GREENLINK
SUMMARY OF ONSHORE AND OFFSHORE ENVIRONMENTAL EFFECTS

TO ACCOMPANY WELSH MARINE LICENCE APPLICATION

P1975_R4799
September 2019

Greenlink Interconnector
- connecting the power markets
in Ireland and Great Britain

Greenlink
INTERCONNECTOR

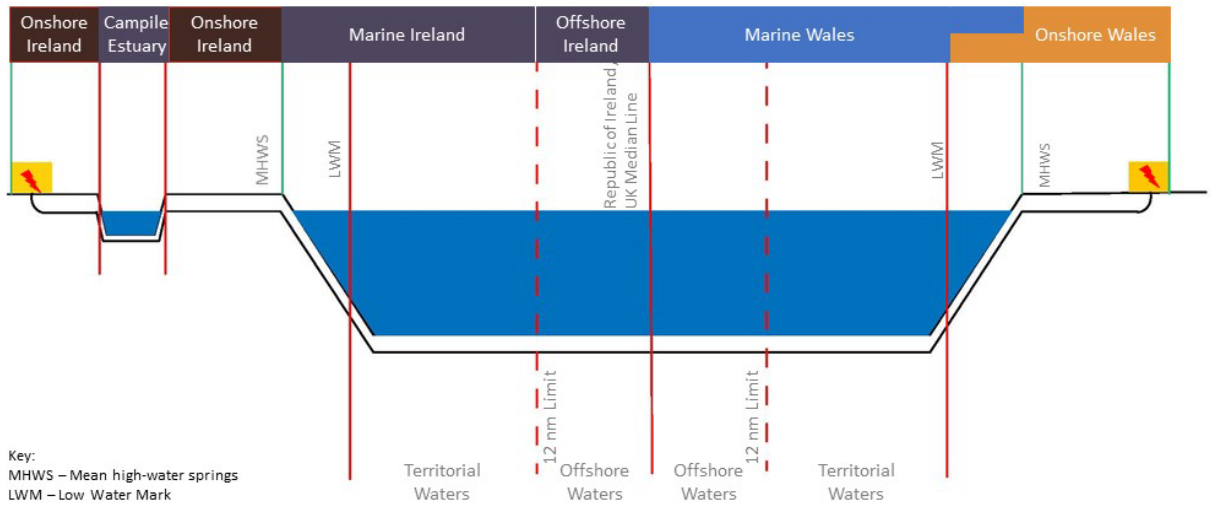
EXECUTIVE SUMMARY

Greenlink is a proposed subsea and underground electricity interconnector cable between the existing electricity grids in Ireland and Great Britain (GB), with a nominal capacity of 500 megawatts (MW). Greenlink will provide a new grid connection between EirGrid's Great Island substation in County Wexford (Ireland) and the National Grid's Pembroke substation in Pembrokeshire (Wales). The power will be able to flow in either direction, depending on supply and demand in each country. Greenlink is being developed by Greenlink Interconnector Limited (GIL).

Greenlink is in line with the European Commission's approach to an integrated energy market to ensure value of money for consumers. Greenlink has been awarded European Project of Common Interest (PCI) status, making it one of Europe's most important energy infrastructure projects and granting it the "highest national significance" possible.

Greenlink is a linear infrastructure project, with both onshore and marine elements. Different regulations in Ireland and Wales and different onshore and marine consenting requirements mean that separate development consents (which are subject to separate Environmental Impact Assessment [EIA] Regulations) are required for the onshore and marine components of Greenlink. The components, as defined by planning requirements, are illustrated in Figure 1-1 below. GIL has elected to follow the EIA process for all project components.

Components of Greenlink



This document has been prepared at the request of Natural Resources Wales and has been submitted with the Welsh Marine Licence application. It discusses each component starting at the Great Island (Ireland) converter station progressing sequentially to the Pembroke converter station (Wales). It provides a summary of the onshore and marine environmental assessments in both Ireland and Wales and gives an overview of the combined environmental effects of Greenlink. More detailed information on Greenlink and the environmental

assessments is contained within the permit applications and supporting documentation, available at www.greenlink.ie.

The Environmental Statement (ES) of the Marine Wales component and Environmental Impact Assessment Report (EIAR) of the Irish Marine component provide comprehensive assessments of the likely significant effects which would result from installation, operation (including repair & maintenance) and decommissioning of the component parts located within the Welsh and Irish jurisdiction respectively. Where potential for cumulative effects arise, these are assessed within the relevant ES and EIAR, as appropriate. Through careful routeing and embedding mitigation within the design of the project, GIL has prevented or reduced several potentially significant environmental effects. Through careful selection of additional project specific mitigation any remaining residual effects have been reduced to an acceptable level and are not significant.

Greenlink crosses two maritime jurisdictions (Wales and Republic of Ireland) and as such transboundary assessment has been an integral component of the environmental assessment. Transboundary effects will be limited to underwater noise and sediment dispersion. These effects will be limited in spatial extent near the jurisdictional boundary and will be associated with one-off events that move along the cable centreline e.g. geophysical survey and cable installation. The environmental assessments for Marine Wales, Marine Ireland and Offshore Ireland concluded that the effects from the pressures associated with sediment dispersion and underwater noise changes are not significant and therefore transboundary effects will also not be significant.

For the Onshore Ireland and Onshore Wales components, surveys to support production of the environmental assessments have been completed and the conclusions are currently being finalised. The current direction of assessment suggests that effects can be managed through industry best practice embedded into the design of the project or the implementation of project specific mitigation designed to avoid or reduce significant effects. Local effects will occur during construction of the Irish converter station; but whilst significant they will be temporary, lasting for the duration of the construction works only. Through careful siting of the Welsh converter station, and the semi-industrial setting, local effects during construction will not be significant.

For a linear interconnector cable project such as Greenlink, the scope of intra-project effects is limited to the interfaces between onshore and marine project components i.e. between Marine Wales and Onshore Wales at the intertidal area; and between Marine Ireland and Onshore Ireland at the intertidal area, where two different activities could be occurring at the same time. Taking into consideration the potential for both direct and indirect effects on all receptors including pressures such as changes in noise and changes in air quality, no effects have been identified within Onshore Ireland, Campile Estuary, Marine Ireland, Offshore Ireland (outside 12nm), Marine Wales and Onshore Wales that could accumulate to have a significant effect.

In conclusion, Greenlink will not have a significant effect on the environment either alone or in combination with other plans or projects.

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GLOSSARY

AA	Appropriate Assessment
AC	Alternating current
CBS	Cement bound sand
CLV	Cable lay vessel
CTMP	Construction Traffic Management Plan
DC	Direct current
EC	European Commission
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EirGrid	Irish transmission network operator
ES	Environmental Statement
GB	Great Britain
GIL	Greenlink Interconnector Ltd
HDD	Horizontal directional drilling
HRA	Habitats Regulations Assessment
HVAC	High voltage alternating current
HVDC	High voltage direct current
JNCC	Joint Nature Conservation Committee
MHWS	Mean high water springs
MW	Megawatts
NIS	Natura Impact Statement
NRW	Natural Resources Wales
OMHSR	Conservation of Offshore Marine Habitats and Species Regulations
PCI	Project of Common Interest
SACs	Special Area of Conservation
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage Systems
TJP	Transition jointing pit
UXO	Unexploded ordnance
XLPE	Cross linked polyethylene

1. Introduction

1.1 Purpose of this Document

This document has been prepared at the request of Natural Resources Wales (NRW) to support a Marine Licence Application for the installation, operation and maintenance of the Greenlink Interconnector (**Greenlink**). Greenlink is a linear infrastructure project between Wales and Ireland, with both onshore and marine elements, and it is a project of common interest (**PCI**) under European Commission Regulation 347/2013 on guidelines for trans-European energy infrastructure in recognition of its pan-European importance. It is being developed by Greenlink Interconnector Ltd (**GIL**). The aim of this document is to provide a summary of the onshore and marine elements in both Ireland and Wales and give an overview of the combined environmental effects of Greenlink.

Greenlink requires development consent in both Wales and Ireland. Although it does not fall neatly within the categories of development listed in Annex I and II of the EIA Directive, GIL has been advised that the project categories listed in the EIA Directive must be understood by reference to a wide scope and broad purpose. GIL is therefore following the EIA process for all project components. The summaries of the environmental assessments for each project component are presented below.

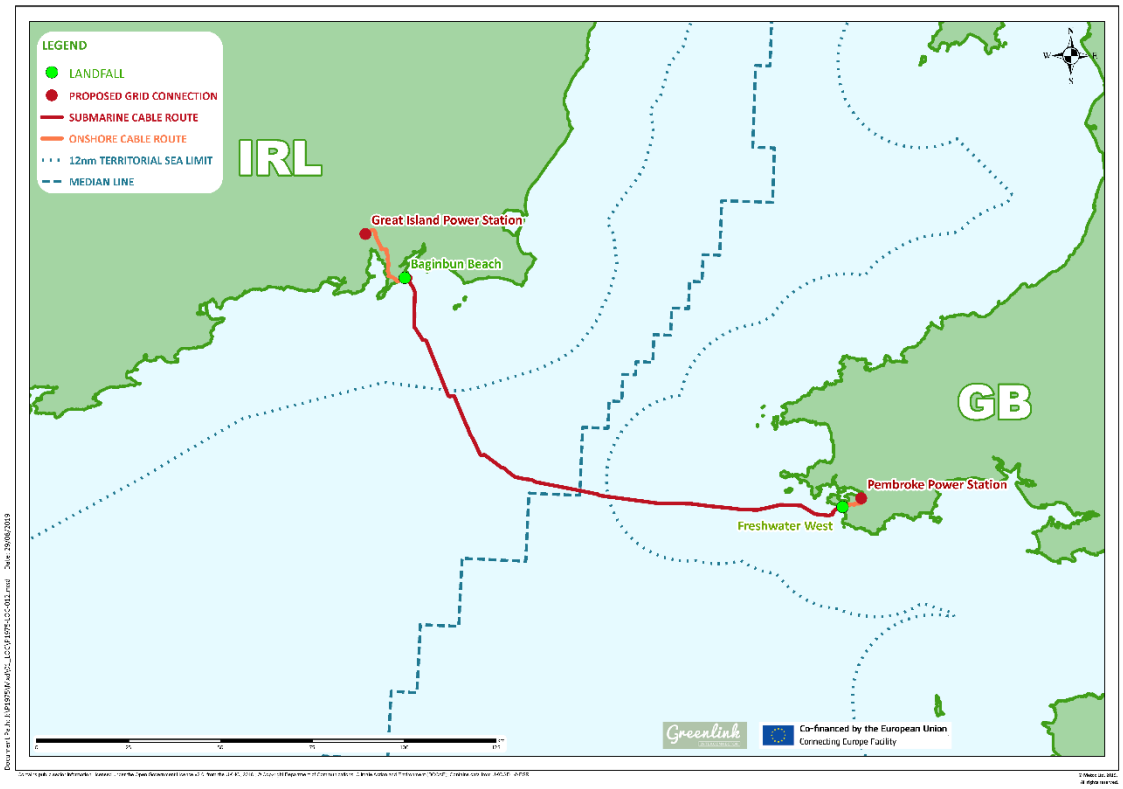
More detailed information on Greenlink and the environmental assessments will be provided on the Greenlink website (www.greenlink.ie) and within the permit applications and supporting documentation once submitted to the respective determining authorities.

1.2 The Greenlink Project

Greenlink is a proposed subsea and underground electricity interconnector cable between the existing electricity grids in Ireland and Great Britain (GB), with a nominal capacity of 500 megawatts (MW). Greenlink will provide a new grid connection between EirGrid's Great Island substation in County Wexford (Ireland) and the National Grid's Pembroke substation in Pembrokeshire (Wales). The power will be able to flow in either direction, depending on supply and demand in each country.

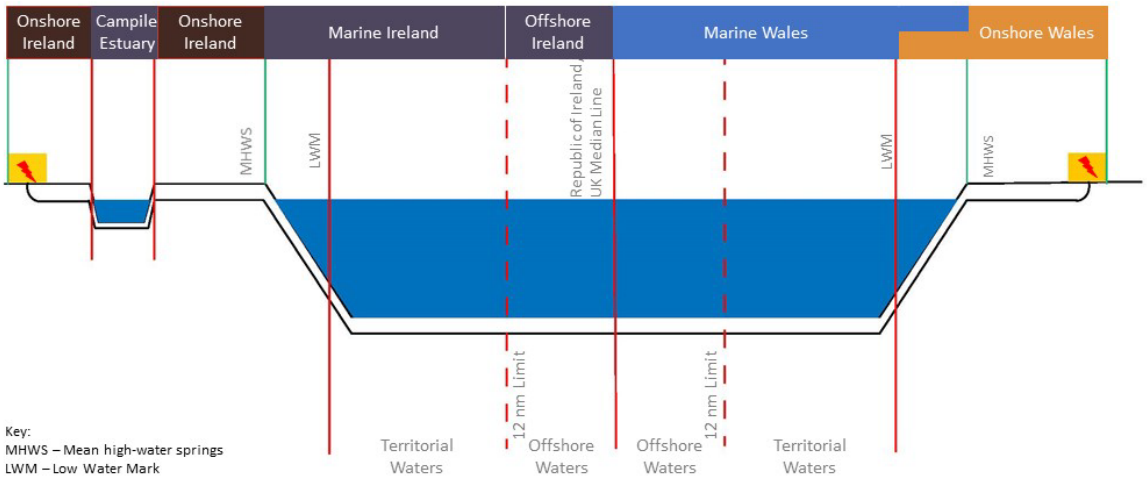
The subsea and underground cable route is illustrated in Figure 1-1. The landfalls, where the subsea cables are connected to the underground onshore cables, have been selected as Baginbun Beach (Ireland) and Freshwater West (Wales) following an extensive consideration of alternatives, which included technical and environmental assessment of potential landfall sites in both regions and consultation with key stakeholders.

Figure 1-1 Greenlink Overview



Different regulations in Ireland and Wales and different onshore and marine consenting requirements mean that separate development consents (which are subject to separate EIA Regulations) are required for onshore and marine components of Greenlink. The components, as defined by planning requirements, are illustrated in Figure 1-2. This document discusses each component starting at the Great Island (Ireland) converter station progressing sequentially to the Pembroke converter station (Wales).

Figure 1-2 Components of Greenlink



Once the appropriate development consents have been obtained, the scheme will be constructed which is expected to take approximately three years from start to finish. Construction will commence in 2020 and be fully operational in 2023.

1.3 The Developer

GIL is owned jointly by Element Power Holdings, part of Hudson Sustainable Investment, and Partners Group on behalf of its clients. Hudson Sustainable Investment is an independent investment management firm with a strong track record and expertise in investing in and developing sustainable energy infrastructure projects in Ireland, the UK and internationally. Partners Group is a global private markets investment management firm with €73 billion in investment programs under management in private equity, private real estate, private infrastructure and private debt.

1.4 Need for the Project

The 'Energy Union' endorsed by Member States of the European Commission in October 2015, is driving a fundamental transition towards more innovative ways to produce, transport and consume energy, and to address different approaches to design, implement and, where needed, enforce energy policy.

A range of actions will be required to make this happen, including improvements to the physical interconnectedness of energy grids (both gas and electricity) to meet a 10% interconnection target by 2020 and to possibly reach 15% by 2030. As of November 2017, 17 EU Member States have reached the 10% target, with a further 7, including Ireland, on the path to reach the target by 2020 (European Commission 2017).

An interconnected European energy grid is vital for Europe's energy security, for more competition in the internal market resulting in more competitive prices, and for better achieving the decarbonisation and climate policy targets, to which the European Union (EU) has committed. An interconnected grid will help to deliver the ultimate goal of the Energy Union i.e. to ensure affordable, secure and sustainable energy, as well as growth and jobs across Europe.

The European Union, the Irish, Welsh and UK Governments support the continued development of interconnectors as a means of integration and providing a robust and resilient energy supply. There is broad consensus that, in a post-Brexit world, the efficient cross-border trade in electricity between the UK and the EU should continue. The UK government has stated its commitment to mechanisms to achieve this (BEIS 2019).

Greenlink is in line with the European Commission's approach to an integrated energy market to ensure value of money for consumers. Greenlink has been awarded **European Project of Common Interest (PCI)** status, making it **one of Europe's most important energy infrastructure projects** and granting it the "highest national significance" possible.

Greenlink will have key strategic importance, as it will provide significant additional interconnection capacity between Ireland and GB with onward connections to continental Europe. The construction and development of Greenlink will deliver increased energy security; regional investment and value for money to consumers; and enable the further integration of low carbon renewable energy sources.

2. Project Description

2.1 Introduction

Greenlink will consist of two converter stations - one located close to the Great Island substation in County Wexford and the other close to the Pembroke substation in Pembrokeshire - connected by two high voltage direct current (HVDC) cables under the Irish Sea. A converter station converts electricity from alternating current (AC) to direct current (DC) and vice versa.

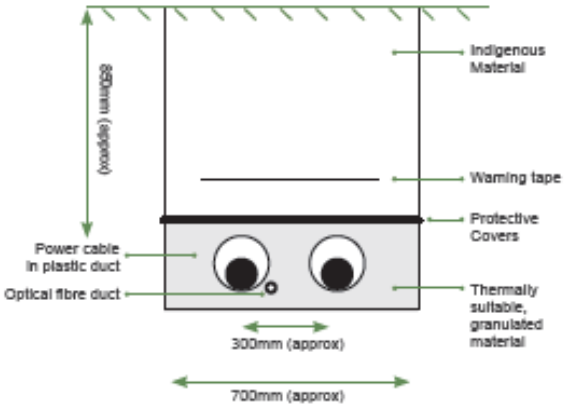
DC electricity is typically used for the transmission of electricity over long distances because it has lower losses, negligible heating effects and is therefore suitable to be buried underground. Accordingly, there will be no overhead lines between the two converter stations. Onshore, the cables will be buried underground and offshore the cables will be buried in the seabed or laid on the seabed with protection, if burial is not practicable.

2.2 Cable technology

The HVDC cables will be a cross linked polyethylene (XLPE) type covered by a lead sheath and steel wire armour to protect the cable from external damage during installation and burial. The armouring is made from round or flat steel wire wound in a helical form. Over the armour wires a polyethylene sheath is applied to make the cable easier to handle and ensure the armour wires remain in place during bending. The cable conductor will be either aluminium or copper.

2.3 Summary of onshore cable installation

The onshore cables will be buried circa 850mm underground in a single trench, installed in plastic ducts to simplify the construction process. The trench will be circa 700mm wide but may vary as the depth of cover above the cables increases i.e., the deeper the cables are buried the wider the trench may become. It is usual to increase the depth of cover in agricultural land to around 1050mm (from 850mm).



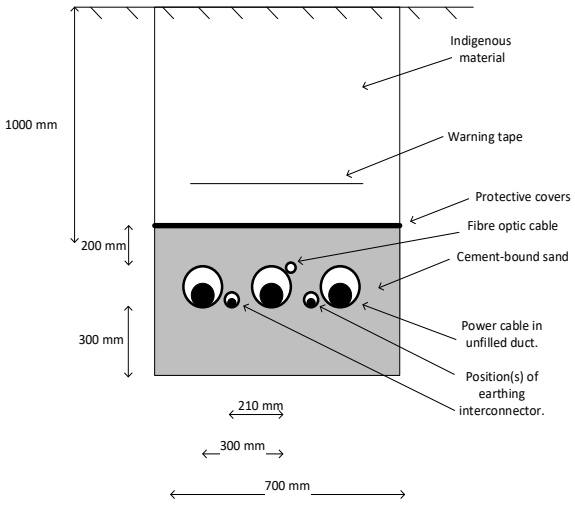
The cable ducts will be laid circa 300mm apart to achieve thermal independence, alongside the fibreoptic cable duct, within a bedding of thermally suitable compactable granulated material, such as cement-bound sand (CBS). The remainder of the trench will be reinstated within a bedding of indigenous sub-soil, overlain by topsoil and any extant turf.

Protective covers, such as steel plates may be employed as a physical barrier above the ducts at culvert crossings where the cables may be shallower; in addition, yellow warning tape will be laid above as a precautionary measure to avoid accidental excavation. All cable infrastructure will be installed at a depth to ensure that there is no interference to local land uses; such as ploughing. Following installation, the land will be restored, and land use activities will be able to resume unaffected.

Marker posts will be placed at the following locations to notify the presence of the cables: road crossings, field boundaries, joint locations and changes in cable alignment.

Within the highway, cable installation will be similar to that in agricultural land; i.e. a circa. 700mm width trench. In the highway, the depth to cable protection will be shallower at 750mm below ground level. Where practicable, cable installation would take place in verges rather than the highway; however, this will vary depending upon available verge width and existing utilities. At road crossings, cable ducts are likely to be embedded in concrete, rather than CBS to provide additional protection. Rolling temporary road closures will maintain safe working areas during highway installation.

HVAC cable installation will be comparable to the HVDC cable installation, i.e. a circa. 700mm width trench. The primary exception is that three cable ducts will be installed to accommodate an extra cable for HVAC, in addition to two earthing cable ducts. Due to the greater heat dissipation of HVAC cables, the ducts are likely to be laid on a 300mm depth of CBS and a 200mm capping of CBS applied over the ducts to maintain thermal independence.



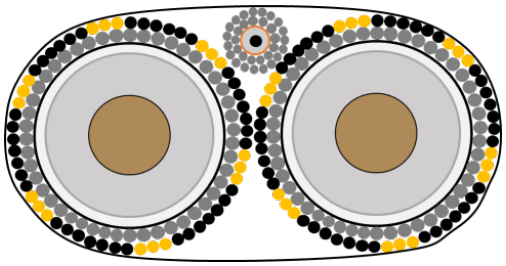
A 5m wide haul road may be required to install cables in agricultural land. The purpose of the haul road is to allow construction access along the cable route collecting and delivering materials with minimal disturbance to agricultural land.

Jointing bays will also be required approximately every kilometre, to allow individual cable reels to be joined together. Jointing bays will be temporary and underground, facilitating the pulling of cables through the ducts and allowing a clean and safe space for jointing.

The cable route in Ireland and Wales has been carefully aligned to avoid impacting landscape and boundary features, such as hedgerows and treelines, but where such effects are unavoidable, clearance widths will be minimised, temporary connectivity measures employed, and full replacement of hedgerows provided post-installation.

During the construction phase GIL will, where practical, coordinate works with any works being carried out be Local Authorities.

2.4 Summary of marine cable installation



The marine cables will be tied together in a bundle with a fibre optic cable (used for control and communication purposes) and laid in a single trench. A cable burial risk assessment was conducted to determine the target depth of burial for the cables. This considered risks such as anchoring and fishing intensity and concluded that target depth is 1.0m for all areas of loose sediment (sands/gravels) and 0.6m for areas of glacial till.

Subsea surveys were undertaken in 2018/2019 in order to identify and confirm the presence of any constraints facing the subsea cable route. The route chosen offers the best solution to challenges identified while maintaining the shortest route solution. The final subsea route is approximately 160km long; 86km in Irish waters and 74km in Welsh waters.

The results of the subsea surveys not only supported the selection of the preferred cable route but also the appropriate installation and protection methods to be adopted.

The nature of the seabed varies along the cable route ranging from fine sediments to stony reefs, consisting of pebbles and boulders and bedrock outcrops. The choice of burial technique or protection method will depend upon the seabed conditions in each section. The preference is burial in the seabed as this provides the best protection. Where the seabed composition is not suitable for burial, external mechanical protection will be provided through rock placement or concrete mattressing. Subsea surveys indicated burial in sediment is achievable for approximately 89% of the route.

Approximately 16km of the subsea cable route in Welsh waters will require external cable protection due to ground conditions. External cable protection will also be used where Greenlink crosses existing subsea telecommunication cables in both Irish and Welsh waters.

2.5 Summary of transition between onshore and offshore

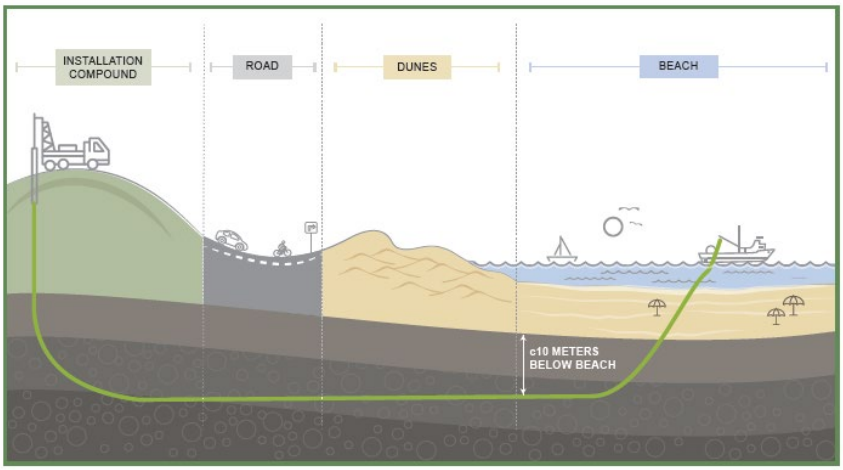
The marine HVDC cable will be connected to the terrestrial HVDC cable in an underground transition jointing pit (TJP). This will be sited within a temporary landfall compound set back from the beach above MHWS. In Ireland and Wales the TJP will be sited within agricultural land.

Using a trenchless technique for installing underground cables called horizontal directional drilling (HDD), ducts will be installed from the TJP to emerge below the low water mark. The ducts will pass approximately 10m beneath the beach. The marine cables will then be pulled through the ducts to be jointed to the terrestrial HVDC cables. All cabling and jointing infrastructure would be below ground and

following completion of the HDD and jointing activities, the landfall compound would be reinstated and returned to arable use.

Construction work at Baginbun Beach (Ireland) and Freshwater West (Wales) will last for approximately three months and be scheduled to avoid the most popular periods of use. No works will be undertaken on either beach. The use of HDD avoids damaging sensitive ecological features such as the dune system at Freshwater West. Figure 2-1 is an illustration of how an HDD might work.

Figure 2-1 Illustration showing how HDD might work



2.6 Converter station design

A converter station consists of various components. These include a converter hall, converter transformers, AC switchgear and busbars, harmonic filters (if required), lightning towers, ancillary plant such as cooling bank and stand-by back-up emergency generators, and a control building (Figure 2-2). The maximum height of the converter station will be determined by the valve hall, which would be a maximum height of 21m at its apex. In addition to this, two key elements are the 26m high lightning tower and potential gantries at 23m height.

The converter hall and control building will likely be rectangular, shallow pitch, single-storey structures. Internally, the converter hall would typically be divided into the following: reactor hall, valve hall and DC hall. Cladding design and colour will be sympathetic to the local environment and landscape screening provided to mitigate landscape and visual effect.

Three operational transformers are required to operate the converter station, with a fourth transformer installed to provide redundancy. Transformers will be sited within reinforced concrete bunds which will be linked to an underground oil dump tank and designed to pollution prevention requirements.

Prior to establishing the principal converter station works area and construction compounds, site clearance and earthworks are required in advance to create level

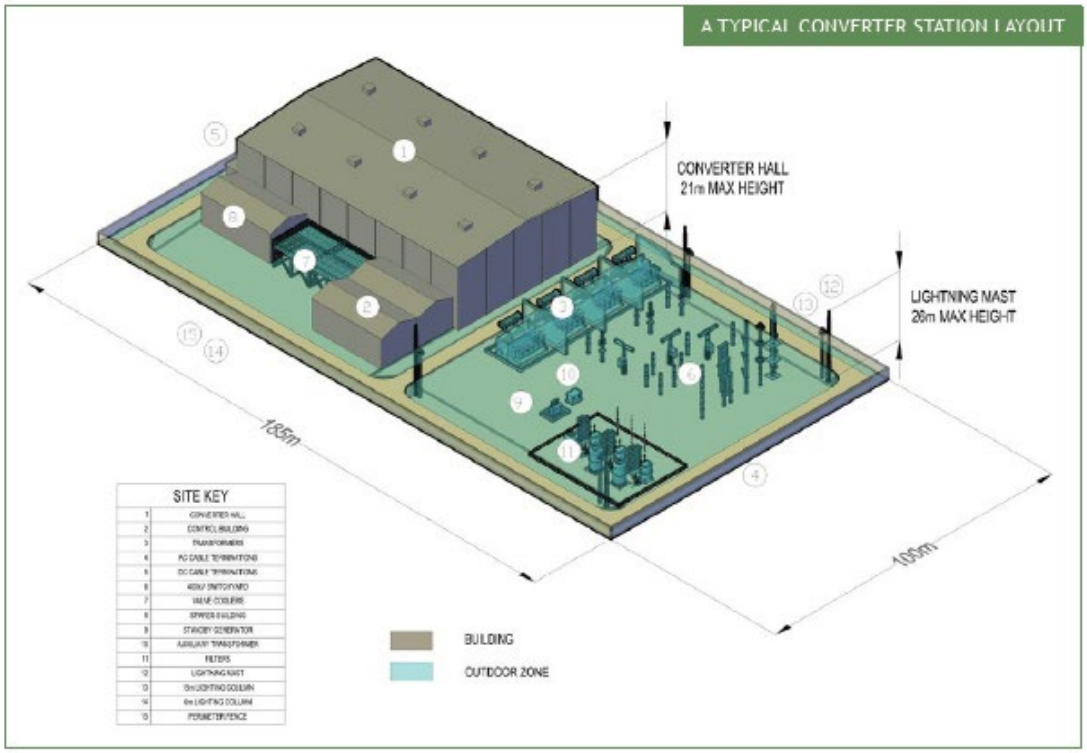
surfaces. Site clearance will comprise vegetation clearance and a topsoil strip; all soil would be segregated and stored in accordance with best practice.

Following consultation, EirGrid has confirmed that a tail station will need to be developed alongside the converter station in Ireland. A tail station is a substation built adjacent to the converter station. A tail station is not required in Wales.

The layout of the converter station and final dimensions will depend on the local terrain, physical constraints, the results of environmental surveys, consultations and the supplier's technical requirements. The indicative converter station footprint is circa 1.85 hectares (185m x 100m). The tail station will be circa 0.42 hectares (60m x 70m).

The final design of the converter station will fully consider the results of technical and environmental assessments. Figure 2-2 provides an indicative layout.

Figure 2-2 Typical converter station layout



2.7 *Summary of Ireland onshore cable route*

In Ireland, the substation at Great Island was identified as the connection point for Greenlink following the completion of assessments and consultation with EirGrid (Irish transmission network operator). AC cables will connect the HVDC converter station to the substation. A site adjacent to the substation (Figure 2-3) has been identified as the most suitable location to construct the HVDC converter station following environmental studies, technical assessments and consultation with key stakeholders. Two configurations of this converter station are currently being assessed, and the environmental assessment documents the 'worst case' potential environmental effects of the two alternatives.

From the Irish converter station, approximately 22km of underground HVDC cable will be laid beneath the existing road network and across agricultural land (Figure 2-3, Drawing P1975-LOC-013). Approximately 2.7km from the converter station, the onshore cable route will cross beneath the Campile Estuary using HDD, a trenchless method of installing underground cables. This technique will also be used to install the cables at Baginbun Beach. This method of installation will ensure that cables can be installed without any impact on the Campile Estuary and the beach. External cable protection may be required at the Baginbun Beach HDD exit location. The installation contractor will be required to avoid if possible or if not feasible, restrict the use of external cable protection.

2.8 Summary of Wales onshore cable route

In Wales, the Pembroke substation was identified as the connection point for Greenlink following the completion of assessments and consultation with National Grid. AC cables will connect the Greenlink converter station to the substation. Three sites, near to the substation, were assessed as potential locations to locate the HVDC converter station, prior to the final site being selected.

A preferred cable route from the Pembroke HVDC converter station to Freshwater West has been selected following environmental and technical studies and consultation with stakeholders. The cable route is approximately 7km long beneath agricultural land and the existing road network.

At Freshwater West, HDD will be used to install the cables beneath the sensitive dune system and the beach. Cables will pass approximately 10m below the beach and emerge below the low water mark. No external cable protection will be required at the HDD exit point.

2.9 Final Greenlink Route

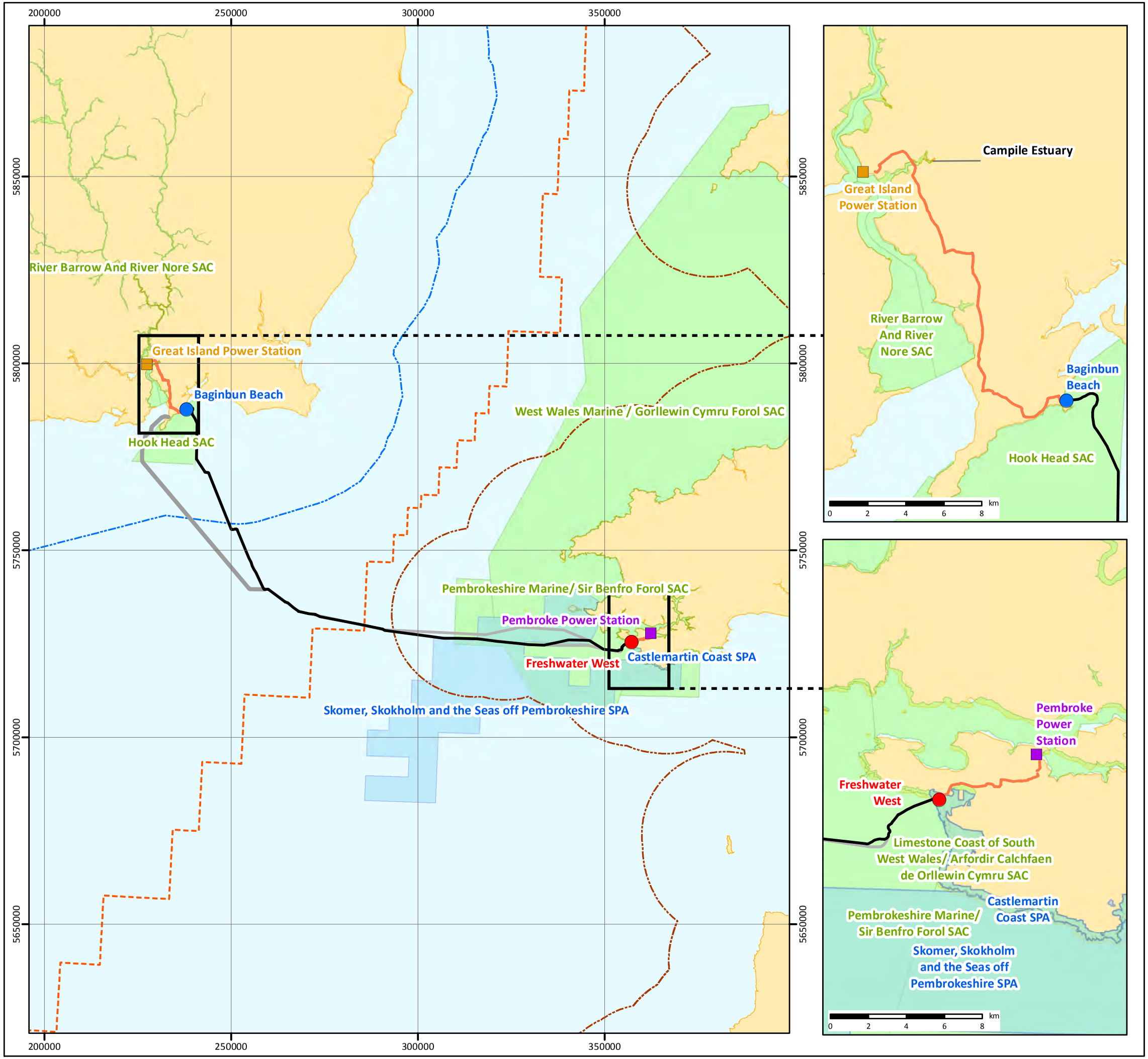
The final Greenlink route which has been subject to environmental assessment is shown in Figure 2-3, Drawing P1975-LOC-013.

GREENLINK INTERCONNECTOR

ROUTE OVERVIEW

Submarine & Onshore Route Connections

Drawing No: P1975-LOC-013 | **A**



Legend

Proposed Grid Connection
- Pembroke Power Station
- Great Island Power Station

Landfall
- Baginbun Beach
- Freshwater West

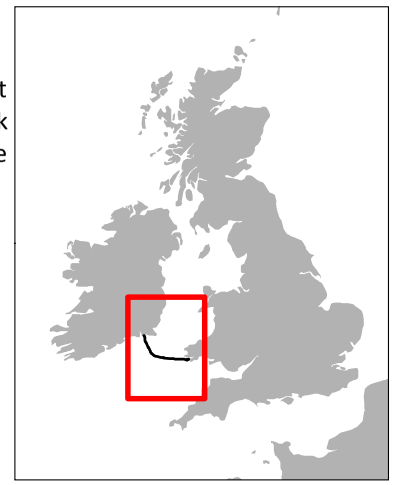
Greenlink Interconnector
- Submarine Cable Route
- Onshore Cable Route
- Prevoius Alternative Routes

Administrative Boundaries
- ROI 12nm Territorial Sea Limit
- UK 12nm Territorial Sea Limit
- Median Line

Environmental Designations
- SAC
- SPA

NOTE:

Only SPA's and SAC's that intersect the Greenlink Interconnector route are shown on the map.



NOTE: Not to be used for Navigation

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Spheroid	WGS_1984
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Data Source	DCCAE; UKHO; CDA; NPWS; JNCC; OSOD; EPA; Greenlink
File Reference	J:\P1975\Mxd\01_LOC\ P1975-LOC-013.mxd
Created By	Chris Goode
Reviewed By	Emma Langley
Approved By	Anna Farley

Co-financed by the European Union Connecting Europe Facility

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3. Permitting and Environmental Assessment

3.1 Greenlink Permitting Overview

Permits are required for both onshore and offshore works in Ireland and Wales. The statutory permits for Greenlink include the following:

Component	Infrastructure	Consent required	Authority
Onshore Ireland	Converter station Onshore cable route	Strategic Infrastructure Development	An Bord Pleanála
		Authorisation to construct	Commission for the Regulation of Utilities (CRU)
		Consent to lay electricity lines across lands	CRU
		Consent to lay electricity lines under the public road	CRU
Campile Estuary & Marine Ireland	HDD under the Estuary Offshore cable route	Foreshore Licence under the Foreshore Acts 1933 - 2011	Department of Housing, Planning and Local Government (Foreshore Unit)
Offshore Ireland	Offshore cable route	No consent required	
Marine Wales	Offshore cable route	Marine Licence under the Marine and Coastal Access Act 2009	Natural Resources Wales
		Marine Works Licence	Milford Haven Port Authority
Onshore Wales	Converter station Onshore cable route	Major Development under the Town & Countryside Planning Act 1990	Pembrokeshire County Council
			Pembrokeshire Coast National Park Authority

3.2 Environmental Impact Assessment (EIA)

In order to gain development consent, the authorities listed above require that the applicant has met all legal requirements under relevant European Union Directives, and in particular Directive 2014/52/EU (amending Directives 2011/92/EU and 85/337/EEC) on the assessment of the impacts of certain private and public projects on the environment (the Environmental Impact Assessment [EIA] Directive).

The EIA Directive requires that certain types of project, listed in Annex I and II of the Directive, with the potential to significantly affect the environment have an EIA before a licence decision is made.

The proposed interconnector does not constitute a "project" listed within either Annex I or Annex II to the EIA Directive. Accordingly, an EIA is not required in relation to the proposed interconnector.

Greenlink does not fall neatly within the categories of development listed in Annex I and II of the EIA Directive or any of the following national transposing legislation:

1. Strategic Infrastructure Development in respect of the onshore elements of Greenlink (Onshore Ireland);
2. Foreshore Act 1933 – 2011 in respect of the offshore elements of Greenlink (Marine Ireland);
3. Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended in 2017) in respect of the offshore elements of Greenlink (Marine Wales); or
4. Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017 in respect of the onshore components of Greenlink (Onshore Wales).

GIL has been advised that the project categories listed in the EIA Directive must be understood by reference to a wide scope and broad purpose. GIL is therefore following the EIA process for all project components.

Separate Environmental Statements (ESs) / Environmental Impact Assessment Reports (EIARs) are being prepared which cover individually the Welsh Onshore; the Irish Onshore; the Welsh Marine (the submarine route from the Ireland/UK median line to mean high-water springs [MHWS] at the Welsh landfall at Freshwater West, Pembrokeshire); and the Irish Marine (the submarine route from MHWS at the Irish landfall at Baginbun Beach, County Wexford to the 12nm limit) and Irish Offshore (the submarine route from the 12nm limit to the Ireland/UK median line). These include a full cumulative effects assessment of all five components of the project.

As the ESs / EIARs are submitted they will be available online at www.greenlink.ie.

3.3 *Appropriate Assessment*

European Commission (EC) Directive 92/43/EC on the conservation of natural habitats and of wild fauna and flora (Habitats Directive) and EC Council Directive 2009/147/EC on the conservation of wild birds (Birds Directive) enable European Union member states to work together within the same legislative framework to protect Europe's most valuable species and habitats, irrespective of political or administrative boundaries. At the heart of these Directives is the creation of a network of sites, known as the Natura 2000 network.

The aim of the Natura 2000 network is to ensure the long-term survival of European threatened species and habitats. The network comprises Special Areas of Conservation (SACs) designated under the Habitats Directive, and Special Protection Areas (SPAs) designated under the Birds Directive. Sites which have been submitted to the European Union (by individual member states) but which have not formally been adopted e.g. candidate SACs and proposed SPAs, also form part of the network and are treated as if fully designated. In the UK and Ireland, Natura 2000 sites are collectively referred to as European Sites.

A key requirement of the Habitats Directive is that the effects of any plan or project, alone, or in combination with other plans or projects, on the Natura 2000 site network, should be assessed in view of the site's conservation objectives before any decision is made to allow that plan or project to proceed. There can be no reasonable scientific doubt on the conclusions drawn by the assessment. This process is known as Appropriate Assessment (AA) and is provided for under Articles 6(3) and 6(4) of the Habitats Directive and is transposed into UK law through The Conservation of Offshore Marine Habitats and Species Regulations 2017 (OMHSR) and The Conservation of Habitats and Species Regulations 2017; collectively referred to as the 'Habitats Regulations'. In Ireland the requirements are transposed into Irish law through the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended) (the "2011 Regulations").

The Habitats Regulations and 2011 Regulations require that all plans and projects must be assessed to determine whether the plan or project is likely to have any significant effects on any European Site in light of the site's conservation objectives. If the project is likely to have a significant effect on a European Site, either alone or in combination with other plans or projects, it must undergo an AA by the competent authority (those with decision making powers).

The AA procedure (referred to as the Habitats Regulations Assessment [HRA] process in the UK) is based on a four-stage approach, where the outcome at each successive stage determines whether a further stage in the process is required. The first stage is to undertake AA screening which establishes whether, in relation to a particular plan or project, AA is required. If the AA Screening concludes 'Significant effects are certain, likely or uncertain' the plan or project must proceed to Stage two. Stage two is a more detailed ecological assessment of the proposed activities and considers, in greater detail, whether the plan or project could adversely affect the integrity of the European Site. There can be no reasonable scientific doubt on the conclusions drawn. The results of this stage are presented by the applicant to the competent authority in a Habitats Regulations Assessment (HRA) in Wales and a Natura Impact Statement (NIS) in Ireland.

Greenlink crosses (and therefore potentially affects) seven European Sites – as illustrated in Figure 2-3, Drawing P1975-LOC-013. As Greenlink is not directly connected with or necessary to the management of the European Sites, it is necessary for the project to be subject to the AA / HRA process.

Stage 1 Screening assessed the European Sites crossed by Greenlink and additional sites which were either in the direct zone of influence of the project or contain mobile species that could potentially travel into the Greenlink application area. Stage 1 Screening concluded that there is the potential for a likely significant effect on the following sites:

Onshore Ireland

- River Barrow & River Nore SAC (site code: IE002162)
- Hook Head SAC (site code: IE0000764)

- Bannow Bay SPA (site code: IE0004033)

Marine Ireland

- Hook Head SAC (site code: IE0000764)
- Saltee Islands SAC (site code: IE0000707)
- Slaney River Valley SAC (side code: IE0000781)

Marine Wales

- Pembrokeshire Marine / Sir Benfro Forol SAC (site code: UK0013116)
- West Wales Marine / Gorllwein Cymru Forol SAC (site code: UK0030397)

Onshore Wales

- Limestone Coast of South West Wales / Arfordir Calchfaen De Orllewin Cymru SAC (site code: UK0014787).
- Castlemartin Coast SPA (site code: UK9014061).
- Pembrokeshire Marine / Sir Benfro Forol SAC (site code: UK0013116).
- Pembrokeshire Bat Sites and Bosherton Lakes / Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherton SAC (site code: UK0014793).

HRAs and NISs have therefore been prepared for all Greenlink components and will be submitted with the appropriate consent applications. Other plans, projects and licensable activities have been considered within 10km of Greenlink, taking into account the temporal extent of project activities, for a potential in-combination effect on European Sites and species. The in-combination screening assessment has considered common receptor pressures with other projects and identified no significant effects.

The Marine HRAs and NISs conclude that **Greenlink will not have an adverse effect on the integrity of any European Site either alone or in combination with other plans or projects.**

The Onshore HRA and NIS are currently being finalised for Onshore Wales and Onshore Ireland. The current direction of assessment indicates that following the implementation of project specific mitigation there will be no adverse effect on the integrity of any European Site either alone or in combination with other plans or projects.

3.4 Method for Assessment of Effects

The EIA process has considered four types of effects on the environment:

3.4.1 Direct and indirect effects

The definitions used to describe direct and indirect effects are as follows:

- Direct effect - Effects that result from a direct interaction between the Project/Project activities and the receiving environment; and

- Indirect effect - Effects on the environment, which are not a direct result of the Project/Project activities, often produced away from the activity or as a result of a complex pathway. For example, loss of habitat from trenching, leading to reduction in prey species availability, having an indirect impact on predators.

The EIA process for each Greenlink component has assessed direct and indirect effects of the project's activities on physical, biological and socio-economic receptors. The significance of the effect has been determined and if effects are significant project specific mitigation has been proposed to eliminate or reduce the significance of the effect. The results of the EIA process are presented in separate ESs / EIARs which cover individually the components of Greenlink. A summary of the post-mitigation effects is presented in:

- Chapter 4 – Onshore Ireland (SID Consent)
- Chapter 5 – Campile Estuary, Marine Ireland & Offshore Ireland (Foreshore Licence)
- Chapter 6 – Marine Wales (Marine Licence)
- Chapter 7 – Onshore Wales (Town & Country Planning Act 1990)

3.4.2 Intra-project effects

Intra-project effects are an accumulation of effects from activities within different components of Greenlink i.e. effects caused by an activity within the Onshore Wales component combining with effects caused by an activity within the Marine Wales component.

For a linear interconnector cable project such as Greenlink, the scope of intra-project effects is limited to the interfaces between onshore and offshore project components i.e. between Marine Wales and Wales Onshore at the intertidal area. At the marine interfaces e.g. between Marine Wales and Offshore Ireland; and Offshore Ireland and Marine Ireland, the effects from the cable installation will move with the installation spread and therefore there is no spatial or temporal overlap; it is a continuation of the effects along the linear project. The significance of effects on receptors is therefore considered by the individual environmental assessments. No effects have been identified within Onshore Ireland; Campile Estuary, Marine Ireland & Offshore Ireland; Marine Wales; and Onshore Wales that could accumulate to have a significant effect.

3.4.3 Cumulative effects

Cumulative effects are the addition of many minor or significant effects caused by the actions of other past, present or reasonably foreseeable projects, plans and licensable activities together with Greenlink.

Projects, plans and licensable activities within 10km of Greenlink have been identified and assessed to determine whether there are potential cumulative effects.

The results of these assessments are presented in the individual ESs / EIARs and summarised in Chapters 4 to 7 of this document.

3.4.4 Transboundary effects

Transboundary effects are effects that cross from one jurisdiction into another. Greenlink crosses two maritime jurisdictions (UK and Republic of Ireland). An EIA has been conducted for each jurisdiction, and as such transboundary assessment has been an integral component of the environmental assessment. The assessments have concluded that transboundary effects will be limited to sediment dispersion and underwater noise. These effects will be limited in spatial extent near the jurisdictional boundary and will be associated with one-off events that move along the cable centreline e.g. geophysical survey and cable installation. The EIAs for Marine Wales and Irish Marine & Irish Offshore concluded that the effects from the pressures associated with sediment dispersion and underwater noise changes are not significant and therefore transboundary effects will also not be significant.

3.5 Mitigation

Greenlink has been developed through an iterative process that sought to avoid or reduce potential environmental effects. Steps taken to reduce environmental disturbance include:

- Sensitive environmental features were identified through a desk-based assessment that used publicly available datasets and survey data acquired from other developers in the region.
- Nearshore sections of the route in Wales and Ireland were refined to follow identified sand channels through the bedrock reef habitat.
- Geophysical survey was widened in selected places to investigate the extent of potential reef habitat and sand wave features to see if they could be avoided.
- A reconnaissance survey was undertaken on two route options (Route A & Route E) through the Pembrokeshire Marine / Sir Benfro Forol SAC to identify areas of reef habitat. In consultation with NRW, a new route option was engineered between the two route options that sought to minimise the crossing of the sensitive habitats in the area.

In addition, to the route engineering that has taken place, the project will comply with international and national statute which is designed to avoid or abate negative environmental effects.

Project specific mitigation is generally only proposed if the EIA process identifies significant effects on the environment. Project specific mitigation are measures to be adopted and implemented during construction and operation that are over and above legal compliance. Mitigation measures have been proposed as necessary in the ESs / EIARs and are listed in a Schedule of Mitigation.

The Schedule of Mitigation will form the basis of an Environmental Management Plan (EMP) to be implemented in all project phases. The EMP will be prepared by the appointed Installation Contractor and will form the basis of the approach to mitigating potential effects on the natural and human environment and local community.

4. Onshore Ireland (SID Consent)

4.1 Components

Onshore Ireland will comprise:

- A High Voltage Alternating Current (HVAC) connection to a substation on the Irish HV transmission grid;
- A converter station near the existing Great Island substation, County Wexford;
- A HVDC onshore cable with a nominal capacity of 500MW from the converter station to the landfall site at Baginbun Beach; and
- A landfall site at Baginbun Beach.

The red line boundary (the area to be included in the SID consent application) is shown in Figure 4-1.

4.2 Route overview

The Irish HVAC Grid connection will be made from the Great Island 220kV substation in Co. Wexford, Ireland, to the planned Great Island converter station. These sites are adjacent to each other and the connection will be made by a very short underground cable.

4.3 Converter Station

Refer to Section 2 above for a description of the Converter Station.

A2

Legend

- Preferred Cable Route
- Indicative Joint Bay Locations

Greenlink INTERCONNECTOR

Co-financed by the European Union
Connecting Europe Facility

Issue	Date	By	Chkd	Appd
P1	2019-09-25	GM	MM	MD

Kilometers
0 0.275 0.55 1.1

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Client
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Job Title
Greenlink Interconnector

Emerging Preferred Cable Route

Sheet 1 of 5

Scale at A2
1:40,000

Job No	Drawing Status
246369-00	**Preliminary**

Drawing No	Issue
SK064	**P1**

MXD Location Z:\246000\246369-00\4. Internal\4-03 Design\4-03-03 Infrastructure\00 GIS Ireland\3_Workspaces\ENG_Engineering\SK064 Preferred Cable Route.mxd

4.4 Cable installation

The onshore cable as described in Section 2 above will be installed on a rolling basis. It is expected that progress rates for the trench excavation will be 100m per day in open country and no more than 50m per day in urban areas. These may be exceeded under favourable conditions and if very few obstructions are found.

The expected programme for each cable section (of up to one kilometre) is as follows:

Excavation/Ducting	2 to 3 weeks Or, a typical HDD crossing requires 4 to 6 weeks to install.
Cable Pulling	1 day per cable length.
Jointing	To excavate and prepare joint-bay: 5 days To pull cables into joint-bays: 4 days Jointing activities: 5 days Fill in joint and re-surface road: 5 days
Total	A minimum of 7 weeks per 2km cable section of trench. Or, at least 10 weeks if there is an HDD within the section.

Construction of the proposed development will require temporary land take to accommodate construction activities in addition to the permanent land take required to accommodate specific above ground elements of the proposed development.

Land will be temporarily required to accommodate construction compounds and temporary on-site activities.

4.5 Summary of environmental effects and Project Specific Mitigation

Surveys to support the production of the EIAR for Onshore Ireland have been completed and the conclusions are currently being finalised. The current direction of assessment and anticipated effects and mitigation are included within Table 4-1 to provide an indication of the likely residual effects and overall significance. The final full assessment and all requisite mitigation will be made available on completion and uploaded to the Greenlink website (www.greenlink.ie) for download.

Table 4-1 summarises the anticipated findings of the environmental assessment process.

Table 4-1 Onshore Ireland – summary of anticipated environmental assessment findings

Receptor	Summary of environmental effect	Anticipated Project Specific Mitigation (subject to change once assessment complete)	Anticipated EIAR Conclusion
Traffic and Transport	Operational traffic will be negligible and will have no effect. General construction traffic will have a minor adverse effect on a temporary basis and will be managed using a Construction Traffic Management Plan (CTMP).	A detailed construction traffic management plan will be prepared by the Contractor in advance of any works taking place and will be implemented for the duration of the proposed works. Traffic management is likely to include the use of traffic lights to maintain two-way traffic flows and the use of a 'stop and go' system, if deemed necessary. No mitigation is required for operational traffic due to negligible change in baseline.	Not significant
Air Quality and Climate	During the construction phase, the potential for significant dust emissions will only arise in respect of works in dry weather and during such activities the levels of dust are likely to be small. Dust may be raised by wind from dry surfaces and temporary stockpiles. A number of sensitive receptors, primarily residential receptors, are located along the route of the onshore cable. The closest of these is located within 10m of the proposed construction works. Given the scale of the proposed works, and the temporary nature of the same, CO_2 emissions predicted to arise during the construction phase of the proposed development are not considered to be significant, and a short term, imperceptible effect on climate is predicted. Operational effects on air quality will be solely generated from air emissions from some of the ancillary plant at the converter station, such as the proposed standby diesel generators. These will be two 1MVA units housed in a weatherproof enclosure and standing upon a concrete bund.	The following measures will be implemented. These measures are based on best practice as outlined in the British Research Establishment (BRE) document Controlling particles, vapour and noise pollution from construction sites (BRE, 2003) and the Institute of Air Quality Management (IAQM) document Guidance on the assessment of dust from demolition and construction (IAQM, 2016). • Exhaust emissions from vehicles operating within the working areas, including trucks, excavators, diesel generators or other plant equipment, will be controlled by the contractor through regular servicing of machinery; • During dry periods when dust generation is likely or during windy periods, working areas and vehicles delivering	Not significant

Receptor	Summary of environmental effect	Anticipated Project Specific Mitigation (subject to change once assessment complete)	Anticipated EIAR Conclusion
		material with dust forming potential will also be sprayed with water, as appropriate; • Areas where materials will be handled and stockpiled will be designed to minimise their exposure to wind – all stockpiles shall be kept to the minimum practicable height with gentle slopes; • There shall be no long-term stockpiling within the working areas and storage time will be minimised; • Material drop heights from plant to plant or from plant to stockpile will be minimised; • Dust screens will be implemented at locations where there is the potential for air quality effects during the construction phase, i.e. at locations where sensitive receptors are located within 100m of the works; and truck loads will be covered when carrying material likely to generate dust.	
Noise and Vibration	The operational assessment has focussed on key receptors and determined no likely significant effects. Construction noise assessment focussed on temporary effects of construction activities and concludes no likely significant effect.	Specific noise parameters will be applied to operational design. Construction noise management will be implemented through the Construction Environmental Management Plan (CEMP).	Not significant

Receptor	Summary of environmental effect	Anticipated Project Specific Mitigation (subject to change once assessment complete)	Anticipated EIAR Conclusion
Biodiversity	The development will impact primarily on low value habitats. There will be a net loss of a common terrestrial habitats and high value habitats have been avoided at the design stage. No adverse impact on designated sites or their conservation objectives will occur. Except for localised impacts and short-term impacts during construction, no significant impacts on fauna are envisaged. The implementation of standard protection measures will prevent significant impacts on otters, bats and badgers from arising. The loss of some common terrestrial habitat will result in the loss of some feeding habitats for some common mammals and bird species. These species will be displaced into the surrounding area or to alternative roosting sites, with no significant effects predicted. The implementation of industry standard controls for invasive species will prevent any impact from the spread of invasive species. During operation, levels of noise and activity will not be significant in the context of the surrounding landscape. No significant impact on water quality is predicted to occur as horizontal directional drilling will be used for sensitive aquatic habitats.	Best practice construction practice; e.g. CIRIA and Guidelines for Pollution Prevention, integrated into the Construction Environmental Management Plan. Pre-construction ecological surveys to confirm no change in protected species distribution prior to works. Appropriate methods and timing restrictions on clearance works to comply with protected species requirements; e.g. two-stage clearance, vegetation clearance in accordance with any protected species licence requirements.	Not significant
Archaeology, Architectural and Cultural Heritage	The proposed development site is located within an area that was easily accessible to prehistoric settlers. This type of landscape was attractive to nomadic hunter/gatherer groups or Mesolithic people as it offered food resources both from the land and sea. Scatters of flint tools of these population groups have been recovered in the Waterford Harbour area. The possibility is that remains of these early settlers remain undetected within the development area. Similarly, the first farmers or Neolithic populations	All ground disturbance within the five complexes of archaeological monuments, all greenfield areas and any ground disturbance associated with the excavation of launch and receptor pits will be monitored by a suitably qualified archaeologist. Topsoil strip will be re-inspected after some days to locate any Stone Age (Mesolithic and Neolithic) lithic material that may not be apparent in freshly-turned soil. The	Not significant

Receptor	Summary of environmental effect	Anticipated Project Specific Mitigation (subject to change once assessment complete)	Anticipated EIAR Conclusion
	found this type of landscape attractive because of the easily cultivated soil and the proximity of riverine and coastal areas to a settlement site. Settlement sites of this period have been discovered on infrastructure projects to the north of the development area. The landscape has several monuments from the Early and High Medieval periods and include the highly visible medieval landscapes at Dunbrody, Kilmokea, Great Island and Templetown. The initial landing area of the Anglo-Norman invading armies is at Baginbun. These sites are indicative of past use and it must be assumed that there is a possibility of uncovering further sites when ground levels are disturbed during construction works. No significant residual effects on archaeological, architectural and cultural heritage are predicted.	archaeologist will secure an excavation licence for monitoring in the event of an archaeological discovery, prior to any works being carried out. The licence is issued by The Heritage Service, Department of Culture, Heritage and The Gaeltacht and approved by the National Museum of Ireland.	
Landscape and Visual	Embedded mitigation throughout design development led to a cable corridor that has minimal effect on existing hedgerows and trees. Operational landscape and visual effects are attributed to the converter station as the only above ground installation. Embedded mitigation (design measures) led to a location close to existing industrial infrastructure such that additional development would be placed within a suitable location. Photomontages of key viewpoints have been assessed using a worst-case approach and determined no likely significant effect following incorporation of project-specific mitigation.	Additional landscape planting and berming will be provided to surround and screen the converter station from key viewpoints; the building will also be designed to blend with the surrounding landscape with appropriate cladding and colour scheme. Any hedgerow removal during cable installation will be replanted following installation.	Not significant
Soils, Geology and Hydrogeology	No effects on soils, geology and hydrogeology are predicted during operation as proposed maintenance activities are not predicted to create a pathway for effect. During construction, HDD activities and cable installation design	Operational and construction pollution prevention measures will be managed through the CEMP to minimise pollution risk to groundwater.	Moderate local impacts at the converter station

Receptor	Summary of environmental effect	Anticipated Project Specific Mitigation (subject to change once assessment complete)	Anticipated EIAR Conclusion
	represent embedded mitigation (design measures) reducing the magnitude of impact to negligible by minimising excavation widths and depths. Cable installation will primarily be within roadways and natural ground; no known sources of contamination are present. Groundwater will typically be below construction depth for cable installation, whereas converter station earthworks may temporarily intercept groundwater; potential pollution effects will be managed by pollution prevention measures documented in the CEMP.	Materials management and dust mitigation measures will also be secured through the CEMP, which forms an appendix to the EIAR for the proposed development.	site, otherwise imperceptible
Water and Hydrology	Ground and surface water effects have been assessed as not significant. No significant rivers will be affected, and potential impacts on small waterbodies and drains will be managed by best practice construction measures secured through the CEMP.	The CEMP establishes mitigation measures to manage construction activities near water.	Not significant
Resources and Waste Management	The likely significance of environmental effects from the use of resources and the generation and management of waste during construction and operation have been assessed in accordance with relevant guidance. No effects are predicted during operation due to the nature of the equipment proposed; however, slight to moderate adverse effects are predicted by the assessment to be managed via controls within the CEMP to conclude an overall not significant conclusion.	The CEMP includes measures that will be implemented to minimise potential resource and waste management effects: primary material sources on-site, imported material sources off-site and waste and materials management infrastructure off-site. The construction contractor will be required to adhere to the waste hierarchy.	Not significant
Population and Human Health	Minor beneficial effects will arise from the creation of construction jobs, training opportunities and increase in demand for service accommodation, with moderate beneficial effects for induced spend by the local workforce. An overall conclusion of no likely significant effect is anticipated.	The CEMP will secure measures to minimise potential effects on the population, including noise parameter limits, dust management, traffic management, etc. Landfall HDD works will be timed to avoid core tourism periods.	Not significant

Receptor	Summary of environmental effect	Anticipated Project Specific Mitigation (subject to change once assessment complete)	Anticipated EIAR Conclusion
		Construction-phase to focus on local resourcing for materials and skills.	
Material Assets	Following implementation of the mitigation measures, it is anticipated that the proposed development will have no significant residual effects on land-use and property, electricity, telecommunications, gas, water supply or the sewer network and drainage infrastructure. The delivery of the proposed development will result in long-term positive effects on the electricity network of Ireland.	Operational restrictions will be placed on third parties. These will be as follows: • No building directly over the cable reserve. • No storing materials or changing ground levels (i.e. soil, sand, straw, hay etc) directly over the cable route. • No crossing the HVDC cables with other utilities without written agreement from Greenlink. • No direct digging over the HVDC cables or joint-bays without written agreement from Greenlink. Any excavation over cables must be by hand and supervised by Greenlink staff. • No planting trees on the cable reserve. Note, normal farming processes can proceed as usual. There will be occasional access to the link-box or pillars (every 2 years) to test the cable.	No significant negative effects, with positive effects predicted with regard to the electricity network in Ireland.
Major Accidents and Disasters	The potential risk of fire and/or explosion has been identified, with the potential consequent adverse effects of fire water reaching nearby receptors. This risk has been minimised through best practice in design and technology, to ensure that there will be no significant effects.	The contractor will be required to ensure that the fire safety systems are implemented in the construction and commissioning of the proposed development, and that the completed development also reflects the requirements of Wexford County Council and Greenlink.	Not significant

Receptor	Summary of environmental effect	Anticipated Project Specific Mitigation (subject to change once assessment complete)	Anticipated EIAR Conclusion
		Fire extinguishers and an industrial purpose fire hose reel will be available for use at the converter station site. In accordance with standard industrial practice, the proposed development will be subject to a fire safety risk assessment through the design and construction phases, ensuring the identification of any major risks of fire, and mitigation of the same during the operational phase. Further, a maintenance programme will be implemented for the proposed development. The purpose of the maintenance programme is to ensure that all critical equipment throughout the proposed development is operating correctly, therefore reducing the residual risk of major accidents and/or disasters on site to a negligible level.	
Cumulative Effects	Interrelationships between environmental topics have been assessed, in addition to the cumulative effects of the wider Greenlink project components, and the potential for the proposed development to have cumulative effects with other projects. The cumulative assessment concludes no likely significant effect.	No project-specific mitigation is included solely to address any cumulative effects.	Not significant

5. Campile Estuary, Marine Ireland & Offshore Ireland (Foreshore Licence)

5.1 Components

Campile Estuary, Marine Ireland & Offshore Ireland comprises:

- A HDD crossing beneath the Campile Estuary to avoid impacts on the Campile River;
- A landfall site at Baginbun Beach, County Wexford where cables will be installed using HDD to avoid impacts on the beach, fringing reef habitat and associated protected site; and
- Two HVDC cables and a fibre optic cable installed bundled and buried together in one trench beneath the seabed for approximately 86km in Irish waters.

The red line boundary (the area to be included in the Foreshore licence application) is shown in Figure 5-1 (Campile Estuary) and Figure 5-2 (Marine Ireland).

5.2 Route overview

Following identification of Great Island substation as the connection point, GIL commissioned studies to determine a suitable landfall site. A decision was taken early on to discount a route up the River Barrow estuary directly to Great Island because:

- The River Barrow Estuary adjacent to the Great Island substation forms part of the River Barrow and River Nore Special Area of Conservation (SAC), an important fish breeding (spawning) area.
- Although there is a navigation channel through the estuary to the Port of Waterford in which water depths reach 10m, water depths across most of the estuary are typically 5m or less. Constraints in this area include:
    - Navigation channels, dredged channels and designated anchor zones which are avoided where possible when routeing a cable due to the risk posed to the cable from dredging and accidental anchoring.
    - Long stretches of shallow water depths are technically difficult from a cable installation perspective, requiring very slow-moving anchored barges. This can lead to increased levels of disruption (e.g. to fishing and commercial shipping), habitat disturbance and higher costs.

Ten potentially suitable landfall locations were identified within County Wexford, which were visited and assessed using a range of environmental, technical and economic criteria, such as vessel access, beach composition, environmental constraints, beach access, existing infrastructure and more. These ten sites were Rathmoylan Cove, Boyce's Bay, Sandeel Bay, Carnivan Bay, Baginbun Beach, Dollar Bay, Booley Bay, Newtown Beach, Bannow Beach and Cullenstown Beach.

Of the ten potential sites, six were discounted as less preferential on environmental and technical grounds. Four 'preferred' landfall options were recommended for further investigation; Baginbun Beach, Booley Bay, Boyce's Bay and Sandeel Bay.

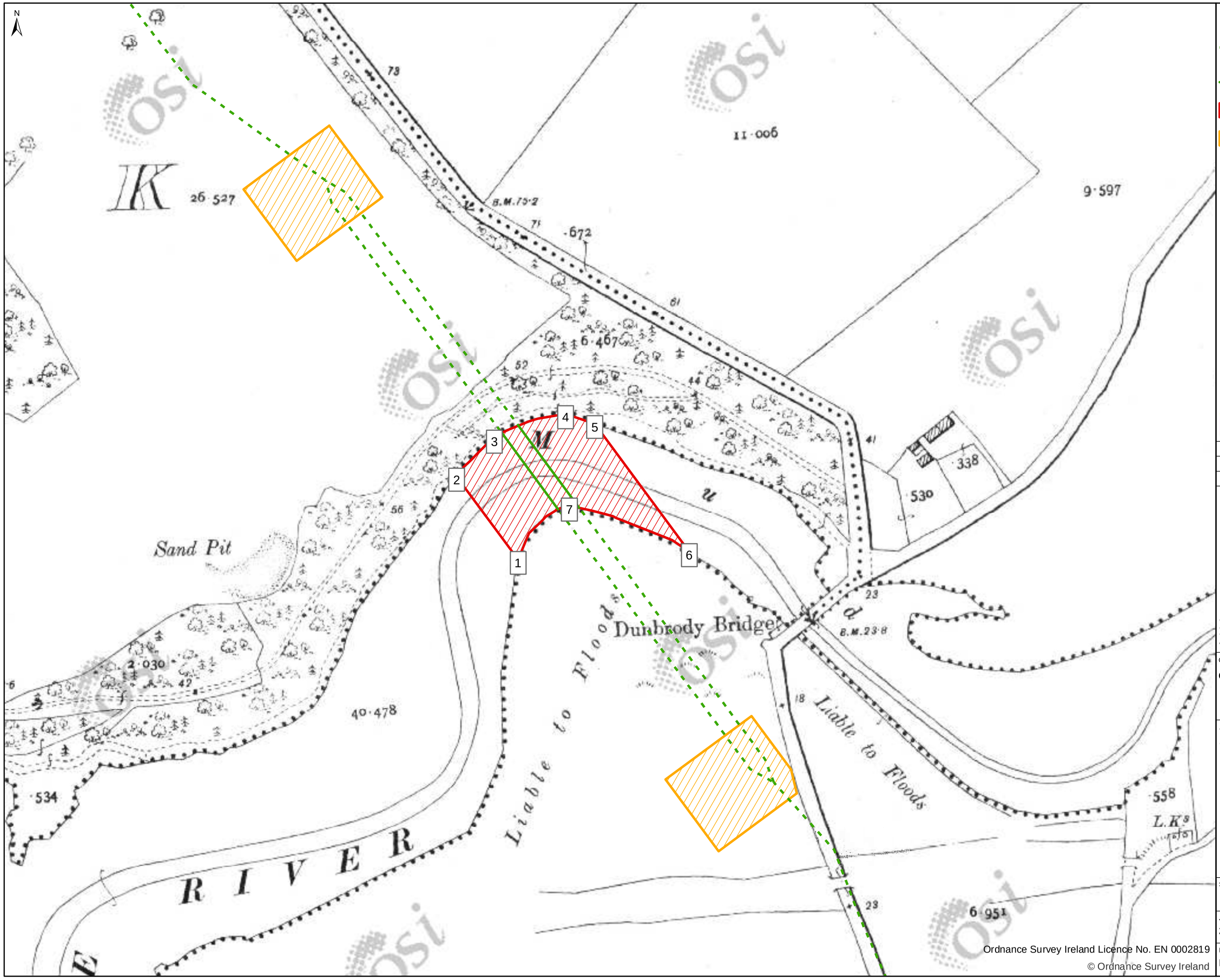
Booley Bay was discounted due to the level of dredging at Duncannon, putting both the cable and the dredging at risk. Sandeel Bay was discounted due to costs and environmental considerations associated with rocky reef within the Hook Head SAC.

Baginbun Beach was selected as the preferred Irish landfall location as it yielded the shortest overall cable route length and met the requirements the other landfall options fall short on. However, selection as the preferred option was dependent on the results of the cable route survey. The survey needed to demonstrate that the submarine cable route could be installed without significantly affecting the integrity of the Hook Head SAC. Boyce's Bay was selected as an alternative option if the cable route survey indicated Baginbun Beach was not a feasible option.

Initial desk-top studies undertaken in 2015 identified offshore routes between Freshwater West (Wales) and short-listed Irish landfalls. These routes were refined and developed following consultation with the National Parks & Wildlife Service.

Ahead of the cable route survey, the route options were re-examined in light of new data and consultation undertaken with the Port of Waterford Company. A route to Baginbun Beach was selected for survey with a short nearshore approach option developed to avoid an area of outcropping rock identified on bathymetric survey data obtained from INFOMAR. Survey later confirmed that this short option, although extending the length of the cable marginally, avoids sensitive reef habitat and will allow the cables to be buried without the use of external cable protection. Following the cable route survey, Baginbun Beach was selected as the preferred landfall.

A3



Legend

- Proposed Cable Route outside Foreshore
- Proposed Cable Route within Foreshore
- Foreshore Licence
- Temporary Works Area (HDD Compound Area)

Notes

Area of Foreshore Required = 5006m^2

All coordinates to ITM.

Point	Easting	Northing
1	671016.291	615473.591
2	670981.650	615519.779
3	671003.094	615541.223
4	671190.900	615480.457
5	671060.005	615550.709
6	671112.379	615477.302
7	671045.159	615503.283

Greenlink INTERCONNECTOR

Co-financed by the European Union Connecting Europe Facility

Issue	Date	By	Chkd	Appd
P1	2019-09-16	EG	MM	MD
P0	2019-01-25	GM	MM	MD

Kilometers

0 0.0125 0.025 0.05

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Client
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Job Title
Greenlink Interconnector

Foreshore Licence Map

Scale at A3
1:2,000

Job No
246369-00

Drawing Status
Preliminary

Drawing No
FL001

Issue
P1

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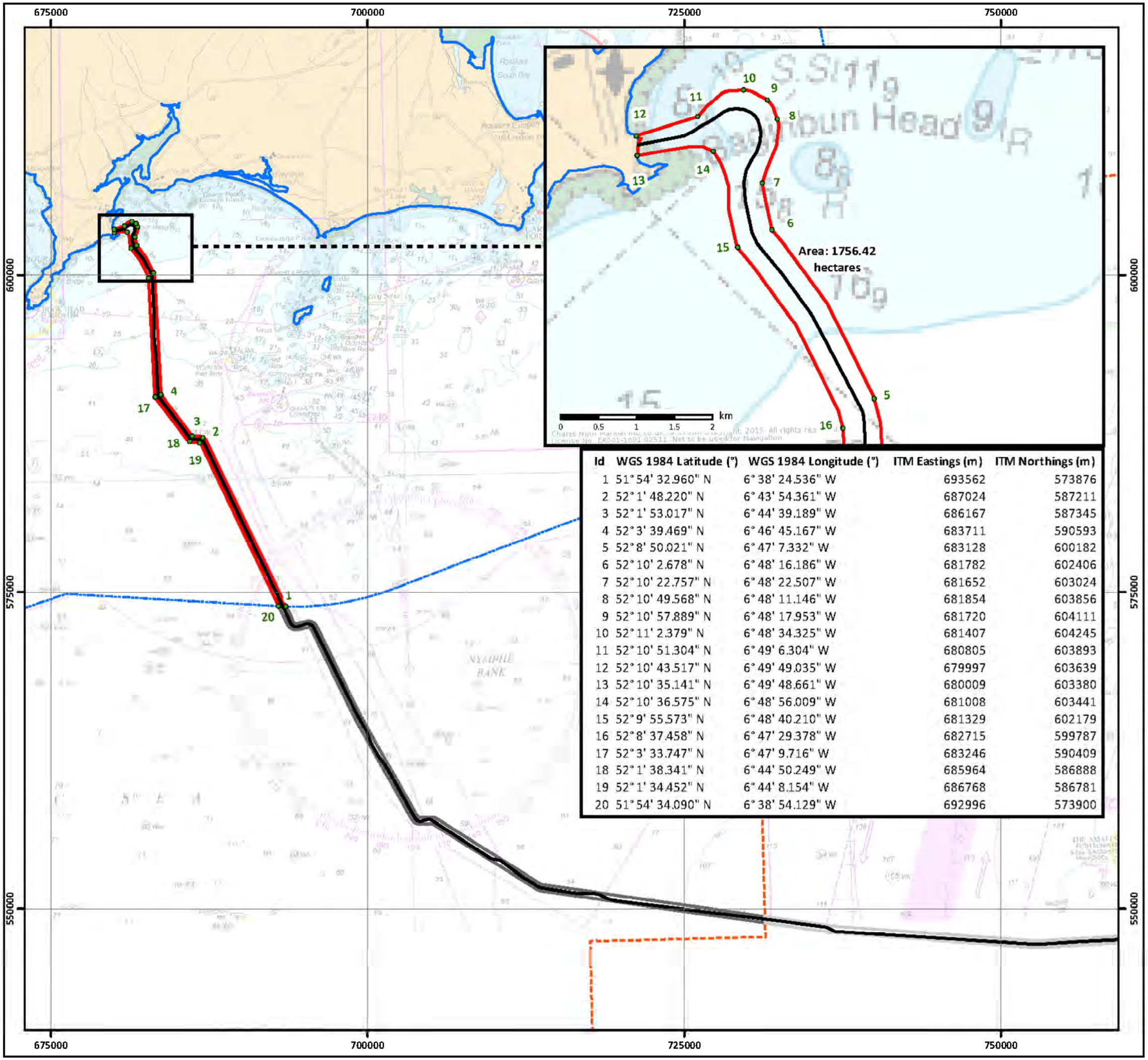
MXD Location: J:\246000\246369-00\4. Internal\4-03 Design\4-03-03 Infrastructure\00 GIS Ireland\3_Workspaces\LG_Legal\FL001 - FL002 Foreshore Licence Maps.mxd

GREENLINK INTERCONNECTOR

Foreshore Licence Map

Drawing No: P1975-CORR-003 | **A**



Id	WGS 1984 Latitude (°)	WGS 1984 Longitude (°)	ITM Eastings (m)	ITM Northings (m)
1	51° 54' 32.960" N	6° 38' 24.536" W	693562	573876
2	52° 1' 48.220" N	6° 43' 54.361" W	687024	587211
3	52° 1' 53.017" N	6° 44' 39.189" W	686167	587345
4	52° 3' 39.469" N	6° 46' 45.167" W	683711	590593
5	52° 8' 50.021" N	6° 47' 7.332" W	683128	600182
6	52° 10' 2.678" N	6° 48' 16.186" W	681782	602406
7	52° 10' 22.757" N	6° 48' 22.507" W	681652	603024
8	52° 10' 49.568" N	6° 48' 11.146" W	681854	603856
9	52° 10' 57.889" N	6° 48' 17.953" W	681720	604111
10	52° 11' 2.379" N	6° 48' 34.325" W	681407	604245
11	52° 10' 51.304" N	6° 49' 6.304" W	680805	603893
12	52° 10' 43.517" N	6° 49' 49.035" W	679997	603639
13	52° 10' 35.141" N	6° 49' 48.661" W	680009	603380
14	52° 10' 36.575" N	6° 48' 56.009" W	681008	603441
15	52° 9' 55.573" N	6° 48' 40.210" W	681329	602179
16	52° 8' 37.458" N	6° 47' 29.378" W	682715	599787
17	52° 3' 33.747" N	6° 47' 9.716" W	683246	590409
18	52° 1' 38.341" N	6° 44' 50.249" W	685964	586888
19	52° 1' 34.452" N	6° 44' 8.154" W	686768	586781
20	51° 54' 34.090" N	6° 38' 54.129" W	692996	573900

Legend

- Application Area Points
- Greenlink Route Centreline (Indicative)
- Proposed Development
- Irish Offshore
- Wales Marine
- ROI Mean High Water
- ROI 12nm Territorial Sea Limit
- Median Line

N W E S

Application Area = 1756.42 hecatres

Note: Coordinates provided in WGS 1984 Decimal Degrees (EPSG 42347) and in IRENET95 (Irish Transverse Mercator EPSG 215

Map prepared by:
Chris Goode, MSc Water & Environmental Engineering, MEng Civil Engineering

Intertek Energy and Water
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Liphook
Hampshire
GU30 7DW

Scale @A3: 1:300,000

NOTE: Not to be used for Navigation

Date	Monday, June 17, 2019 13:12:22
Projection	WGS_1984_UTM_Zone_30N
Spheroid	WGS_1984
Datum	D_WGS_1984
Data Source	DCCAE; OSI; CDA; GEBCO; UKHO; MarineFind
File Reference	J:\P1975\Mxd\03_CORR\ P1975-CORR-003.mxd
Created By	Chris Goode
Reviewed By	Emma Langley
Approved By	Anna Farley

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0 3 6 9 12 km

5.3 Cable installation

5.3.1 Application area

The submarine cable route is approximately 86km long in Irish waters. Of this ~36km is within the Foreshore area (territorial waters out to 12nm limit), and ~50km is within the Irish exclusive economic zone (EEZ). The application area is generally 500m wide. The final cable configuration will only need a small part of this width for installation (of the order of 10-20m). It is proposed to finalise the precise position of the submarine cables within the corridor after permits are granted but before installation has commenced. This will allow for optimisation of the final laid submarine cables to minimise engineering and environmental challenges.

5.3.2 Pre-installation works

Although detailed engineering surveys have been completed for the submarine route (autumn 2018 – spring 2019), further surveys to confirm that no new obstructions have appeared on the seabed will be completed prior to the commencement of cable installation. This typically takes place 3-6 months ahead of installation and will involve a range of standard geophysical survey techniques such as multi-beam echosounder, side scan sonar, sub-bottom profiler and magnetometer.

Prior to the start of marine cable installation, it is essential to ensure the proposed centreline is clear of obstructions that may hinder the installation works. A pre-lay grapnel (a wire with a string of specially designed hooks) will be towed along the entire route to remove any debris.

Greenlink crosses one out-of-service telecoms cable within territorial waters, and a further four in-service telecoms cables within the EEZ. GIL is in discussion with the cable owners to cut the out-of-service cable. The in-service cables will be crossed on a 'bridge' comprised of aggregate (rock) and concrete mattresses.

If unexploded ordnance (UXO) is encountered during cable installation it will be avoided by micro-routeing around the object within the permitted corridor. If this is not possible and it is safe to do so, the UXO will be removed. As a last resort demolition measures will be undertaken in accordance with Best Practice.

5.3.3 Cable installation

The cable lay operation will be performed on a 24-hour basis. It will be undertaken by a cable lay vessel (CLV); a specialist ship designed to carry and handle long lengths of heavy power cables. Other vessels, such as a jack-up barge or a cable lay barge and small work boats may be used to support the CLV particularly in the nearshore area where water depths are shallow.

Two cable installation techniques are being considered:

- Simultaneous lay and burial – the CLV tows the burial equipment or it is deployed by another vessel navigating close behind, creating effectively a single large

spread. The cables are fed into the burial equipment directly from above and the cables are buried as the spread progresses along the route.

- Post-lay burial – in this operation the CLV lays the cables on the seabed first. A post-lay burial vessel follows to bury the cables. The post-lay burial vessel may be some physical distance, or some days, behind the lay vessel, so there are two discrete operations separated physically and in time.

Guard vessels may be deployed in areas where the cables are exposed on the seabed prior to burial or external protection being applied.

Due to the length of the route, it may be necessary to install the cables in two sections. A cable joint will be made on board the cable lay vessel, at which point the vessel is likely to remain in position for up to a week.

Preliminary assessment suggests that burial within sediment is achievable for the entire cable route within Irish waters, except for at crossings with telecoms cables and a small contingency at the HDD exit point (see Section 5.3.4).

5.3.4 Installation at Baginbun Beach

The shore crossing will be accomplished by horizontal directional drilling (HDD) which will exit seaward of the low water mark. The cable ducts will pass approximately 10m below the beach. There will be no works on the beach at Baginbun Beach between MHWS and mean low water.

The HDD will be engineered to exit into an area of deep sediment where post-lay burial of the cables and the ducts can be achieved. Review of the geophysical data suggests that burial in sediment is achievable past the 9m water depth contour. There is a risk that due to the underlying geology, the HDD could exit at an angle which would mean that a small area of external cable protection could be required at the end of each active duct to protect the cable as it transitions from the duct to the seabed. If required, external cable protection would be used at two locations and would cover an area of seabed approximately 20m by 5.2m.

5.4 Summary of environmental effects and project specific mitigation

Table 5-1 summarises the findings of the EIA process and the EIAR conclusions.

Table 5-1 Campile Estuary, Marine Ireland & Offshore Ireland – EIA summary

Receptor	Summary of environmental effect	Project Specific Mitigation	EIAR Conclusion
Baginbun Beach	Baginbun Beach is a concentric beach orientated north to south. A thin veneer of sand (coarse sediment) approximately 1m deep lies on consolidated material and bedrock. The cove is sheltered by Baginbun headland, to the south, and a 300m fringing rock reef. Low cliffs form the back of the beach. The EIA process concluded that there is the potential for significant effects if trenching is undertaken across the fringing bedrock reef. Project specific mitigation has been proposed that will remove the pathway for effects resulting in No Effects to the beach.	Exclusion zones have been established around the fringing bedrock reef. No intrusive works will be carried out on Baginbun Beach or within the exclusion zones.	Not significant
Protected sites	The Natura Impact Statement (NIS) assessed all Natura 2000 sites within 10km of the proposed cable route and selected sites greater than 10km because they are important for mobile species e.g. marine mammals. Greenlink crosses two Natura 2000 sites: • Hook Head SAC. This site is designated for the protection of certain habitats. Of particular relevance to the project are the habitats 'reef' and 'large shallow inlets and bays'. • River Barrow and River Nore SAC. This site is designated for the protection of a wide range of habitats and species including estuaries; reefs; salt marsh habitat; twaite shad; sea, river and brook lamprey; salmon and otter. The NIS concluded that following the implementation of the project specific mitigation prescribed in the NIS, Greenlink will not have an adverse effect on the integrity of any Natura 2000 site either alone or in combination with other plans or projects.	The NIS prescribed mitigation measures with respect to avoiding reef habitat, minimising the use of external cable protection in the habitat shallow inlets and bays, and minimising the effects on grey seal and harbour seal from UXO detonation (if required). These measures are described against the respective receptor below.	Not significant
Estuarine, intertidal	The Campile Estuary at Dunbrody Bridge is tidal, with the shoreline habitat classified as upper salt marsh habitat. Baginbun Beach contains a complex mosaic of rock platforms and sand filled gullies supporting a variety of biotopes dominated by brown algae, kelp,	The subsea cable route has been optimised to avoid the majority of the Bedrock Reef habitat, by following a sediment channel. Exclusion zones have been	Not significant

Receptor	Summary of environmental effect	Project Specific Mitigation	EIAR Conclusion
and benthic ecology	aggregations of honeycomb worms and barnacles. 12 subtidal habitats were identified offshore including two habitats of conservation importance; shallow inlets and bays and reef. The EIA concluded that there will be No effect on estuarine habitats. There is the potential for a significant effect if trenching is undertaken on Bedrock Reef habitat and project specific mitigation has been proposed to avoid this. All other effects were assessed as not significant, including the deposit of external cable protection at the HDD exit points.	established around Bedrock reef features. No intrusive works will be undertaken within these exclusion zones, or on Baginbun Beach. Measures have been proposed to either remove the need for external cable protection or reduce the footprint at the HDD exits. If external cable protection is used, monitoring has been recommended.	
Fish and Shellfish	The route crosses the Dunmore East herring spawning grounds and is close to spawning and nursery grounds for other commercially important fish species. Sandeel and herring are known to be particularly sensitive to seabed disturbance and a specific habitat assessment has been conducted to support the EIA process for these species. There is potential for activities that disturb the seabed e.g. cable installation, to have a significant effect on herring, allis and twaite shad, due to the potential effects of habitat loss. Implementation of the project specific mitigation measures however will reduce the significance of this effect to not significant, as no herring eggs or larvae will be present on the seabed during the installation period, removing the potential pressure-receptor pathway. All other effects on fish were assessed to be not significant.	Seasonal restrictions will be implemented to ensure that intrusive works during the peak herring spawning period (October to January) is avoided.	Not significant
Birds	During winter bird counts, eighteen species were counted at Campile Estuary and eleven species at Baginbun Beach. This included four species listed on Annex I of the EC Birds Directive at Campile Estuary (Little Egret, Kingfisher, Red-throated Diver and Dunlin) and three species at Baginbun Beach (Great Northern Diver, Merlin (overflying) and Red-throated Diver). There are four Special Protection Areas (SPAs) within 10km of Greenlink supporting a range of seabirds, wetland and waterbirds (including waders and wildfowl).	Mandatory separation distance between construction works and the high-water mark at Campile Estuary is to be observed as follows: 75m at the northern side, and 50m at the southern side. No works will be carried out at the Campile Estuary during the period: 1 October to 31 March (inclusive).	Not significant

Receptor	Summary of environmental effect	Project Specific Mitigation	EIAR Conclusion
	The EIA concluded that the effects of visual disturbance of all birds potentially affected by Greenlink was not significant.	No works will be carried out within 100m of the high tide line (landward side) at Baginbun Beach to prevent flight response.	
Marine mammals and marine reptiles	Harbour porpoise and short-beaked common dolphin are the most abundant and commonly sighted species in the waters around Greenlink, with seven other species also observed. Grey seal and harbour seal from nearby SACs use the area for foraging and otter are known to use the Campile Estuary and Baginbun Beach. Underwater noise generated from continuous sources such as geophysical survey and cable installation/repair will not have a significant effect on marine mammals. Should UXO detonation be required along the route, brief but extensive disturbance to marine mammals could occur, as well as potential injury. Implementation of Industry Best Practice for UXO detonation will ensure that UXO detonation will not have a significant effect on marine mammals.	If UXO detonation is required as best practice GIL will require Contractors to follow the Department of Arts Heritage and the Gaeltacht (DAHG) 'Guidance to Manage the Risk to Marine Mammals from Man-made sound sources in Irish Waters'. In addition, passive acoustic monitoring (PAM) will be used during periods of darkness and poor visibility (e.g. fog and increased sea states) to support the marine mammal observer watches. Acoustic deterrent devices will also be used and smaller charges will be deployed in a soft start procedure to encourage animals to flee the area.	Not significant
Shipping and navigation	A Navigation Risk Assessment has been undertaken to support the EIA process. The area with the highest shipping traffic intensity is associated with the entrance to the Waterford Estuary and Harbour; the submarine cable route runs parallel approximately 10km distance from this area. The Tuskar Rock traffic separation scheme (TSS) lies to the north of the Irish Offshore components of Greenlink. Greenlink crosses perpendicular to the traffic lanes associated with this TSS. The assessment concluded that there will be no significant effects on shipping and navigation. Water depths at the HDD exit points are sufficient that only a slight electromagnetic change will be experienced at the sea surface once the cables are operational. This will have an imperceptible effect on magnetic compasses.	No project specific mitigation is proposed.	Not significant

Receptor	Summary of environmental effect	Project Specific Mitigation	EIAR Conclusion
Commercial fisheries	The most important demersal target species include; cod, haddock, ling, monkfish, plaice, ray, skate and sole. Key shellfish species include; lobster, Nephrops, crabs, scallops, razor clams and whelks. Scallop dredging is a key fishing activity in the waters surrounding the Wexford coastline. Shrimp is another key target species for many vessels, including those landing into Dunmore East and Kilmore Quay. The herring fishery located in the bay between Hook Head and the Saltee Islands is particularly important during late summer/autumn. The EIA concluded effects are not significant due to the embedded mitigation incorporated into the project design e.g. fisheries liaison, notices to mariners, use of guard vessels. The exception is if external cable protection is used within the Dunmore East herring spawning grounds during a cable repair event. In the unlikely event that burial in sediment is not achievable there is the potential for a significant effect.	Seasonal restrictions will be implemented within the Dunmore East spawning ground to ensure that the deposition of external cable protection, if required during cable repair, will not disturb herring eggs or larvae. Operational phase asset management surveys will be reviewed, and any areas of cable exposure/reduced depth of burial communicated to the fishing industry via Notice to Mariners.	Not significant
Other marine users	Baginbun Beach is a popular public beach. It was highlighted during public consultations that commemorations will be held at Baginbun Beach in May 2020 to mark the 350th anniversary of the Anglo-Norman landings. The submarine cable route lies within an area of the Celtic Sea where there is limited offshore infrastructure. However, SSE Renewables (Ireland) Ltd has applied for a Foreshore Licence to conduct marine survey to support the development of an offshore windfarm (Celtic Sea Array) in the region. Part of the survey area will overlap with Greenlink. While access to Baginbun Beach will not be restricted during installation works, the EIA concluded that the presence of project vessels in the nearshore during, for example, the peak tourist season or the Anglo-Norman commemoration event could have a	No intrusive works will be undertaken on Baginbun Beach. All works in the nearshore will be avoided during July and August. GIL will liaise with the local council and councillors with regards to the Anglo-Norman commemoration event to confirm location and viewing points. Efforts will be made to reduce presence of vessels within the nearshore area during the selected weekend. If necessary, GIL will cooperate in reaching mutually agreeable terms for proximity agreements with SSE Renewables (Ireland) Ltd.	Not significant

Receptor	Summary of environmental effect	Project Specific Mitigation	EIAR Conclusion
	significant effect on recreational boat users. However, implementation of project specific mitigation will reduce the significance of the effect to not significant. The potential for Greenlink to restrict offshore wind development options was assessed as not significant.		
Marine archaeology	Analysis of the marine geophysical datasets identified 64 anomalies with archaeological potential. Of the 64 anomalies identified, none were identified as wreck sites or as having high archaeological potential. A review of the sub-bottom seismic survey data has identified 11 areas where features of archaeological potential are present. All anomalies have been mapped and will be avoided. Considering the embedded mitigation, including implementing a protocol for reporting unexpected archaeological finds and a scheme-specific Underwater Archaeology Impact Assessment, the EIA concluded that there will be no significant effects.	Archaeological exclusion zones will be implemented around the geophysical anomalies identified.	Not significant
Cumulative effects	14 projects and plans were identified within 10km of Greenlink. Following consideration of the spatial and temporal overlaps, it was identified that there was a common pressure-receptor pathway between Greenlink and 3 projects and plans: • Kilmore Quay Disposal Site, • Seaweed Harvesting • Celtic Sea Array – geophysical, geotechnical and benthic survey to inform design of potential future offshore windfarm. The cumulative effects assessment concluded that there was the potential for cumulative effects between Greenlink and the Celtic Sea Array survey however the cumulative effects are not significant.	No project specific mitigation is proposed.	Not significant

6. Marine Wales (Marine Licence)

6.1 Components

Marine Wales comprises:

- A landfall site at Freshwater West, Pembrokeshire where cables will be installed beneath the beach using HDD to avoid impacts on the beach, dunes and associated protected sites; and
- Two HVDC cables and a fibre optic cable installed bundled and buried together in one trench beneath the seabed for approximately 74km in Welsh waters.

The red line boundary (the area to be included in the Marine licence application) is shown in Figure 6-1 (Drawing P1975-CORR-001).

6.2 Route overview

Eight substations were initially considered as potential connection points in Wales. After completing a Connections and Infrastructure Options Note and Cost Benefit Analysis, National Grid Electricity System Operator determined the most economical connection point to be Pembroke 400kV substation.

Following identification of Pembroke substation as the connection point, an options appraisal study of the Pembrokeshire coastline was undertaken to determine a suitable landfall location. Eleven potential suitable landfall locations were identified, visited and assessed using the same range of environmental, technical and economic criteria used for Marine Ireland. All potential sites were located within the Pembrokeshire Marine / Sir Benfro Forol SAC and therefore would be subject to the same HRA process.

Of the eleven potential locations, nine were discounted as less preferential on environmental and technical grounds. Two 'preferred' landfall options were recommended for further investigation; Broad Haven and Freshwater West.

The Broad Haven landfall, north of Milford Haven, has minimal offshore routeing constraints but the main disadvantage was that the onshore route would require a technically challenging crossing of the Milford Haven estuary. The main benefit was that it avoided an offshore route through the Castlemartin Firing Range.

The Freshwater West landfall provided the shortest onshore route to the converter substation and tie in point. It was recognised that the sand dunes behind the beach are environmentally sensitive but that a trenchless technique (HDD) could be used to avoid disturbance of the feature. Offshore the route was highly constrained due to the proximity of the Castlemartin Firing Range and Milford Haven harbour mouth. However, consultation with the Ministry of Defence and Port of Milford Haven Authority from 2013 through to 2018 determined that the co-location of a submarine cable, the military firing range and port activities was possible. Therefore, Freshwater West was chosen as the preferred landfall.

As discussed in Section 5.1, offshore routes were developed between Freshwater West and Ireland. In Wales, NRW, Milford Haven Port Authority and Castlemartin Firing Range were consulted on route options and three alternatives were developed (Route A, Route B and Route E, see Figure 2-3, Drawing P1975-LOC-003). These sought to reduce the distance the cable route crossed a SPA; and areas defined by the Joint Nature Conservation Committee (JNCC) as having the potential to be reef habitat within the Pembrokeshire Marine / Sir Benfro Forol SAC. They also made use of bathymetric data obtained from SEACAMs.

A survey strategy was agreed with NRW and a reconnaissance survey was conducted on Route A and Route E in autumn 2018. Extensive route development was carried out during the cable route survey, which resulted in a final route being designed between Route E and Route A that avoided sensitive reef habitat on both routes.

Minor route refinements were also made during the survey. This included acquiring additional survey lines to determine the extent of sandwaves to investigate the feasibility of routeing around them; and the extent of a sand channel through extensive rock outcrop allowing the route to follow the channel avoiding sensitive habitat.

6.3 Cable installation

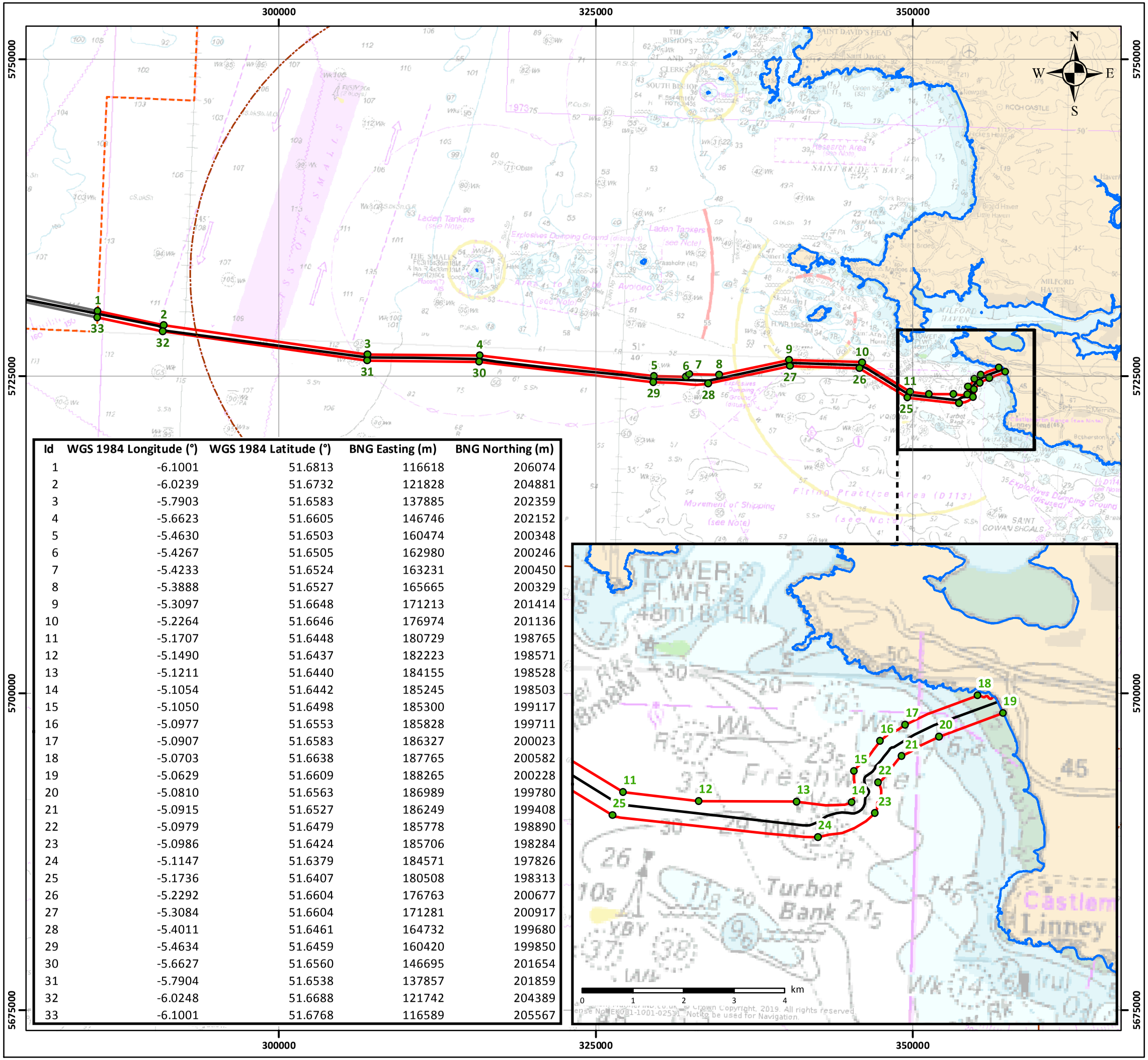
6.3.1 Application area

The submarine cable route is approximately 74km long in Welsh waters. Of this ~66km is within territorial waters, and ~8km is within the Welsh offshore area. The application area is generally 500m wide. The final cable configuration will only need a small part of this width for installation (of the order of 10-20m). It is proposed to finalise the precise position of the submarine cables within the corridor after permits are granted but before installation has commenced. This will allow for optimisation of the final laid submarine cables to minimise engineering and environmental challenges.

GREENLINK INTERCONNECTOR

PROPOSED DEVELOPMENT
UK Waters

Drawing No: P1975-CORR-001 | **A**



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3	-5.7903	51.6583	137885	202359
4	-5.6623	51.6605	146746	202152
5	-5.4630	51.6503	160474	200348
6	-5.4267	51.6505	162980	200246
7	-5.4233	51.6524	163231	200450
8	-5.3888	51.6527	165665	200329
9	-5.3097	51.6648	171213	201414
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11	-5.1707	51.6448	180729	198765
12	-5.1490	51.6437	182223	198571
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14	-5.1054	51.6442	185245	198503
15	-5.1050	51.6498	185300	199117
16	-5.0977	51.6553	185828	199711
17	-5.0907	51.6583	186327	200023
18	-5.0703	51.6638	187765	200582
19	-5.0629	51.6609	188265	200228
20	-5.0810	51.6563	186989	199780
21	-5.0915	51.6527	186249	199408
22	-5.0979	51.6479	185778	198890
23	-5.0986	51.6424	185706	198284
24	-5.1147	51.6379	184571	197826
25	-5.1736	51.6407	180508	198313
26	-5.2292	51.6604	176763	200677
27	-5.3084	51.6604	171281	200917
28	-5.4011	51.6461	164732	199680
29	-5.4634	51.6459	160420	199850
30	-5.6627	51.6560	146695	201654
31	-5.7904	51.6538	137857	201859
32	-6.0248	51.6688	121742	204389
33	-6.1001	51.6768	116589	205567

Legend

- Proposed Development Points
- Greenlink Route Centreline (Indicative)
- Proposed Development
- Irish Offshore
- UK Mean High Water
- 12nm Limit
- Median Line

NOTE: Not to be used for Navigation

Date	Wednesday, June 5, 2019 12:44:02
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Created By	Chris Goode
Reviewed By	Emma Langley
Approved By	Anna Farley

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6.3.2 Pre-installation works

Like the Irish Marine component, ahead of installation, geophysical surveys and a pre-lay grapnel run will be required in Wales. Additional seabed preparation will also be required due to ground conditions. This will likely consist of:

- Boulder clearance – a plough may be towed across the seabed pushing boulders to either side, clearing a swathe between 5-10m wide for installation equipment. It has been identified that approximately 9.3km of the route may require preparation.
- Pre-sweeping of sandwaves – a mass flow excavator or trail suction hopper dredger may be used to remove a proportion of a sandwave prior to installation. This is to allow the burial machine to place the cables below the level at which they may be affected by the mobility of the sandwave feature. Approximately 5.6km of the route may require preparation. Sand removed will be returned to the seabed within the application area.

Greenlink crosses one in-service telecoms cable within the offshore area. This will be crossed on a 'bridge' comprised of aggregate (rock) and concrete mattresses.

If unexploded ordnance (UXO) is encountered during cable installation the same strategic decision-making process will be followed as for Ireland i.e. first avoid, then remove or as a last resort use demolition measures in accordance with Best Practice.

6.3.3 Cable installation

The cable lay operation will be performed in the same manner as discussed in Section 5.3.3.

A preliminary assessment of the cable installation methods estimates that at least 78% of the Wales Marine component of Greenlink will be buried within sediment. Approximately 16km of the cable route may require either cutting below the base of the sand unit to achieve required burial depth or external cable protection such as rock.

6.3.4 Installation at Freshwater West

The shore crossing will be accomplished by horizontal directional drilling (HDD) which will exit seaward of the low water mark. The cable ducts will pass approximately 10m below the beach. There will be no works on the beach at Freshwater West between MHWS and mean low water.

The HDD will be engineered to exit into a deep sediment unit where post-lay burial of the cables and the ducts can be achieved. Review of the geophysical data suggests that burial in sediment is achievable and that there is no requirement to use external cable protection at the HDD exit location.

6.4 Summary of environmental effects and project specific mitigation

Table 6-1 summarises the findings of the EIA process and the ES conclusions.

Table 6-1 Marine Wales – EIA summary

Receptor	Summary of environmental effect	Project Specific Mitigation	ES Conclusion
Freshwater West	Freshwater West is a long exposed sandy beach, known for its strong waves and currents. It is backed by extensive dune fields and enclosed by the limestone cliffs at Linney Head to the south, with low jagged sandstone cliffs backed by semi-natural vegetation on the south coast of the Angle peninsula. The beach is exposed to high wave energy during the winter months (November to April) where sediment is generally suspended and moved offshore. During the summer months, lower energy waves act upon the sediment to build up the beach to a fuller summer profile. There exists the potential for significant effects to occur to Freshwater West if trenching was to be undertaken on the upper beach terrace. If an area of consolidated coarse sediment is trenched through there is the potential a scour channel would form, affecting the way sediment is transported on and off the beach. Due to the potential for significant effects on coastal processes the decision was made to exclude trenching on the beach from the Project Description. This has been enforced by project specific mitigation which has removed the pathway for effect. No effects on Freshwater West are expected.	No intrusive works will be carried out between mean high-water springs and mean low water. An exclusion zone around the upper beach terrace has been defined and will be implemented.	No effect
Physical processes	Close to the coastline, the cable route follows a sediment channel between outcropping bedrock before crossing the Turbot Bank, a large sandbank, for 5km. The cable route then avoids further outcropping bedrock by routeing to the north and west through an area of mixed cobbles and boulders. It crosses two large sandwaves before routeing through mainly sand and gravelly sand to sandy gravel sediments to the UK/Ireland median line. Sampling confirmed sediments are not contaminated. Trenching across areas of bedrock reef, and pre-sweeping of sandwaves using dredging could result in a significant effect. However, the EIA concluded implementation of the Project Specific Mitigation will reduce the significance of effects to not significant.	No external cable protection will be deposited at the HDD exit point. Exclusion zones have been established around Annex I bedrock reef features. No intrusive works will be undertaken within these exclusion zones. Should dredging be employed for sandwave pre-sweeping then material will be deposited up-current and as close to the disturbed sandwave as	Not significant

Receptor	Summary of environmental effect	Project Specific Mitigation	ES Conclusion
		possible to allow sand to migrate back into the sandwave system.	
Protected sites	The Habitats Regulations Assessment (HRA) assessed all European sites within 10km of the proposed cable route and selected sites greater than 10km because they are important for mobile species e.g. marine mammals. Freshwater West lies within two European sites and offshore the submarine cable route crosses three European sites: • Pembrokeshire Marine / Sir Benfro Forol SAC. This site is designated for the protection of certain habitats and species. Of relevance to the project are the presence of the habitat 'Reef' and species grey seal and otter. • West Wales Marine / Gorllewin Cymru Forol SAC. This site has been designated to protect harbour porpoise. • Skomer, Skokholm and the seas off Pembrokeshire /Sgomer, Sgogwm a moroedd Penfro SPA. This site is designated to protect breeding birds including red-billed chough and European storm petrel; migratory species such as lesser black-backed gull, Manx shearwater, and Atlantic puffin; and seabird assemblages. • Castlemartin Coast SPA. Designated to protect breeding and overwintering populations of red-billed chough. • Limestone Coast of South West Wales/ Arfordir Calchfaen de Orllewin Cymru SAC. This site is designated for the protection of a range of terrestrial habitats and plant species. The HRA concluded that following the implementation of the project specific mitigation prescribed in the Stage 2 Information to Inform AA, Greenlink will not have an adverse effect on the integrity of any European site either alone or in combination with other plans or projects.	The HRA prescribed mitigation measures with respect to avoiding reef habitat, minimising the use of external cable protection on reef habitat, and minimising the effects on harbour porpoise and grey seal from UXO detonation (if required). These measures are described against the respective receptor below.	Not significant

Receptor	Summary of environmental effect	Project Specific Mitigation	ES Conclusion
Intertidal and benthic ecology	Freshwater West consists predominantly of hard rocky substrate, shingle and fine sand habitats. The majority of the intertidal area is characterised as barren littoral coarse sand. Offshore, 22 habitats were identified by the cable route survey including three habitats of conservation importance: mudflats and sandflats not covered by seawater at low tide; sandbanks which are slightly covered by seawater all the time; and reef (including all three sub-types - bedrock, stony and biogenic). The EIA concluded that there will be No effect on intertidal habitats. There is the potential for a significant effect if trenching is undertaken on Bedrock Reef habitat and project specific mitigation has been proposed to avoid this. Where external cable protection is required on stony reef, species are short-lived, fast-growing, opportunistic epifauna which have fast rates of colonisation. Colonisation of the external cable protection is therefore expected in the short-term and the overall significance of the effect has been assessed as not significant.	Exclusion zones have been established around the majority of bedrock reef habitat. Micro-routeing will also be used to avoid reef habitat where possible. However, in certain areas the features cover the entire width of the application area and cannot be avoided. It is proposed that a monitoring programme will be established to monitor colonisation of the external cable protection within the area of medium grade stony reef.	Not significant
Fish and Shellfish	The route crosses or is close to the spawning and nursery grounds for commercially important fish species. Sandeel and herring are known to be particularly sensitive to seabed disturbance and a specific habitat assessment has been conducted to support the EIA process for these species. Brown crab, green crab, velvet crab, spider crab, lobster, nephrops and whelk are all abundant in the region. The EC Habitats Directive Annex II listed species sea lamprey, river lamprey, Twaite shad and Allis shad may also be present within the application area. The EIA concluded that of the species present herring (including allis and twaite shad which are members of the same family) are likely to be marginally more sensitive but that effects on herring will be not significant. All other effects on fish were assessed to be not significant.	As no significant effects were identified no project specific mitigation will be implemented for this receptor.	Not significant

Receptor	Summary of environmental effect	Project Specific Mitigation	ES Conclusion
Birds	The islands and cliffs of the Pembrokeshire coastline are important places for breeding, nesting, foraging and loafing seabirds. The submarine cable route crosses two European sites important for bird species and within range of other SPAs and Sites of Special Scientific Interest in the area which support a wide range of breeding seabirds, including the third largest colony of gannet in the UK and important populations of red-billed chough. The EIA concluded that the effects of visual disturbance of all birds potentially affected by Greenlink will not be significant.	As no significant effects were identified no project specific mitigation will be implemented for this receptor.	Not significant
Marine mammals and marine reptiles	Harbour porpoise and short-beaked common dolphin are the most abundant and commonly sighted species in the waters around Greenlink, with common bottlenose dolphin and nine other species also observed. Grey seal is frequently observed in the region. Harbour seal may use the area for foraging, and otter may use the beach at Freshwater West. Underwater noise generated from continuous sources such as geophysical survey and cable installation/repair will not have a significant effect on marine mammals. Should UXO detonation be required along the route, brief but extensive disturbance to marine mammals could occur, as well as potential injury. Implementation of Industry Best Practice for UXO detonation will ensure that UXO detonation will not have a significant effect on marine mammals.	Greenlink will apply for an EPS Licence for UXO detonation. If UXO detonation is required as best practice GIL will require Contractor to follow the Joint Nature Conservation Committee (JNCC) guidelines for minimising the risk of injury to marine mammals from using explosives. In addition, passive acoustic monitoring (PAM) will be used during periods of darkness and poor visibility (e.g. fog and increased sea states) to support the marine mammal observer watches. Acoustic deterrent devices will also be used and smaller charges will be deployed in a soft start procedure to encourage animals to flee the area.	Not significant
Shipping and navigation	A Navigation Risk Assessment has been undertaken to support the EIA process. Greenlink lies within a moderately busy shipping area within ships passing to and from Milford Haven. Offshore the submarine cable route crosses a Traffic Separation Scheme that separates north	No external cable protection will be deposited at the HDD exit point.	Not significant

Receptor	Summary of environmental effect	Project Specific Mitigation	ES Conclusion
	and south bound shipping passing through the eastern side of the Irish Sea. The submarine cable route also intersects the Rosslare to Pembroke ferry route. The assessment concluded that temporary disruption will occur but that there will be no significant effects on shipping and navigation. Where it has been indicated external cable protection may be required water depths are sufficient to allow safe passage if a rock berm is used.	GIL will apply for a Milford Haven Port Authority Marine Works Licence for all installation / construction, repair and maintenance activities. Communication protocols have been proposed / agreed with Milford Haven Port Authority and Castlemartin Firing Range and procedures to minimise disruption near high density shipping areas will be developed and implemented.	
Commercial fisheries	In Welsh waters demersal and shellfish are the key target species groups. With the exception of larger vessels working out of Milford Haven, most fishing off the southwest coast of Wales occurs close inshore. The most important shellfish species include crabs, lobster, whelk, Nephrops, scallops and razor clams, whilst key demersal target species include cod; haddock; ling; monkfish; plaice; ray; skate; and sole. Pelagic fish landings from this area are mainly of herring and mackerel, and of relatively less economic importance compared to shellfish and demersal species. Most fishermen working from the Pembrokeshire coast rely heavily on potting for crabs and lobsters, with activity peaking during the warmer months. The EIA concluded effects are not significant due to the embedded mitigation incorporated into the project design e.g. fisheries liaison, notices to mariners, use of guard vessels. It was noted that residual effects remain for example from temporary displacement of fishing activity, and the risk of snagging the cables. However, residual effects were assessed as not significant.	Review of operational phase asset management surveys will be undertaken and any areas of exposure/reduced depth of burial communicated to the fishing industry via Notice to Mariners.	Not significant
Other marine users	Freshwater West is a popular public beach, especially important for surfing. The Proposed Development crosses the northern boundary of the Castlemartin Firing Range. Greenlink has been routed to avoid two closed disposal sites, but they remain in close proximity. Marine Energy Wales (MEW) is developing a Marine Energy Test Area (META) in and around the Milford	No intrusive works are to be undertaken on Freshwater West between mean high-water springs and mean low water, in addition no onshore works	Not significant

Receptor	Summary of environmental effect	Project Specific Mitigation	ES Conclusion
	Haven Waterway. Site 8 is located at Freshwater West and Bombora Wave Power are proposing to test a 1.5 MW Wave prototype during 2020 and 2021 at the site. There is the potential that presence of Greenlink will restrict development options within the META Site 8. GIL has been in consultation with MEW and Bombora Wave Power since early 2018 but will continue to cooperate in reaching mutually agreeable terms for proximity agreements. While access to Freshwater West will not be restricted during installation works, the EIA concluded that the presence of project vessels in the nearshore during the peak tourist season or surfing championships could have a significant effect on recreational beach users. However, implementation of project specific mitigation will reduce the significance of the effect to not significant.	will be undertaken between July and August (inclusive). GIL will liaise with the Welsh Surfing Federation to ensure nearshore works scheduling is optimized to minimise conflicts. GIL will cooperate in reaching mutually agreeable terms for proximity agreements with MEW and other asset owners. GIL and their appointed Installation Contractor will look at the feasibility of scheduling works within the Castlemartin Firing Range during Easter and August shut-down periods.	
Marine archaeology	The wreck of the Willemoes lies buried beneath the sand at Freshwater West, becoming exposed after severe storms. The wreck lies outside the application area, as do two submerged forest exposures at Freshwater West. In the nearshore, a palaeochannel associated with the Castlemartin Corse stream was detected crossing the submarine cable route. Analysis of the marine geophysical datasets identified 84 anomalies with archaeological potential. None were identified as wreck sites or were identified as having high archaeological potential. 24 were deemed to have medium potential, with the remaining 60 having low potential. No wreck sites were identified within the available data. For each of the archaeological anomalies identified, archaeological exclusion zones have been defined.	Archaeological exclusion zones will be implemented around the geophysical anomalies identified.	Not significant

Receptor	Summary of environmental effect	Project Specific Mitigation	ES Conclusion
	Considering the embedded mitigation, including preparing a Written Scheme of Investigation for Greenlink and establishing and implementing a Protocol for Archaeological Discoveries (PAD), the EIA concluded that there will be no significant effects.		
Cumulative effects	26 plans and projects were identified within 10km of Greenlink. Following consideration of the spatial and temporal overlaps, it was identified that there was a common pressure-receptor pathway between Greenlink and 6 projects. These are META Site 8 Bombora Wave Power Seacam device; deployment of a marker buoy associated with the Bombora Wave Power project; two marine surveys; Neyland Yacht Haven Marina piling works; and the Castlemartin Firing Range. Potential cumulative effects identified included effects on fish and marine mammals from underwater noise changes; marine birds from physical disturbance; commercial fisheries from temporary habitat disturbance and the potential for cable snagging; and commercial fishing, shipping and recreational boating from disruption to planned routes. The EIA concluded that there was the potential for cumulative effects however, the cumulative effects are not significant.	No project specific mitigation is proposed.	Not significant

7. Onshore Wales (Town & Country Planning Act 1990)

7.1 Components

Onshore Wales comprises:

- A landfall site at Freshwater West, Pembrokeshire, where the marine cables will be installed via HDD to avoid impacts on the beach, dunes and associated protected sites.
- HVDC cable will be installed underground for approximately 7km from the landfall site to the converter station located in the vicinity of the Pembroke Power Station to the east.

The red line boundary (the area to be included in the Town & Countryside Planning Act application) is shown in Figure 7-1.

7.2 Route overview

Various cable route alignment options were considered between the landfall and converter station. The cable corridor follows an alignment identified as the most compatible with environmental constraints, technical requirements and landowner preferences. The cable corridor is illustrated in Figure 2-3, Drawing P1975-LOC-013.

In summary, as described from west to east, the cable corridor comprises the following: the cable will be installed by HDD under the beach and dunes at Freshwater West, prior to the cable corridor continuing northwards from the landfall compound along the agricultural field boundary towards the B4320. HDD would be employed to install the HVDC cable under the B4320 to an exit point beyond the Limestone Coast of South West Wales SAC and the Broomhill Burrows Site of Special Scientific Interest (SSSI) and a sensitive treeline.

The HVDC cable will continue underground eastwards in agricultural (pastoral and arable) fields outside the protected sites, continuing eastwards through agricultural fields before turning northwards beyond a water supply pond. The cable continues north, through a short section of woodland, before re-emerging into agricultural land and merging with the unnamed road linking Wallaston Cross and Angle Bay.

The cable will then be installed within the road, progressing eastwards to Wallaston Cross, before continuing eastwards to the converter station site near Lambeeth Farm. The converter station will be contained within a single field with HVDC cables entering at the south and HVAC cables emerging to the north.

The HVAC cable route emerges from the converter station field within a hedgerow gap on the northern field boundary, before following further gaps in hedgerows and treelines north and east to avoid existing infrastructure, crossing the Wales Coast Path, before continuing north to connect at the National Grid substation.

A3

Legend

Red Line Planning Boundary

Greenlink INTERCONNECTOR

Co-financed by the European Union
Connecting Europe Facility

Issue	Date	By	Chkd	Appd
P1	19-03-19	JH	GM	XX

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Client
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Job Title
Greenlink Interconnector

Red Line Boundary

Scale at A3
1:20,000

Job No
246369-00

Drawing Status
In Progress

Drawing No
001

Issue
P2

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7.3 Cable installation

Following an extensive optioneering exercise, Freshwater West was determined to be the optimum landfall location for the marine HVDC cable. The construction design at the landfall reflects the sensitivity of the location within the Pembrokeshire Coast National Park and protected sites. HDD was selected at an early stage to avoid open-cut excavation across the beach and dunes, and represents fundamental embedded mitigation.

Initial works involve installation of the cable ducts within trenches below ground level bedded within thermally-suitable compactable material to avoid heat dissipation. Two PVC or HDPE cable ducts will be laid at a depth of 1,050mm within a single 700mm wide trench with protective covers placed at a depth of 900mm and warning tape approximately 800mm below ground level.

7.4 Converter Station installation

Earthworks would be required to create the footprint of the convertor station and construction of the associated batters, which would be completed within a perimeter secured by temporary fencing; e.g. Heras type or similar. Permanent fencing would be installed following completion of earthworks.

A permanent access will be constructed into the converter station, including a temporary turning area to allow construction plant safe entry / exit from the converter station footprint. Sustainable Drainage Systems (SuDS) would be installed on site, including bioretention swales and an attenuation pond.

Temporary construction compounds will be installed in the field to the south of the converter station with an anticipated footprint of 100m x 100m. Both locations are currently in arable use and will not require any vegetation clearance prior to use. Following commissioning, the construction compound will be restored to agricultural land use.

Access will be upgraded from the junction at Wallaston Cross to the converter station site to accommodate construction traffic. The road will be upgraded to a double-lane tarmac road that will enable continuous access for local residents and support abnormal load deliveries.

7.5 Summary of environmental effects and project specific mitigation

Surveys to support the production of the Environmental Statement for Onshore Wales have been completed and the conclusions are currently being finalised. The current direction of assessment and anticipated effects and mitigation are included within Table 7-1 to provide an indication of the likely residual effects and overall significance. The final full assessment and all requisite mitigation will be made available on completion and uploaded to the Greenlink website (www.greenlink.ie) for download.

Table 7-1 summarises the anticipated findings of the environmental assessment process.

Table 7-1 Onshore Wales – EIA summary

Receptor	Summary of environmental effect	Anticipated Project Specific Mitigation (subject to change once assessment complete)	Anticipated ES Conclusion
Biodiversity	Protected sites will not be directly affected; however, indirect effects will be managed by pollution prevention measures secured through the Outline Construction Environmental Management Plan (CEMP). Species impacts on protected site features are limited to horseshoe bats, associated with temporary effects on flightlines. Project-specific mitigation will be implemented to manage these effects and it is concluded that there will be no significant effect. Dormice are presumed to be present across the study area and may be affected by habitat loss and severance between habitats. Embedded mitigation throughout design of the cable corridor avoided the majority of hedgerows and woodland such that mitigation is only required at a few locations leading to a no likely significant effect conclusion. Standard ecological mitigation will be required to avoid and reduce effects on wider protected species with minor adverse effects reduced to negligible as a result. Any hedgerows affected by the Proposed Development will be reinstated and impacts on the woodland block would be minimised through use of arboricultural supervision during cable installation. The converter station site has been designed to avoid encroachment into the Root Protection Zone (RPZ) of the adjacent Tree Preservation Order (TPO) woodland. Replacement planting with native species of local provenance will be provided to deliver enhancement and expansion of important bat and dormouse habitat; including improving connectivity between woodland blocks by enhancing landscape screening to the south of the converter station.	Best practice construction practice; e.g. CIRIA and Guidelines for Pollution Prevention, integrated into the Outline CEMP. Mobile screening to provide connectivity within hedgerow gaps during cable installation at hedgerow sections and hedgerow replacement post-installation; to maintain bat flightlines and avoid dormouse habitat severance. Pre-construction ecological surveys to confirm no change in protected species distribution prior to works. Appropriate methods and timing restrictions on clearance works to comply with protected species requirements; e.g. two-stage clearance, vegetation clearance in accordance with any protected species licence requirements (dormice). Avoidance of TPO woodland RPZ utilising suitable fencing, delivery of new planting to support protected species and connectivity between habitats.	Not significant

Receptor	Summary of environmental effect	Anticipated Project Specific Mitigation (subject to change once assessment complete)	Anticipated ES Conclusion
		Minimal operational lighting to avoid affecting bat and badger commuting and foraging habitat.	
Landscape & Visual	Embedded mitigation throughout design development led to a cable corridor that has minimal effect on existing hedgerows and trees. Operational landscape and visual effects are attributed to the converter station as the only above ground installation. Even in the absence of any mitigation, the structure would not be visible from the Pembrokeshire Coast National Park. Embedded mitigation led to a location close to existing industrial infrastructure such that additional development would be placed within a suitable location. Photomontages of key viewpoints have been assessed using a worst-case approach and determined no likely significant effect following incorporation of project-specific mitigation.	Additional landscape planting is proposed to surround and screen the converter station from key viewpoints; the building will also be designed to blend with the surrounding landscape with appropriate cladding and colour scheme. Further planting is also proposed to screen views from the south-west, whilst also providing valuable connectivity between key habitats. Any hedgerow removal during cable installation will be replanted following installation. Net positive planting will be achieved across the Proposed Development providing local enhancement.	Not significant
Historic Environment	Known archaeology has been avoided during initial design stages, including consultation with relevant bodies to ensure adequate offset distances from cable installation. Detailed survey explored potential unknown archaeology, which highlighted potential features. Initial results suggest that all potential features are avoidable following development of a flexible approach to design. Setting effects on key receptors were assessed as being not significant, primarily based on viewshed and project-specific mitigation. As such, no significant effect is anticipated on historic environment features.	Landscape screening reduces potential setting effects on key heritage receptors, whilst avoidance and an archaeological watching brief approach will be employed for any confirmed unrecorded archaeological features or archaeological exclusion zones restrict construction plant access enforcing separation from vulnerable areas as required.	Not significant
Traffic and Transport	Operational traffic will be negligible and will have no significant effect.	An Outline CTMP secures measures to manage construction traffic. No mitigation is required for	Not significant

Receptor	Summary of environmental effect	Anticipated Project Specific Mitigation (subject to change once assessment complete)	Anticipated ES Conclusion
	General construction traffic will have a minor adverse effect on a temporary basis and will be managed via an Outline Construction Traffic Management Plan (CTMP). Abnormal load delivery may be via a highway or marine route; should abnormal loads be routed through Pembroke, swept-path analysis and any requisite structural assessments would inform the final routeing.	operational traffic due to negligible change in baseline.	
Noise and Vibration	Operational noise parameters are proposed to limit converter station noise to as close to background levels as practicable; in line with BS4142. The operational assessment has focussed on key receptors and determined no likely significant effects. Construction noise assessment focussed on temporary effects of construction activities and concludes no likely significant effect.	Noise parameters to be applied to operational design. Construction noise management to be secured via the Outline CEMP as necessary.	Not significant
Air Quality	Construction traffic has been routed to avoid the Pembroke Air Quality Management Area (AQMA), with only minimal abnormal loads potentially transiting through the AQMA, enabling a no likely significant effect conclusion; secured via the Outline CTMP. A dust impact assessment also concluded no likely significant effect following review of construction activities and mitigation embedded within the Outline CEMP.	Dust mitigation measures integrated within Outline CEMP. Outline CTMP requires all construction traffic to avoid the Pembroke AQMA; excepting any abnormal loads.	Not significant
Water	Ground and surface water effects have been assessed as not significant, supported by a Water Framework Directive (WFD) Screening Assessment. No main rivers are affected, and ordinary watercourses managed by best practice construction measures secured through the Outline CEMP. A preliminary SuDS Approval Body Consent will also be submitted to demonstrate that sustainable development principles apply to the operational design of the converter station.	The Outline CEMP secures mitigation measures to manage construction activities near water; e.g. compliance with Guidelines for Pollution Prevention 5: Working near Water. Adherence to preliminary SAB Consent requirements; re. SuDS hierarchy to ensure resilient drainage. Bioretention swales and	Not significant

Receptor	Summary of environmental effect	Anticipated Project Specific Mitigation (subject to change once assessment complete)	Anticipated ES Conclusion
		attenuation pond proposed with ecological enhancement.	
Soils, Geology and Hydrogeology	No effects on soils, geology and hydrogeology are predicted during operation as proposed maintenance activities are not predicted to create a pathway for effect. During construction, HDD activities and cable installation design represent embedded mitigation reducing the magnitude of impact to negligible by minimising excavation widths and depths. Cable installation would primarily be within natural ground with made ground localised to private access tracks; no known sources of contamination are present. Geology at the converter station is of negligible importance due to the restricted area of impact and type and nature of local geology with no made ground identified; the requirement for earthworks predicts a minor adverse impact. Hydrogeology would not be affected at the landfall site due to the depth of groundwater (c.6m bgl); effects of HDD on the Secondary (A) aquifer are deemed to be temporary, minor and localised. Groundwater would typically be below construction depth for cable installation, whereas converter station earthworks may temporarily intercept groundwater; potential pollution effects would be managed by pollution prevention measures secured in the Outline CEMP. As such, no licenced groundwater extractions or controlled waters would be affected by the Proposed Development. UXO risk is determined to be: Low, Low-Medium and Medium risk across the Proposed Development.	Operational and construction pollution prevention measures will be secured within the Outline CEMP to manage pollution risk to groundwater. The Environmental Permitting and abstraction licensing processes would be followed where applicable prior to any dewatering during construction. Materials management and dust mitigation measures will also be secured through the Outline CEMP. Site-Specific UXO Toolbox talks would be implemented for all invasive works and UXO Specialist On-Site Support provided in Medium UXO Risk Areas.	Not significant

Receptor	Summary of environmental effect	Anticipated Project Specific Mitigation (subject to change once assessment complete)	Anticipated ES Conclusion
Material Assets	The likely significance of environmental effects from the use of material resources and the generation and management of waste during construction and operation have been assessed in accordance with relevant guidance; IAN 153/11. No effects are predicted during operation due to the nature of the equipment proposed; however, slight to moderate adverse effects are predicted by the assessment to be managed via controls within the Outline CEMP to conclude an overall not significant conclusion.	The Outline CEMP will secure measures to minimise potential effects on material assets: primary material sources on-site, imported material sources off-site and waste and materials management infrastructure off-site. The Outline CEMP will require adherence to the waste hierarchy and require preparation of a Materials Management Plan prior to construction.	Not significant
Socio-Economics	There will be minor beneficial effects regarding creation of construction jobs, training opportunities and increase in demand for service accommodation, moderate beneficial effects for induced spend by the local workforce and minor adverse effects for local population receptors and temporary loss of Best Most Versatile (BMV) land. A major adverse effect is anticipated on the permanent loss of BMV land associated with the converter station. On balance, an overall conclusion of no likely significant effect is anticipated.	The Outline CEMP and Outline CTMP will secure measures to minimise potential effects on the population, including noise parameter limits, dust management, traffic management, etc. Landfall HDD works timed to avoid core tourism periods. Construction-phase to focus on local resourcing for materials and skills.	Not significant
Cumulative effects	Interrelationships between chapters have been assessed, in addition to cumulative effects between elements of Greenlink consented under different regimes; i.e. Onshore Wales and Marine Wales. PCC and PCNPA were consulted to identify additional plans or projects that may interact with the Proposed Development; potential interaction was identified with the Co-Generation Facility at Valero Refinery. The cumulative assessment concludes no likely significant effect.	No project-specific mitigation is included solely to address any cumulative effects.	Not significant

8. Intra-Project Effects

Typically, intra-project effects can occur between different components of the same project from activities which are geographically close to each other and have the potential for the pressures they exert on receptors to overlap spatially and temporally. For a linear interconnector cable project such as Greenlink, the scope of intra-project effects is limited to the interfaces between onshore and offshore project components i.e. between Marine Wales and Onshore Wales at the intertidal area; and between Marine Ireland and Onshore Ireland at the intertidal area, where two different activities could be occurring at the same time. Although there is an interface between the environmental assessments for the planning documents at the Campile Estuary and Onshore Ireland, the works proposed are an isolated singular event that spans the two boundaries. It doesn't have the potential to add to other project components and therefore there is no potential for intra-project effects.

At the marine interfaces e.g. between Marine Wales and Offshore Ireland, the effects from the cable installation will move with the installation spread and therefore there is no spatial or temporal overlap; it is a continuation of the effects along the linear project. The significance of effects on receptors is therefore considered by the individual environmental assessments.

Table 8-1 identifies the potential pressure-receptor pathways at the interface between Marine Ireland and Onshore Ireland and between Marine Wales and Onshore Wales which have been identified and considered by the environmental assessment process. No other intra-project effects have been identified.

Taking into consideration the potential for both direct and indirect effects on all receptors including pressures such as changes in noise and changes in air quality, no effects have been identified within Onshore Ireland, Campile Estuary, Marine Ireland, Offshore Ireland, Marine Wales and Onshore Wales that could accumulate to have a significant effect.

Table 8-1 Summary of intra-project effects

Interface		Receptor	Summary of environmental effect	EIA conclusion
Components				
Marine Ireland	Onshore Ireland	Recreation	There is the potential that if works in the nearshore area occur at the same time as works at the onshore HDD compound there could be a temporary elevation in the visual disturbance to recreational users of Baginbun Beach. At certain times of the year the public will be more sensitive due to increased use of the beach or specific events i.e. May 2020 (Anglo-Norman commemorations), July and August. However, Project Specific Mitigation in the form of seasonal restrictions will be implemented to reduce the significance of the effect.	Not Significant

Interface Components		Receptor	Summary of environmental effect	EIA conclusion
Marine Ireland	Onshore Ireland	Birds	The Campile Estuary is spatially too far apart from activities within the Marine Ireland component for there to be intra-project effects on birds between these two project components. The area identified as having potential for intra-project effects is at the interface between onshore works at the Baginbun landfall and nearshore works in the Marine Ireland component. However, due to a lack of spatial overlap between the two project component activities which could affect birds, and due to the difference in bird species which have the potential to be affected by the different project components, it has been concluded there will be no significant intra-project effects.	Not Significant
Wales Marine	Onshore Wales	Recreation	There is the potential that if works in the nearshore area occur at the same time as works at the onshore HDD compound there could be a temporary elevation in the visual disturbance to recreational users of Freshwater West. At certain times of the year the public will be more sensitive due to increased use of the beach or specific events i.e. May 2020 (Surfing Championships), July and August. However, Project Specific Mitigation in the form of seasonal restrictions will be implemented to reduce the significance of the effect.	Not significant
Wales Marine	Onshore Wales	Birds	There could be potential for intra-project effects on bird species which could be affected by both the onshore and offshore works. Chough have been identified as having this potential however, based on the Marine Wales EIA and the preliminary Onshore Wales HRA it has been concluded that due to low numbers of chough observed during surveys in the vicinity of the landfall, the distance to known chough territories and the timings of onshore vs offshore works, no significant intra-project effects are expected.	Not significant

9. Conclusion

Greenlink is in line with the European Commission's approach to an integrated energy market to ensure value of money for consumers. Greenlink has been awarded European Project of Common Interest (PCI) status, making it one of Europe's most important energy infrastructure projects and granting it the "highest national significance" possible.

Greenlink is a linear infrastructure project between Wales and Ireland, with both onshore and marine elements. This document provides a summary of the onshore and marine elements in both Ireland and Wales and give an overview of the combined environmental effects of Greenlink. More detailed information on Greenlink and the environmental assessments is contained within the permit applications and supporting documentation, available at www.greenlink.ie.

The ES of the Marine Wales component and EIAR of the Irish Marine component provide comprehensive assessments of the likely significant effects which would result from installation, operation (including repair & maintenance) and decommissioning. Through careful routeing and embedding mitigation within the design of the project, GIL has prevented or reduced several potentially significant environmental effects. Through careful selection of additional project specific mitigation any remaining residual effects have been reduced to an acceptable level and are not significant.

For the Onshore Ireland and Onshore Wales components, surveys to support production of the environmental assessments have been completed and the conclusions are currently being finalised. The current direction of assessment suggests that effects can be managed through industry best practice embedded into the design of the project or the implementation of project specific mitigation designed to avoid or reduce significant effects. Local effects will occur during construction of the Irish converter station; but whilst significant they will be temporary, lasting for the duration of the construction works only. Through careful siting of the Welsh converter station, and the semi-industrial setting, local effects during construction will not be significant.

For a linear interconnector cable project such as Greenlink, the scope of intra-project effects is limited to the interfaces between onshore and offshore project components i.e. between Marine Wales and Onshore Wales at the intertidal area; and between Marine Ireland and Onshore Ireland at the intertidal area, where two different activities could be occurring at the same time. Taking into consideration the potential for both direct and indirect effects on all receptors including pressures such as changes in noise and changes in air quality, no effects have been identified within Onshore Ireland, Campile Estuary, Marine Ireland, Offshore Ireland, Marine Wales and Onshore Wales that could accumulate to have a significant effect.

Greenlink crosses two maritime jurisdictions (Wales and Republic of Ireland) and as such transboundary assessment has been an integral component of the environmental assessment. Transboundary effects will be limited to underwater noise and sediment

dispersion. These effects will be limited in spatial extent near the jurisdictional boundary and will be associated with one-off events that move along the cable centreline e.g. geophysical survey and cable installation. The environmental assessments for Marine Wales, Marine Ireland and Offshore Ireland concluded that the effects from sediment dispersion and underwater noise changes are not significant and therefore transboundary effects will also not be significant.

Table 9-1 presents a summary of the environmental assessment conclusions; overall **Greenlink will not have a significant effect on the environment either alone or in combination with other plans or projects.**

Table 9-1 Summary of environmental assessment conclusions

Key: NS = Not Significant

EIA Directive category	Topic Chapters included in category	Onshore Ireland	Campile Estuary, Marine Ireland & Offshore Ireland	Marine Wales	Onshore Wales	Inter-Project Interactions	Overall Effect
Population & human health	Traffic & Transport, Noise & Vibration, Population & Human Health, Shipping & navigation	**NS**	**NS**	**NS**	**NS**	**No Interaction**	**NS**
Biodiversity	Biodiversity, Protected sites, Intertidal and benthic ecology, Fish and Shellfish, Birds, Marine mammals and marine reptiles	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
Land, soil, water, air and climate	Air Quality and Climate, Soils, Geology and Hydrogeology, Water and Hydrology, Physical Processes, Resources and Waste Management	**Local moderate effects at converter station, otherwise not significant**	**NS**	**NS**	**NS**	**No Interaction**	**NS**
Material assets, cultural heritage and the landscape	Archaeology, Architectural and Cultural Heritage, Marine archaeology, Landscape and Visual, Material Assets, Major Accidents and Disasters, Commercial fisheries, Other marine users	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
Cumulative effects	Cumulative effects	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

The embedded and project specific mitigation proposed in the environmental assessments will form the basis of an Environmental Management Plan (EMP) to be implemented during the installation and operation of Greenlink. The EMP will be prepared by the appointed Installation Contractor and will form the basis of the approach to mitigating potential effects on the natural and human environment and local community.