory framework of the World Network of Biosphere Reserves (1995), with UNESCO designating Dublin Bay as a Biosphere. UNESCO biosphere reserves are areas internationally recognised for their biological diversity that have also actively managed to promote a balanced relationship between people and nature. The biosphere designation brings no new regulations; its aims are achieved by people working together. The Dublin Bay UNESCO Biosphere Reserve is the only one within the study area for the proposed development. The Biosphere covers Dublin Bay, reflecting its significant environmental, economic, cultural and tourism importance, and extends to over 300km². The Biosphere is comprised of three different management zones - the core zone, buffer zone and transition zone. The core zone comprises 50km² of areas of high natural value. Key areas include the Tolka and Baldoyle Estuaries, Booterstown Marsh, Howth Head, North Bull Island, Dalkey Island and Ireland's Eye[14]. The buffer zone surrounds the core zone and comprises 82 km^2 of public and private green spaces. It is managed to support the core zone, and the area supports research, monitoring, training, education and other environmentally sustainable activities. The transition zone is the outermost section of the Biosphere, covering 173 km^2. This zone includes residential communities, harbours, ports and industrial and commercial areas, and promotes sustainable social and economic development[15]. Protected areas within the core zone are managed for the conservation of landscapes and biodiversity, therefore the core zone of the biosphere is what is considered as part of the assessment herein.

Important Marine Mammal Areas

8.6.10 Important Marine Mammal Areas (IMMAs) are internationally recognised marine areas defined as *'discrete portion of habitat, important to marine mammal species, that has the potential to be delineated and managed for conservation'*[16] of species that satisfy one or more of the IMMA criteria as outlined by the Marine Mammal Protected Areas Task Force[17].

[14] https://www.dublinbaybiosphere.ie/about/
[15] https://www.catchments.ie/dublin-bay-unesco-biosphere/
[16] https://www.marinemammalhabitat.org/immas/#:~:text=Important%20Marine%20Mammal%20Areas%20(IMMAs,based%20protection%20and%2For%20monitoring.
[17] The Marine Mammal Protected Areas Task Force was created by the International Committee on Marine Mammal Protected Areas (ICMMPA), the International Union for Conservation of Nature's (IUCN) World Commission on Protected Areas (WCPA) Marine Vice Chair, and members of the IUCN Species Survival Commission (SSC) in 2013 to advocate for Marine Mammal Protected Areas within the IUCN and to increase the global profile of marine mammals.

8.6.11 IMMAs are not marine protected areas (MPAs) with any legal or regulatory status. However, they are areas for which an international community of scientists have assessed a credible body of evidence to demonstrate the importance of the habitat for critical life functions of marine mammals. It should be noted that IMMAs are meant to identify the habitat of a given species, not the presence of the species itself i.e. if a migratory marine mammal abandons an IMMA on a seasonal basis, the validity of that IMMAs remains unchanged because the habitat remains.

8.6.12 As of May 2024, there are a number of IMMAs that include the Irish Sea, the closest to the offshore infrastructure being Celtic Sea IMMA (Qualifying Species and Criteria: Fin whales, Minke whales and Humpback whales)[18] and Central Irish Sea IMMA (Qualifying Species and Criteria: Common bottlenose dolphin, Harbour porpoise, Risso's dolphin, Grey seal)[19]. IMMAs are identified in order to prioritise their consideration for conservation measures requiring further study and monitoring but do not have any legal or regulatory status.

European designations

8.6.13 In addition to the Natura 2000 sites which are addressed in the Habitats Directive Assessments which accompany this Planning Application, other sites designated within the study area governed by European legislation, including Salmonid Waters.

Natura 2000 Designations

8.6.14 Natura 2000 Designations consist of Special Areas of Conservation (SACs) and Special Protection Areas (SPAs). Consideration of Natura 2000 sites is required under the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011), as amended (Habitats Regulations) which transpose the EU Habitats Directive and Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds, as amended (EU Birds Directive).

8.6.15 An assessment of the potential impacts as a result of the construction, operation and decommissioning of the offshore infrastructure on European sites and their supporting features is presented in the NIS (Part 4: Habitats Directive Assessments, Volume 4: NIS).

8.6.16 SACs are prime wildlife conservation areas in the country, considered to be important on a European as well as a national level. The legal basis on which SACs are selected and designated is the EU Habitats Directive, transposed into Irish law by the Habitats Regulations.

[18] https://www.marinemammalhabitat.org/wp-content/uploads/imma-factsheets/NorthEastAtlanticOcean/Celtic-Sea-NorthEastAtlanticOcean.pdf
[19] https://www.marinemammalhabitat.org/wp-content/uploads/imma-factsheets/NorthEastAtlanticOcean/Central-Irish-Sea-NorthEastAtlanticOcean.pdf

8.6.17 SPAs are designated under the terms of the EU Birds Directive to provide the protection of listed rare and vulnerable species, regularly occurring migratory species, and wetlands (especially those of international importance). Ireland is required under the terms of the EU Birds Directive to designate SPAs for the protection of: listed rare and vulnerable species; regularly occurring migratory species; and wetlands. The marine areas include some of the productive intertidal zones of bays and estuaries that provide vital food resources for several wintering wader species including Dunlin, Knot and Bar-tailed Godwit, as well as coastal stretches of intertidal and shallow subtidal habitats which provide safe feeding and roosting habitats for waterbirds throughout the winter and migration periods.

8.6.18 While both SACs and SPAs have been identified in this chapter for completeness, neither type of designation will be considered for assessment as they will be subject to Appropriate Assessment (AA) and presented in the NIS. Due regard to relevant policy will be given within the SISAA (Part 4: Habitats Directive Assessments, Volume 3: SISAA) and NIS (Part 4: Habitats Directive Assessments, Volume 4: NIS).

8.6.19 The SISAA and NIS cover a much larger study area than is defined for the assessment of nature conservation sites herein, given the potential for connectivity with more remote sites. The Natura 2000 sites identified within the receiving environment for the NIS are:

- Special Areas of Conservation[20] (SACs) - Rockabill to Dalkey Island SAC, South Dublin Bay SAC, North Dublin Bay SAC, Baldoyle Bay SAC, The Murrough Wetlands SAC, Codling Fault Zone SAC, Wicklow Mountains SAC, Slaney River Valley SAC, River Boyne and River Blackwater SAC, Lambay Island SAC, Blackwater Bank SAC, Pen Llyn a'r Sarnau SAC, Cardigan Bay SAC, Hook Head SAC, Bunduff, Lough and Machair/ Trawalua/ Mullaghmore SAC, Kilkieran Bay and Islands SAC, Inishmore Island SAC, West Connacht Coast SAC, Kenmare River SAC, Carnsore Point SAC, Belgica Mound Province SAC, North Anglesey Marine SAC, West Wales Marine / Gorllewin Cymru Forol SAC, North Channel SAC, The Bristol Channel Approaches SAC, Roaringwater Bay and Islands SAC, Blasket Island SAC, Abers – Côte des Légendes SAC, Anse de Vauville SAC, Baie de Lancieux, Baie de l'Arguenon, Archipel de Saint Malo et Dinard SAC, Baie de Morlaix SAC, Baie de Saint-Brieuc – Est SAC, Baie du Mont Saint-Michel SAC, Banc et récifs de Surtainville SAC, Cap d'Erquy-Cap Fréhel SAC, Chausey SAC, Chaussée de Sein SAC, Côte de Granit Rose-Sept Iles SAC, Côtes de Crozon SAC, Estuaire de la Rance SAC, Mers Celtiques – Talus du golfe de Gascogne SAC, Nord Bretagne DH SAC, Ouessant-Molène SAC, Récifs et landes de la Hague SAC, Tregor Goëlo SAC; and

[20] The SACs listed are consistent with those sites screened in for potential LSE within the NIS (Part 4: Habitats Directive Assessments, Volume 4: NIS) which accompanies this EIAR.

- Special Protection Areas[21] (SPAs) - North Bull Island SPA, Dalkey Island SPA, The Murrough SPA, North-west Irish Sea cSPA, South Dublin Bay and River Tolka Estuary SPA, Howth Head SPA, Ireland's Eye SPA, Baldoyle Bay SPA, Wicklow Mountains SPA, Lambay Island SPA, Wicklow Head SPA, Skerries Islands SPA, Saltee Islands SPA, Skomer Skokholm the Seas off Pembrokeshire SPA, Grassholm SPA, Dungarvan Harbour SPA, Helvick Head and Ballyquin SPA, Blackwater Estuary SPA, Ballymacoda Bay SPA, Ballycotton Bay SPA, Rathlin Island SPA, Ailsa Craig SPA, and Old Head of Kinsale SPA.

- North Bull Island SPA, Dalkey Island SPA, The Murrough SPA, North-west Irish Sea SPA, South Dublin Bay and River Tolka Estuary SPA, Howth Head SPA, Ireland's Eye SPA, Baldoyle Bay SPA, Wicklow Mountains SPA, Lambay Island SPA, Wicklow Head SPA, Skerries Islands SPA, Saltee Islands SPA, Skomer, Skokholm the Seas off Pembrokeshire SPA, Grassholm SPA, Dungarvan Harbour SPA, Helvick Head and Ballyquin SPA, Blackwater Estuary SPA, Ribble and Alt Estuaries SPA, Ballymacoda Bay SPA, Morecambe Bay and Duddon Estuary SPA, Ballycotton Bay SPA, Rathlin Island SPA, Ailsa Craig SPA, North Colonsay and Western Cliffs SPA, Old Head of Kinsale SPA, Isles of Scilly SPA, Mingulay and Berneray SPA, Shiant Isles SPA, St Kilda SPA, Flannan Isle SPA, Handa SPA, Cape Wrath SPA, Sule Skerry and Sule Stack SPA, North Rona and Sula Sgeir SPA.

Salmonid Waters

8.6.20 Salmonid Waters are designated under S.I. No. 293/1988 - European Communities (Quality of Salmonid Waters) Regulations 1988, and also inherently protected through 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, as amended (Water Framework Directive (WFD)) which aims to protect and, where necessary, restore water bodies in order to reach good status, and to prevent deterioration. Salmonid Waters are designed with the aim of protecting and improving water quality in order to sustain populations of Atlantic salmon (*Salmo salar*), trout (*Salmo trutta*), char (*Salvelinus*), and whitefish (*Coregonus*).

8.6.21 Salmonid waters fall under the responsibility of the local authorities, who must give an explanation to the Minister for the Environment, Climate and Communications if the quality standards are not reached and impose measures that reduce pollution so that set criterion can be achieved. The River Dargle Salmonid Waters is the only river designated under the EC Regulations on Quality of Salmonid Waters within the study area[22].

National Designations

8.6.22 In addition to the internationally designated sites above, there are several designations within the study area governed by national legislation, including Natural Heritage Areas, Refuges for Fauna, Nature Reserves, Special Amenity Area Orders (SAAO), Wildfowl Sanctuaries and National Parks.

Natural Heritage Areas

[21] The SPAs listed are consistent with those sites screened in for potential LSE within the NIS (Part 4: Habitats Directive Assessments, Volume 4: NIS) which accompanies this EIAR.
[22] https://gis.epa.ie/EPAMaps/

8.6.23 The Wildlife (Amendment) Act 2000, as amended, makes legal provisions for the protection of NHAs. NHAs are areas deemed to be of special interest containing important wildlife habitat and often contain rare or threatened species. They may also be selected on the basis of their geology or geomorphology. Examples of NHAs across the country include sand dunes systems, blanket bogs and wetlands. To date there are 148 NHAs in Ireland covering primarily raised and blanket bog habitats, however there are none within the study area for the offshore components of the proposed development.

8.6.24 Additionally, 630 Proposed Natural Heritage Areas (pNHAs) were published on a non-statutory basis in 1995 to provide protection for a wider range of habitats, but have not since been statutorily proposed or designated[23],meaning that pNHAs are subject to limited protection, with the only form of protection relevant to the proposed development in the form of recognition of the ecological value of pNHAs by Planning and Licencing Authorities.

8.6.25 Since their publication in 1995, a number of these pNHAs have been statutorily designated as Natura 2000 sites (SPAs or SACs). The following pNHAs occur within the study area for the proposed development; Baldoyle Bay pNHA, Booterstown Marsh pNHA, Bray Head pNHA, Dalkey Coastal Zone and Killiney Hill pNHA, Howth Head pNHA, Ireland's Eye pNHA, North Dublin Bay pNHA, South Dublin Bay pNHA, and The Murrough pNHA.

8.6.26 Only one of these pNHAs, Dalkey Coastal Zone and Killiney Hill pNHA is scoped in for further assessment herein. The other identified sites have not been scoped in for further assessment as they are protected in principle through the Natura 2000 network, as those pNHAs are also formally designated as SPAs or SACs. The highest order of protection is deemed most relevant, therefore those pNHAs listed above which are covered by Natura 2000 designations have been fully assessed within the NIS (Part 4: Habitats Directive Assessments, Volume 4: NIS) which accompanies this EIAR.

Refuges for fauna

8.6.27 The Refuges for Fauna designation provide protection for one or more animal species present at a site. Refuges for Fauna are designated by ministerial order under Section 17 of the Wildlife Act 1976, as amended. Seven designations have been made to date on cliffs and islands to protect breeding seabird populations. The only Refuge for Fauna within the study area is the Rockabill Refuge for Fauna, which was designated under the establishment order S.I. No. 100/1988 - Refuge For Fauna (Rockabill Island) Designation Order, 1988. The same area is also designated as the Rockabill SPA and is assessed in Sections 3.8 and 3.9 of the, Benthic Ecology chapter.

Nature Reserves

8.6.28 Nature Reserves (NRs) are areas of prime importance for flora, fauna or features of geological or other special interest which is protected under Ministerial order (see section 15 of the Wildlife Act 1976, as amended). They are managed for conservation and to provide special opportunities for study or research. Most NRs are owned by the State, however, some are owned by organisations or private landowners.

[23] https://www.npws.ie/protected-sites/nha

8.6.29 All NRs are also NHAs, and some are also SACs (as assessed within the Habitats Directive Assessments which accompany the Planning Application). Two NRs are designated within the study area, the North Bull Island NR designated under establishment order S.I. No. 231 of 1988, and the Baldoyle Estuary NR designated under establishment order S.I. No. 233 of 1988.

Special Amenity Area Orders (SAAO)

8.6.30 SAAO sites are designated under the Planning and Development Act 2000 (as amended)[24] to protect outstanding landscapes, nature and amenities. Additionally, the area proposed for designation should be of outstanding natural beauty or have special recreational value, and regard is to be had to any benefits for nature conservation. There are three SAAOs identified within the study area; the Howth SAAO, designated under confirmation order S.I. No. 133 of 2000, the North Bull Island SAAO, designated under confirmation order S.I. No. 70 of 1995, and Bray Head SAAO, designated under confirmation order S.I. No. 620 of 2017. Visual amenity associated with these SAAOs is addressed within the SLVIA chapter (Volume 3, Chapter 15: Seascape, Landscape and Visual Impact Assessment).

Wildfowl Sanctuaries

8.6.31 Wildfowl Sanctuaries are designated on state or private land by statutory instrument under section 24 of the Wildlife Act 1976, as amended. Wildfowl Sanctuaries are areas that have been excluded from the 'Open Season Order[25]' so that game birds can rest and feed undisturbed. They are used to protect certain ducks, geese and wader species from hunting, with their habitats. The North Bull Island sanctuary and Broad Lough sanctuary are the only two Wildfowl Sanctuaries located within the study area and are correspondingly designated as SACs and SPAs - the North Bull Island SPA/North Dublin Bay SAC covers the North Bull Island sanctuary, and the Murrough SPA / Murrough Wetlands SAC is encapsulates the Broad Lough sanctuary (see Section 6.7 of the Ornithology chapter).

National Park

8.6.32 In 1969, the International Union for the Conservation of Nature (IUCN[26]) recommended that all governments agree to reserve the term 'National Park' to areas sharing the following characteristics[27]:

- Where one or several ecosystems are not materially altered by human exploitation and occupation; where plant and animal species, geomorphological sites and habitats are of special scientific, educational and recreational interest or which contain a natural landscape of great beauty;

[24] Please note, special amenity is covered in section 266 of the Planning and Development Act (2024) however this has not been enacted at this juncture.
[25] Open season orders identify species of wild game birds that can be hunted at certain times of the year.
[26] The IUCN s a membership Union of government and civil society organisations. created in 1948 to advance sustainable development through an international environmental network
[27] https://www.npws.ie/national-parks

- Where the highest competent authority of the country has taken steps to prevent or eliminate as soon as possible exploitation or occupation in the whole area and to enforce effectively the respect of ecological, geomorphological or aesthetic features which have led to its establishment;
- Where visitors are allowed to enter, under special conditions, for inspirational, educational, cultural and recreational purposes.

8.6.33 It is the policy of the Department of Housing, Local Government and Heritage, endorsed by successive governments, to abide by the criteria and standards for National Parks as set by the IUCN.

8.6.34 Wicklow Mountains National Park is a terrestrial National Park which was designated in 1991. It encompasses the Wicklow Mountains SAC, which has otters as one of the qualifying interests. This site has been screened into the NIS and is captured within the onshore EIAR chapters as there is a potential pathway for otters. As such, the National Park and supporting features are not repeated within this chapter. The only Marine National Park in Ireland - Páirc Náisiúnta na Mara is outside of the study area. Furthermore, it encompasses a number of important sites that are protected in practice through the designation of SACs and SPAs. As such, there are no additional regulations or restrictions being added to those sites within the limits of the National Park now that they are under National Park status.

Local Designations

8.6.35 County Geological sites (CGS') are areas of geological importance. CGS' are not a legal or statutory designation but are integrated into county development plans and are audited to accurately document the geological features present[28]. Thirteen CGS' occur along the coastline within 17 km of the array and offshore ECC) namely; Dalkey Island CGS, White Rock Killiney CGS, Killiney Bay CGS, Bray Head CGS, Greystones Beach CGS, Greystones (Appinite) CGS, Wicklow – Greystones Coast CGS, Blackrock Breccia CGS, North Bull Island CGS, Bottle Quay CGS, Claremont strand CGS, Balscaddan Bay CGS, and Irelands Eye CGS.

8.7 Future receiving environment

8.7.1 The receiving environment is not static and will exhibit some degree of natural change over time, due to naturally occurring cycles and processes. Therefore, when undertaking impact assessments, it is necessary to place any potential impacts in the context of the envelope of change that might occur naturally over the timescale of the project.

8.7.2 Impacts on the future receiving environment from physical changes include sea level rise, waves and surge and coastal flooding, rising sea temperatures. Other changes include large-scale shifts in oceanic circulation patterns and chemical changes such as increase in ocean acidification and changes to salinity levels. The resultant effects of the changing environment on marine receptors may cause alterations to ecosystem services.

[28] https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx

8.7.3 Further detail about future receiving environments relevant to Nature Conservation sites is presented in detail in the Physical Processes Chapter, Benthic Ecology Chapter and Fish and Shellfish Chapter (as listed in section 8.1).

8.7.4 Within this assessment, the Applicant has considered sites which are currently designated, or for which a formal process to designate sites has begun; for example, Marine Protected Areas (MPAs) or pNHAs. Careful assessment has, in addition, been carried out in respect of all habitats with the potential for future designation also. Accordingly, the project's offshore infrastructure has been designed with the intention of reducing the potential for environmental impacts across current and anticipated receptors.

8.8 Do-nothing environment

8.8.1 In the absence of Dublin Array being constructed, the receiving environment is unlikely to show future natural variations outside of that presented in the previous section. No alterations to the receiving environment are anticipated to impact the sites described above.

8.9 Defining the sensitivity of the baseline

8.9.1 The sensitivity of the receptors for each potential effect, using the criteria outlined in Section 8.1, are presented in Section 8.14 (construction phase of development), Section 8.15(O&M phase) and Section 8.16 (decommissioning phase).

8.10 Uncertainties and technical difficulties encountered

8.10.1 The consideration of nature conservation draws on the information presented within the chapters listed in Section 8.1 (Physical Processes, MW&SQ, Benthic and Intertidal Ecology, Fish and Shellfish, Ornithology and Marine Mammal chapters) and is therefore subject to the uncertainties and technical difficulties described therein. Some notable potential uncertainties identified are as follows:

- The site synopses' outlining the Qualifying Interests for a number of Proposed Natural Heritage Areas (pNHA) are not available or identified on the NPWS protected sites map-viewer[29]. An archive of the Site Synopses for pNHAs can be downloaded from NPWS, however it notes that the 'synopses are based in many cases on old survey data and may not accurately reflect the status of the site at the current time'. Those sites within the study area for the proposed development that no longer have a pNHA site synopses available from the archive are in the same location as corresponding SACs and/or SPAs. Therefore, for the purpose of this assessment it is assumed that the qualifying interests of the pNHAs reflected those now protected under the Natura 2000 designations. On this basis, any impacts on these pNHA sites from the offshore infrastructure are inherently considered under the SPA or SAC assessments presented in the SISAA and NIS, and are therefore not repeated within this chapter.

[29] https://www.npws.ie/protected-sites, accessed January 2025

- As defined within the Physical Processes chapter and Physical Processes Modelling Report a series of potential sediment release scenarios have been modelled and considered. . Together, these scenarios capture the worst-case impacts in terms of the highest concentration suspended sediment plumes, the most persistent suspended sediment plumes, the maximum changes, s in bed level elevation and the greatest spatial extent of change in bed level. Therefore, whilst the exact volumes and tidal states are unknown, the modelling scenarios are precautionary (see section 8.12), and any impacts will be within the limits of the assessment and modelling. The impacts on nature conservation sites have been informed by the project specific modelling.

8.11 Scope of the assessment

8.11.1 To define the scope of the assessment the nature conservation sites within the ZoI of offshore infrastructure (as defined within each technical assessment chapter of the EIAR), see section 8.1 are first identified, along with their associated qualifying interests. Those sites scoped in represent sites that occur within the ZoI of the offshore works but that have not been assessed in depth within the NIS. Potential impacts are then scoped in/out based on the sensitivity of the identified qualifying interests to the potential impacts, using expert judgment.

8.11.2 The species and habitats for which the nature conservation sites are designated are identified in section 8.6 are listed in Annex B of this chapter.

Scoped Out

8.11.3 Potential impacts from the offshore infrastructure on the Natura 2000 SACs and SPAs identified in Section 8.6 are assessed within the NIS (Part 4: Habitats Directive Assessments, Volume 4: NIS) and are therefore not repeated within this chapter.

8.11.4 MPAs have international designation, however, no legislation is currently used in Ireland to legally underpin protected areas established to fulfil commitments under international conventions. The only OSPAR MPA local to the study area (i.e. within 17km of the development) is North Dublin Bay SAC. However, as this MPA is also an SAC, affording it protection under the EU Habitats Directive, it is fully assessed in the NIS. On this basis, any impacts on OSPAR MPAs from offshore infrastructure are inherently considered under the SPA or SAC assessments presented in the NIS and are therefore not repeated within this chapter.

8.11.5 NHAs were scoped out for assessment herein as there is no such designation in the study area of the offshore works.

8.11.6 The Bray Head pNHA is designated for onshore ecological features above MHW (vegetated sea cliffs of the Atlantic and Baltic coasts and European dry heaths), and therefore there is no identifiable impact pathway for this site from activities within the marine environment. This site will be assessed within Volume 5, Chapter 2: Biodiversity Chapter of the EIAR and are therefore scoped out of this assessment.

8.11.7 In addition, Baldoyle Bay pNHA, Howth Head pNHA, Ireland's Eye pNHA, North Dublin Bay pNHA, South Dublin Bay pNHA and the Murrough pNHA have also been scoped out for assessment as they are covered by corresponding SACs and SPAs. Of note, the pNHA site synopses are not available at the time of writing the EIAR for these sites from NPWS. An archive of the Site Synopses for pNHAs can be downloaded from NPWS, however it notes that the *'synopses are based in many cases on old survey data and may not accurately reflect the status of the site at the current time'*[30].Given each of the aforementioned pNHAs are in the same location as corresponding SACs and SPAs. As such, it is assumed that the qualifying interests of the pNHAs reflected those now protected under the Natura 2000 designations. On this basis, any impacts on these pNHA sites from the offshore infrastructure are inherently considered under the SPA or SAC assessments presented in the AA Screening and NIS and are therefore not repeated within this chapter.

8.11.8 The only Refuge for Fauna within the study area is the Rockabill Island Refuge for Fauna, which was designated under the establishment order S.I. No. 100 of 1988. The Order designates Rockabill Island as a refuge for Roseate tern. The Order specifies the measures to be taken for the protection of this species of fauna. Since the sites designation as a refuge for fauna in 1988, the island and surrounding waters were designated as an SPA in 2012 under the European Communities (Conservation of Wild Birds (Rockabill Special Protection Area 004014)) Regulations 2012 (S.I. No. 94/2012). Rockabill SPA lists Roseate tern as a qualifying interest for protection under the EU birds directive. On this basis, any impacts on this Refuge for Fauna and the species that utilise it, from the offshore infrastructure are inherently considered under the SPA assessments presented in the AA Screening and NIS, and are therefore not repeated within this chapter.

8.11.9 The wildfowl sanctuaries identified within the study area are North Bull Island and Broad Lough Wildfowl Sanctuaries. These sites are protected in practice through the designation of corresponding SACs and SPAs i.e. North Bull Island SPA/SAC and The Murrough SPA and the Murrough Wetlands SAC, as the sites are the same in terms of location and features. Potential impacts from the offshore infrastructure on SACs and SPAs are assessed within the NIS (Part 4: Habitats Directive Assessments, Volume 4: NIS). Furthermore, the purpose of these wildfowl sanctuaries is to provide an area for game birds to rest and feed undisturbed onshore. As such any onshore impacts from Dublin Array on these sites will be assessed within the onshore volumes of this EIA. On this basis, any impacts on Wildfowl Sanctuaries are not repeated within this chapter.

8.11.10 Three SAAOs are identified within the study area, the Howth Head SAAO, the North Bull Island SAAO and the Bray Head SAAO. These sites are designated for onshore features that lie above MHWM and are therefore scoped out of the offshore assessment as there is no identifiable impact pathway on these sites from activities within the marine environment. Potential impacts to visual amenity associated with these SAAOs is addressed within the Seascape, Landscape and Visual Impact Assessment (SLVIA) Chapter (Volume 3, Chapter 15).

[30] https://www.npws.ie/protected-sites/nha

8.11.11 The only Marine National Park in Ireland - Páirc Náisiúnta na Mara is outside of the study area. Wicklow Mountains National Park is a terrestrial National Park designated in 2024. It encompasses the Wicklow Mountains SAC, which has otters as a qualifying interest. This has been screened into the NIS and onshore EIAR chapters as there is a potential pathway for otters. As such, the National Park and supporting features are not repeated within this chapter.

8.11.12 Of the IMMAs identified, none overlap with the study area for the offshore components of the proposed development. Furthermore, IMMAs are not marine protected areas (MPAs) with any legal or regulatory status. In addition, the IMMAs identified around Ireland encompass a number of important sites that are protected in practice through the designation of SACs and SPAs. Therefore, IMMAs are not considered further within this chapter as protected marine mammal species are considered within the SISAA (Part 4: Habitats Directive Assessments, Volume 3: SISAA) and NIS (Part 4: Habitats Directive Assessments, Volume 4: NIS).

8.11.13 To summarise, the following nature conservation sites have therefore been scoped out, or assessed within the NIS and are therefore not considered within this chapter:

- OSPAR MPAs;
- European Sites (SAC and SPAs);
- NHAs;
- pNHAs - Bray Head pNHA, Howth Head pNHA Baldoyle Bay pNHA, Ireland's eye pNHA, North Dublin Bay pNHA, South Dublin Bay pNHA, and the Murrough pNHA;
- Refuges for Fauna (Rockabill); and
- Wildfowl Sanctuaries;
- SAAOs;
- Marine National Park; and
- IMMAs.

Scoped In

8.11.14 The following nature conservation sites have been scoped in for assessment (See Figure 1)

- Salmonid Waters (River Dargle);
- Nature Reserves (Baldoyle Estuary and North Bull Island);
- pNHAs (Dalkey Coastal Zone and Killiney Hill pNHA);

- Ramsar sites [31] (Baldoyle Bay, North Bull Island, and Sandymount Strand / Tolka Estuary);
- UNESCO Biosphere Reserve (Dublin Bay); and
- County Geological Sites (CGS').

8.11.15 Of the identified nature conservation sites, qualifying interests for migratory fish, birds, benthic habitats and geological features were identified. Taking these into consideration, and applying expert judgement based on knowledge of feature sensitivities, the following impacts have been scoped in for assessment:

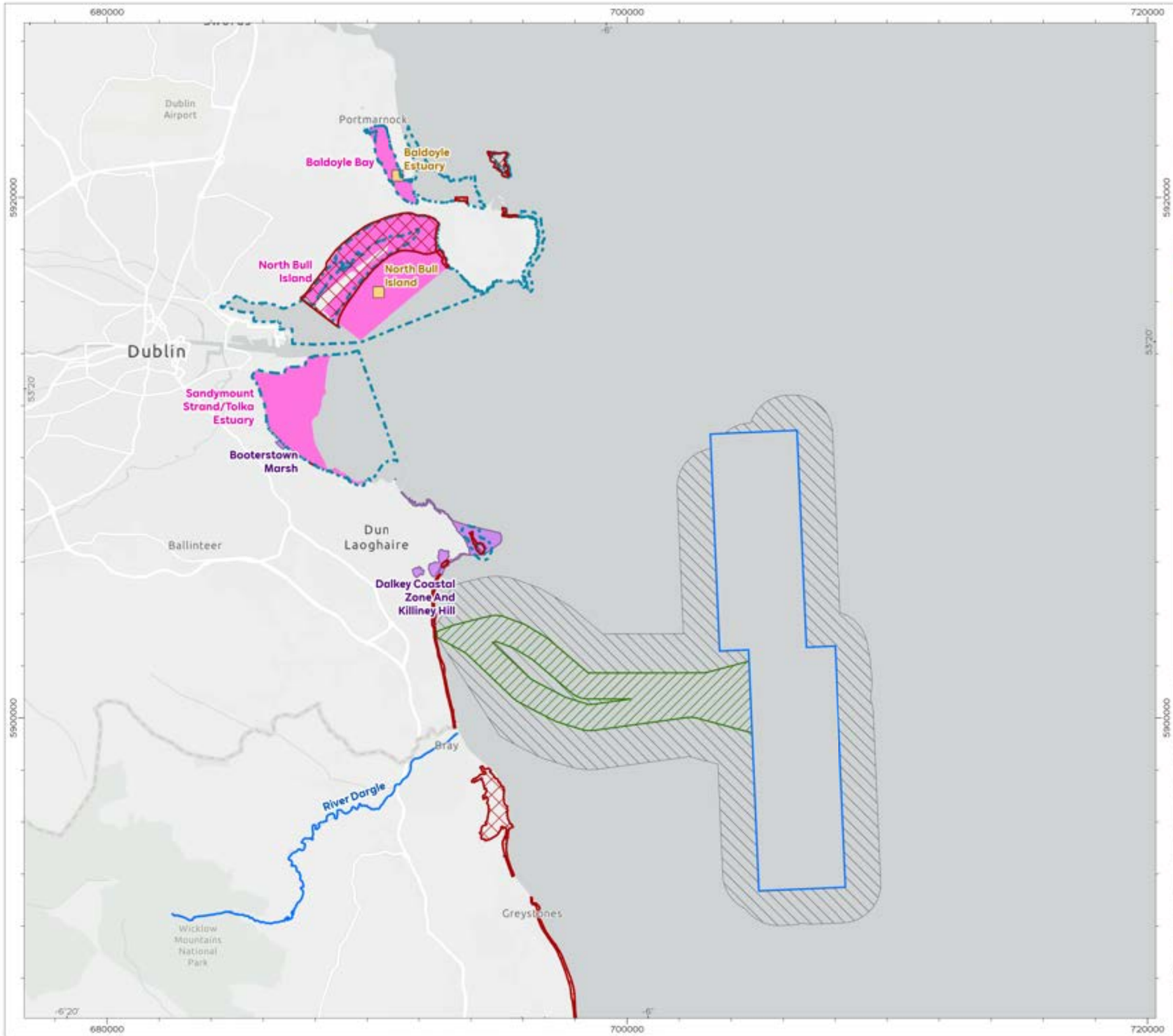
8.11.16 The impacts that will be assessed are detailed in Table 6.

Table 6 Potential impacts considered within the fish and shellfish ecology assessment

Potential impact / change	Impact	Corresponding Assessment Chapter
Construction		
Temporary increases in Suspended Sediment Concentration and deposition from construction activities on benthic features	Impact 1	Benthic Ecology. chapter, See impact 1 therein.
Temporary increases in Suspended Sediment Concentration and deposition in the offshore ECC from construction activities on mobile features	Impact 2	Fish and Shellfish chapter. See impact 1 therein.
Underwater noise disturbance to migratory fish	Impact 3	Fish and Shellfish chapter. See impact 4 therein.
Disturbance and displacement of birds	Impact 4	Ornithology chapter. See impact 1, impact 2, impact 3 and impact 4 therein.
Changes to coastal geological features arising from construction activities	Impact 5	Physical Processes chapter. See impact 2 therein.
Operation and Maintenance (O&M)		
Changes to benthic habitats arising from effects on physical processes, including changes in the sediment transport and hydrodynamic and wave regimes	Impact 6	Benthic Ecology chapter. See impact 12 therein.
Disturbance and displacement of birds	Impact 7	Ornithology chapter. See impact 5, impact 6, impact 7, and impact 8 therein.
Potential for bird collisions with the offshore infrastructure	Impact 8	Ornithology chapter. See impact 9 therein.
Changes to coastal geological features arising from construction activities	Impact 9	Physical Processes chapter. See impact 4 therein.
Decommissioning		

[31] The listed Ramsar sites are part of the European designation for SPA sites in the same location. Therefore, the assessment of most qualifying features of the Ramsar sites is undertaken as part of the assessment of potential impacts on European sites within the NIS (Part 4: Habitats Directive Assessments, Volume 4: NIS). However, Zostera noltii beds, and sandflats are a qualifying feature of these Ramsar sites not directly covered by the European site, therefore the Ramsar sites are partially screened in for Zostera noltii beds, and sandflats only.

Potential impact / change	Impact	Corresponding Assessment Chapter
Temporary increases in Suspended Sediment Concentration and deposition from decommissioning activities on benthic features	Impact 10	Benthic Ecology chapter. See impact 14 therein.
Temporary increases in Suspended Sediment Concentration and deposition from decommissioning activities on mobile features	Impact 11	Fish and Shellfish chapter. See impact 12 therein.
Underwater noise disturbance to migratory fish	Impact 12	Fish and Shellfish chapter. See impact 15 therein.
Disturbance and displacement of birds	Impact 13	Ornithology chapter. See impact 10, impact 11, impact 12, and impact 13 therein.
Changes to coastal geological features arising from decommissioning activities	Impact 14	Physical Processes chapter. See impact 6 therein.
Cumulative		
Temporary increases in SSC and deposition from construction activities on benthic features	Effect 15	Benthic Ecology chapter. See impact 19 therein.
Temporary increases in SSC and deposition from construction activities on mobile features	Effect 16	Fish and Shellfish chapter. See Effect 16 therein.
Underwater noise disturbance to migratory fish	Effect 17	Fish and Shellfish chapter. See Effect 18 therein.
Disturbance and displacement of birds	Effect 18	Ornithology chapter. See impact 10, impact 11, impact 12, and impact 13 therein.
Potential for bird collisions with the offshore infrastructure	Effect 19	Ornithology chapter. See impact 10, impact 11, impact 12, and impact 13 therein.
Changes to coastal geological features arising from effects on physical processes	Effect 20	Physical Processes chapter. See impact 4 therein.



- Array Area
- Temporary Occupation Area
- Export Cable Corridor
- Proposed Natural Heritage Areas
- RAMSAR Sites
- Geoheritage Audited Sites
- UNESCO Biosphere Reserve (Dublin Bay) Core Zone
- Salmonid Waters
- Nature Reserve

DRAWING STATUS

FINAL

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PROJECT TITLE

Dublin Array

DRAWING TITLE

Nature Conservation Sites Scoped in for Assessment

DRAWING NUMBER: **1**

PAGE NUMBER: **1 of 1**

VER	DATE	REMARKS	DRAW	CHEK	APRD
01	2024-06-10	For Issue	GB	BB	SS

SCALE 1:100,000 PLOT SIZE A3

DATUM WGS 1984 VERTICAL REF LAT

PROJ WGS 1984 UTM Zone 29N

GoBe APEM Group

Dublin Array Generation for generations

Kish Offshore Wind Limited - Bray Offshore Wind Limited

8.12 Key parameters for assessment

8.12.1 As set out in the Application for Opinion under Section 287B of the Planning and Development Act 2000, flexibility is being sought where details or groups of details may not be confirmed at the time of the Planning Application. In summary, and as subsequently set out in the ABP Opinion on Flexibility (detailed within Volume 2, Chapter 3: EIA Methodology) the flexibility being sought relates to those details or groups of details associated with the following components (in summary - see further detail in see Volume 2, Chapter 6: Project Description):

- WTG (model – dimensions and number);
- OSP (dimensions);
- Array layout;
- Foundation type (WTG and OSP; types and dimensions and scour protection techniques); and
- Offshore cables (IAC and ECC; length and layout).

8.12.2 To ensure a robust, coherent, and transparent assessment of the proposed Dublin Array project for which development consent is being sought under section 291 of the Planning Act, the Applicant has identified and defined a Maximum Design Option (MDO) and Alternative Design Option(s) (ADO) for each environmental topic/receptor. The MDO and ADO have been assessed in the EIAR to determine the full range and magnitude of effects, providing certainty that any option within the specified parameters will not give rise to environmental effects more significant than that which could occur from those associated with the MDO. The extent of significant effects is therefore defined and certain, notwithstanding that not all details of the proposed development are confirmed in the application.

8.12.3 The range of parameters relating to the infrastructure and technology design allow for a range of options in terms of construction methods and practices, which are fully assessed in the EIAR. These options are described in the project description and are detailed in the MDO and ADO tables within each offshore chapter of the EIAR. This ensures that all aspects of the proposed Dublin Array project are appropriately identified, described and comprehensively environmentally assessed.

8.12.4 In addition to the details or groups of details associated with the components listed above (where flexibility is being sought), the confirmed design details and the range of normal construction practises are also assessed within the EIAR (see the Project Description Chapter). Whilst flexibility is not being sought for these elements (for which plans and particulars are not required under the Planning Regulations), the relevant parameters are also incorporated into the MDO and alternative option(s) table (Table 10) to ensure that all elements of the project details are fully considered and assessed.

8.12.5 With respect to project design features where flexibility is not being sought, such as trenchless techniques for cable installation methodology at the landfall, the MDO and alternative design option(s) are the same (as there is no alternative). With respect to the range of normal construction practises that are intrinsic to installation of the development, such as the nature and extent of protection for offshore cables and the design of cable crossings, but which cannot be finally determined until after consent has been secured and detailed design is completed, the parameters relevant to the receptor being assessed are quantified, assigned and assessed as a maximum and alternative, as informed by the potential for impact upon that receptor. In the event of a favourable decision on the Planning Application they will be agreed prior to the commencement of the relevant part of the development by way of compliance with a standard 'matters of detail' planning condition (see Volume 2, Chapter 2: Consents, Legislation, Policy and Guidance). Throughout, an explanation and justification is provided for the MDO and alternative(s) within the relevant tables, as it relates the details or groups of details where statutory design flexibility is being sought, and wider construction practises where flexibility is provided by way of planning compliance condition.

8.12.6 This assessment draws upon the assessments of various technical impacts presented in other chapters of this EIAR. Therefore, the appropriate MDO and ADO defined for each technical assessment will be utilised in this chapter. The MDO for each receptor type is therefore detailed in the relevant chapters, as listed:

- Physical Processes chapter;
- Benthic Ecology chapter;
- Fish and Shellfish chapter; and
- Ornithology chapter.

8.13 Project Design Features and Avoidance and Preventative Measures

8.13.1 As outlined within the EIA Methodology Chapter and in accordance with the EPA Guidelines (2022), this EIAR describes the following:

- Project Design Features: These are features of the Dublin Array project that were selected as part of the iterative design process, which are demonstrated to avoid and prevent significant adverse effects on the environment in relation to nature conservation. These are presented within Table 7.
- Other Avoidance and Preventative Measures: These are measures that were identified throughout the early development phase of the Dublin Array project, also to avoid and prevent likely significant effects, which go beyond design features. These measures were incorporated in as constituent elements of the project, they are referenced in the Project Description chapter of this EIAR and they form part of the project for which development consent is being sought. These measures are distinct from design features and are found within our suite of management plans. These are also presented within Table 7.

- Additional Mitigation: These are measures that were introduced to the Dublin Array project after a likely significant effect was identified during the EIA assessment process. These measures either mitigate against the identified significant adverse effect or reduce the significance of the residual effect on the environment. The assessment of impacts is presented in Sections 8.14, 8.15 and 8.16 of this EIAR chapter.

8.13.2 All measures are secured within Volume 8, Chapter 2: Schedule of Commitments.

8.13.3 Where additional mitigation is identified as being required to reduce the significance of any residual effect in EIA terms, this is presented in Sections 8.14, 8.15 and 8.16.

Table 7 Project Design Features and Avoidance and Preventative Measures relating to nature conservation sites

Project Design Features / other avoidance and preventative measures	Where secured
Use of trenchless technology at landfall, cables will be installed by trenchless installation technique beneath the intertidal zone and cliffs at landfall. Exit pits will be located within the offshore ECC seaward of the Mean Low Water (MLW) at a point/depth where cable installation vessels can operate. No cable protection will be used inshore of the exit pits. During excavation of the exit pits, material will be stored to minimise loss of sediment as far as is reasonably practicable.	Outlined in the Project Description Chapter (Volume 2, Chapter 6).
Backfill of sediment trenches where IACs are to be installed perpendicular to the Kish and Bray Banks, requiring trenching works across the banks. Whilst the trenches are open sediment will be stored temporarily alongside the trench and utilised as backfill material. Measures will be taken to ensure sediment is not lost prior to backfilling including minimising the duration of time the material is stored and the distance the deposited material is located from the excavated trench.	Outlined in the Project Description Chapter.
During the lifetime of the project the Applicant and its contractors will comply with all measures outlined in the Marine Biosecurity Plan to include: ▪ All vessels of 400 gross tonnage (gt) and above to be in possession of a current international Anti-fouling System (AFS) certificate; ▪ Details of all ship hull inspections and biofouling management measures be documented by the Contractor; and ▪ All vessels to be compliant (where applicable) with the International Convention for the Control and Management of Ships' Ballast Water and Sediments (IMO Convention, developed and	The PEMP includes details of the Marine Biosecurity plan that details requirements and relevant legislation.

Project Design Features / other avoidance and preventative measures	Where secured
adopted by the International Maritime Organisation (IMO).	
Waste management and disposal arrangements - the developer will dispose of sewage and other waste in a manner which complies with all regulatory requirements, including but not limited to the IMO MARPOL requirements.	The PEMP includes provision for waste management and disposal arrangements compliant with relevant legal obligations.
Installation of cables to an optimum cable burial depth - offshore cables will, where possible, be buried in the seabed to the optimal performance burial depth for the specific ground conditions. Where optimum burial depth cannot be achieved secondary protection measure will be deployed e.g. concrete mattress, rock berm, grout bags or an equivalent in key areas.	Project Description chapter details the requirement for a Cable Installation Plan (CIP) and Cable Burial Risk Assessment (CBRA) which will be developed upon award of consent and in advance of construction. The CIP and CBRA will provide information on the installation plan for subsea cables. The CBRA, will provide a risk assessment and evaluation for cable protection, unburied or shallow buried cables. The CIP will detail pertinent mitigation measures to be used during cable installation and will be applied throughout the construction phase. The CIP and CBRA will be submitted to the consenting authority in advance of construction phase. "
Applicant will implement the following, in line with the Sea Pollution Act 1991 and MARPOL convention and other similar binding rules and obligations imposed on ship owners and operators by inter alia the International Maritime Organisation as relevant:: ▪ Marine Pollution Contingency Plan to cover accidental spills, potential contaminant release and include key emergency contact details (e.g., the Irish Coast Guard (IRCG) and will comply with the National Maritime Oil/ HNS Spill Contingency Plan (IRCG, 2020) . Measures include Storage of all chemicals in secure designated areas with impermeable bunding (up to 110% of the volume); and double skinning of pipes and tanks containing hazardous materials to avoid contamination.	The PEMP includes measures outlined within the Marine Pollution Contingency Plan compliant with relevant legal obligations and frameworks.
A code of conduct will be implemented by all vessel operators when encountering marine species. In addition, vessel movements to and from construction sites and ports will, where feasible, follow existing routes. While these measures are primarily targeted towards marine mammals and birds at sea, they would equally reduce the risk of injury and disturbance to marine turtles and other larger mobile receptors, such as basking sharks.	The PEMP incorporates all measures within an environmental Vessel Management Plan While these measures are primarily targeted towards marine mammals and birds at sea, they would equally reduce the risk of injury and disturbance to marine turtles and other larger mobile receptors, such as basking sharks.
Disposal of spoil from TSHD generate by seabed preparation (for foundations and cables) works	Outlined in the Project Description Chapter.

Project Design Features / other avoidance and preventative measures	Where secured
to be redeposited in the project area within areas of similar sediment type, and in areas where current speeds are such that dredged material would be redistributed into the sediment transport system.	
Impact piling of a single pile will occur at any one time, i.e. no simultaneous impact piling will occur.	Outlined in the Project Description Chapter.
Procedures for impact piling, will include: ▪ Implementation of a 1000m mitigation zone; ▪ Pre-piling Marine Mammal Observer (MMO) watches; ▪ pre-piling Passive Acoustic Monitoring (PAM) (if required to supplement the MMO); ▪ Acoustic Deterrent Device (ADD), as an additional mitigation tool prior to the start of piling activities at night; ▪ Soft start procedure; and ▪ Breaks in piling procedure.	Outlined within the MMMP. The MMMP has been developed to comply with all relevant guidance, specifically NPWS, (2014); DAHG (2014); IDWG (2020) The use of soft start procedure allows fish and shellfish receptors to vacate the area before sound energy levels reach levels where lethal or sublethal effects may occur.
The Applicant commits to the implementation of at-source noise mitigation methods (e.g. bubble curtains, casings, resonators) to reduce the source level of the underwater noise from pile driving by at least 10 decibels (dB).	Outlined within the Project Description chapter with further details relevant to marine mammals within the MMMP.
Procedures for UXO detonation will include: ▪ Implementation of a mitigation zone of 1000 m; ▪ Pre-detonation MMO and PAM; ▪ Soft start charges; ▪ Use of bubble curtains for high clearance UXO; and ▪ Post detonation searches.	Outlined within the MMMP. The MMMP has been developed to comply with all relevant guidance, specifically NPWS, (2014); DAHG (2014); IDWG (2020).
Scour protection measures, options include rock protection or concentrated mattresses, flow energy dissipation devices, protective aprons or bagged solutions.	Project Description chapter sets out the methods for scour protection and outlines the requirement for a Scour Protection Management Plan (SPMP) developed prior to construction for all offshore infrastructure which will include details of the need, location, type, quantity and installation methods for scour protection which will be undertaken in accordance with the design options, quantities & methods outlined the Project Description.
Minimum WTG blade clearance of 28m above MHWS (31.6 LAT) (exceeds minimum requirement of 22m).	Outlined within the Project Description Chapter.

8.14 Environmental assessment: construction phase

8.14.1 The effects of the construction of the offshore infrastructure on the nature conservation sites within the study area have been assessed in accordance with the methodology as defined in section 8.4.

8.14.2 A description of the significance of effects upon nature conservation sites caused by each identified impact is provided below. An assessment of the qualifying interests of Natura 2000 sites is undertaken within the NIS.

Impact 1: Temporary increases in Suspended Sediment Concentration and deposition from construction activities on benthic features

8.14.3 Increases in suspended sediment will arise from construction activities that interact with the seabed, namely dredging prior to foundation installation, foundation and cable installation, sand bank crossing and trenchless installation at landfall. For benthic habitats and species, the MDO for increases in SSC would result in the largest seabed footprint thus greatest volumes of SSC generated from construction activities, This is represented by the largest volume of fine sediments released into the water column over the shortest interval which then has the potential for greatest SSC within a plume that advects away from the point of discharge.

8.14.4 Other construction activities undertaken within the array area and Offshore ECC, namely the use of jack-up vessels and anchors during the construction, O&M, and decommissioning phases have been screened out within the Physical Processes Chapter) for suspended sediment and deposition with their use not resulting in notable changes in SSC. Similarly, associated sediment deposition will result in the suspension of very small sediment volumes close to the seabed, which will rapidly settle from suspension within the immediate area. Jack-up legs may result in seabed indentations, these features will be highly localised and short-term, with depressions expected to be subject to natural infill processes once the leg is removed as evidenced in several established offshore windfarm sites in the UK where the seabed recovers quickly from jack-up leg indentations in areas characterised by mobile sands (DECC, 2008). As such, all proposed works undertaken with in the temporary occupation area are not considered further here.

8.14.5 This assessment should be read in conjunction with the Physical Process Chapter and the Physical Process Modelling Report which provide a full description of the offshore physical environment assessment (including project specific modelling of sediment plume dynamics), which defines the maximum sediment plume distances and peak increases in SSC and deposition that will occur because of construction activities.

8.14.6 As identified within the Physical Processes Modelling Report, sediment plumes caused by seabed preparation and installation activities along the offshore ECC are expected to be restricted to approximately 2 km from the point of release. Sediment plumes caused by seabed preparation and installation activities within the array area are anticipated to be restricted to 10 km from the works.

8.14.7 Plumes containing coarser sediment fractions will fall quickly to the seabed and will not form part of any lasting sediment plume, typically fall out of suspension in the order of minutes Any wider dispersion of finer sediments will reduce quickly over time (within 24 hours) to background levels (5 mg/l). Sediment deposition will consist primarily of coarser sediments deposited close to the source, with a small proportion of finer silt deposition (reducing exponentially from source).

8.14.8 The sites scoped in for assessment within Section 8.11 which are located over 2 km from the offshore ECC and over 10km from the offshore infrastructure area are not considered to have the potential to be subject to impacts from increased SSCs from works along the offshore ECC or works within the array area. As such, the following sites were scoped out for impacts from increases in SSC on benthic features:

- Salmonid Waters (River Dargle);
- Nature Reserves (Baldoyle Estuary and North Bull Island);
- pNHAs (Booterstown Marsh pNHA);
- Ramsar sites (Baldoyle Bay, North Bull Island, and Sandymount Strand / Tolka Estuary);
- UNESCO Biosphere Reserve (Dublin Bay); and
- County Geological Sites (CGS').

8.14.9 The magnitude of impact is assessed within Table 8 below.

8.14.10 Only Dalkey Coastal Zone and Killiney Head pNHA was scoped in for assessment (see section 8.11) which is located within 2 km of the offshore ECC and within 10 km of the array area, and is therefore potentially subject to impacts from increased SSCs from construction works along the offshore ECC.

8.14.11 The sensitivity of the scoped in site for this impact is assessed in Table 9 below.

Table 8 Determination of magnitude of temporary increases in SSC and sediment deposition

Definition	Maximum design option	Alternative design options
Extent	The temporary impact of increased SSC and deposition from construction activities are modelled to be restricted to the near field (within the temporary occupation area, array area or offshore ECC and the adjacent areas of the far-field (within one spring tidal cycle).	In line with the maximum design option, impacts restricted to the near field and adjacent areas of the far field however the increase in SSC will be less given the alternative design options include the potential for fewer locations requiring seabed preparation.
Duration	The impact will be restricted to the construction phase of the project and will therefore be short-term 30 months), although works in any given discrete location within the project boundary will be temporary (less than one year).	In line with the maximum design option but construction phase limited to a minimum of 18 months and a mid of 24 months

Definition	Maximum design option	Alternative design options
Frequency	The impact will occur frequently in discrete areas throughout the construction phase of the development.	in line with the maximum design option, however the impact will occur less frequently.
Probability	The impact upon the subtidal benthic habitats can reasonably be expected to occur.	In line with the maximum design option
Consequence	Modelling predicts the sediment plumes will quickly dissipate after cessation of the activities, due to settling and wider dispersion and the concentrations will reduce quickly over time to background levels. Sediment deposition will consist primarily of coarser sediments deposited close to the source, with a small proportion of silt deposition (reducing exponentially from source). Therefore, the consequence will be barely discernible to noticeable change in concentrations and deposition occurring during the construction phase within the near-field and the adjacent areas of the far-field.	In line with the maximum design option, however the increase in SSC will be less.
Overall magnitude	*The potential magnitude of the predicted changes is rated as **Low.***	*The potential magnitude of the predicted changes is rated as **Low.***

Table 9 Determination of sensitivity of the Dalkey Coastal Zone and Killiney Hill pNHA to temporary increases in SSC and sediment deposition

	Justification
Context	**Tolerance:** The site represents a fine coastal system with habitats ranging from the sub-littoral to coastal heath, and supporting various coastal invertebrate species (squat lobsters, swimming crabs, crawfish, nudibranchs and Spiny Starfish). These species inhabit the intertidal area and are therefore naturally exposed to increased turbidity due to runoff and re-suspension of sediment by wave and tidal action. These species are therefore of high tolerance to temporary increases in SSC and sediment deposition. **Recoverability** The intertidal species of value to this site are expected to recover quickly from temporary increases in SSC and sediment deposition.
Value	The Dalkey Coastal Zone and Killiney Hill pNHA is a European designated nature conservation site and is therefore considered to be of medium value.
Overall sensitivity	The potential sensitivity of the Dalkey Coastal Zone and Killiney Hill pNHA site is rated as **Medium**.

8.14.12 The magnitude of the impact has been assessed as **Low for both the MDO and the alternative design options**, with the maximum sensitivity of the nature conservation site being **Medium**. Therefore, the significance of effect from direct disturbance and damage to Nature conservation sites is a **Slight Adverse** impact, which is not significant in EIA terms.

8.14.13 The alternative design options (any other option within the range of parameters set out in the project description) will not give rise to an effect which is more significant than the maximum design option.

Residual effect

The significance of effect from impacts to nature conservation sites from increased sediment deposition is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 7 is considered necessary. Therefore, ***no significant adverse residual effects*** *have been predicted in respect of nature conservation sites.*

Impact 2: Temporary increases in Suspended Sediment Concentration and deposition in the offshore ECC from construction activities on fish

8.14.14 As for Impact 1, increases in suspended sediment will arise from construction activities that interact with the seabed, namely dredging prior to foundation installation, foundation and cable installation, sand bank crossing and trenchless installation at landfall. For fish species, the MDO for increases in SSC would result in the largest seabed footprint thus greatest volumes of SSC generated from construction activities, This is represented by the largest volume of fine sediments released into the water column over the shortest interval which then has the potential for greatest SSC within a plume that advects away from the point of discharge.

8.14.15 Temporary localised increases in SSC and associated sediment deposition within the intertidal area are expected from cable installation works. This assessment should be read in conjunction with the Physical Process chapter and the Physical Processes Modelling Report which provides a full description of the offshore physical environment assessment and project specific modelling of sediment plume dynamics).

8.14.16 As defined under Impact 1, the magnitude of impact for temporary increases in SSC and deposition is Low for both the MDO and alternative design options.

8.14.17 The only site designated for mobile features, that lies within the maximum sediment plume extent, and therefore has the potential to be subject to impacts from increased SSC, is the River Dargle Salmonid River. This site is designated for Atlantic Salmon, pollan, schelly, char, rainbow trout, brook trout, and sea trout. Of these species, only salmon, and sea trout have migratory tendencies, and therefore have the potential to transit through the offshore infrastructure and the wider ZoI. Increased SSC has the potential to impede the passage of migratory fish through temporary barrier effects. Both Atlantic salmon and sea trout are anadromous species, spawning in the freshwater and migrating to the sea as juveniles. Both species return to their natal areas to spawn.

8.14.18 The following sites were scoped out for impacts from increases in SSC on mobile features:

- Nature Reserves (Baldoyle Estuary and North Bull Island);
- pNHAs (Booterstown Marsh pNHA, Dalkey Coastal Zone and Killiney Head pNHA);
- Ramsar sites (Baldoyle Bay, North Bull Island, and Sandymount Strand / Tolka Estuary);
- UNESCO Biosphere Reserve (Dublin Bay); and
- County Geological Sites (CGS').

8.14.19 The sensitivity of the River Dargle Salmonid River and its associated features to this impact are assessed in Table 10 below.

Table 10 Determination of sensitivity of the River Dargle Salmonid River to temporary increases in SSC and sediment deposition

	Justification
Context	**Tolerance:** Migratory species such as salmon and sea trout may be at risk of temporary barrier effects which might impede migration in the very short term. Due to the localised and temporary nature of the predicted changes in SSC and sediment deposition as a worst case these impacts may result in a temporary delay in migration for the duration of the plume. A study by Carlson *et al*. (2001) documented the behavioural responses of salmonids to dredging activities and observed avoidance responses of migrating salmon upon encountering the sediment plume. Migratory species are therefore considered to be of low tolerance to SSC plumes. **Recoverability** Migratory species are expected to be able to continue their migration during interim periods between the seabed preparation works, as recognised in a study by Carlson *et al*. (2001), whereby migrating salmon were observed to return to their pre disturbance distribution t a short time after encountering dredging activity and associated sediment plumes. Therefore, recoverability of migrating species is anticipated to be high.
Value	The River Dargle Salmonid River site is a European designated nature conservation site and is therefore considered to be of medium value.
Overall sensitivity	The potential sensitivity of the River Dargle Salmonid River is rated as **Medium**.

8.14.20 The magnitude of the impact has been assessed as **Low for both the MDO and alternative designs**, with the maximum sensitivity of the nature conservation sites being **Medium**. Therefore, the significance of effect from direct disturbance and damage to Nature conservation sites is **Slight Adverse** impact, which is not significant in EIA terms.

8.14.21 The alternative design options (any other option within the range of parameters set out in the project description) will not give rise to an effect which is more significant than the maximum design option.

Residual effect

The significance of effect from impacts to nature conservation sites from increased sediment deposition is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 7 is considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of nature conservation sites.

Impact 3: Underwater noise disturbance to migratory fish

8.14.22 Underwater noise from the project will arise during the construction phase, primarily from piling for foundations,, UXO clearance and other project infrastructure and seabed preparation works. For underwater noise from impact piling, the MDO presented is based on the maximum spatial extent of noise propagation and the longest duration of piling. The MDO aligns with the noise modelling (Underwater noise assessment, Volume 4, Appendix 4.3.5-7) with the piling scenario with the largest noise impact ranges represents the maximum spatial design option.

8.14.23 Underwater noise has the potential to cause disturbance of fish receptors and to create barrier effects to migratory fish species.

8.14.24 The only site designated for fish receptors is the River Dargle Salmonid Waters. The River Dargle is located 2.5 km from the ECC. This distance is provided to the mouth of the river, the relevant range for migratory fish is not from the site itself but the point of access, i.e. the estuary mouth. As defined above in paragraph 8.6.20, Salmonid Waters are designated for salmon, pollan, schelly, char, rainbow trout, brook trout, and sea trout. Of these species, only salmon and sea trout (hearing categories group 2 – see, Fish and Shellfish chapter) have migratory tendencies, and therefore have the potential to transit the array area and offshore ECC. The sensitivity of these migratory fish species to underwater noise and vibration is outlined in Table 11.

8.14.25 The following sites were scoped out for impacts from underwater noise disturbance to migratory fish:

- Nature Reserves (Baldoyle Estuary and North Bull Island);
- pNHAs (Booterstown Marsh, Dalkey Coastal Zone and Killiney Head pNHA);
- Ramsar sites (Baldoyle Bay, North Bull Island, and Sandymount Strand / Tolka Estuary);
- UNESCO Biosphere Reserve (Dublin Bay); and
- County Geological Sites (CGS').

8.14.26 The magnitude of potential impacts of underwater noise on migratory fish features of the River Dargle is assessed in Atlantic salmon smolts migrate out to sea to feed during late spring and summer and return as adults to their riverine spawning grounds mainly in late spring to early summer. The migratory process associated with Atlantic Salmon away from coastal waters to the open ocean is generally poorly understood. However, there is evidence from tracking data that salmon smolts within the east coast of Ireland (where the study area is located) move quickly into deeper offshore waters upon leaving their home rivers (Barry et al., 2020). There is therefore potential that migratory smolts from rivers on Ireland's east coast (e.g., River Dargle) would pass through the study area, including areas where noise levels may induce mortal or recoverable injuries. No information is available on the movement patterns of returning salmon; however, a similar pathway to that of outward moving smolts may be assumed.

8.14.27 Atlantic salmon are mobile and would therefore be able to vacate the area during soft-start procedures before sounds reach levels that can cause lethal or sublethal physical injuries, thereby reducing the likelihood of mortal and/ or recoverable injuries. In addition, due to their migratory nature Atlantic salmon are anticipated to be transient across the study area, and therefore any exposure of salmon to high levels of sound pressure or particle motion is anticipated to be limited and temporary.

8.14.28 Based on this and considering the short-term and intermittent nature of the impact together with the small area potentially affected, any potential lethal or recoverable injuries in Atlantic salmon are anticipated to be barely discernible from baseline conditions, and therefore, the magnitude for this aspect of the impact is deemed to be Low adverse.

8.14.29 There is also the potential for salmon to experience TTS or exhibit temporary avoidance reactions during piling. This is of particular concern for adult individuals returning to their natal rivers, with the potential of behavioural responses delaying migration, which subsequently may affect the reproductive success to some individuals. However, behavioural responses would be temporary, with affected individuals anticipated to resume normal behaviours and continue their migration shortly after piling has ceased, including during piling-free days. Effects of TTS would also be temporary, with existing studies suggesting that fish affected by TTS recovered to normal hearing levels within a few hours to several days after noise exposure (Popper et al., 2014; Popper and Hawkins, 2019). In addition, the modelled maximum impact ranges for the onset of TTS in Group 2 receptors do not reach the coastline (see Fish and Shellfish chapter) with the risk of behavioural response within nearshore areas also likely to be low. Therefore, any potential TTS and behavioural changes in Atlantic salmon during impact piling are not considered to present a long-term barrier to Atlantic salmon from accessing or leaving their natal rivers. Therefore, the magnitude of TTS and disturbance effects associated with piling on salmon is deemed to be Low adverse.

8.14.30 Tracking data indicate that sea trout remain closer to their spawning rivers and swim closer to the coast and river mouths (Barry et al., 2020). This suggests that sea trout might mostly avoid the area over which mortality and potential mortal injury, recoverable injury, TTS and/ or behavioural response are likely to occur (see Fish and Shellfish chapter). Therefore, the magnitude of the impact for sea trout is deemed to be at most Low adverse.

8.14.31 The potential impacts of underwater noise on the River Dargle Salmonid waters is assessed in Atlantic salmon smolts migrate out to sea to feed during late spring and summer and return as adults to their riverine spawning grounds mainly in late spring to early summer. The migratory process associated with Atlantic Salmon away from coastal waters to the open ocean is generally poorly understood. However, there is evidence from tracking data that salmon smolts within the east coast of Ireland (where the study area is located) move quickly into deeper offshore waters upon leaving their home rivers (Barry et al., 2020). There is therefore potential that migratory smolts from rivers on Ireland's east coast (e.g., River Dargle) would pass through the study area, including areas where noise levels may induce mortal or recoverable injuries. No information is available on the movement patterns of returning salmon; however, a similar pathway to that of outward moving smolts may be assumed.

8.14.32 Atlantic salmon are mobile and would therefore be able to vacate the area during soft-start procedures before sounds reach levels that can cause lethal or sublethal physical injuries, thereby reducing the likelihood of mortal and/ or recoverable injuries. In addition, due to their migratory nature Atlantic salmon are anticipated to be transient across the study area, and therefore any exposure of salmon to high levels of sound pressure or particle motion is anticipated to be limited and temporary.

8.14.33 Based on this and considering the short-term and intermittent nature of the impact together with the small area potentially affected, any potential lethal or recoverable injuries in Atlantic salmon are anticipated to be barely discernible from baseline conditions, and therefore, the magnitude for this aspect of the impact is deemed to be Low adverse.

8.14.34 There is also the potential for salmon to experience TTS or exhibit temporary avoidance reactions during piling. This is of particular concern for adult individuals returning to their natal rivers, with the potential of behavioural responses delaying migration, which subsequently may affect the reproductive success to some individuals. However, behavioural responses would be temporary, with affected individuals anticipated to resume normal behaviours and continue their migration shortly after piling has ceased, including during piling-free days. Effects of TTS would also be temporary, with existing studies suggesting that fish affected by TTS recovered to normal hearing levels within a few hours to several days after noise exposure (Popper et al., 2014; Popper and Hawkins, 2019). In addition, the modelled maximum impact ranges for the onset of TTS in Group 2 receptors do not reach the coastline (see Fish and Shellfish chapter) with the risk of behavioural response within nearshore areas also likely to be low. Therefore, any potential TTS and behavioural changes in Atlantic salmon during impact piling are not considered to present a long-term barrier to Atlantic salmon from accessing or leaving their natal rivers. Therefore, the magnitude of TTS and disturbance effects associated with piling on salmon is deemed to be Low adverse.

8.14.35 Tracking data indicate that sea trout remain closer to their spawning rivers and swim closer to the coast and river mouths (Barry et al., 2020). This suggests that sea trout might mostly avoid the area over which mortality and potential mortal injury, recoverable injury, TTS and/ or behavioural response are likely to occur (see Fish and Shellfish chapter). Therefore, the magnitude of the impact for sea trout is deemed to be at most Low adverse.

Table 11 Determination of sensitivity of Group 2 migratory fish species to underwater noise and vibration

Criteria	Justification
Atlantic salmon, sea trout	Group 2 species identified as of relevance to the proposed development are Atlantic salmon and sea trout. Both species are considered to primarily sense underwater sounds through particle motion despite the presence of a swim bladder (Popper *et al.*, 2014). Evidence suggests that the presence of a swim bladder increases the likelihood of injury to body tissues as sound-induced volume changes to the swim bladder can damage nearby organs (Popper *et al.*, 2014). As such, Group 2 receptors are generally considered more susceptible to recoverable and potential mortal injuries in comparison to Group 1 receptors (Popper and Hawkins, 2019). However, given their mobile nature, Atlantic salmon and sea trout would be able to adapt their behaviour and vacate the area during soft-start procedures to avoid mortal or recoverable injuries. Therefore, like fleeing Group 1 receptors, Atlantic salmon and sea trout are considered to have a medium adaptability to the impact. Given their

Criteria	Justification
	general higher susceptibility to pressure-related injuries, the tolerance of these receptors to mortality and potential mortal injury and recoverable injury impact is deemed to be medium. TTS and behavioural responses might occur, with any TTS likely to be temporary (Popper *et al.*, 2014). Few studies have investigated behavioural reactions of sea trout and Atlantic salmon to piling noise, providing unconclusive results with some studies showing a lack of behavioural responses and others reporting changes in the abundance and distribution of Atlantic salmon due to avoidance reactions (reviewed by Gillson *et al.*, 2022). There is, however, evidence that behavioural responses in fish as a result of underwater noise might be reduced when fish are engaged in life history critical activities such as spawning and feeding (e.g. Doksaeter *et al.*, 2009; Pena *et al.*, 2013; Skaret *et al.*, 2005). While a similar damping of behavioural reactions might occur in sea trout and Atlantic salmon during migration, the implications of experiencing temporary avoidance or stress responses remain not fully understood, and it cannot be excluded that such responses delay migration in the short-term. Based on this, the receptors are assessed as having a medium tolerance to TTS and behavioural changes. Taking into consideration the regional importance of sea trout together with their medium adaptability, medium tolerance, and medium recoverability, the sensitivity of sea trout to underwater noise from impact piling is deemed to be **Low**. Based on the national and international importance of Atlantic salmon, the sensitivity of this receptor is rated as **Medium**.

Table 12 Determination of magnitude of underwater noise disturbance to migratory fish (Group 2 species)

Definition	Maximum design option	Alternative design option
Extent	The extent of underwater noise disturbance will be restricted to the near field and immediate far as shown in the modelling outputs that predicted for a fleeing fish receptor the largest recoverable injury ranges were less than 100 m. Mortality and potential mortal injury and risk of TTS predicted to occur <100 m from the noise source from monopile and jacket foundation piling	In line with the maximum design option.
Duration	The impact will be temporary (less than one year in the case of installing monopile foundations) to short-term (one to seven years in the case of installing jacket foundations).	Under the alternative design options, fewer WTGs will be installed, resulting in fewer piling days.
Frequency	The impact will occur intermittently during the construction phase.	In line with the maximum design option
Consequence	There is potential for Group 2 fleeing receptors to experience mortality, potential mortal injury, or recoverable injury during impact piling close to the sound source (<100 m),	In line with the maximum design option

Definition	Maximum design option	Alternative design option
Overall magnitude	*The potential magnitude of the predicted changes for Group 2 receptors is rated as **Low adverse**.*	*The potential magnitude of the predicted changes for Group 2 receptors is rated as **Low adverse**.*

8.14.36 Atlantic salmon smolts migrate out to sea to feed during late spring and summer and return as adults to their riverine spawning grounds mainly in late spring to early summer. The migratory process associated with Atlantic Salmon away from coastal waters to the open ocean is generally poorly understood. However, there is evidence from tracking data that salmon smolts within the east coast of Ireland (where the study area is located) move quickly into deeper offshore waters upon leaving their home rivers (Barry et al., 2020). There is therefore potential that migratory smolts from rivers on Ireland's east coast (e.g., River Dargle) would pass through the study area, including areas where noise levels may induce mortal or recoverable injuries. No information is available on the movement patterns of returning salmon; however, a similar pathway to that of outward moving smolts may be assumed.

8.14.37 Atlantic salmon are mobile and would therefore be able to vacate the area during soft-start procedures before sounds reach levels that can cause lethal or sublethal physical injuries, thereby reducing the likelihood of mortal and/ or recoverable injuries. In addition, due to their migratory nature Atlantic salmon are anticipated to be transient across the study area, and therefore any exposure of salmon to high levels of sound pressure or particle motion is anticipated to be limited and temporary.

8.14.38 Based on this and considering the short-term and intermittent nature of the impact together with the small area potentially affected, any potential lethal or recoverable injuries in Atlantic salmon are anticipated to be barely discernible from baseline conditions, and therefore, the magnitude for this aspect of the impact is deemed to be Low adverse.

8.14.39 There is also the potential for salmon to experience TTS or exhibit temporary avoidance reactions during piling. This is of particular concern for adult individuals returning to their natal rivers, with the potential of behavioural responses delaying migration, which subsequently may affect the reproductive success to some individuals. However, behavioural responses would be temporary, with affected individuals anticipated to resume normal behaviours and continue their migration shortly after piling has ceased, including during piling-free days. Effects of TTS would also be temporary, with existing studies suggesting that fish affected by TTS recovered to normal hearing levels within a few hours to several days after noise exposure (Popper et al., 2014; Popper and Hawkins, 2019). In addition, the modelled maximum impact ranges for the onset of TTS in Group 2 receptors do not reach the coastline (see Fish and Shellfish chapter) with the risk of behavioural response within nearshore areas also likely to be low. Therefore, any potential TTS and behavioural changes in Atlantic salmon during impact piling are not considered to present a long-term barrier to Atlantic salmon from accessing or leaving their natal rivers. Therefore, the magnitude of TTS and disturbance effects associated with piling on salmon is deemed to be Low adverse.

8.14.40 Tracking data indicate that sea trout remain closer to their spawning rivers and swim closer to the coast and river mouths (Barry et al., 2020). This suggests that sea trout might mostly avoid the area over which mortality and potential mortal injury, recoverable injury, TTS and/ or behavioural response are likely to occur (see Fish and Shellfish chapter). Therefore, the magnitude of the impact for sea trout is deemed to be at most Low adverse.

Table 13 Determination of sensitivity of the River Dargle Salmonid Waters to disturbance from underwater noise

	Justification
Context	**Tolerance:** The designated features of the River Dargle are expected to be broadly capable of adapting to impacts from underwater noise. The features may adapt to the impact by temporarily moving away from the source of the sound. All features of the River Dargle are considered to have a moderate to low ability to adapt to UXO clearance events due to the nature of the sound source and lack of warning and time in which to escape the area prior to the impact. **Recoverability**: As outlined within Table 12, all designated features have some measure of mobility and will rapidly recolonise the affected area from adjacent locations. Recovery is anticipated to be almost immediate for all features following cessation of the noise impact.
Value	The River Dargle Salmonid Waters site is a European designated nature conservation site and is therefore considered to be of medium value.
Overall sensitivity	*The potential sensitivity of the River Dargle site is rated as **Medium**.*

8.14.41 As such, the magnitude of the impact has been assessed as **Low for both the MDO and alternative design options**, with the maximum sensitivity of the nature conservation site being **Medium**. Therefore, the significance of effect from underwater noise on migratory fish is a **Slight Adverse** impact, which is not significant in EIA terms.

8.14.42 The alternative design options (any other option within the range of parameters set out in the project description) will not give rise to an effect which is more significant than the maximum design option.

Residual effect

The significance of effect from impacts to nature conservation sites from underwater noise is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 7 is considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of nature conservation sites.

Impact 4: Disturbance and displacement of birds

8.14.43 For disturbance and displacement the spatial area where disturbance and displacement could arise is consistent for all options with activity ongoing across the array area, Offshore ECC and temporary occupation area. Therefore, the MDO is dictated by the temporal extent with the longest construction period will lead to the greatest period of disturbance and therefore the maximum design option results in the greatest displacement.

8.14.44 This assessment should be read in conjunction with the Ornithology Chapter, Benthic Ecology Chapter and NIS which describe in full the impacts on birds and their habitats through disturbance and displacement.

8.14.45 The Ornithology chapter assessed the impacts of construction from disturbance and displacement split into four different pathways. The results of this are summarised in Table 14 below.

8.14.46 The sites are identified for ornithological features within section 8.11 ; Baldoyle Estuary Nature Reserve, North Bull Island Nature Reserve, Booterstown Marsh pNHA, Dalkey Coastal Zone and Killiney Hill pNHA, the Dublin Bay Biosphere, Baldoyle Bay Ramsar site, North Bull Island Ramsar site, and Sandymount Strand / Tolka Estuary Ramsar site.

8.14.47 It should be noted that birds differ in their sensitivity to disturbance, thus in order to focus the assessment, an exercise was undertaken to identify those species likely to be sensitive to disturbance and displacement as a result of construction activities. As such 7 bird species were considered for displacement assessment relating to construction activities: red-throated diver, cormorant, shag, guillemot, razorbill, great northern diver and common scoter. However, common scoter is not a QI for any of the nature conservation sites scoped in for assessment (see Annex B of this Chapter). Of the 7 species identified as being sensitive to displacement, only 4 are listed as QIs of the sites that are scoped in for ornithological features as listed above, as follows:

- Red-throated diver is a QI of; Baldoyle Bay Ramsar site, North Bull Island Ramsar site and Sandymount Strand / Tolka Estuary Ramsar site.
- Cormorant is a QI of; Dalkey Coastal Zone and Killiney Hill pNHA, Baldoyle Bay Ramsar site, North Bull Island Ramsar site and Sandymount Strand / Tolka Estuary Ramsar site.
- Shag is a QI of; Dalkey Coastal Zone and Killiney Hill pNHA.
- Great northern diver is a QI of; Sandymount Strand / Tolka Estuary Ramsar site.

8.14.48 Ramsar sites are not considered here as the bird species listed as qualifying features for the Ramsar sites are assessed within the NIS under the associated SAC and SPA designations within which these Ramsar sites lie.

8.14.49 Only one site scoped in for assessment supports any of the 4 species identified as being sensitive to disturbance from construction, namely Dalkey Coastal Zone and Killiney Hill pNHA whose QIs include cormorant and shag. As such, this site is the only one with the potential to be impacted by the construction of the offshore infrastructure.

8.14.50 Disturbance arising from construction activities has the potential to affect bird species both directly (e.g. disturbance of individuals) and indirectly (e.g. disturbance to prey distribution or availability, which subsequently affects foraging seabirds). However, it should be noted that the nature conservation sites considered here are designated primarily for the protection of wetland habitats and breeding grounds that support wading birds, with seabirds and foraging birds who venture beyond wading depths assessed for impacts within the the Ornithology Chapter and NIS thus not repeated herein.

8.14.51 The Ornithology chapter assesses the impacts from disturbance and displacement on birds split into four different geographical areas / activities of the project. The results of this are summarised in Table 14.

Table 14 Summary of impacts on birds through disturbance and displacement

Impact	Significance	In EIA terms
Disturbance and displacement from increased vessel activity and other construction activity within the array area	Slight adverse	Not significant in EIA terms
Disturbance and displacement on key bird species as a result of increased vessel activity and other construction activity within the offshore ECC	Slight adverse	Not significant in EIA terms
Disturbance and displacement on key bird species as a result of construction activity for the export cable landfall within the intertidal study area	Slight adverse	Not significant in EIA terms
Disturbance from UXO	Not significant	Not significant in EIA terms

8.14.52 The ornithology assessment concluded that there would be at worst **slight adverse** effects on birds through disturbance and displacement and that these impacts are not significant in EIA terms. Therefore, regarding Dalkey Coastal Zone and Killiney Hill pNHA whose QIs include cormorant and shag, there would be at worst **slight adverse** effects on birds through disturbance and displacement, which is not significant in EIA terms.

8.14.53 The alternative design options (any other option within the range of parameters set out in the project description) will not give rise to an effect which is more significant than the maximum design option.

Residual effect

The significance of effect from impacts to nature conservation sites from disturbance and displacement of birds is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 7 is considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of nature conservation sites.

Impact 5: Changes to coastal geological features arising from construction activities

8.14.54 For construction activities, the maximum design scenario presented results in the greatest disturbance to the coastal environment from the use of trenchless technique at the cable landfall. This assessment should be read in conjunction with the Physical Processes chapter which describes in full the impacts on coastal features through changes in physical processes.

8.14.55 The CGS' that are scoped in, having local importance are; Dalkey Island CGS, White Rock Killiney CGS, Killiney Bay CGS, Bray Head CGS, Greystones Beach CGS, Greystones (Appinite) CGS, Wicklow – Greystones Coast CGS, Blackrock Breccia CGS, North Bull Island CGS, Bottle Quay CGS, Claremont strand CGS, Balscaddan Bay CGS, and Irelands Eye CGS. All of these identified CGS' are located along the coastline and are therefore inherently assessed as part of assessment of impacts on coastal features through changes in physical processes (see Physical Processes Chapter Impacts to coastlines).

8.14.56 The following sites were scoped out for impacts from changes to coastal geological features arising from effects on physical processes:

- Salmonid Waters (River Dargle);
- Nature Reserves (Baldoyle Estuary and North Bull Island);
- pNHAs (Booterstown Marsh pNHA and Dalkey Coastal Zone and Killiney Hill pNHA);
- Ramsar sites (Baldoyle Bay, North Bull Island, and Sandymount Strand / Tolka Estuary); and
- UNESCO Biosphere Reserve (Dublin Bay).

8.14.57 The only coastal CGS that physically overlaps with the proposed development is Killiney Bay CGS, which spans the length of Killiney Beach, overlapping with the proposed landfall. The Killiney Bay CGS is designated for notable geology, which takes the form of a 5 kilometres long coastal section exposes a succession of several units of glacial till.

8.14.58 As identified in the Physical Processes chapter the use of trenchless techniques is proposed as the methodology to make landfall. Depending upon the position of the exit pits and associated mounds in the subtidal, they may have the potential to modify the nearshore wave regime and therefore seabed morphology resulting in impacts to the CGS. The use of trenchless techniques avoids interaction with surface features of the cliff and intertidal areas between the entry and exit points of the drill, neither of which will be located within the CGS The potential magnitude of morphological changes at the coast was concluded to be low in the Physical Processes chapter concluding that the exit pits (and any associated spoil mounds) will be temporary features and it is anticipated that they would only be present for a short period (up to a few weeks) before the excavated material was used to backfill the pits. . .

8.14.59 In addition, as outlined within the Physical Processes Chapter, the proposed activities will not result in changes to coastal flooding as a result of landfall activities (or any other wind farm construction activities).

8.14.60 The sensitivities of coastline receptors are assessed within the Physical Processes chapter, as **High**. Therefore, the significance of potential changes to coastal processes including geological exposures such as those within the Killiney Bay CGS occurring as a result of the use of trenchless techniques is Moderate which is not significant in EIA terms.

8.14.61 The alternative design options (any other option within the range of parameters set out in the project description) will not give rise to an effect which is more significant than the maximum design option.

Residual effect

The significance of effect on CGS' from changes coastal processes is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 7 are considered necessary. Therefore, ***No ecologically significant adverse residual effects*** *have been predicted in respect of effects of local hydrodynamic, wave and sediment transport processes along the coastline and associated CGS'.*

8.15 Environmental assessment: operation and maintenance (O&M) phase

8.15.1 The effects of the O&M of the offshore infrastructure on the nature conservation sites within the study area have been assessed in accordance with the methodology as defined in section 8.4.

8.15.2 A description of the significance of effects upon nature conservation sites caused by each identified O&M impact is provided below. An assessment of the qualifying interests of Natura 2000 sites is undertaken within the NIS.

Impact 6: Changes to benthic habitats arising from effects on physical processes

8.15.3 The presence of project infrastructure and protection material may introduce changes to the local hydrodynamic and wave regime, resulting in changes to the sediment transport pathways and associated effects on benthic features of nature conservation sites. With the MDO for benthic features presented by the greatest footprint of foundations, scour protection and cable protection material. Scour and increases in flow rates can change the characteristics of the sediment potentially making the habitat less suitable for some species.

8.15.4 Only one site; Dalkey Coastal Zone and Killiney Head pNHA, scoped in for assessment (see section 8.11) as it lies within 2 km of the offshore ECC and within 10km of the array area, and is therefore potentially subject to impacts arising from effects on physical processes from the presence of the offshore infrastructure.

8.15.5 The magnitude of potential impacts to benthic habitats from effects on physical processes is assessed in Table 15 below.

Table 15 Determination of magnitude of risk of changes to benthic habitats arising from effects on physical processes during O&M

Definition	Maximum design option	Alternative design option
Extent	The extent of the impact will be largely restricted to the placement of infrastructure which will be within the near-field, with only de-minimis potential impacts within adjacent far-field areas.	In line with the maximum design option
Duration	The impact is anticipated to persist for the lifetime of the project and therefore is considered to be long-lasting (35 years).	The impact is anticipated to persist for the lifetime of the project and therefore is considered to be long-lasting (35 years).
Frequency	The impact will occur constantly throughout the operational phase of the development.	In line with the maximum design option
Probability	The impact will likely be expected to occur.	In line with the maximum design option

Definition	Maximum design option	Alternative design option
Consequence	No discernible change in the tidal regime, wave regime and therefore changes to sediment transport and sediment transport pathways and scour of seabed sediments throughout the operation of offshore infrastructure, will be encountered within the near-field and the adjacent far-field.	No discernible change in the tidal regime, wave regime and therefore changes to sediment transport and sediment transport pathways and scour of seabed sediments throughout the operation of the offshore infrastructure, will be encountered within the near-field and the adjacent far-field.
Overall magnitude	*The potential magnitude of the predicted changes is rated as **Negligible**.*	*The potential magnitude of the predicted changes is rated as **Negligible.***

8.15.6 The Benthic chapter concluded that the impacts on hydrodynamic and wave regimes, changes to sediment transport and sediment transport pathways and scour of seabed sediments will not be significant and would therefore not have any significant impacts on benthic subtidal and intertidal ecology. The magnitude of this effect has been assessed as **Negligible for both the MDO and alternative design options**. Irrespective of the sensitivity of the scoped in nature conservation site - Dalkey Coastal Zone and Killiney Head pNHA, the significance of the impact is not significant as defined in the assessment of significance matrix (Table 5) and is therefore not considered further.

8.15.7 The alternative design options (any other option within the range of parameters set out in the project description) will not give rise to an effect which is more significant than the maximum design option.

Residual effect

The significance of effect from impacts to nature conservation sites from changes to habitats from effects on physical processes is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 7 is considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of nature conservation sites.

Impact 7: Disturbance and displacement of birds

8.15.8 Disturbance and displacement of birds can arise from vessel activity, presence of aviation and navigational lighting and from the presence of above surface offshore infrastructure. As such the MDO will be defined by the greatest number of vessels and structures. This assessment should be read in conjunction with Ornithology chapter which describes in full the impacts on birds through disturbance and displacement.

8.15.9 The Ornithology Chapter assessed the impacts of operation and maintenance from disturbance and displacement split into three different pathways. The results of this are summarised in Table 16. It should be noted that birds differ in their sensitivity to disturbance and that 14 different species were considered for displacement assessment relating to O&M: common scoter, red-throated diver, great northern diver, cormorant, shag, black guillemot, guillemot, razorbill, puffin, little tern, Sandwich tern, roseate tern, common tern and Arctic tern.

8.15.10 The sites that are scoped in for ornithological features within section 8.11 are; Baldoyle Estuary Nature Reserve, North Bull Island Nature Reserve, Booterstown Marsh pNHA, Dalkey Coastal Zone and Killiney Hill pNHA, the Dublin Bay Biosphere, Baldoyle Bay Ramsar site, North Bull Island Ramsar site, and Sandymount Strand / Tolka Estuary Ramsar site. Ramsar sites are not considered here as the bird species listed as qualifying features for the Ramsar sites are assessed within the NIS under the associated SAC and SPA designations within which these Ramsar sites lie. Therefore, only one site supports any of the 14 species identified as being sensitive to disturbance from O&M, namely Dalkey Coastal Zone and Killiney Hill pNHA whose QIs include cormorant, shag, roseate tern, common tern and arctic tern (see Annex B of this chapter). As such, this site is the only one with the potential to be impacted by the O&M of the offshore infrastructure.

8.15.11 The Ornithology chapter assesses the impacts from disturbance and displacement on birds split into three different geographical areas / activities of the project. The results of this are summarised in Table 16.

Table 16 Summary of impacts on birds through disturbance and displacement

Impact	Significance	In EIA terms
Disturbance and displacement on key bird species as a result of vessel activity associated with O&M	Not significant	Not significant in EIA terms
Disturbance from aviation and navigation lighting	Slight adverse	Not significant in EIA terms
Displacement and barrier effects on key bird species within the array area and appropriate buffer as a result of offshore infrastructure	Not significant for all species with exception of moderate adverse (red-throated diver)	Not significant in EIA terms

8.15.12 The ornithology assessment concluded that there would be at worst **moderate adverse** effects on birds (which was concluded for red-throated diver) through disturbance and displacement and that these impacts are not significant in EIA terms.

8.15.13 The alternative design options (any other option within the range of parameters set out in the project description) will not give rise to an effect which is more significant than the maximum design option.

Residual effect

The significance of effect from impacts to nature conservation sites from disturbance and displacement of birds is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 7 is considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of nature conservation sites.

Impact 8: Potential for bird collisions with the offshore infrastructure

8.15.14 The potential for bird collisions is largely influenced by the height of the WTGs and rotor diameter, as such in line with Volume 4, Appendix 4.3.6-2: Method Statement: Offshore Wind Ornithology Assessment for East Coast Phase 1 (referred to as the Seabird CRM Technical Report) the MDO aligns with the WTG option that has the largest theoretical collision impact risk for all species considered.

8.15.15 This assessment should be read in conjunction with the Ornithology chapter, Seabird CRM Technical Report,), and Volume 4, Appendix 4.3.6-5: Offshore Ornithology Migratory Collision Risk Modelling (mCRM) Technical Report (referred to as the mCRM Technical Report), which describe in full the potential for bird collisions with offshore infrastructure.

8.15.16 The Seabird CRM has been undertaken on 11 seabird species based on their abundance within the array area on baseline surveys see the Offshore and Intertidal Ornithology Technical Baseline and on evidence about their sensitivity to collision effects (Furness *et al.,* 2013). The 11 seabird species are as follows: Gannet, Black-headed gull, Common gull, Lesser black-backed gull, Herring gull, Great black-backed gull, Kittiwake, Sandwich tern, Roseate tern, Common tern and Arctic tern. However, it should be noted that the nature conservation sites considered here are designated primarily for the protection of wetland habitats and breeding grounds that support wading birds, with seabirds and foraging birds who venture beyond wading depths assessed for impacts within the the Ornithology Chapter and NIS.

8.15.17 The Migratory CRM has been undertaken on 34 migratory non-seabird species using species-specific biometric input parameters, together with turbine parameters, as well as flight speeds and avoidance rates from published sources. The 34 species are as follows: Bewick's swan, Black-tailed godwit, Common scoter, Corncrake, Curlew, Dunlin, Eider, Goldeneye, Great crested grebe, Greenland white-fronted goose Greenshank, Grey plover, Hen harrier, Knot, Lapwing, Light-bellied brent goose, Mallard, Merlin, Oystercatcher, Pintail, Pochard, Purple Sandpiper, Red-breasted merganser, Redshank, Ringed plover, Scaup, Shelduck, Shoveler, Snipe, Teal, Tufted duck, Turnstone, Whooper swan and Wigeon.

8.15.18 Within both CRM's, ornithological receptors are screened in for the assessment of collision risk with offshore infrastructure if they are considered vulnerable to collision risk, and if they are expected to be present in the project array area in sufficient numbers. Vulnerability to collision risk is based on available literature and guidance (e.g., Bradbury et al., 2014 and Natural England CRM guidance), while likely presence in the array area is determined based on project specific digital aerial survey (DAS) data. As such, where the previously listed species have been identified in the vicinity of the offshore infrastructure and are deemed to be at risk of collision, they are assessed in full within the NIS, Ornithology Chapter, and / or collision risk modelling reports and thus are not repeated herein.

8.15.19 For all assessed species, the predicted number of annual collisions was found to be negligible (less than one bird per year). This was the case for all three turbine design options presented with the MDO (50 turbines) having the highest annual collision values for all species. The assessment of non-seabird species concludes that the magnitude of impact was considered to be **Negligible.** Assuming the sensitivity of migratory species was a maximum of **High**, then the significance of any effect on migratory species from collisions associated with the offshore infrastructure is a **Not Significant** effect, which is not significant in EIA term.

8.15.20 Given the results of the collision risk assessment, it is therefore concluded that any impact on nature conservation sites which support these bird features would be **Not Significant.**

8.15.21 The alternative design options (any other option within the range of parameters set out in the project description) will not give rise to an effect which is more significant than the maximum design option.

Residual effect

The significance of effect from impacts to nature conservation sites from bird collisions with offshore infrastructure is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 7 is considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of nature conservation sites.

Impact 9: Changes to coastal geological features arising during the operational phase

8.15.22 This assessment should be read in conjunction with the Physical Processes Chapter which describes in full the potential impacts on coastal features through changes in physical processes.

8.15.23 The primary means by which the coast could be impacted by the operational presence of the offshore infrastructure are:

- Modification of the tidal and wave regime due to the presence of foundations within the array area, causing associated changes in sedimentary transport processes and possible alterations to coastal behaviour;

- The presence of cable protection measures in shallow nearshore areas, locally modifying hydrodynamic, wave and sediment transport processes; and
- Exposure of buried export cables and associated infrastructure, locally modifying nearshore hydrodynamic, wave and sediment transport processes.

8.15.24 The maximum design option assessed within the physical processes chapter is defined by the option that results in the greatest net blockage to waves and flows from the WTG options, cable protection and cable crossing design options, with the potential to impact on sediment transport processes and coastal and seabed receptors.

8.15.25 The CGS' that are scoped in, having local importance are; Dalkey Island CGS, White Rock Killiney CGS, Killiney Bay CGS, Bray Head CGS, Greystones Beach CGS, Greystones (Appinite) CGS, Wicklow – Greystones Coast CGS, Blackrock Breccia CGS, North Bull Island CGS, Bottle Quay CGS, Claremont strand CGS, Balscaddan Bay CGS, and Irelands Eye CGS. All of these identified CGS' are located along the coastline and are therefore inherently assessed as part of assessment of impacts on coastal features through changes in physical processes (see Physical Processes Chapter Impacts to coastlines).

8.15.26 The only coastal CGS that physically overlaps with the proposed development is Killiney Bay CGS, which spans the length of Killiney Beach, overlapping with the proposed landfall.

8.15.27 No O&M works are planned or are foreseeable at the landfall in the intertidal and as such have not been assessed. Based on expert analysis and assessment, it has been concluded that the presence of buried cables in the ducts and in the seabed is not likely to result in significant effects to coastal processes.

8.15.28 In line with the assessment undertaken in the Physical Processes Chapter. the magnitude of the potential modification of hydrodynamics, wave and sediment transport processes resulting in effects to CGS' has been assessed as **Negligible**. The sensitivity of the coastline receptors is considered to be **High.** Therefore, the significance of potential changes to coastal processes occurring as a result of the presence of infrastructure associated with Dublin Array is **Not Significant**, which is not significant in EIA terms.

Residual effect

The significance of effect on CGS' from changes coastal processes is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 7 is considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of nature conservation sites during the operational phase.

8.16 Environmental assessment: decommissioning phase

8.16.1 As referenced in the Project Description, the Decommissioning and Restoration Plan (Volume 7, Appendix 2), including the three rehabilitation schedules attached thereto, describes how the Applicant proposes to rehabilitate that part of the maritime area, and any other part of the maritime area, adversely affected by the permitted maritime usages that are the subject of the MACs (Reference Nos. 2022-MAC-003 and 004 / 20230012 and 240020).

8.16.2 It is based on the best scientific and technical knowledge available at the time of submission of this planning application. However, the lengthy passage of time between submission of the application and the carrying out of decommissioning works (expected to be in the region of 35 years as defined in the MDO) gives rise to knowledge limitations and technical difficulties. Accordingly, the Decommissioning and Restoration Plan will be kept under review by the Applicant as the project progresses, and an alteration application will be submitted if necessary. In particular, it will be reviewed having regard to the following:

- The baseline environment at the time rehabilitation works are proposed to be carried out,
- What, if any, adverse effects have occurred that require rehabilitation,
- Technological developments relating to the rehabilitation of marine environments,
- Changes in what is accepted as best practice relating to the rehabilitation of marine environments,
- Submissions or recommendations made to the Applicant by interested parties, organisations and other bodies concerned with the rehabilitation of marine environments, and/or
- Any new relevant regulatory requirements.

8.16.3 The Decommissioning and Restoration Plan outlines the process for decommissioning of the WTG, foundations, scour protection, OSP, inter array cables and offshore ECC. The plan outlines the assumption that the most practicable environmental option is to leave certain structures in situ (e.g. inter array cables, scour protection), however the general principle for decommissioning is for all surface structures to be removed and it is assumed that the wind turbine generators (WTG's) will be dismantled and completely removed to shore. Piled foundations will be cut at a level below the seabed, buried cables and scour and cable protection left in situ.

Impact 10: Temporary increases in Suspended Sediment Concentration and deposition from decommissioning activities on benthic features

8.16.4 Increases in SSC and sediment deposition from the decommissioning works are expected to be less than that for construction with cables and scour protection left in situ as practicable and no requirement for seabed preparation and are therefore of a lower magnitude. The magnitude of the impact and the sensitivities of the benthic features to SSC and sediment deposition are as described for the construction phase under Impact 1.

8.16.5 As defined in the Decommissioning and Restoration Plan as cables and scour protection are likely to remain in-situ, it is predicted that the maximum magnitude of the effect is Low and the sensitivity of the receptors is medium (as defined for Impact 1). In the event that cables require removal, the magnitude of the effect would be no greater than that defined for construction (Impact 1). Therefore, the significance of effect from temporary increases in SSC and disposition as a result of the offshore infrastructure decommissioning is Slight Adverse, which is not significant in EIA terms.

8.16.6 The alternative design options (any other option within the range of parameters set out in the project description) will not give rise to an effect which is more significant than the maximum design option.

Residual effects

The significance of effect associated with temporary increases in SSC and deposition as a result of the offshore infrastructure decommissioning is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 7 is considered necessary. No significant adverse residual effects on nature conservation sites have therefore been predicted.

Impact 11: Temporary increases in Suspended Sediment Concentration and deposition from decommissioning activities on mobile features

8.16.7 Increases in SSC and sediment deposition from the decommissioning works are expected to be less than that for construction and are therefore of a reduced magnitude. The magnitude of the impact and the sensitivities of the mobile features to SSC and sediment deposition are as described for the construction phase under Impact 2.

8.16.8 Based on the assessment undertaken for construction, which would be considered to be a very precautionary MDS for the decommissioning process as structures are likely to remain in-situ, it is predicted that the maximum sensitivity of the receptors is **Medium,** and the magnitude is **Low for both the MDO and alternative design options**. Therefore, the significance of effect from temporary increases in SSC and deposition as a result of the offshore infrastructure decommissioning is **Slight Adverse**, which is not significant in EIA terms.

8.16.9 The alternative design options (any other option within the range of parameters set out in the project description) will not give rise to an effect which is more significant than the maximum design option.

Residual effect

The significance of effect associated with temporary increases in SSC and deposition as a result of the offshore infrastructure decommissioning is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 7 is considered necessary. No significant adverse residual effects on nature conservation sites have therefore been predicted.

Impact 12: Underwater noise disturbance to migratory fish

8.16.10 The nature and extent of underwater noise impacts during decommissioning will be significantly less than that described for the construction phase under Impact 3, on the basis that no piling will be undertaken during decommissioning.

8.16.11 The details of the proposed decommissioning process will be included within the Decommissioning and Restoration Plan (Table 7) which will be developed and updated throughout the lifetime of the offshore infrastructure to account for changing best practice.

8.16.12 Based on the assessment undertaken for construction, which would be considered to be a very precautionary MDS for the decommissioning process, it is predicted that the maximum sensitivity of the receptors is **Medium**, and the magnitude is **Low**. Therefore, the significance of effect from temporary habitat disturbance as a result of the offshore infrastructure decommissioning is **Slight Adverse**, which is not significant in EIA terms.

8.16.13 The alternative design options (any other option within the range of parameters set out in the project description) will not give rise to an effect which is more significant than the maximum design option.

Residual effects

The significance of effect associated with underwater noise as a result of the offshore infrastructure decommissioning is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 7 is considered necessary. No significant adverse residual effects on nature conservation sites have therefore been predicted.

Impact 13: Disturbance and displacement of birds

8.16.14 This assessment should be read in conjunction with the Ornithology chapter which describes in full the potential impacts and likely significant effects on birds through disturbance and displacement.

8.16.15 That chapter concluded that direct temporary disturbance or displacement of birds within the array area during the decommissioning phase may occur as a result of a range of activities including use of jack-up vessels during structure removal. The Ornithology chapter concluded that any impact from decommissioning is predicted to affect a small proportion of the regional populations and will be intermittent, and of temporary to short-term duration with a potential magnitude of low.

8.16.16 Based on the assessment undertaken in the Ornithology chapter, it is predicted that the significance of effect from temporary habitat disturbance and displacements of birds as a result of the offshore infrastructure decommissioning is **Slight Adverse**, which is not significant in EIA terms.

8.16.17 The alternative design options (any other option within the range of parameters set out in the project description) will not give rise to an effect which is more significant than the maximum design option.

Residual effect

The significance of effect from impacts to nature conservation sites from disturbance and displacement of birds is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 7 is considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of nature conservation sites.

Impact 14: Changes to coastal geological features arising from decommissioning activities

8.16.18 Based on the assessment undertaken for construction (Impact 5), which would be considered to be a very precautionary MDO for the decommissioning process, as piled foundations will be cut at a level below the seabed, buried cables and scour and cable protection left in situ. It is predicted that the maximum sensitivity of the receptors is **High**, and the magnitude of the impact is **Low**. Therefore, the significance of potential changes to coastal processes occurring as a result of the use of trenchless techniques (i.e. HDD or direct pipe) resulting in effects to CGS' is **Moderate** which is not significant in EIA terms.

8.16.19 The alternative design options (any other option within the range of parameters set out in the project description) will not give rise to an effect which is more significant than the maximum design option.

Residual effect

The significance of effect on CGS' from changes coastal processes is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 7 are considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of coastal receptors during the operational phase.

8.17 Environmental assessment: cumulative effects

8.17.1 This section outlines the Cumulative Effects Assessment on nature conservation designations and takes in account the impacts of the proposed development alone, together with other plans and projects. As outlined in the Cumulative Effects Assessment Methodology chapter (Volume 2, Chapter 4), the screening process involved determination of appropriate search areas for projects, plans and activities and Zones of Influence (ZoIs) for potential cumulative effects. These were then screened according to the level of detail regarding plans and projects publicly available and the potential for interactions of impact pathways as well as spatial and temporal overlap.

8.17.2 The CEA long list of projects, plans and activities with which Dublin Array's offshore infrastructure has the potential to interact with to produce a cumulative effect is presented within the Cumulative Effect Assessment Methodology Chapter. Each plan and project has been considered on case by case basis with the maximum suite of projects identified from a long list within a search area defined as the ICES Ecoregion subsection 7a. Division 7a of the Celtic Sea ICES Ecoregion[32] is considered appropriate for this exercise in relation to physical processes as it will fully encompass all projects and plans with the potential to have spatial overlap with the effects of the offshore works associated with Dublin Array offshore infrastructure.

8.17.3 As stated in section 8.1, this chapter aims to focus on the potential impacts of the proposed Dublin Array offshore wind farm on nature conservation sites that are designated for ecological and physical features/receptors. However, this chapter avoids repetition of receptor specific assessments conducted within other technical chapters (i.e. fish, benthic features, birds, geological features etc.) but focuses on the nature conservation sites themselves, with due regard to their qualifying interests if and where required. Therefore, the zone of influence for nature conservation receptors for the purposes of this cumulative assessment has been defined as 17 km from the offshore infrastructure, on the basis of impacts to sites being limited to spatial overlap, which is consistent with the Physical Processes ZoI. Nature Conservation sites are not mobile, but may have mobile QIs. Cumulative effects on mobile species (i.e. fish, birds, marine mammals) are addressed within the other technical chapters and are therefore not repeated herein.

8.17.1 Plans and projects screened in, together with their allocated tier as defined in the Cumulative Effect Assessment Methodology Chapter that reflects their current stage within the planning and development process are presented in Table 17.

8.17.2 For the purposes of the cumulative impact assessment, a precautionary construction period has been assumed between the years 2029 to 2032, with offshore construction (excluding preparation works) lasting up 30 months as a continuous phase within this period (refer to the Project Description Chapter).

[32] Ecoregions are used to provide regional advice, steer regional integrated approaches and are the primary geographical units for ICES to develop science, new techniques and monitoring programmes. They provide the broad-scale spatial framework for the knowledge base to address management challenges and monitor the changing ecology of the North-East Atlantic. Division 7a is part of the Celtic Sea Ecoregion and broadly covers the Irish Sea

8.17.3 This cumulative assessment has been drafted based on the findings of assessments on the cumulative effects on qualifying features of nature conservation sites undertaken in the following chapters:

- Physical Processes chapter; Benthic Ecology chapter;
- Fish and Shellfish chapter;
- Ornithology chapter;
- SISAA and
- NIS.

8.17.4 For details on the methodologies followed, please refer to the chapters listed above.

Projects screened out

8.17.5 The following types of developments have been scoped out from this cumulative assessment on nature conservation receptors based on lack of spatial overlap (i.e. stage one):

- Aggregate production;
- Designated disposal sites;
- Oil and gas pipelines and infrastructure;
- Shipping associated with existing traffic lanes and ports;
- Aquaculture; and
- Carbon Capture and Storage (CCUS).

8.17.6 Marine surveys were screened out from a cumulative effects assessment for nature conservation receptors on the basis of a lack of pathway which could result in significant effects in EIA terms, on the basis that the potential magnitude of effect (such as use of boreholes etc.) would result in a negligible magnitude of effect upon nature conservation receptors.

Projects for cumulative assessment

8.17.7 The specific projects scoped into this Cumulative Effects Assessment, and the tiers into which they have been allocated are presented inTable 17 below. The full list of plans and projects considered, including those screened out, are presented in Volume 2, Chapter 4, Annex A: List.

Table 17 Projects for Cumulative Effect Assessment

Development type	Project name	Current status of development	Data confidence assessment / phase	Planned programme
Tier 1				
Dumping at Sea and Coastal Assets	Dublin Port Company MP2 Project	Consented	High - Under construction License FS006893 Permit S0024-02 (2022-2032) Permit S0024-03 (2022-2029)	Construction activities in Dublin Harbour scheduled to take place from 2022-2032; works include dredging within Dublin Harbour and the release of dredged material from vessels west of Burford Bank in outer Dublin Bay. Various activities in Dublin Port including construction of passenger building and new jetty.
Dredging	Dublin Port Company Maintenance Dredging	Consented	High Licence FS007132	Maintenance dredging at various locations in Dublin Port during the years 2022-2029
Subsea Cables	EXA Atlantic	Consented	High - Operational	Active telecommunication cable. Unknown O&M activities as required.
Subsea Cables	Aqua Comms CeltixConnect 1 (CC-1)	Consented	High - Operational	Active telecommunication cable. Unknown O&M activities as required.
Subsea Cables	Hibernia Atlantic - Hibernia 'C'	Consented	High - Operational	Active telecommunication cable. Unknown O&M activities as required.
Subsea Cables	ESB, ZAYO Emerald Bridge Fibres	Consented	High - Operational	Active telecommunication cable. Unknown O&M activities as required.
Tier 2				
No screened projects classed as Tier 2.				
Tier 3				

Development type	Project name	Current status of development	Data confidence assessment / phase	Planned programme
Terminal construction and dredging	Dublin port Company 3FM Project	Pre-consent	Medium – EIA available (submitted July 2024)	2026 – 2040
Subsea cables	Foresight Group and Etchea Energy - Mares Connect	Pre-application	Low - Proposed Environmental assessments ongoing; Foreshore licence (2023) in consultation	Subsea HVED electricity cable between Wales and Ireland. Construction period may overlap with offshore construction at Dublin Array (construction is scheduled for 2026 to 2029).
Offshore Wind Farm	Fred. Olsen Seawind, EDF Energies - Codling Wind Park	Pre-consent	Medium – Phase 1 project (MAC awarded). Scoping report and EIA available (EIA submitted Q2 2024). Initial foreshore licence granted in 2005, more recently in 2021.	Installation of up to 75 WTGs, three export cables and three OSPs. Commencement in 2027 with offshore construction lasting 2-3 years.

8.17.8 Table 18 below contains a summary of the conclusions made for the potential cumulative effects as identified by the projects listed within Table 17 above, on the relevant designations, from each impact.

Table 18 Cumulative maximum design option assessed for potential cumulative effects on nature conservation sites

Impact	Receptor	Projects to be assessed	Maximum Design Option Assessed	Justification for scoping in	Assessment	Corresponding Assessment Chapter
Impact 15: Temporary increases in SSC and deposition from construction activities on benthic features	Dalkey Coastal Zone and Killiney Head pNHA.	**Tier 1:** ▪ Dublin Port Company MP2 Project ▪ Dublin Port Company Maintenance Dredging ▪ EXA Atlantic ▪ Aqua Comms CeltixConnect 1 (CC-1) ▪ Hibernia Atlantic - Hibernia 'C' ▪ ESB, ZAYO Emerald Bridge Fibres **Tier 3:** ▪ Mares Connect ▪ Codling Wind Park ▪ Dublin 3FM project	Maximum design option for Dublin Array plus the release of sediments and sediment deposition associated with the identified Tier 1 and Tier 3 projects. Dublin Port Company MP2 Project ▪ Capital dredging and disposal will cause temporary localised sediment plumes both at the loading and licensed disposal sites. ▪ Total volume to be dredged: 424,644 m^3. Dublin Port Company (Licence: FS007132) ▪ 300,000 m^3 of material to be dredged per annum using TSHD. ▪ Disposal of material into a licenced DAS site (west of Burford Bank). ▪ Dredged sediment consists mostly of silt and sand with elements of clay, gravel, and cobbles. Dublin Port Company (DAS permit: S0004-03) ▪ The activities involve the loading and dumping of a maximum of 3,960,000 tonnes (wet weight) of dredged material during the months of April to September from 2022-2029. ▪ A maximum quantity of 495,000 tonnes (wet weight) per annum. ▪ Disposal of material into a licenced DAS site (west of Burford Bank). Dublin Port Company (DAS permit: S0024-02) ▪ Material arising from the MP2 project, which involves the loading and dumping of a maximum of 1,102,723 tonnes (wet weight) of dredged material. ▪ Disposal of material into a licenced DAS site (west of Burford Bank). Cable Maintenance Routine planned and unplanned cable maintenance over the lifetime of the cables. Exact details and programmes are unknown and so there is a high uncertainty. Construction and/or maintenance of the proposed Mares Connect power cable: ▪ Two HVDC subsea cables; ▪ Construction between 2026 to 2029; ▪ Landfall in the Greater Dublin area; ▪ Installation methodologies and exact route is unknown at the time of writing; and ▪ Routine planned and unplanned cable maintenance over the lifetime of the cables.	**Tier 1:** ▪ If these intermittent activities overlap temporally with either the construction or maintenance of Dublin Array, there is potential for cumulative SSC and sediment deposition to occur. ▪ SSC plumes may be generated through cable installation, reburial and repair operations which has the potential to result in a cumulative deterioration in water quality and increase of deposition in benthic habitats. **Tier 3:** ▪ SSC plumes may be generated through cable installation, reburial and repair operations which has the potential to result in a cumulative deterioration in water quality and increase of deposition in benthic habitats. ▪ There may be overlap with dredging operations, If these intermittent activities overlap temporally with offshore construction activities for Dublin Array, there is potential for spatial (and temporal) overlap of SSC plumes generated by the developments.	The magnitude of the potential cumulative increases in SSC and deposition from simultaneous operations is concluded to be Low, i.e. the same as the project alone. The maximum sensitivity of receptors in the area is assessed as High; this could result in a Moderate effect, which is not significant in EIA terms.	Benthic Ecology chapter. See impact 19 therein.

Impact	Receptor	Projects to be assessed	Maximum Design Option Assessed	Justification for scoping in	Assessment	Corresponding Assessment Chapter
			Codling Wind Park Installation of the Codling Wind Park's six export cables into Dublin Bay making landfall at Poolbeg. The export cables may be installed using a variety of techniques, however, in the absence of assessment for the installation of the project alone the modelling from Dublin Array has been applied. Dublin Port Company 3FM Project: Capital dredging and disposal ▪ Total dredge volume suitable for disposal at sea: 1,189,000 m^3			
Impact 16: Temporary increases in SSC and deposition from construction activities on mobile features	River Dargle Salmonid Waters.	**Tier 1:** ▪ Dublin Port Company MP2 Project ▪ Dublin Port Company Maintenance Dredging ▪ EXA Atlantic ▪ Aqua Comms CeltixConnect 1 (CC-1) ▪ Hibernia Atlantic - Hibernia 'C' ▪ ESB, ZAYO Emerald Bridge Fibres **Tier 3:** ▪ Mares Connect ▪ Codling Wind Park ▪ Dublin 3FM project	Maximum design option for Dublin Array plus the release of sediments and sediment deposition associated with the identified Tier 1 and Tier 3 projects. Dublin Port Company MP2 Project ▪ Capital dredging and disposal will cause temporary localised sediment plumes both at the loading and licensed disposal sites. ▪ Total volume to be dredged: 424,644 m3. Dublin Port Company (Licence: FS007132) ▪ 300,000 m3 of material to be dredged per annum using TSHD. ▪ Disposal of material into a licenced DAS site (west of Burford Bank). ▪ Dredged sediment consists mostly of silt and sand with elements of clay, gravel, and cobbles. Dublin Port Company (DAS permit: S0004-03) ▪ The activities involve the loading and dumping of a maximum of 3,960,000 tonnes (wet weight) of dredged material during the months of April to September from 2022-2029. ▪ A maximum quantity of 495,000 tonnes (wet weight) per annum. ▪ Disposal of material into a licenced DAS site (west of Burford Bank). Dublin Port Company (DAS permit: S0024-02) ▪ Material arising from the MP2 project, which involves the loading and dumping of a maximum of 1,102,723 tonnes (wet weight) of dredged material. ▪ Disposal of material into a licensed DAS site (west of Burford Bank). Cables maintenance:	**Tier 1** ▪ If these intermittent activities overlap temporally with either the construction or maintenance of Dublin Array, there is potential for cumulative effects on fish and shellfish receptors including early life stages and spawning and nursery grounds. ▪ SSC plumes are likely to be generated during cable re-burial and repair operations, which has the potential to result in cumulative effects on fish and shellfish receptors including early life stages. **Tier 3** ▪ Due to the close proximity of the cable route to the Dublin Array and the potential for temporal overlap during construction and O&M activities there is potential for the effects of increases in SSC and sediment deposition to act cumulatively. These assumptions are considered to be precautionary and an appropriate estimation in the absence of further information. ▪ There may be overlap with dredging operations, If these intermittent activities overlap temporally with offshore construction activities for Dublin Array, there is potential for spatial (and temporal) overlap of SSC plumes generated by the developments.	The magnitude of the potential cumulative increases in SSC and sediment deposition from simultaneous operations is concluded to be Low adverse. The maximum sensitivity of the receptors in the area is assessed as Medium. The potential significance of effect of cumulative increases in SSC and deposition from simultaneous operations on mobile fish species utilising River Dargle Salmonid Waters is, at most, **Slight adverse** (i.e. the same as the project alone), which is not significant in EIA terms.	Fish and Shellfish chapter . See Effect 16 therein.

Impact	Receptor	Projects to be assessed	Maximum Design Option Assessed	Justification for scoping in	Assessment	Corresponding Assessment Chapter
			Routine planned and unplanned maintenance works over the lifetime of the cables and pipelines. Exact details and maintenance schedules are unknown and so there is a high uncertainty. Mares Connect ▪ Two HVDC subsea cables with construction anticipated between 2026 to 2029. ▪ Installation methodologies and exact route is unknown at the time of writing. ▪ Landfall in the Greater Dublin area. ▪ Routine planned and unplanned cable maintenance over the lifetime of the cables. Codling Wind Park ▪ Three export cables with landfall at Poolbeg. ▪ Cable corridor crossing the offshore ECC of Dublin Array. ▪ Sediments to be released during pre-construction surveys, seabed preparation works, foundation and cable installation, landfall works, and maintenance activities. Dublin Port Company 3FM Project: Capital dredging and disposal; ▪ Total dredge volume suitable for disposal at sea: 1,189,000 m^3			
Impact 17: Underwater noise disturbance to migratory fish	River Dargle Salmonid Waters.	**Tier 1** ▪ All listed projects **Tier 3** ▪ Mares Connect ▪ Codling Wind Park	Maximum design option for Dublin Array plus any underwater noise emitted during the construction or maintenance of the identified Tier 1 and Tier 3 projects. Mares Connect ▪ Underwater noise from construction and maintenance-related activities (e.g. seabed preparation, cable installation and maintenance, cable protection, vessel noise). Codling Wind Park ▪ Piling of 78 monopile foundations (75 WTGs and three OSPs). ▪ Modelled maximum impact ranges for the onset of TTS up to 34 km for stationary receptors and 24 km for fleeing receptors. ▪ Detonation of up to 10 UXO. ▪ Underwater noise from other construction and maintenance-related activities (e.g. seabed preparation, cable installation and maintenance, cable protection, vessel noise, geophysical surveys).	**Tier 1** Due to the potential for temporal overlap of the identified projects and the Dublin Array construction period there is potential for the effects of underwater noise to act cumulatively. These assumptions are considered to be precautionary and an appropriate estimation in the absence of further information. **Tier 3** If piling and other construction and maintenance-related activities associated with the identified projects overlap temporally with either the construction or maintenance of Dublin Array, there is potential for cumulative effects on fish populations. Furthermore, cumulative effects on fish may arise due to the prolonged exposure to piling noise because of the sequential piling of	The maximum magnitude of the potential cumulative underwater noise from simultaneous and sequential operations (inclusive of piling and UXO clearance) is concluded to be Low (adverse). The maximum sensitivity of the qualifying interests of the site are assessed as Medium. Therefore, the potential maximum significance of cumulative underwater noise effects on fish receptors is Slight adverse (i.e., the same as the project alone), which is not significant in EIA terms.	Fish and Shellfish chapter. See Effect 18 therein.

Impact	Receptor	Projects to be assessed	Maximum Design Option Assessed	Justification for scoping in	Assessment	Corresponding Assessment Chapter
				foundations for the identified wind farm projects.		
Impact 18: Disturbance and displacement of birds	Dalkey Coastal Zone and Killiney Hill pNHA.	**Tier 3:** Codling Wind Park	Codling Wind Park Based on abundance estimated provided within the Codling Wind Park application, an annual cumulative displacement assessment was conducted for four species: gannet, kittiwake, guillemot and razorbill.	If construction and maintenance-related activities associated with the identified project overlap temporally with either the construction or maintenance of Dublin Array, there is potential for cumulative effects on bird displacement.	The ornithology cumulative assessment concluded that the effect on key bird species from cumulative displacement effects associated with Dublin Array and Tier 3 projects was 'not significant' in EIA terms. No ecologically significant adverse residual effects on offshore ornithology have therefore been predicted.	Ornithology chapter. See impact 10, impact 11, impact 12, and impact 13 therein.
Impact 19: Potential for bird collisions with the offshore infrastructure	Baldoyle Estuary Nature Reserve. North Bull Island Nature Reserve. Booterstown Marsh pNHA. Dalkey Coastal Zone and Killiney Hill pNHA. Dublin Bay Biosphere. Baldoyle Bay Ramsar site. North Bull Island Ramsar site. Sandymount Strand / Tolka Estuary Ramsar site.	**Tier 3:** Codling Wind Park	Codling Wind Park Based on collision risk modelling provided within the Codling Wind Park application, a cumulative collision assessment was conducted for five species: gannet, herring gull, great black-backed gull, kittiwake and common tern.	If construction and maintenance-related activities associated with the identified project overlap temporally with either the construction or maintenance of Dublin Array, there is potential for cumulative effects on bird collision with offshore infrastructure.	The ornithology cumulative assessment concluded that the effect on key bird species and migratory species from cumulative collision effects associated with Dublin Array Tier 3 projects have been assessed as 'not significant' in EIA terms. No ecologically significant adverse residual effects on offshore ornithology have therefore been predicted.	Ornithology chapter. See impact 10, impact 11, impact 12, and impact 13 therein.
Impact 20: Changes to coastal geological features arising from effects on physical processes	Dalkey Island CGS. White Rock Killiney CGS. Killiney Bay CGS. Bray Head CGS. Greystones Beach CGS, Greystones (Appinite) CGS. Wicklow – Greystones Coast CGS. Blackrock Breccia CGS. North Bull Island CGS. Bottle Quay CGS.	**Tier 3:** Codling Wind Park	Codling Wind Park Installation of the Codling Wind Park's six export cables into Dublin Bay making landfall at Poolbeg. The export cables may be installed using a variety of techniques, however, in the absence of assessment for the installation of the project alone the modelling from Dublin Array has been applied.	The largest structures proposed for installation at Codling Wind Park and Dublin Array, given the locations of the developments, may have limited potential to create modifications to the wave and tidal regime of a scale large enough to allow interaction between them.	Despite being potentially additive, it is not anticipated that the cumulative changes arising from the developments would be measurable at the identified receptors (including the coast) or be significant in EIA terms when considered cumulatively.	Physical Processes chapter. See impact 4 therein.

Impact	Receptor	Projects to be assessed	Maximum Design Option Assessed	Justification for scoping in	Assessment	Corresponding Assessment Chapter
	Claremont strand CGS. Balscaddan Bay CGS. Irelands Eye CGS.					

8.18 Interactions of environmental factors

8.18.1 A matrix illustrating where interactions between effects on different factors have been addressed is provided in Volume 8, Chapter 1: Interactions of the Environmental Factors.

8.18.2 Interactions of the foregoing are considered to be the effects and associated effects of different aspects of the proposal on the same receptor. These are considered to be:

- Project lifetime effects: Assessment of the scope for effects that occur throughout more than one phase of the project (construction, O&M and decommissioning) to interact and potentially create a more significant effect on a receptor than if just assessed in isolation in these three key project phases; and
- Receptor led effects: Assessment of the scope for all effects to interact, spatially and temporally, to create inter-related effects on a receptor. As an example, all effects on benthic ecology such as direct habitat loss or disturbance, sediment plumes, scour, jack up vessel use etc., may interact to produce a different, or greater effect on this receptor than when the effects are considered in isolation. Receptor-led effects might be short-term, temporary or transient effects.

8.18.3 There are linkages between the topic-specific chapters presented within this EIAR, whereby the effects assessed in one chapter have either the potential to result in secondary effects on another receptor (e.g. effects on fish and shellfish ecology have the potential to result in secondary effects on marine mammals prey resources).

8.18.4 The potential effects on nature conservation sites during construction, operational and maintenance and decommissioning phases of the Project have been assessed in sections 8.14– 8.16 above.

8.18.5 The different effects on nature conservation sites are already inter-related; in particular, effects on fish and shellfish and marine ornithology resulting from impacts to habitats and prey species, and therefore these linked processes have already been considered within the assessment. As effects on nature conservation sites (i.e. from effects to habitats and prey species) also have the potential to have secondary effects on other receptors which have been fully assessed in the topic-specific chapters. These receptors are:

- Effects on physical processes also have the potential to have secondary effects on nature conservation sites. Those potential effects are considered within Section 8.14–8.16 above, and in Physical Processes chapter;.
- Effects on MW&SQ also have the potential to have secondary effects on nature conservation sites. Those potential effects are considered within Section 8.14– 8.16 above, and in MW&SQ chapter;
- Effects on benthic, subtidal and intertidal ecology receptors also have the potential to have secondary effects on nature conservation sites. Those potential effects are considered within Section 8.14– 8.16 above, and in Benthic Ecology chapter;

- Effects on fish and shellfish receptors also have the potential to have secondary effects on nature conservation sites. Those potential effects are considered within Section 8.14– 8.16 above, and in fish and shellfish chapter;
- Effects on marine mammal receptors also have the potential to have secondary effects on nature conservation sites. Those potential effects are considered within Section 8.14– 8.16 above, and in Marine Mammal Chapter; and
- Effects on offshore ornithology receptors also have the potential to have secondary effects on nature conservation sites. Those potential effects are considered within Section 8.14– 8.16 above, and in Ornithology chapter.

8.18.6 For nature conservation receptors, the following potential impacts have been considered within the interactions assessment:

- Impacts to benthic ecology as a result of the temporary increase in SSC and sediment deposition;
- Impacts to mobile features as a result of the temporary increase in SSC and sediment deposition;
- Loss/disturbance of benthic habitats;
- Underwater noise disturbance to migratory fish;
- Disturbance and displacement of birds; and
- Changes to coastal geological features arising from effects on physical processes.

Project lifetime effects

8.18.7 Project lifetime effects consider impacts from the construction, operation or decommissioning of the offshore infrastructure on the same receptor (or group). The potential inter-related effects that could arise in relation to nature conservation sites are presented in Table 19 below and in Volume 8, Chapter 1: Interactions of the Environmental Factors.

Table 19 Project lifetime effects assessment for potential inter-related effects on Nature Conservation sites.

Impact Type	Effects (Assessment Alone)			Interaction Assessment
	C	O&M	D	Project lifetime effects
Impacts to benthic ecology as a result of the temporary increase in SSC and sediment deposition.	Moderate Adverse	Negligible	Moderate Adverse	The majority of the seabed disturbance (resulting in the highest SSC and sediment deposition) will occur during the construction phase, with any effects being short-lived. There is potential for some disturbance within the decommissioning phase although there is no requirement for seabed preparation and also during the operational phase however, these activities will be localised and temporally discrete. It is therefore considered that impacts in the operation phase will not materially contribute to inter-related effects. Due to this, and the recoverability of the species and habitats affected, the interaction of these impacts across all stages of the development is not predicted to result in an effect of any greater significance than those assessed in the individual project phases.
Impacts to mobile features as a result of the temporary increase in SSC and sediment deposition.	Slight Adverse	N/A	Slight Adverse	The majority of seabed disturbance resulting in increased suspended sediment and deposition will be within the construction phase and decommissioning phase (with a reduced scope with no requirement for seabed preparation and certain structures remaining in situ). The two phases are significantly temporally separate such that there will be no interaction between the two. There will therefore be no inter-related effects of greater significance compared to the impacts considered alone.
Loss/disturbance of benthic habitats.	Moderate Adverse	Negligible	Slight Adverse	When considering habitat loss or disturbance additively across all phases, it should be noted that the total area of individual habitat affected is low and that these habitats are common and widespread. While the introduction of hard substrate will alter the nature of predominantly sedimentary habitats on decommissioning, all benthic habitats are predicted to recover to the baseline condition within two to ten years of removal of introduced hard infrastructure. Therefore, across the

Impact Type	Effects (Assessment Alone)			Interaction Assessment
	C	O&M	D	Project lifetime effects
				project lifetime, the effects on benthic ecology receptors are not anticipated to be such as to result in combined effects of greater significance than the assessments presented for each individual phase. There will therefore be no inter-related effects of greater significance compared to the impacts considered alone.
Underwater noise disturbance to migratory fish	Slight Adverse	N/A	Slight Adverse	The majority of impacts from underwater noise disturbance to migratory fish will be within the construction phase, with underwater noise impacts during the decommissioning phase significantly less than that described for the construction phase. The construction and decommissioning phases are significantly temporally separate such that there will be no interaction between the two. There will therefore be no inter-related effects of greater significance compared to the impacts considered alone.
Disturbance and displacement of birds	Slight Adverse	Moderate Adverse	Slight Adverse	Disturbance arising from the construction, O&M and decommissioning phases have the potential to affect identified sites and QIs both directly (e.g. disturbance of individuals) and indirectly (e.g. disturbance to prey distribution or availability). Such disturbance is predicted to occur intermittently throughout the construction and decommissioning periods, with less disturbance from vessel activity predicted in the O&M period. As this disturbance will be temporary and intermittent in nature, effects on seabirds are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual period.
Changes to coastal geological features arising from effects on	Moderate Adverse	Negligible	Moderate Adverse	Changes to coastal geological features arising from effects on physical processes will primarily occur during the construction and decommissioning phases, with the main source of effect relating to the construction required at landfall to accommodate the cable ducts

Impact Type	Effects (Assessment Alone)			Interaction Assessment
	C	O&M	D	Project lifetime effects
physical processes				It is noted that there is potential for a localised morphological response near the landfall, relating to modification to the nearshore wave regime and therefore seabed morphology depending upon the position of the exit pits and associated mounds in the subtidal. However, such an impact is likely to be more pronounced the closer to shore or the shallower the waters in which the exit pits are located. The exit pits (and any associated spoil mounds) will be temporary features and it is anticipated that they would only be present for a short period (up to a few weeks) before the excavated material is used to backfill the pits. Accordingly, the potential for longer term morphological change arising from changes to the tidal and/or wave regime is considered to be very small. With the implementation of construction methods designed avoid such impacts at landfall (i.e. use of trenchless techniques, such as HDD or direct pipe), no significant effects are predicted for the construction, operation and maintenance, and decommissioning phases of the project. Therefore, across the project lifetime, the effects on coastal geological features as a result of changes in physical processes are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase.

Receptor led effects

8.18.8 There is the potential for spatial and temporal interactions between the effects arising from habitat loss / disturbance and increases SSC and sediment deposition during the project lifetime. The greatest potential for inter-related effects is predicted to occur through the interaction of both temporary and permanent habitat loss / disturbance from foundation installation/ jack-up vessels/ anchor placement/ scour, indirect habitat disturbance due to sediment deposition and indirect effects of changes in physical processes due the presence of infrastructure in the operational wind farm.

8.18.9 With respect to this interaction, these individual impacts were assigned a significance of negligible to moderate significance as standalone impacts and although potential combined impacts may arise (i.e. spatial and temporal overlap of direct habitat disturbance), it is predicted that this will not be any more significant than the individual impacts in isolation. This is because the combined amount of habitat potentially affected would remain very limited, the supporting habitat types affected are widespread across the Irish Sea, and full recovery is predicted where temporary damage/disturbance occurs at the nature conservation sites, for all QIs. In addition, any effects due to changes in the physical processes (i.e. for benthic habitats) are likely to be limited, both in extent and in magnitude, with receptors having low sensitivity to the scale of changes predicted. As such, these interactions are predicted to be no greater in significance than that for the individual effects assessed in isolation.

8.18.10 In line with the Offshore Ornithology Chapter, regarding the disturbance of birds it is considered that due to the mobility of bird species that may occur within the study area, and their ability to exploit different prey species, and the small scale of potential changes in the context of the wider available habitats, any resulting changes to fish prey communities are unlikely to have a significant effect on foraging birds.

8.18.11 Overall, the interactions of the foregoing assessment does not identify any significant inter-related effects that were not already covered by the topic-specific assessments set out in the chapters referred to in Section 8.1. However, certain individual effects were identified that did interact with each other whilst not leading to any greater significance of effect.

8.19 Transboundary statement

8.19.1 No transboundary effects have been identified. This is because the predicted changes to the key physical process pathways (i.e., tides, waves, and sediment transport), and disturbance from underwater noise are not anticipated to be sufficient to influence identified qualifying features of nature conservation sites beyond the boundaries of Ireland's Exclusive Economic Zone (EEZ). It can therefore be concluded that there will be no transboundary effects from the offshore infrastructure.

8.19.2 Although the 17km range around the proposed development encompasses UK territorial water (13.6km north of the array) this does not overlap with a similar range around any identified project within UK waters. Consequently, there are no identified pathways for transboundary cumulative effects and therefore transboundary cumulative effects are screened out and no transboundary effects have been identified.

8.20 Summary of effects

8.20.1 A summary of the effects presented within this EIAR Chapter are presented in Table 20.

Table 20 Summary of predicted impacts of the offshore infrastructure

Impact	Receptor	Additional mitigation measures	Residual effect
Construction			
Impact 1: Temporary increases in SSC and deposition from construction activities on benthic features	Dalkey Coastal Zone and Killiney Head pNHA.	Not Applicable – no additional mitigation identified	No significant adverse residual effects
Impact 2: Temporary increases in SSC and deposition from construction activities on mobile features	River Dargle Salmonid Waters.	Not Applicable – no additional mitigation identified	No significant adverse residual effects
Impact 3: Underwater noise disturbance to migratory fish	River Dargle Salmonid Waters.	Not Applicable – no additional mitigation identified	No significant adverse residual effects
Impact 4: Disturbance and displacement of birds	Baldoyle Estuary Nature Reserve, North Bull Island Nature Reserve, Booterstown Marsh pNHA, Dalkey Coastal Zone and Killiney Hill pNHA, Dublin Bay Biosphere, Baldoyle Bay Ramsar site, North Bull Island Ramsar site, Sandymount Strand / Tolka Estuary Ramsar site.	Not Applicable – no additional mitigation identified	No significant adverse residual effects
Impact 5: Changes to coastal geological features	Dalkey Island CGS, White Rock Killiney CGS,	Not Applicable – no additional mitigation identified	No significant adverse residual effects

Impact	Receptor	Additional mitigation measures	Residual effect
arising from effects on physical processes	Killiney Bay CGS, Bray Head CGS, Greystones Beach CGS, Greystones (Appinite) CGS, Wicklow – Greystones Coast CGS, Blackrock Breccia CGS, North Bull Island CGS, Bottle Quay CGS, Claremont strand CGS, Balscaddan Bay CGS, Irelands Eye CGS.		
O&M			
Impact 6: Changes to benthic habitats arising from effects on physical processes, including changes in the sediment transport and hydrodynamic and wave regimes	Dalkey Coastal Zone and Killiney Head pNHA.	Not Applicable – no additional mitigation identified	No significant adverse residual effects
Impact 7: Disturbance and displacement of birds	Baldoyle Estuary Nature Reserve, North Bull Island Nature Reserve, Booterstown Marsh pNHA, Dalkey Coastal Zone and Killiney Hill pNHA, Dublin Bay Biosphere, Baldoyle Bay Ramsar site, North Bull Island Ramsar site, Sandymount Strand / Tolka Estuary Ramsar site.	Not Applicable – no additional mitigation identified	No significant adverse residual effects
Impact 8: Potential for bird collisions with the offshore infrastructure	Baldoyle Estuary Nature Reserve, North Bull Island Nature Reserve, Booterstown Marsh pNHA,	Not Applicable – no additional mitigation identified	No significant adverse residual effects

Impact	Receptor	Additional mitigation measures	Residual effect
	Dalkey Coastal Zone and Killiney Hill pNHA, Dublin Bay Biosphere, Baldoyle Bay Ramsar site, North Bull Island Ramsar site, Sandymount Strand / Tolka Estuary Ramsar site.		
Impact 9: Changes to coastal geological features arising from effects on physical processes	Dalkey Island CGS, White Rock Killiney CGS, Killiney Bay CGS, Bray Head CGS, Greystones Beach CGS, Greystones (Appinite) CGS, Wicklow – Greystones Coast CGS, Blackrock Breccia CGS, North Bull Island CGS, Bottle Quay CGS, Claremont strand CGS, Balscaddan Bay CGS, Irelands Eye CGS.	Not Applicable – no additional mitigation identified	No significant adverse residual effects
Decommissioning			
Impact 10: Temporary increases in SSC and deposition from decommissioning activities on benthic features	Dalkey Coastal Zone and Killiney Head pNHA.	Not Applicable – no additional mitigation identified	No significant adverse residual effects
Impact 11: Temporary increases in SSC and deposition from decommissioning activities on mobile features	River Dargle Salmonid Waters.	Not Applicable – no additional mitigation identified	No significant adverse residual effects

Impact	Receptor	Additional mitigation measures	Residual effect
Impact 12: Underwater noise disturbance to migratory fish	River Dargle Salmonid Waters.	Not Applicable – no additional mitigation identified	No significant adverse residual effects
Impact 13: Disturbance and displacement of birds	Baldoyle Estuary Nature Reserve, North Bull Island Nature Reserve, Booterstown Marsh pNHA, Dalkey Coastal Zone and Killiney Hill pNHA, Dublin Bay Biosphere, Baldoyle Bay Ramsar site, North Bull Island Ramsar site, Sandymount Strand / Tolka Estuary Ramsar site.	Not Applicable – no additional mitigation identified	No significant adverse residual effects
Impact 14: Changes to coastal geological features arising from effects on physical processes	Dalkey Island CGS, White Rock Killiney CGS, Killiney Bay CGS, Bray Head CGS, Greystones Beach CGS, Greystones (Appinite) CGS, Wicklow – Greystones Coast CGS, Blackrock Breccia CGS, North Bull Island CGS, Bottle Quay CGS, Claremont strand CGS, Balscaddan Bay CGS, Irelands Eye CGS.	Not Applicable – no additional mitigation identified	No significant adverse residual effects
Cumulative effects			
Effect 15: Cumulative temporary increases in SSC and deposition on benthic features	Dalkey Coastal Zone and Killiney Head pNHA.	Not Applicable – no additional mitigation identified	No significant adverse residual effects
Effect 16: Cumulative temporary increases in SSC	River Dargle Salmonid Waters	Not Applicable – no additional mitigation identified	No significant adverse residual effects

Impact	Receptor	Additional mitigation measures	Residual effect
and deposition on mobile features			
Effect 17: Cumulative temporary loss/disturbance of benthic habitats	Dublin Bay Biosphere	Not Applicable – no additional mitigation identified	No significant adverse residual effects
Effect 18: Cumulative underwater noise disturbance to migratory fish	River Dargle Salmonid Waters	Not Applicable – no additional mitigation identified	No significant adverse residual effects
Effect 19: Cumulative disturbance and displacement of birds	Baldoyle Estuary Nature Reserve, North Bull Island Nature Reserve, Booterstown Marsh pNHA, Dalkey Coastal Zone and Killiney Hill pNHA, Dublin Bay Biosphere, Baldoyle Bay Ramsar site, North Bull Island Ramsar site, Sandymount Strand / Tolka Estuary Ramsar site.	Not Applicable – no additional mitigation identified	No significant adverse residual effects
Effect 20: Potential for cumulative bird collisions with offshore infrastructure	Baldoyle Estuary Nature Reserve, North Bull Island Nature Reserve, Booterstown Marsh pNHA, Dalkey Coastal Zone and Killiney Hill pNHA, Dublin Bay Biosphere, Baldoyle Bay Ramsar site, North Bull Island Ramsar site, Sandymount Strand / Tolka Estuary Ramsar site.	Not Applicable – no additional mitigation identified	No significant adverse residual effects
Effect 21: Cumulative changes to coastal geological features arising	Dalkey Island CGS, White Rock Killiney CGS, Killiney Bay CGS, Bray Head CGS, Greystones Beach CGS, Greystones (Appinite) CGS, Wicklow – Greystones Coast CGS, Blackrock	Not Applicable – no additional mitigation identified	No significant adverse residual effects

Impact	Receptor	Additional mitigation measures	Residual effect
from effects on physical processes	Breccia CGS, North Bull Island CGS, Bottle Quay CGS, Claremont strand CGS, Balscaddan Bay CGS, and Irelands Eye CGS		
Transboundary			
No transboundary effects have been identified.			

8.21 References

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Annex A: Nature Conservation Policy

Legislation, Policy and Guidance

Policy/Legislation	Key provisions	Section where provision is addressed
Legislation		
European Communities (Birds and Natural Habitats) Regulations 2011	S.I. No. 477 of 2011 - The 2011 Regulations require the designation of SPAs for the protection of listed rare and vulnerable species, regularly occurring migratory species and wetlands especially those of international importance. S.I. No. 477 of 2011 - The 2011 Regulations, require the designation of SACs for the protection of certain habitats and species of plants and animals (other than birds).	An assessment of the qualifying interests of SPAs and SACs is undertaken within the NIS (Part 4: Habitats Directive Assessments, Volume 4: NIS).
European Communities (Quality of Salmonid Waters) regulations. S.I. No 293 of 1988	Defines freshwaters as being waters capable of supporting Salmon (*Salmo Salar*), Trout (*Salmo trutta*), Char (*Salvelinus*) and whitefish (*Coregonus*) and are thereby designated as Salmonid waters. The objective of this designation type is the maintenance of water quality for salmon and trout freshwater species.	Salmonid Waters are discussed in Section 8.6 and Section 8.11. An assessment of potential impacts on Salmonid Waters is undertaken in Sections 8.14 - 8.16 of this Chapter.
Wildlife Act, 1976, as amended	The principal national legislation for the protection of wildlife and the control of activities that may adversely affect wildlife. Also seeks to conserve a representative sample of important	Nature reserves and Refuges for Flora and Fauna are discussed in Section 8.6 and Section 8.11. An assessment of potential impacts on Nature Reserves and Refuges for Fauna is undertaken in Sections 8.14 - 8.16 of this Chapter.

Policy/Legislation	Key provisions	Section where provision is addressed
	ecosystems and regulate game resources. It makes licences mandatory for certain activities which may interfere with ecosystems and regulates the possession, trade and movement of wildlife. Areas of importance for wildlife may be protected under the Act, either as Nature Reserves, Refuges for Fauna, or by way of management agreements.	
Guidelines and technical standards		
Ireland's 4th National Biodiversity Plan (NBAP) 2023-2030 (Department of Housing, Local Government and Heritage, 2023).	Sets out Ireland's vision, objectives and outcomes for biodiversity in Ireland. Objective number 2 is to 'Meet Urgent Conservation and Restoration Needs. Outcome 2A: The protection of existing designated areas and protected species is strengthened and conservation and restoration within the existing protected area network are enhanced. Outcome 2D: Biodiversity and ecosystem services in the marine and freshwater environment are conserved and restored. This includes 16 targets and 21 actions.	Conservation and restoration needs of Nature Conservation sites are addressed throughout this Chapter. Nature Conservation sites are identified in Section 8.6 with those deemed as having the potential to be impacted identified in section 8.11, and assessed in Sections 8.14 - 8.16 of this Chapter. Project design features adopted in the interest of avoiding or minimizing potential impacts on these sites and conserving the sites and their qualifying interests are outlined within Section 8.13 of this Chapter.
Non-Statutory		

Policy/Legislation	Key provisions	Section where provision is addressed
Guidelines and technical standards		
Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2018)	The construction of a wind farm may have a variety of local effects, but defining the zones of influence of the project also needs to take account of the potential for more widespread impacts. These include changes to sediment movement and potentially to coastal morphology depending upon proximity to the shore and the method of protecting transmission cables; direct construction impacts; provision of substrate for colonisation by native or non-native species.	The ZoI incorporates the extent of any potential primary and secondary impacts on qualifying features of the nature conservation sites as a result of the development. The ZoI is defined in full in Section 8.1.
DCCAE Guidance, 2017 Table 4	Developers and competent authorities should have regard to when planning/assessing a project – Protected sites and species	Due regard has been given to protected sites and species within this Chapter. Due regard has been given to Natura 2000 sites within the NIS (Part 4: Habitats Directive Assessments, Volume 4: NIS)
DCCAE Guidance, 2017 Section 3.2	All phases of the development should be considered in the assessment process. Each of these phases will have its own specific effects on the environment and will differ in duration. Considering all phases of the development will address full lifecycle effects of a proposed development.	All phases of the development have been considered within this physical process EIA assessment. The assessment of effects in the construction phase are presented in Section 8.14 The assessment of effects in the operational phase (including maintenance) are presented in Section 8.15. The assessment of effects in the decommissioning phase are presented in Section 8.16.

Policy/Legislation	Key provisions	Section where provision is addressed
DCCAE Guidance, 2017 Section 4.5.3	"The zones of influence may differ depending upon the topic under consideration (e.g. the visual zone will differ from the biodiversity zone). In establishing the zones of influence, the following should be identified: the physical footprint of the project; the measures required to determine the overall zones of influence of a project (i.e. the area impacted by the development with reference to the likely significant effects); and the study area (i.e. that selected for the review).	The ZoI for nature conservation sites drew upon the appropriate ZoI for each technical focus, as relevant to the site's qualifying interests. Details of the study area are presented in Section 8.1 of this Chapter, with further details of the zone of influence and the development of the study area presented in the Physical Processes Chapter (Volume 3, Chapter 1).
DCCAE Guidance, 2017 Section 4.5.3	A source – pathway – target risk assessment methodology may be of benefit in establishing the potential zones of influence.	A source-pathway-receptor assessment methodology was used to scope the receptors within the ZoI for this assessment - see Section 8.11 for those nature conservation sites scoped in for assessment.
DCCAE Guidance, 2017 Section 4.6.5	Mitigation measures are usually required where likely significant effects on the environment are identified. Mitigation measures may be proposed in order to avoid, prevent, reduce, rectify, or sometimes compensate for any major adverse effects. The impact of residual effects should then be assessed.	The Project Design Features and Avoidance and Preventative Measures relevant to this assessment is presented in Table 7. As no significant effects arose no additional mitigation measures were required.
Guidelines on the Information to be contained in Environmental	The Guidelines have been drafted with the primary objective of improving the quality of EIARs with a view to facilitating compliance (with the [EIA]	The methodology presented within the Guidelines was utilised in the development of the EIA methodology applied within this EIAR. Further details are provided in Volume 2, Chapter 3: EIA Methodology. The Project Design Features and Avoidance and

Policy/Legislation	Key provisions	Section where provision is addressed
Impact Assessment reports (Environmental Protection Agency, 2022) (hereafter referred to as the Guidelines) DCCAE Guidance, 2017 Section 4.6.5	Directive). By doing so they contribute to a high level of protection for the environment through better informed decision-making processes. They are written with a focus on the obligations of developers who are preparing EIARs. The Guidelines emphasise the importance of the methods used in the preparation of an EIAR to ensure that the information presented is adequate and relevant mitigation measures are usually required where likely significant effects on the environment are identified. Mitigation measures may be proposed in order to avoid, prevent, reduce, rectify, or sometimes compensate for any major adverse effects. The impact of residual effects should then be assessed.	Preventative Measures relevant to this assessment is presented in Table 7. As no significant effects arose no additional mitigation measures were required.
Advice Notes on Current Practice (in the preparation of Environmental Impact Statements) (Environmental Protection Agency, 2003) (as referenced in the Guidelines)	The advice note provides key provisions in the assessment of the flora and fauna (including marine habitats).	This note was reviewed to ensure that all relevant potential impacts outlined in the note are captured within this EIAR Chapter. The advice provided in the draft advice notes published in 2015 (see below) are considered to be more appropriate for consideration given the transposition of the WFD directive into Irish law since the publication of the 2003 advice notes.

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Annex B: Identified Nature Conservation Sites

Identified Nature Conservation Sites Within the Study Area

Site Type	Site Name	Qualifying Interest(s)
International Nature Conservation Sites		
OSPAR MPAs	North Dublin Bay SAC	The OSPAR network of MPAs aims: To protect, conserve and restore species, habitats and ecological processes which have been adversely affected by human activities; To prevent degradation of, and damage to, species, habitats, and ecological processes, following the precautionary principle; and To protect and conserve areas that best represent the range of species, habitats, and ecological processes in the maritime area.
Ramsar Sites	Baldoyle Bay (site no. 413)	A tidal embayment separated from the sea by a major sand dune system. Vast mudflats are exposed at low tide and there are extensive beds of Spartina. The site is internationally important for the wintering goose (*Branta bernicla hrota)*, and nationally important numbers of various species of waterbirds use the site. **Flora:** Meadow barley (*Hordeum secalinum*) Dwarf eelgrass (*Zostera noltii*) **Birds:** Northern Pintail (*Anas acuta*) Common teal (*Anas crecca*) Eurasian wigeon (*Anas Penelope*) Pale-bellied Brent Goose (*Branta bernicla hrota*) Dunlin (*Calidris alpina*) Red Knot (*Calidris canutus*) Little egret (*Egretta garzetta*) Common diver (*Gavia immer*) Red-throated diver (*Gavia stellata*) Eurasian oystercatcher (*Haematopus ostralegus*) Bar-tailed godwit (*Limosa lapponica*) Black-tailed godwit (*Limosa limosa*) Eurasian curlew (*Numenius Arquata*) Great cormorant (*Phalacrocorax carbo*) European golden plover (*Pluvialis apricaria*) Great crested grebe (*Podiceps cristatus*) Common shelduck (*Tadorna tadorna*) Common redshank (*Tringa tetanus*) Northern lapwing (*Vanellus vanellus*) **Ecological Communities:** Saltmarsh community Estuarine sandy mud with *Pygospio elegans* and *Tubificoides benedii* community complex [1140] Mudflats and sandflats not covered by seawater at low tide [1310] Salicornia and other annuals colonising mud and sand [1330] Atlantic salt meadows (*Glauco Puccinellietalia maritimae*)

Site Type	Site Name	Qualifying Interest(s)
		[1410] Mediterranean salt meadows (*Juncetalia maritimi*) *Zostera noltii* community
	North Bull Island (site no. 406)	A small island built up over 200 years against a harbour wall and the adjoining foreshore of sandy beaches, saltmarshes and mudflats. The site is unique in Ireland because it supports well-developed saltmarsh and dune systems displaying all stages of development from the earliest phase of colonization to full maturity. The site supports five protected or threatened plant species and nationally important populations of three insect species. The area is important for nesting Sterna albifrons (80 pairs, or about 30% of the Irish population) and for numerous species of wintering waterbirds. **Flora:** Lesser centaury (*Centaurium pulchellum*) Red hemp-nettle (*Galeopsis angustifolia*) Petalwort (*Petalophyllum ralfsii*) Meadow saxifrage (*Saxifraga granulate*) **Birds:** Northern Pintail (*Anas acuta*) Northern shoveler (*Anas clypeata*) Common teal (*Anas crecca*) Eurasian wigeon (*Anas Penelope*) Pale-bellied Brent Goose (*Branta bernicla hrota*) Common goldeneye (*Bucephala clangula*) Dunlin (*Calidris alpina*) Red knot (*Calidris canutus)* Mute Swan (*Cygnus olor*) Little Egret (*Egretta garzetta*) Red-throated diver (*Gavia stellata*) Eurasian oystercatcher (*Haematopus ostralegus*) Bar-tailed godwit (*Limosa lapponica*) Black-tailed godwit (*Limosa limosa*) Eurasian curlew (*Numenius Arquata*) Great cormorant (*Phalacrocorax carbo*) European golden plover (*Pluvialis apricaria*) Great crested grebe (*Podiceps cristatus*) Little Grebe (*Tachybaptus ruficollis*) Common shelduck (*Tadorna tadorna*) Common redshank (*Tringa tetanus*) Northern lapwing (*Vanellus vanellus*) **Ecological Communities:** Fine sand to sandy mud with *Pygospio elegans* and *Crangon crangon* community complex *Zostera noltii* community Saltmarsh community 1410] Mediterranean Salt Meadows [2120] Marram Dunes (White Dunes) [2130] Fixed Dunes (Grey Dunes)*

Site Type	Site Name	Qualifying Interest(s)
		[2110] Embryonic Shifting Dunes [2190] Humid Dune Slacks *Mytilus edulis* dominated community [1210] Annual Vegetation of Drift Lines [1310] Salicornia Mud [1330] Atlantic Salt Meadows
	Sandymount Strand / Tolka Estuary (site no. 832)	An intertidal system supporting a large bed of eelgrass (*Zostera noltii*) with extensive areas of sandflats. The site is important for various species of waterbirds, supporting internationally important numbers of Brent Geese and large numbers of roosting gulls and terns. Various species of annelids, bivalves and small gastropods occur. **Flora:** Dwarf eelgrass (*Zostera noltii*) **Bird:** Common teal (*Anas crecca*) Eurasian wigeon (*Anas Penelope*) Pale-bellied Brent Goose (*Branta bernicla hrota*) Dunlin (*Calidris alpina*) Mute Swan (*Cygnus olor*) Little egret (*Egretta garzetta*) Common Snipe (*Gallinago gallinago*) Great northern diver (Gavia immer) Red-throated diver (*Gavia stellata*) Eurasian oystercatcher (*Haematopus ostralegus*) Mediterranean gull (*Ichthyaetus melanocephalus*) Bar-tailed godwit (*Limosa lapponica*) Black-tailed godwit (*Limosa limosa*) Eurasian Curlew (*Numenius Arquata*) Great cormorant (*Phalacrocorax carbo*) Great crested grebe (*Podiceps cristatus*) Common tern (*Sterna hirundo*) Common shelduck (*Tadorna tadorna*) Sandwich tern (*Thalasseus sandvicensis*) Common redshank (*Tringa tetanus*) Northern lapwing (*Vanellus vanellus*) **Ecological Communities:** Saltmarsh community *Zostera noltii* community [1140] Tidal Mudflats and Sandflats [1310] Salicornia and other annuals colonising mud and sand
UNESCO Biosphere Reserve	Dublin Bay	The Dublin Bay Biosphere Reserve (former North Bull Island) comprises Dublin Bay, North Bull Island and adjacent land, including parts of Dublin. The Biosphere also encompasses three Ramsar sites, Sandymount Strand, North Bull Island and Baldoyle Bay.

Site Type	Site Name	Qualifying Interest(s)
		The biosphere reserve is significant from a conservation perspective since it supports well-developed salt marshes and dune systems displaying all stages of development from the earliest phase of colonization to stable and full maturity. The area is also important for nesting and wintering waterfowls. The major habitats and land cover types are saltmarsh with glasswort (*Salicornia dolichostachya* and *S. europaea*), Puccinellia maritima and sea lavender (*Limonium humile*); sand dune complex with saltwort (*Salsola kali*), sea rocket (*Cakile maritima*), sea couchgrass (*Agropyron junceiforme*) etc.; beaches; lagoonal sand flat; lagoonal mud flats with algae such as *Enteromorpha intestinalis*, *E. compressa* and *Ulva lactuca*. It also qualifies for international importance as the numbers of three species exceed the international threshold – Light-bellied Brent Goose (*Branta bernicla hrota*), Black-tailed Godwit (*Limosa limosa*) and Bar-tailed Godwit (*Limosa lapponica*). Species such as Grey Heron (*Ardea cinerea*), Goldeneye (*Bucephala*), Red-breasted Merganser (*Mergus serrator*) and Greenshank (*Tringa nebularia*) are regular in winter in numbers of regional or local importance. The North Bull Island and parts of the buffer zone in north Dublin include populations of Irish Mountain Hare (*Lepus timidus hibernicus*), a uniquely Irish sub-species of a species of national and international importance, but under severe pressure from recreational disturbance and illegal poaching.
Important Marine Mammal Areas (IMMAs)	IMMAs within the Irish Sea, Celtic Sea, English Channel, and North Sea.	The IMMA initiative is the major activity of the Marine Mammal Protected Areas Task Force (MMPATF) which was created in 2013 by the International Committee on Marine Mammal Protected Areas (ICMMPA), the International Union for Conservation of Nature's (IUCN) World Commission on Protected Areas (WCPA) Marine Vice Chair, and members of the IUCN Species Survival Commission (SSC) to help support a stronger global profile for the role of marine mammals in protected areas. Important Marine Mammal Areas (IMMAs) are defined as discrete portions of habitat, important to marine mammal species, that have the potential to be delineated and managed for conservation. IMMAs are identified in order to prioritise their consideration for conservation measures by governments, intergovernmental organisations, conservation groups, and the general public.
European Nature Conservation Sites		
Natura 2000 Sites	SACs and SPAs	SACs are prime wildlife conservation areas designated under the EU Habitats Directive, transposed into Irish law by the Habitats Regulations. SPAs are designated under the terms of the EU Birds Directive (2009/147/EC) to provide the protection of listed rare and vulnerable species, regularly occurring migratory species, and wetlands. The marine areas include some of the productive intertidal zones of bays and estuaries that provide vital food

Site Type	Site Name	Qualifying Interest(s)
		resources for several wintering wader species including Dunlin, Knot and Bar-tailed Godwit.
Salmonid Waters	River Dargle	Salmonid Waters are designated for the following: Salmon (*Salmo Salar*); Pollan (*Coregonus autumnalis pollan*); Sea trout (*Salmo trutta*); Schelly (*Coregonus nilssoni*) Trout (*Salmo trutta*); Char (*Salvelinus alpinus*); Rainbow trout (*Salmo gairdneri*); and Brook trout (*Salvelinus fontinalis*);
National Nature Conservation Sites		
pNHA	Baldoyle Bay (000199)	The qualifying interests for this nature conservation site have been sourced from the Baldoyle Bay SAC and SPA. SAC qualifying interests: Mudflats and sandflats not covered by seawater at low tide; Salicornia and other annuals colonising mud and sand; Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*); and Mediterranean salt meadows (*Juncetalia maritimi*). SPA qualifying interests: Light-bellied Brent Goose (*Branta bernicla hrota*); Shelduck (*Tadorna tadorna*); Ringed Plover (*Charadrius hiaticula*); Golden Plover (*Pluvialis apricaria*); Grey Plover (*Pluvialis squatarola*); Bar-tailed Godwit (*Limosa lapponica*); and Wetland and Waterbirds.
	Booterstown Marsh (pNHA 001205)	Watercress (*Nasturtium officinale*); Water Horsetail (*Equisetum fluviatile*); Amphibious Bistort (*Persicaria amphibia*); Fool's Watercress (*Apium nodiflorum*); Creeping Bent (*Agrostis stolonifera*); Sea Club-rush (*Bolboschoenus maritimus*); Saltmarsh Rush (*Juncus gerardi*); Common Saltmarsh-grass (*Puccinellia maritima*); Sea-milkwort (*Glaux maritima*); Sea Aster (*Aster tripolium*); Borrer's Saltmarsh grass (*Puccinellia fasciculata*); Snipe (*Gallinago gallinago*); Oystercatchers (*Haematopus ostralegus*); Redshanks (*Tringa totanus*); Black-headed Gull (*Chroicocephalus ridibundus*); Mallard (*Anas platyrhynchos*); Teal (*Anas crecca*); Kingfisher (*Alcedo atthis*); Grey Heron (*Ardea cinerea*);

Site Type	Site Name	Qualifying Interest(s)
		Little Egret (*Egretta garzetta*); and Yellow Wagtail (*Motacilla flava*).
	Bray Head (SAC 000714)	The qualifying interests for this nature conservation site have been sourced from the Bray Head SAC. SAC qualifying interests: Vegetated sea cliffs of the Atlantic and Baltic coasts European dry heaths
	Dalkey Coastal Zone and Killiney Hill (pNHA 001206)	This site represents a fine example of a coastal system with habitats ranging from the sub-littoral to coastal heath. The flora is well developed and includes interesting species. The islands are important bird sites and are known nesting and roosting areas for many species including: Herring Gulls, Great Black-backed Gull, Lesser Black-backed Gull, Shelduck, Fulmar, Mallard, Oystercatcher, Cormorants, Shag, Curlew The site is also known for the presence of various tern species including: Common tern; Arctic tern; and Roseate tern. Dalkey Sound is noteworthy for the occurrence of many coastal invertebrate species including: Squat lobsters (*Galathea spp*.); Swimming crabs (*Portunus spp*.); Crawfish (*Palinurus vulgaris*); European species of the Order Nudibranchia; and Spiny Starfish (*Marthasterias glacialis*). The site is also classified for its geological importance.
	Howth Head (SAC 000202 / SPA 004113)	The qualifying interests for this nature conservation site have been sourced from the Howth Head SAC and the Howth Head Coast SPA. SAC qualifying interests: Vegetated sea cliffs of the Atlantic and Baltic coasts; and European dry heaths. SPA qualifying interests: Kittiwake (*Rissa tridactyla*).
	Ireland's Eye (pNHA 000203 /	The qualifying interests for this nature conservation site have been sourced from the Irelands Eye SAC and SPA designations. SAC qualifying interests:

Site Type	Site Name	Qualifying Interest(s)
	SAC 002193 / SPA 004117)	Perennial vegetation of stony banks; and Vegetated sea cliffs of the Atlantic and Baltic coasts. SPA qualifying interests: Cormorant (*Phalacrocorax carbo*); Herring Gull (*Larus argentatus*); Kittiwake (*Rissa tridactyla*); Guillemot (*Uria aalge*); and Razorbill (*Alca torda*).
	North Dublin Bay (SAC 000206 / SPA 004006)	The qualifying interests for this nature conservation site have been sourced from the North Dublin Bay SAC and North Bull Island SPA designations. SAC qualifying interests: Mudflats and sandflats not covered by seawater at low tide; Annual vegetation of drift lines; Salicornia and other annuals colonising mud and sand; Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*); Mediterranean salt meadows (*Juncetalia maritimi*); Embryonic shifting dunes; Shifting dunes along the shoreline with European Marram Grass (*Ammophila arenaria*); Fixed coastal dunes with herbaceous vegetation (grey dunes); Humid dune slacks; and Petalwort (*Petalophyllum ralfsii*). SPA qualifying interests: Light-bellied Brent Goose (*Branta bernicla hrota*) Shelduck (*Tadorna tadorna*) Teal (*Anas crecca*) Pintail (*Anas acuta*) Shoveler (*Anas clypeata*) Oystercatcher (*Haematopus ostralegus*) Golden Plover (*Pluvialis apricaria*) Grey Plover (*Pluvialis squatarola*) Knot (*Calidris canutus*) Sanderling (*Calidris alba*) Dunlin (*Calidris alpina*) Black-tailed Godwit (*Limosa limosa*) Bar-tailed Godwit (*Limosa lapponica*) Curlew (*Numenius arquata*) Redshank (*Tringa totanus*) Turnstone (*Arenaria interpres*) Black-headed Gull (*Chroicocephalus ridibundus*) Wetland and Waterbirds

Site Type	Site Name	Qualifying Interest(s)
	South Dublin Bay (SAC 000210 / SPA 004024)	The qualifying interests for this nature conservation site have been sourced from the South Dublin Bay SAC and South Dublin Bay and River Tolka Estuary SPA. SAC qualifying interests: Mudflats and sandflats not covered by seawater at low tide; Annual vegetation of drift lines; Salicornia and other annuals colonising mud and sand; and Embryonic shifting dunes SPA qualifying interests: Light-bellied Brent Goose (*Branta bernicla hrota*) Oystercatcher (*Haematopus ostralegus*) Ringed Plover (*Charadrius hiaticula*) Grey Plover (*Pluvialis squatarola*) Knot (*Calidris canutus*) Sanderling (*Calidris alba*) Dunlin (*Calidris alpina*) Bar-tailed Godwit (*Limosa lapponica*) Redshank (*Tringa tetanus*) Black-headed Gull (*Chroicocephalus ridibundus*) Roseate Tern (*Sterna dougallii*) Common Tern (*Sterna hirundo*) Arctic Tern (*Sterna paradisaea*) Wetland and Waterbirds
	The Murrough (SAC 002249 / SPA 004186)	The qualifying interests for this nature conservation site have been sourced from the Murrough Wetlands SAC and the Murrough SPA. SAC qualifying interests: Annual vegetation of drift lines; Perennial vegetation of stony banks; Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*); Mediterranean salt meadows (*Juncetalia maritimi*); Calcareous fens with Cladium mariscus and species of the Caricion davallianae; and Alkaline fens. SPA qualifying interests: Red-throated Diver (*Gavia stellata*); Greylag Goose (*Anser anser*); Light-bellied Brent Goose (*Branta bernicla hrota*); Wigeon (*Anas penelope*); Teal (*Anas crecca*); Black-headed Gull (*Chroicocephalus ridibundus*); Herring Gull (*Larus argentatus*); and Little Tern (*Sterna albifrons*).
National Nature Conservation Sites		

Site Type	Site Name	Qualifying Interest(s)
Refuge for Fauna	Rockabill	The Rockabill Refuge for Fauna is designated (under S.I. No. 100/1988) for: Roseate Tern (*Sterna dougallii*).
SAAO	Howth Head	The Howth SAAO protects many of the special qualities of the area and aims to preserve and enhance the character and special features of Howth. It covers a total of 547 hectares, including Ireland's Eye and the heathland, woods, cliffs, shingle beaches and wooded residential areas of the south-eastern half of the Howth peninsula. These areas have a rich diversity of flora and fauna and include protected species such as the green-winged orchid, the red squirrel and seabirds such as kittiwakes, guillemots and gannets. The order also designates a 21km network of public footpaths.
	North Bull Island	The North Bull Island SAAO has been designated to combine amenity and nature conservation interests on the basis of the outstanding natural beauty of the area, its special recreational value and its nature conservation value. North Bull Island is a unique site in Ireland in terms of its wealth of habitats, biodiversity, its relatively young age (just over 200 years), its geomorphology and the range of natural successional stages between habitats. There are high quality examples of several rare and threatened coastal habitats present on the island.
	Bray Head	Bray Head has a relatively low building line with very little residential or commercial development. This is very unusual on the east coast, as both Howth Head and Killiney Hill have significantly high levels of development. Bray Head is one of the most important amenity areas in County Wicklow and therefore, it is an attractive site for future development. As a result, there is a need to protect, enhance and sympathetically develop this natural resource as it is an important area for built heritage, geology, scenery and biodiversity.
Nature Reserve (NR)	Baldoyle Estuary	Baldoyle is of international importance as a wintering area for Brent Geese. Wading birds that winter at Baldoyle include black-tailed Godwits, Redshanks and Curlews. When the tide comes in, fish enter the estuary and become prey for diving birds like the Great-crested Grebe and the Red-breasted Merganser.
	North Bull Island	The island is covered with dune grassland. An extensive salt marsh lies to the northwest and at extreme low tides there are extensive mud flats between the island and the mainland. The reserves are of international scientific importance for Brent Geese and also on botanical, ornithological, zoological and geomorphological grounds.
Wildfowl Sanctuary	North Bull Island	A range of wildfowl and wading birds protected under the EU Birds Directive spend the winter on North Bull Island, these birds migrate to the island every year from as far away as Canada and Africa. Three species regularly occur in numbers that are considered internationally important: light-bellied brent goose, black-tailed godwit and bar-tailed godwit. Fourteen other species regularly occur in nationally important numbers: shelduck, teal, pintail, shoveler, oystercatcher, grey plover, golden plover, knot,

Site Type	Site Name	Qualifying Interest(s)
		sanderling, dunlin, curlew, redshank, turnstone and black-headed gull. The island also supports significant numbers of birds during the summer.
	Broad Lough	A range of wildfowl and wading birds protected under the EU Birds Directive spend the winter at Broad Lough estuarine habitat, these birds migrate to the island every year from as far away as Canada and Africa. The site is considered internationally important for Light-bellied Brent Goose and nationally important for Red-throated Diver, Greylag Goose, Wigeon, Teal, Black-headed Gull and Herring Gull. It is probably the most important site in the country for nesting Little Tern. There is also the regular occurrence of Red-throated Diver, Little Egret, Whooper Swan, Greenland White-fronted Goose, Golden Plover, Little Tern, Sandwich Tern, Short-eared Owl and Kingfisher at the site. Other species that are known to occur here in winter are Little Grebe, Grey Heron, Cormorant, Mute Swan, Shelduck, Gadwall, Shoveler, Mallard, Ringed Plover, Lapwing, Dunlin, Curlew, Greenshank and Redshank.
Marine National Park	Páirc Náisiúnta na Mara	In April 2024, Ireland's first Marine National Park, Páirc Náisiúnta na Mara was established, representing Ireland's largest National Park covering more than 70,000 acres of land and sea. The National Park is situated in Co. Kerry and encompasses a number of already protected sites. As such, there are no additional regulations or restrictions being added to those sites within the limits of the National Park now that they are under National Park status. The main objective of Páirc Náisiúnta na Mara is the conservation and sustainable use of biodiversity. In addition to biodiversity, locations within the Park are very significant for language, literature and cultural heritage.
Local Nature Conservation Sites		
CGS	Killiney Bay	This sequence of sediments is one of the most renowned in Irish Quaternary literature and has been interpreted as 'glaciomarine' in origin (i.e., deposited under a floating ice sheet in the sea) by some academics. However, the general consensus is that the sediments are the product of a terrestrial ice sheet, interpreted as 'subglacial' tills deposited at the base of an ice sheet on land. Examining the sedimentology of the cliff shows that there are a number of till units stacked on top of each other. The tills include gravel beds, sand pockets and clay lenses, and are dominated by erratic limestone rocks. Large boulders of Leinster granite and limestone are also seen in the section and strewn across the beach. Small pebbles of a distinctive microgranite from Ailsa Craig in the Firth of Clyde can also be found. The southern portion of the section, between Bray and Shankill, hosts spectacular examples of clastic dykes, which are vertical beds of gravels set within consolidated, muddy till sediment, which result from

Site Type	Site Name	Qualifying Interest(s)
		expulsions of meltwater under a glacier. Micromorphological analysis of some of the sediment units at Killiney Bay has shown shear structures that can only have resulted from subglacial deposition.

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