Celtic Interconnector Project

Environmental Impact Assessment Report

Volume 8B (Marine Strategy Framework Directive Assessment - Ireland)

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1 Background

1.1 Introduction

This report has been prepared with reference to the Marine Strategy Framework Directive (MSFD) 2008/56/EC of the European Parliament and of the Council adopted on 17 June 2008, which established a framework for community action in the field of marine environmental policy.

Under Article 1 of the MSFD, Ireland, as a European Member State, has a responsibility to develop a marine strategy for its marine waters, and to execute a programme of measures designed to achieve or maintain good environmental status (GES), as defined by the MSFD, in the marine environment. As the consenting decision-maker in the marine environment in Ireland, it is the responsibility of the Department of Housing, Local Government and Heritage (DHLGH) to consider whether development proposals in its jurisdiction are likely to influence the ability of Ireland's marine waters to achieve or maintain GES.

An MSFD assessment has been undertaken with regards to the Irish marine environment for the Celtic Interconnector Project, with the findings presented in this report. This provides the DHLGH with the information it needs to determine whether the installation, operation, and decommissioning of the Project in Irish waters (including both Irish Territorial Waters and the Irish Exclusive Economic Zone (EEZ)) has the potential to influence the GES of Ireland's marine waters and therefore the Government of Ireland's ability to uphold its responsibilities under the MSFD.

1.2 Legislative Context

1.2.1 The Marine Strategy Framework Directive

The MSFD established a framework for community action in the field of marine environmental policy, with the overall aim of protecting the marine environment across Europe. In order to deliver this, the MSFD strives to achieve GES [1] in all relevant water bodies by 2020. The Directive places a requirement on each Member State to develop its own marine strategy, outlining how GES can be achieved or maintained. Under Article 17, marine strategies must be reviewed and updated every six years.

Such marine strategies include the following key stages:

- Initial assessment of the current (at the time) environmental status of national marine waters and the environmental impact and socioeconomic analysis of human activities in these waters;
- Determination of what GES means for each Member State's national marine waters;

[1] As defined in Article 3(5) of the MSFD Directive, GES refers to: the environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas that are clean, healthy and productive within their intrinsic conditions, and the use of the marine environment is at a level that is sustainable, thus safeguarding the potential for uses and activities by current and future generations.

- Establishment of environmental targets and associated indicators to show how / if GES will have been achieved by 2020;
- Establishment of a monitoring programme for the ongoing assessment and regular update of targets; and
- Development of a programme of measures designed to achieve or maintain GES by 2020.

The process is cyclical in nature (Figure 1.1), with the second cycle having commenced in 2018.

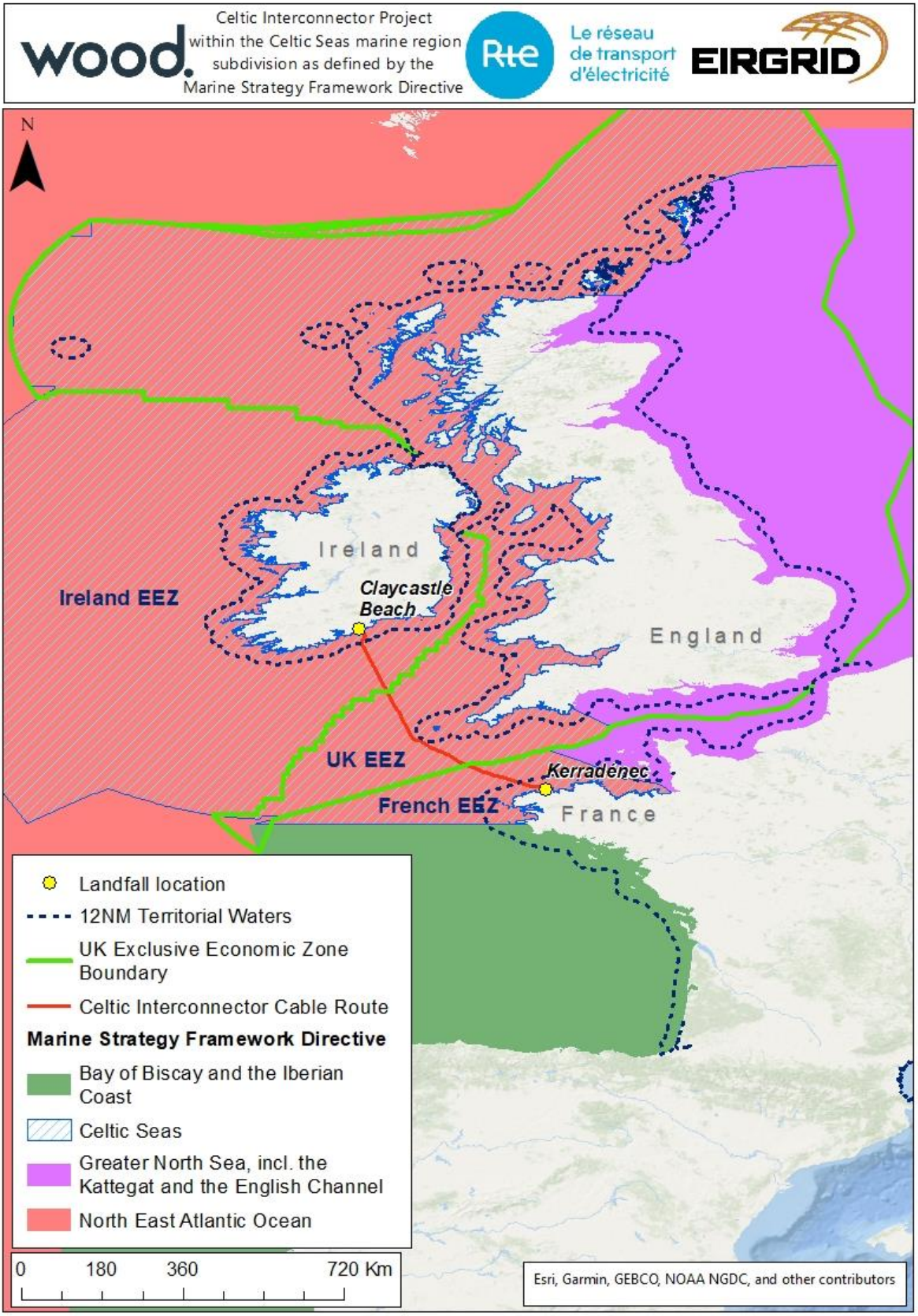
Figure 1.1 The MSFD cycle

Article 3 1(a) of the MSFD defines 'marine waters' as "waters, the seabed and subsoil on the seaward side of the baseline from which the extent of territorial waters is measured extending to the outmost reach of the area where a Member State has and/or exercises jurisdictional rights, in accordance with the Unclos, with the exception of waters adjacent to the countries and territories mentioned in Annex II to the Treaty and the French Overseas Departments and Collectivities".

Article 3 2 defines 'marine regions' as 'a sea region which is identified under Article 4. Marine regions and their subregions are designated for the purpose of facilitating implementation of this Directive and are determined taking into account hydrological, oceanographic and biogeographic features.'

The marine region of relevance to the Celtic Interconnector, is defined in Article 4 2(a)(ii) of the MSFD as ‘North-East Atlantic Ocean’, within ‘the Celtic Seas’ subdivision. The Celtic Seas subdivision includes all waters along the western coast of Ireland, Scotland, Wales and England. It includes the entire Irish EEZ and Irish Territorial Waters as well as the UK EEZ and UK Territorial Waters from the Orkney and Shetland Islands in the north to Cornwall in the south. It also includes waters of the western English Channel and extends to Brittany in France. The Celtic Interconnector cable route is therefore located entirely within the Celtic Seas marine region as defined by the MSFD.

Figure 1.2 Celtic Interconnector Project within the Celtic Seas marine region subdivision as defined by the Marine Strategy Framework Directive



1.2.2 MSFD Descriptors

To assist in the determination of GES within their marine waters, Annex I of the MSFD sets out eleven qualitative Descriptors, which Member States can use to describe what the environment will 'look like' when GES has been achieved. These Descriptors are presented in Table 1.1 and will be discussed in greater context for Ireland in Section 3.

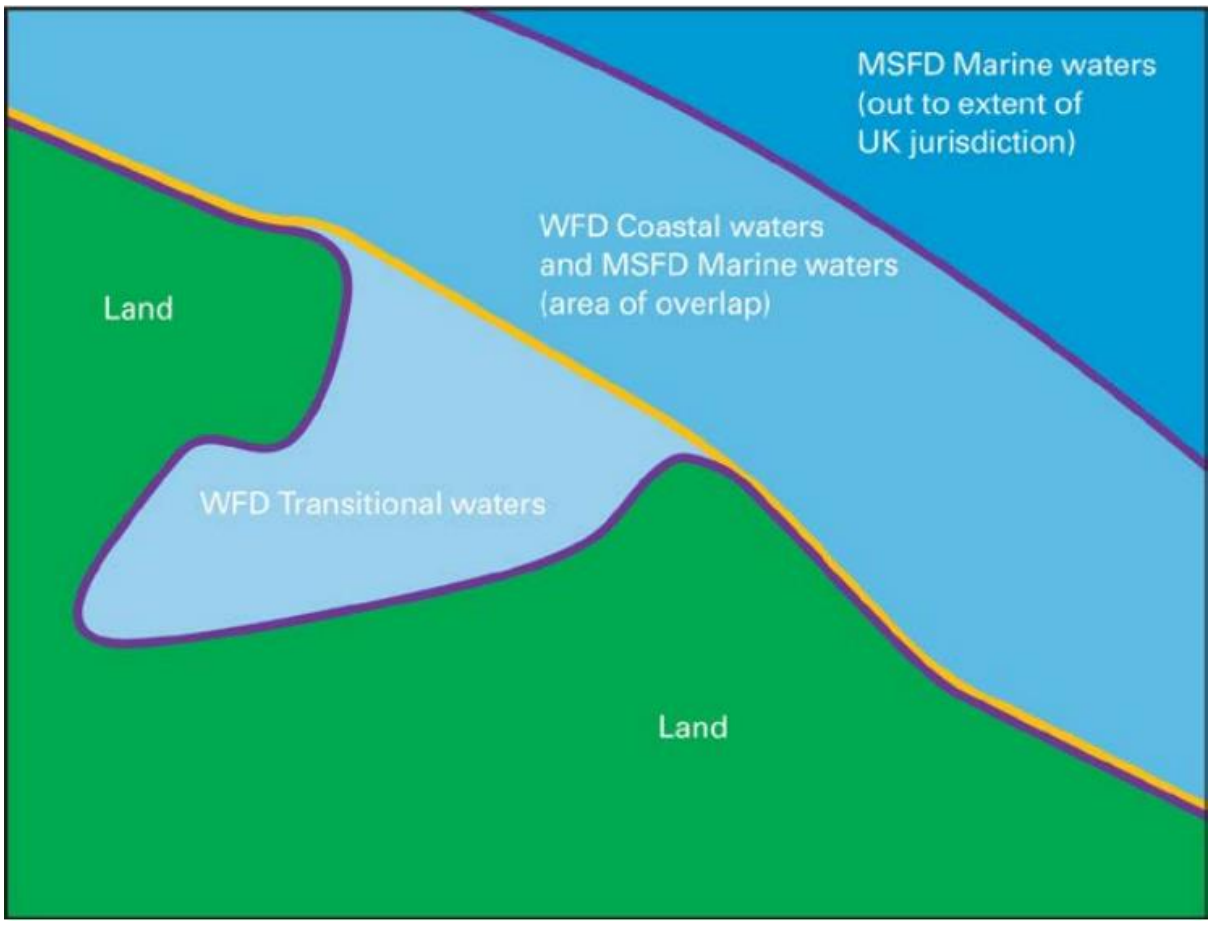
Table 1.1 The eleven Descriptors used to steer the Marine Strategy Framework Directive

Descriptor	Overarching Objective (European Commission)
Biodiversity	The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions.
Non-indigenous species	Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystems.
Populations of commercial species	Populations of all commercially exploited fish and shellfish are within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock.
Food web structures	All elements of the marine food webs, to the extent that they are known, occur at normal abundance and diversity and levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity.
Eutrophication	Human-induced eutrophication is minimised, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algae blooms and oxygen deficiency in bottom waters.
Sea floor integrity	Sea-floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected.
Alterations to hydrography	Permanent alteration of hydrographical conditions does not adversely affect marine ecosystems.
Contaminants	Contaminants are at a level not giving rise to pollution effects.
Sea food contaminants	Contaminants in fish and other seafood for human consumption do not exceed levels established by Community legislation or other relevant standards.
Marine litter	Properties and quantities of marine litter do not cause harm to the coastal and marine environment.
Energy and noise	Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment.

1.2.3 Relationship with Water Framework Directive

There is some overlap between the jurisdictions and objectives of the MSFD and the Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy (the Water Framework Directive, or WFD). The WFD's aim is to improve and protect the chemical and ecological status of surface waters from rivers, lakes, groundwaters, estuaries and coastal waters out to 1nm. The MSFD includes coastal waters, but not WFD transitional waters (eg estuaries, sea lochs or coastal lagoons). The line between the two directives is the 'bay closing line', or the seaward limit of transitional waters as defined under the WFD. This is presented in Figure 1.3.

Figure 1.3 Extent of MSFD / WFD boundaries (noting example is from UK documentation)



1.2.4 Relationship with the Marine Spatial Planning Directive

Directive 2014/89/EU of the European parliament and of the Council of 23 July 2014 establishing a framework for maritime spatial planning (The Marine Spatial Planning Directive, or MSPD) created a legal requirement for Member States to develop a transparent planning system for the marine environment.

Under Article 3(1) of the MSPD, 'marine waters' relate to those covered by Article 3(1) of the MSFD, and coastal waters as defined in Article 2(7) of the WFD. It is noted that the MSP Directive does not require marine plans to be established for transitional waters, as defined by the WFD. Marine planning in Ireland is led by the Department of Housing, Local Government, and Heritage (DHLGH).

To meet the requirements of the MSPD, Ireland is currently undergoing a transition into a new National Marine Planning Framework (NMPF). A NMPF Baseline Report was published in 2018 and a draft NMPF is currently in its public consultation phase. Draft Marine Planning Policy Statements have been published following public consultation, outlining the future development of the marine planning system. These set out the overarching policies and principals that the Government or Ireland expects marine planning bodies and other public bodies to adhere to when engaging with the marine planning system. It is being introduced initially on a non-statutory basis, pending the introduction of legislation that will provide for the preparation, adoption and review of statutory marine planning policy statements on six-yearly cycles.

Whilst EirGrid is fully cognisant of marine spatial planning implementation activities, it is not anticipated that the plan will be implemented in the same timescales as the consent application for the Celtic Interconnector Project. EirGrid will however, continue to liaise with DHLGH's Foreshore Unit to ensure that the proposed EIA and Foreshore Consent application align with activities to implement the Marine Planning Policy Statement and the Marine Spatial Plan.

1.2.5 National MSFD Legislation

In Ireland, the MSFD has been transposed into national law through the European Communities (Marine Strategy Framework) Regulations S.I. No. 249 of 2011 (as amended). It defines the Ministerial responsibilities for implementing the requirements of the MSFD.

Key stages in the Irish MSFD process to date have been:

- Transposition of the Directive into national legislation (July 2010);
- Completion of the Initial Assessment of Irish marine waters, establishment of environmental targets and indicators (Marine Institute, 2013);
- Establishment of a marine monitoring programme (Marine Institute, 2015);
- Establishment of a programme of measures to achieve GES (DECLG, 2016);
- Implementation of the programme of measures and monitoring programme (ongoing from 2016); and
- Publication of an update to Ireland's Marine Strategy Part 1: Assessment, Determination of Good Environmental Status and Environmental Targets (Government of Ireland, 2020). Consultation on this is currently ongoing and expected to be concluded in February 2021.

2 MSFD Status in Irish Waters

2.1 The Celtic Seas Partnership Project

The Celtic Seas Partnership was set up in 2013 to bring the governments of Ireland, the UK, France and the Isle of Man together, along with marine users and scientists, with a combined interest in the Celtic Seas area. The objective was to look at the ongoing sustainable management of the Celtic Seas marine region subdivision and to use a stakeholder-led approach to contribute to the development of marine strategies under the MSFD. The four-year project established working groups to explore key challenges faces the Celtic Seas, including marine litter, invasive non-native species, and general data collection. The Celtic Seas Partnership data catalogue brings together data under each of the eleven MSFD Descriptors.

At the start of the Celtic Seas partnership project, the following key areas were identified as the main pressures affecting the Celtic Seas:

- Fishing;
- Seafloor damage;
- Pollution through nutrient enrichment and contaminants;
- Spreading of non-native species;
- Marine litter; and
- Underwater noise.

2.2 Current MSFD Status in Ireland

In Ireland, the DHLGH is the lead body for the implementation of the MSFD. The DHLGH is supported by the Marine Institute, and the implementation of Ireland's Marine Atlas and the Marine Spatial Planning Directive, which gather key information for all marine stakeholders in relation to the marine environment and associated ecosystems and anthropogenic influences. The Programme of Measures Summary Report (Government of Ireland, 2016) was published in July 2016, providing an update to targets and indicators previously issued.

As previously noted, in June 2020, the Government of Ireland published an update to Ireland's Marine Strategy Part 1: Assessment, Determination of Good Environmental Status and Environmental Targets (Government of Ireland, 2020). It noted the following key findings;

- Descriptor 1 - Biodiversity: Partially achieved GES;
- Descriptor 2 - Non-indigenous species: GES fully achieved;
- Descriptor 3 - Populations of commercial species: Partially achieved GES;
- Descriptor 4 - Food web structure: Insufficient data available to conclude on the status;

- Descriptor 5 - Eutrophication: GES fully achieved;
- Descriptor 6 - Sea floor integrity: Partially achieved GES;
- Descriptor 7 - Alterations to hydrography: GES fully achieved;
- Descriptor 8 – Contaminants: GES fully achieved;
- Descriptor 9 – Contaminants in seafood: GES fully achieved;
- Descriptor 10 – Marine litter: GES achieved for primary criteria; and
- Descriptor 11 – Energy and noise: GES achieved for primary criteria.

Overall, in the revised Irish Marine Strategy, the number of environmental targets across all MSFD Descriptors was increased from 24 to 25, and the following next steps for the Marine Strategy include:

- 2021: An update to Part 2 of the Marine Strategy, the Monitoring Programme;
- 2022: An update to Part 3 of the Marine Strategy, the Programme of Measures; and
- 2023: Review of the Directive by EU Commission / Publication of the OSPAR Quality Status Report, to support the third cycle of the MSFD, due to commence in 2024.

3 Approach to MSFD Assessment

There is no formal approach or guidance associated with the completion of an MSFD assessment, unlike WFD Assessment, for which detailed guidance is available. Therefore, the approach used here is qualitative, and narrative-based, drawing on the findings of the Environmental Impact Assessment Report (EIAR) for the components of the Celtic Interconnector in Irish Territorial Waters and the Irish EEZ. The findings of the MSFD assessment also draw upon the outcomes of consultation upon the EIAR and the Project more widely to date.

The objective of the MSFD assessment is to determine whether the Project has the potential to influence Ireland's ability to achieve or maintain GES (as defined by the MSFD) in Ireland's marine waters. The MSFD assessment therefore reviews the targets and indicators set by the Government of Ireland in order to reach or maintain GES in line with its obligations under the MSFD and provides a qualitative assessment of the degree to which Project activities could influence the success of Ireland's Marine Strategy.

Table 3.1 presents the MSFD targets and indicators for Ireland, against which the Project is assessed in this report.

Each of the eleven MSFD Descriptors can be associated with an aspect addressed by EIAR. The MSFD assessment is therefore closely linked with the assessment of potential effects on that aspect. For example, the assessment and reporting of potential effects on biodiversity in the EIAR relates to Descriptors 1 (Biodiversity), 2 (Non-indigenous species), 4 (Food web structures), and 11 (Energy and noise). Likewise, Eutrophication (Descriptor 5) will be covered in the assessment of potential effects on marine water and sediment quality. A summary of these connections is presented in Table 4.1.

Full details of the individual topic-specific impact assessment conclusions are not repeated in this MSFD assessment. Additional information and detail can be obtained by referring to the relevant chapter of the EIAR.

Table 3.1 MSFD Targets and Indicators in Irish Waters (Government of Ireland, 2013)

Descriptor	Definition of GES in Ireland	Targets	Indicators
Biodiversity	Marine Biodiversity is safeguarded in such a way that: • Overall biodiversity is maintained or where appropriate restored; • Ecosystem structure and function is not compromised; • Abundance, distribution, extent and condition of key species and habitats (ie the area or environment where an organism or ecological community occurs) are in line with prevailing physiographic, geographic and climate conditions; and • Species and habitats identified as needing protection under national or international agreements are effectively protected or conserved through the appropriate national, regional or international mechanisms.	Under development	Under development
Non-indigenous species	Good status is achieved when the risks and pathways from vectors which facilitate the introduction and spread of NIS as a result of human activities is significantly reduced by way of appropriate measures; and should they arrive, by applying, where feasible, practical and cost-effective means, to control or reduce their further spread.	Target 2.1: Effect a reduction in the risk of introduction and spread of non-native species through the prioritisation of species and improved management of high-risk pathways and vectors.	Indicator 2.1: Reduction in the risk of introduction and spread of non-native species through the prioritisation of species and improved management of high-risk pathways and vectors.
		Target 2.2: The development of action plans for key high-risk marine non-indigenous species by 2020.	Indicator 2.2: The development of action plans for key high-risk marine non-indigenous species by 2020.

Descriptor	Definition of GES in Ireland	Targets	Indicators
Populations of commercial species	Populations of commercially exploited fish and shellfish are within safe biological limits. Stocks of commercially exploited fish and shellfish species are exploited at levels which ensure long term sustainability and maintenance of sufficient reproductive capacity. Populations exhibit a healthy composition with regard to age and size distribution. Consistency to be maintained in accordance with the progressing reform of the EU Common Fisheries Policy.	Target 3.1: Target fishing mortality to be at levels which aim to restore and maintain populations of harvested species at least at levels which can produce the maximum sustainable yield, by 2015, where possible. Where stocks are managed within an agreed management plan, which is consistent with MSY in the long term, target fishing mortality as specified by the management plan should be adhered to.	Indicator 3.1: Primary indicator: F; Secondary indicator: Stock specific proxies of F (F proxy).
		Target 3.2: Target fishing mortality to be at levels which aim to restore and maintain populations of harvested species at least at levels which can produce the maximum sustainable yield, by 2020, for all stocks. Where stocks are managed within an agreed management plan, which is consistent with MSY in the long term, target fishing mortality as specified by the management plan should be adhered to.	Indicator 3.2: Primary indicator: F; Secondary indicator: Stock specific proxies of F (F proxy).
Populations of commercial	Populations of commercially exploited fish and shellfish are within safe biological limits. Stocks of commercially	Target 3.3: Spawning Stock Biomass (SSB) should be within	Indicator 3.3: Primary Indicator: SSB; Secondary

Descriptor	Definition of GES in Ireland	Targets	Indicators
species	exploited fish and shellfish species are exploited at levels which ensure long term sustainability and maintenance of sufficient reproductive capacity. Populations exhibit a healthy composition with regard to age and size distribution. Consistency to be maintained in accordance with the progressing reform of the EU Common Fisheries Policy.	the range of biomasses which would be expected under fishing mortality equal to or below FMSY in the medium to long term and incorporate scientific uncertainty and natural variability.	indicator: Biomass indices.
		Target 3.4: Size and age structure as measured by selected indicators reflect populations which are sustainably fished in the medium to long term and incorporate scientific uncertainty and natural variability.	Indicator 3.4: Proportion of fish larger than the mean size of first sexual maturation. 95% percentile of the fish length distribution observed in research vessel surveys. Size at first sexual maturation, which may reflect extent of undesirable genetic effects of exploitation.
Food web structures	Marine food webs are safeguarded in such a way that: • Abundance, distribution, extent and condition of key species is in line with prevailing physiographic, geographic and climate conditions or are indicative of sustainable exploitation; • Age and size structure of key species is in line with prevailing physiographic, geographic and climate conditions or are indicative of sustainable exploitation; and • Vulnerable (long-lived, slowly reproducing) species populations are maintained in line with prevailing physiographic, geographic and climate conditions or	Under development	Under development

Descriptor	Definition of GES in Ireland	Targets	Indicators
	are indicative of sustainable exploitation.		
Eutrophication	Human induced eutrophication is minimised and nutrient levels do not cause an accelerated growth of algae or higher forms of plant life to produce an undesirable disturbance to the balance of organisms present in the water and to the quality of the water concerned.	Target 5.1: Winter dissolved inorganic nitrogen and phosphorus concentration should not exceed the Environmental Quality Standard laid down in national legislation implementing the Water Framework Directive (SI 272 of 2009) and the corresponding area specific assessment levels used by Ireland in the application of the OSPAR Common Procedure.	Indicator 5.1: Nutrient concentration in the water column.
		Target 5.2: Winter nutrient ratios should not exceed area-specific assessment levels used by Ireland in the application of the OSPAR Common Procedure. (eg, winter nitrogen phosphorus ratio should be less than 24). This target is valid for offshore waters (salinity greater than 34.5).	Indicator 5.2: Nutrient ratios (silica, nitrogen and phosphorus), where appropriate.

Descriptor	Definition of GES in Ireland	Targets	Indicators
		Target 5.3: Median and 90%ile chlorophyll levels in Water Framework Directive defined coastal water bodies should not exceed the Environmental Quality Standards laid down in national legislation implementing the Water Framework Directive (SI 272 of 2009).	Indicator 5.3: Chlorophyll concentration in the water column.
		Target 5.4: The abundance and extent of opportunistic macroalgae for Water Framework Directive defined coastal waters should be consistent with the achievement of the environmental objectives of the Water Framework Directive as specified in national legislation implementing that Directive (SI 272 of 2009).	Indicator 5.4: Abundance of opportunistic macroalgae.
		Target 5.5: The frequency and abundance of phytoplankton blooms in Water Framework Directive coastal water bodies should be consistent with the achievement of the environmental objectives of the Water Framework Directive as specified in national legislation implementing the	Indicator 5.5: Species shift in floristic composition such as diatom to flagellate ratio, benthic to pelagic shifts, as well as bloom events of nuisance/toxic algae blooms (eg cyanobacteria) caused by human activities.

Descriptor	Definition of GES in Ireland	Targets	Indicators
		Directive (SI 272 of 2009).	
		Target 5.6: The composition of perennial macroalgae in Water Framework Directive defined coastal waters should be consistent with the achievement of the environmental objectives of the Water Framework Directive as laid down in national legislation implementing that Directive (SI 272 of 2009).	Indicator 5.6: Abundance of perennial seaweeds.
		Target 5.7: The abundance and species composition of intertidal seagrasses in Water Framework Directive defined coastal waters should be consistent with the achievement of the environmental objectives of the Water Framework Directive as laid down in national legislation implementing that Directive (SI 272 2009).	Indicator 5.7: Abundance of seagrasses .
		Target 5.8: For Water Framework Directive defined coastal water bodies, dissolved oxygen saturation should be consistent with the environmental quality standard specified in national	Indicator 5.8: Dissolved oxygen, ie changes due to increased organic matter decomposition and size of the area concerned.

Descriptor	Definition of GES in Ireland	Targets	Indicators
		legislation implementing the Water Framework Directive (SI 272 of 2009), except in the case of seasonally stratified waters, where the dissolved oxygen concentration (as a 5%ile) in bottom water should remain above area specific assessment levels (eg 5.0 to 6.0 mg/l).	
Sea floor integrity	Sea-floor integrity is safeguarded in such a way that: • The extent and diversity of sea-floor habitats is maintained in line with prevailing physiographic, geographic and climate conditions; • Sea-floor habitats (physically and structurally) are sufficiently productive and extensive to support natural functionality and a healthy and sustainable ecosystem for the long term; and • Sea-floor habitats and their constituent species identified as needing protection under national or international agreements are effectively protected or conserved through the appropriate national, regional or international mechanisms.	Under development	Under development
Alterations to hydrography	Good status is achieved when the nature and scale of any permanent changes (individual and cumulative) to the prevailing hydrographical conditions, resulting from large-scale anthropogenic activities such as coastal defence works, damming of large rivers, land reclamation projects, and structures in open and	Target 7.1: All developments that may give rise to significant permanent changes in the hydrological regime of currents, waves, or sediments must comply with existing regulatory regimes	Indicator 7.1: All developments that may give rise to significant permanent changes in the hydrographical regime of currents, waves, or

Descriptor	Definition of GES in Ireland	Targets	Indicators
	coastal sea such as wind farms, ocean energy device arrays and large scale aquaculture facilities, do not lead to significant long-term impacts on marine ecosystems, in particular those biological components considered under Descriptors, 1, 4 and 6.	and guidance should be followed to ensure that regulatory assessments are undertaken in a way that ensures the full consideration of any potential impacts, including cumulative effects at the most appropriate spatial scales to ensure that GES is not compromised.	sediments must comply with the existing regulatory regimes and guidance should be followed to ensure that regulatory assessments are undertaken in a way that ensures the full consideration of any potential impacts, including cumulative effects at the most appropriate spatial scales, to ensure that GES is not compromised.
Contaminants	Concentrations of contaminants in the marine environment (ie in water, sediment and biota) are within agreed levels and adverse effects on organisms, populations, communities and biological processes do not occur.	Target 8.1: Concentrations of selected substances identified within relevant legislation and under international obligations as relevant for the protection of the marine environment are within agreed levels at which adverse effects are unlikely to occur (eg are less than the Environmental Quality Standards applied within Water Framework Directive (2000/60EC) and Environmental Assessment Criteria applied within OSPAR) and concentrations are not increasing for the Assessment Area.	Indicator 8.1: Concentrations of contaminants in marine compartments (water, sediment or biota as appropriate).

Descriptor	Definition of GES in Ireland	Targets	Indicators
		Target 8.2: The degree of biological or ecological effects that can be specifically attributed to contaminants is below the agreed OSPAR criteria. At present, this is limited to evaluation of reproductive impairment in marine gastropods associated with tributyltin (TBT).	Indicator 8.2: Reproductive effects of TBT in marine gastropods.
		Target 8.3: Occurrence and extent of significant acute pollution events (eg slicks resulting from spills of oil and oil products or spills of chemicals) and the impact on biota affected by the pollution is minimised through appropriate risk-based approaches.	Under development
Sea food contaminants	Concentrations of contaminants* in fish** and other seafood caught or harvested in Irish seas for human consumption do not exceed the relevant maximum levels listed in EU Regulation 1881/2006 (as amended).	Target 9.1: Concentrations of contaminants in fish and shellfish caught or harvested in Irish seas for human consumption show a high rate of compliance with maximum limits listed in EU Regulation 1881/2006 (as amended).	Indicator 9.1: Concentrations of contaminants in fish and shellfish destined for human consumption. Level of compliance of contaminant concentrations in fish and shellfish destined for human consumption with regulatory limits as set in regulation (EC) 1881/2006 (as amended).

Descriptor	Definition of GES in Ireland	Targets	Indicators
Marine litter	The internationally agreed definition of marine litter, developed by the United Nations Environment Programme (UNEP, 2005) is: "... *any persistent, manufactured or processed solid material discarded, disposed of or abandoned in the marine and coastal environment. Marine litter consists of items that have been made or used by people and deliberately discarded into the sea or rivers or on beaches; brought indirectly to the sea with rivers, sewage, storm water or winds; accidentally lost, including material lost at sea in bad weather (fishing gear, cargo); or deliberately left by people on beaches and shores*." Marine litter is a problem that can affect the seabed, the water column and the coastline. It can pose a risk to a wide range of marine organisms such as seabirds, marine mammals and turtles through ingestion and entanglement (OSPAR, 2010a).	Target 10.1: A reduction in the number of visible litter items within specific categories/types on coastlines.	Indicator 10.1: The amount of litter, and its degradation products, on coastlines and in the marine environment is reducing over time and are at levels which do not result in harmful effects to the coastal or marine environment. Note: Degradation products of litter include small plastic particles and micro plastic particles
		Target 10.2: Reduced levels of litter (plastic particles) in fulmar stomachs.	Indicator 10.2: Trends in the amount and composition of litter ingested by marine animals (eg stomach analysis).
Energy and noise	Loud, low and mid frequency impulsive sounds and continuous low frequency sounds introduced into the marine environment through human activities do not have adverse effects on marine ecosystems: Human activities introducing loud, low and mid-frequency impulsive sounds into the marine environment are managed to the extent that no significant long-term adverse effects are incurred at the population level, or specifically to vulnerable / threatened species and key functional groups.	Under development	Under development

Descriptor	Definition of GES in Ireland	Targets	Indicators
	Continuous low frequency sound inputs do not pose a significant risk to marine life at the population level, or specifically to vulnerable / threatened species and key functional groups.		

4 MSFD Assessment

Table 4.1 identifies the potential effects of the Project as identified and assessed in the EIAR (noting the EIAR chapter that provides the detailed assessment) and relates them to the eleven MSFD Descriptors. Certain effects are notable against more than one MSFD Descriptor.

Table 4.1 Alignment of MSFD Descriptors against Project Activities

MSFD Descriptor	Relevant Chapter of Volume 3D Part 2 EIAR for Ireland Offshore (Specialist Chapters) - Chapter	Potential effects associated with the Celtic Interconnector Project as identified in the EIAR Volume 3D
1 Biodiversity	Chapter 13 Biodiversity	Release of hazardous substances through loss of chemicals / fuels from installation vessels Changes to behaviour of fish and shellfish species as a result of electro-magnetic fields (EMF) emitted by the cable Changes in water quality through release of contaminants held within marine and coastal sediments Disturbance to, and loss of, intertidal and benthic habitats during installation of cable / external cable protection (including through smothering) Disturbance to spawning and nursery grounds from installation of cable / cable protection Underwater noise disturbance to marine species in the intertidal and subtidal zones Introduction of invasive and non-native species through installation of cable / external cable protection Vessel noise during installation of cable / external cable protection Noise and vibration through use of subsea survey and monitoring equipment (construction and operational phases) Noise and vibration as a result of cable installation activities including sheet piling on at the Landfall Interface Area

MSFD Descriptor	Relevant Chapter of Volume 3D Part 2 EIAR for Ireland Offshore (Specialist Chapters) - Chapter	Potential effects associated with the Celtic Interconnector Project as identified in the EIAR Volume 3D
2 Non-indigenous species	Chapter 13 Biodiversity	Introduction of invasive and non-native species through installation of cable / external cable protection
3 Populations of commercial species	Chapter 19 Commercial fisheries	Changes to behaviour of fish and shellfish species as a result of electro-magnetic fields (EMF) emitted by the cable Changes in water quality through release of contaminants held within marine and coastal sediments Disturbance to, and loss of, intertidal and benthic habitats during installation of cable / external cable protection (including through smothering) Disturbance to spawning and nursery grounds from installation of cable / cable protection Introduction of invasive and non-native species through installation of cable / external cable protection Damage / disturbance to fishing grounds during installation of cable / external cable protection
4 Food web structures	Chapter 13 Biodiversity	Release of hazardous substances through loss of chemicals / fuels from installation vessels Changes to behaviour of fish and shellfish species as a result of electro-magnetic fields (EMF) emitted by the cable Changes in water quality through release of contaminants held within marine and coastal sediments Disturbance to, and loss of, intertidal and benthic habitats during installation of cable / external cable protection (including through smothering) Disturbance to spawning and nursery grounds from installation of cable / cable protection Underwater noise disturbance to marine species in the intertidal and subtidal zones Introduction of invasive and non-native species through

MSFD Descriptor	Relevant Chapter of Volume 3D Part 2 EIAR for Ireland Offshore (Specialist Chapters) - Chapter	Potential effects associated with the Celtic Interconnector Project as identified in the EIAR Volume 3D
		installation of cable / external cable protection Vessel noise during installation of cable / external cable protection Noise and vibration through use of subsea survey and monitoring equipment (construction and operational phases) Noise and vibration as a result of cable installation activities including sheet piling on at the Landfall Interface Area
5 Eutrophication	Chapter 12 Water quality	Changes in water quality through release of contaminants held within marine and coastal sediments
6 Sea floor integrity	Chapter 11 Marine physical processes	Disturbance to, and loss of, seabed features during installation of cable / external cable protection Changes to coastal erosion patterns due to installation works at cable landfall Changes to bathymetry through placement of external cable protection Changes to local sediment dynamics through the presence of external cable protection
7 Alterations to hydrography	Chapter 11 Marine physical processes	Disturbance to, and loss of, seabed features during installation of cable / external cable protection Changes to coastal erosion patterns due to installation works at cable landfall Changes to bathymetry through placement of external cable protection Changes to local sediment dynamics through the presence of external cable protection
8 Contaminants	Chapter 10 Marine sediment quality	Release of hazardous substances through loss of chemicals / fuels from installation vessels Changes in water quality through release of contaminants held within marine and coastal sediments

MSFD Descriptor	Relevant Chapter of Volume 3D Part 2 EIAR for Ireland Offshore (Specialist Chapters) - Chapter	Potential effects associated with the Celtic Interconnector Project as identified in the EIAR Volume 3D
9 Sea food contaminants	Chapter 12 Water quality	Release of hazardous substances through loss of chemicals / fuels from installation vessels Changes in water quality through release of contaminants held within marine and coastal sediments
10 Marine litter	Chapter 16 Material assets	
11 Energy and noise	Chapter 13 Biodiversity and Chapter 17 Noise and vibration	Underwater noise disturbance to marine species in the intertidal and subtidal zones Vessel noise during installation of cable / external cable protection Noise and vibration through use of subsea survey and monitoring equipment (construction and operational phases) Noise and vibration as a result of cable installation activities including sheet piling on at the Landfall Interface Area

The following section considers the current MSFD status of marine waters in Ireland, the relevant MSFD targets and indicators for each MSFD Descriptor and relates the potential for the effects identified in the EIAR to influence whether GES will be achieved or maintained. The characteristics for GES determined by Ireland, as described in Ireland's Marine Strategy Framework Directive Article 19 Report, Initial Assessment, GES and Targets and Indicators (Marine Institute, 2013) in respect of each MSFD Descriptor are presented under each sub-heading.

4.1 Descriptor 1: Biodiversity

GES for Descriptor 1 in Ireland seeks to safeguard, maintain and restore marine biodiversity, to protect ecosystem structures and maintain healthy population dynamics. Associated targets and indicators for Descriptor 1 are currently under development in Ireland. It is therefore not possible to directly assess Project activities against the targets and indicators for Descriptor 1.

Volume 3D Part 2 EIAR for Ireland Offshore (Specialist Chapters) – Chapter 13: Biodiversity, reports upon the route of the Celtic Interconnector in relation to marine habitats. The interconnector cable route was designed to avoid passing through any environmentally

sensitive or designated habitats. However, while the majority of habitats that occur along the route may be categorised as low value/importance, their disturbance or loss still has the potential to affect the wider benthic and intertidal communities. As a worst-case scenario, it was assumed for the EIAR that all habitats and species present within the area affected by cable installation will be permanently lost, with mixed sediment, and sand-based sediment habitats being those primarily affected.

Although recolonisation rates of sedimentary environments can vary widely, trenches formed through installation will be back-filled, through a combination of installation technique and natural backfill by surrounding sediment. As the areas adjacent to the works will be undisturbed areas of similar habitats, existing biodiversity will be immediately present to recolonise over time. As a result of this, effects have been assessed to be of low magnitude, and not significant.

In the absence of specific targets and indicators but with consideration of the non-significant findings of the EIAR, the Project is unlikely to influence the ability of Ireland to maintain GES for Descriptor 1.

4.2 Descriptor 2: Non-indigenous species

GES for Descriptor 2 in Ireland requires the implementation of appropriate measures to reduce the vectors that act as pathways for the introduction and spread of non-indigenous species. The EIAR identified that there is no credible pathway for non-indigenous species via Project activities. This is because the vessels used for the installation works will be from European providers and will adhere to the International Convention for the Control and Management of Ships Ballast Water & Sediments D-2 Standard (Ballast Water Performance standards). The project therefore demonstrates good management practice as referred to in Indicator 2.1 and it is therefore unlikely that the Project will influence Ireland's ability to achieve Target 2.1.

Target 2.2 relates to the development of action plans for key high risk non-indigenous species. It is not the responsibility of the Project to develop these action plans and it is unlikely that Project activities will limit the ability of those responsible to meet this target.

The Project is therefore unlikely to influence the ability of Ireland to maintain GES for Descriptor 2.

4.3 Descriptor 3: Populations of commercial species

GES for Descriptor 3 relates to the sustainable management of commercially exploited fish stocks, with targets and indicators relating to the specific management measures required to achieve this.

Targets 3.1 and 3.2 relates to the management of target fishing mortality through the implementation of stock management plans. The Project does not influence the development of stock management plans nor Ireland's ability to implement them.

Targets 3.3 and 3.4 relate to SSB and the size and age structure of commercial fish stock populations. Volume 3D Part 2 EIAR for Ireland Offshore (Specialist Chapters) – Chapter 19: Commercial Fisheries, concluded that the Project will not have any significant effects on

commercial fishing activities though damage or disturbance to fishing grounds, displacement of fishing activities, the introduction of obstructions on the seabed, or from the presence of the interconnector cable itself. This included consideration of spawning and nursery grounds for commercial fish species. It is therefore unlikely that the Project will influence the ability of Ireland to meet these targets and it is also therefore unlikely that the Project will influence the ability of Ireland to achieve or maintain GES for Descriptor 3.

4.4 Descriptor 4: Food web structures

GES for Descriptor 4 in Ireland seeks to safeguard food webs such that populations of key species, particularly those that are long-lived or that have slow fecundity, are maintained at healthy levels of abundancy and distribution in line with the prevailing natural environment. Associated targets and indicators for Descriptor 4 are currently under development in Ireland. Furthermore, the status of food web structures in Ireland has not been concluded due to insufficient data. It is therefore not possible to directly assess Project activities against the targets and indicators for Descriptor 4.

As described in relation to Descriptor 1, Volume 3D Part 2 EIAR for Ireland Offshore (Specialist Chapters) – Chapter 13: Biodiversity, concludes that loss or disturbance of habitat is localised, and that the benthic and fish species involved are largely tolerant of displacement. The introduction of hard substrate where cable protection is required could result in localised increased in habitat heterogeneity by providing a more diverse habitat for localised colonisation by macrobenthic communities. Overall, however, the EIAR concludes that there will be no significant effects to benthic communities, fish, marine mammal or turtle populations and communities as a result of the Project. The EIAR has not specifically assessed the effect of the Project on food web structures, but in the absence of any significant impacts on the constituent parts of the food web, it is unlikely that subsequent impacts could occur. Therefore, in the absence of specific targets and indicators but with consideration of the non-significant findings of the EIAR, the Project is unlikely to influence the ability of Ireland to maintain GES for Descriptor 4.

4.5 Descriptor 5: Eutrophication

GES for Descriptor 5 relates to nutrient levels and the abundance and species composition of macroalgae in coastal waters. EIAR Volume 7C (the WFD assessment for the Project) notes that there has been a history of harmful algae in Youghal Bay, and that there was an increase in nitrogen loads and opportunistic macroalgae during the 2013-2015 monitoring period within the Youghal Bay WFD water body. This was found to have improved however in the 2013-2018 RBMP cycle. Water quality at Youghal Bay has been identified as being At Risk (in WFD terms) due to the pressure of pastural agriculture. Youghal Bay failed the environmental quality standard for dissolved oxygen but passed the environmental quality standard for dissolved inorganic nitrogen in the 2013-2018 RBMP cycle.

Volume 3D Part 2 EIAR for Ireland Offshore (Specialist Chapters) – Chapter 12: Water Quality concludes that Project activities will not give rise to significant effects on marine water quality nor consequently on marine organisms including algal blooms. EIAR Volume 7C (WFD assessment) also concludes a negligible risk that the relevant WFD water body

(Youghal Bay) would fail to comply with its WFD objectives, or that there would be any compromise to the delivery of the programme of measures set out in the RBMP for Ireland 2018-2021, as a result of the Celtic Interconnector Project.

The Project is therefore unlikely to influence Ireland's ability to meet the Targets set by Ireland for Descriptor 5 as it does not introduce or otherwise cause an increase in concentrations of the nutrients that result in eutrophication and algal blooms. It is also therefore unlikely that the Project will influence the ability of Ireland to achieve or maintain GES for Descriptor 5.

4.6 Descriptor 6: Sea floor integrity

The targets and indicators for Descriptor 6 are currently under development in Ireland. It is therefore not possible to directly assess Project activities against the targets and indicators for Descriptor 6. However, the EIAR concludes no significant residual effects on marine physical processes, a key component of sea floor integrity. Given the relatively small scale of the Project footprint in the wider context of the Celtic Seas subdivision of the North-east Atlantic marine region and the mitigation in place to bury the interconnector cable wherever possible, it is unlikely that the Project will limit the extent or diversity of sea-floor habitats described by Descriptor 6. In the limited areas where cable protection is required, this will be designed to seabed type and monitored during the operation of the Project. It is therefore also unlikely that the Project will alter the physical structure of seabed habitats to such a degree that the productivity natural functionality of the seafloor ecosystem (and indeed the wider ecosystem that it supports) would be affected.

In the absence of specific targets and indicators, but with consideration of the findings of the EIAR it is considered unlikely that the Project will influence the current partial achievement of GES in relation to Descriptor 6 in Ireland.

4.7 Descriptor 7: Alterations to hydrography

GES for Descriptor 7 in Ireland makes specific reference to the consideration of impacts from developments in the marine environment. The EIAR for the Celtic Interconnector includes an assessment of marine physical processes, which duly includes consideration of hydrographical conditions. GES for Descriptor 7 requires that developments do not result in significant long-term impacts on marine ecosystems from changes to hydrographical conditions. The EIAR concluded that subject to full implementation of mitigation, no significant residual effects on marine physical processes are anticipated.

Target 7.1 and Indicator 7.1 have been met by the Project through the undertaking of a full EIAR and its inclusion of the assessment undertaken in Volume 3D Part 2 EIAR for Ireland Offshore (Specialist Chapters) – Chapter 11: Marine Physical Processes. Given the conclusion of the EIAR in this regard, it is unlikely that the Project will influence Ireland's ability to maintain its achievement of GES for Descriptor 7.

4.8 Descriptor 8: Contaminants

GES for Descriptor 8 in Ireland concerns concentrations in the marine environment in general terms, including in the water, sediment and in biota. During all works at sea and in

the intertidal zone, there is potential for the loss of chemicals, fuels, or other pollutants as a result of accidental spills. To minimise such risks, international good practice will be followed by the Project, including for example adherence to the MARPOL Convention, and project-specific requirements and procedures as outlined within the Construction Environmental Management Plan (CEMP) and Project Prevention Plan (PPP).

Analysis of marine water and sediment quality from along the Celtic Interconnector cable route established generally low levels of contaminants present. Although installation of the cable will inevitably result in the disturbance of marine sediments, and release of any sediment-bound materials into the water column, the magnitude of effects was considered to be low, and the effect not significant.

Volume 3D Part 2 EIAR for Ireland Offshore (Specialist Chapters) - Chapter 10: Marine Sediment Quality and Chapter 12: Marine Water Quality both conclude that Project activities will not give rise to significant effects on marine water quality nor consequently on marine organisms.

The WFD assessment for the Project (EIAR Volume 7C) also concludes a negligible risk that the relevant WFD water body (Youghal Bay) would fail to comply with its WFD objectives, or that there would be any compromise to the delivery of the programme of measures set out in the RBMP for Ireland 2018-2021, as a result of the Celtic Interconnector Project.

The Project is therefore unlikely to influence Ireland's ability to meet Target 8.1 as it does not introduce or otherwise cause an increase in concentrations of contaminants as specified by Indicator 8.1.

Target 8.2 and Indicator 8.2 relate specifically to biological or ecological effects resulting from the use of TBT. TBT is a banned substance (historically used as antifouling paint on ships) under the Convention on the Control of Harmful Anti-fouling Systems on Ships (AFS Convention), which was adopted in 2001 and came into force in September 2008. The Project will use vessels that comply with the AFS Convention. Project activities will therefore not influence the ability of Ireland to achieve GES for Descriptor 8 in terms of Target 8.2.

In relation to Target 8.3 concerning the occurrence and extent of acute pollution events, the EIAR concludes that hydrocarbon or chemical releases during the installation and operation of the Project are unlikely. This is because the fuel and chemical inventory of all vessels used by the Project will be managed in line with international law such as the International Convention for the Prevention of Marine Pollution from Ships (the MARPOL Convention). The indicator for Descriptor 8 is currently under development in Ireland. However, given the conclusions of the EIAR and the Project's commitment to the MARPOL Convention, it is unlikely that Project activities will influence the ability of Ireland to meet GES for Descriptor 8.

4.9 Descriptor 9: Sea food contaminants

GES for Descriptor 9 in Ireland relates to concentrations of contaminants in fish and other seafood as specified in EU Regulation 1881/2006 (as amended) with a view to protecting public health through the prevention and reduction of bioaccumulated toxins and carcinogens in food. The Annex to these EU Regulations sets out the maximum permissible levels for six groups of contaminants (nitrate, mycotoxins, metals, 3-monochloropropane-

1,2-diol [3-MCPD], dioxins and polychlorinated biphenyls [PCBs], and polycyclic aromatic hydrocarbons [PAHs]) across a broad range of food types and products.

Of relevance to fish and marine food products, EU Regulation 1881/2006 (as amended) set maximum permissible concentrations for lead, cadmium, and mercury in the muscle meat of fish, crustacea (excluding brown meat of crab and excluding head and thorax meat of lobster and similar large crustaceans [Nephropidae and Palinuridae]), bivalve molluscs, and cephalopods (without viscera).

The regulations also set maximum permissible concentrations for dioxins and PCBs in the muscle meat of fish, fishery products and products thereof, and for PAHs in the muscle meat of fish, crustaceans, cephalopods, and bivalve molluscs.

Inputs of these contaminants have been identified (Marine Institute, 2013) as primarily coming from riverine and land-based sources, atmospheric deposition, from the disposal of dredge sediments at sea, and from discharges from the offshore industrial activities. The latter most notably relates to produced water discharges from offshore oil and gas installations but also includes shipping as a source.

As is the case for all hydrocarbon-powered vessels, the vessels used during the installation and operation of the Celtic Interconnector Project will introduce trace levels of PCBs and PAHs to the atmosphere and marine environment through the standard combustion of marine fuel. Volume 3D Part 2 EIAR for Ireland Offshore (Specialist Chapters) - Chapter 12: Marine Water Quality concludes that Project activities will not give rise to significant effects on marine water quality nor consequently on marine organisms. Project-related vessel activity has a cumulative role within the wider Irish and international shipping industries in introducing contaminants that can bioaccumulate through the food chain. The trace concentrations released through Project-related fuel combustion are unlikely however, to independently influence the ability of Ireland to achieve Target 9.1 and Indicator 9.1 that make direct reference to the limitation of contaminants.

There is no credible pathway from Project activities for the other contaminants listed of relevance to sea food so there it is therefore not likely that the Project will influence Ireland's ability to achieve or maintain GES for Descriptor 9.

4.10 Descriptor 10: Marine litter

Volume 3D Part 2 EIAR for Ireland Offshore (Specialist Chapters) – Chapter 12: Marine Water Quality, concludes that Project activities will not give rise to significant effects on marine water quality, which includes the potential for impacts as a result of Project-related waste streams.

Targets 10.1 and 10.2 both requires a reduction levels of litter in the Irish marine environment. While it is not the responsibility of the Project to implement any such reduction, the Project is responsible for the careful management of its own waste streams such that it does not increase levels and therefore act in opposition to these targets. All vessels used by the Project will be managed in line the MARPOL Convention including Annex V relating to solid waste streams such as garbage. Solid waste from the Project will therefore be prevented from entering the marine environment in the form of marine litter. It is therefore

unlikely that Project activities will influence the ability of Ireland to meet GES for Descriptor 10.

4.11 Descriptor 11: Energy and noise

GES for Descriptor 11 in Ireland seeks to prevent adverse effects on marine ecosystems by limiting the introduction of sound to the marine environment. Associated targets and indicators for Descriptor 11 are currently under development in Ireland. It is therefore not possible to directly assess Project activities against the targets and indicators for Descriptor 11.

Volume 3D Part 2 EIAR for Ireland Offshore (Specialist Chapters) – Chapter 13: Biodiversity in conjunction with Chapter 17: Noise and Vibration, concludes that unmitigated, there is potential for significant effects on marine mammals and turtles from sheet piling at the Landfall Interface Area, from subsea survey and monitoring that uses sound sources.

The Project is committed to minimising this potential through the implementation of internationally recognised industry good practice, which reduce the risk to as low as reasonably practicable. Vessels used by the Project will be operated and maintained in line with International Maritime Organisation (IMO) Guidelines for the reduction of underwater noise from commercial shipping to address adverse impacts on marine life (MEPC.1/Circ.833) (IMO, 2014). Furthermore, Project operations in the Irish marine environment will be undertaken in line with the ‘Guidance to manage the risk to marine mammals from man-made sound sources in Irish waters’ (DAHG, 2014).

In the absence of specific targets and indicators, but with consideration of the findings of the EIAR and the Project’s commitment to mitigation, it is considered unlikely that the Celtic Interconnector Project will influence the current partial achievement of GES in relation to Descriptor 11 in Ireland.

5 Summary

There is no formal guidance on how to undertake MSFD assessment in Ireland or elsewhere in the EU. A qualitative and narrative-based assessment has therefore been undertaken. It has considered how GES is defined for each of the 11 MSFD Descriptors in Ireland including any targets and indicators that have been defined by the Government of Ireland and its advisor. It is notable that no targets or indicators exist yet for Descriptors 1, 4, 6 and 11. The MSFD assessment for the Celtic Interconnector Project has related the definitions, targets and indicators for Ireland against the findings of the EIAR. This has included consideration of the potential for effects to occur on the indicators defined for GES where appropriate.

In the context of Ireland’s definitions of GES as well as its targets and indicators for success, the MSFD assessment has concluded that the Celtic Interconnector Project is unlikely to independently influence the ability of Ireland to achieve or maintain GES under any of the 11 MSFD Descriptors. This outcome could be reviewed at a future time when further targets and indicators become available, or subject to the findings of Part 2 (Monitoring Programme)

and Part 3 (Programme of Measures) of the Marine Strategy in Ireland. Also of future relevance will be the outcome of the Review of the Directive by EU Commission/Publication of the OSPAR Quality Status Report, to support the third cycle of the MSFD, due to commence in 2024.

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