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

Greenlink
INTERCONNECTOR

DixonBrosnan

environmental consultants

Project	**Natura Impact Statement (NIS) for the proposed Greenlink interconnector (Ireland Onshore)**		
Client	**Arup**		
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1. Introduction

1.1 Background

The information in this report has been compiled by DixonBrosnan Environmental Consultants, on behalf of the applicant. It provides information on and assesses the potential for the proposed development at County Wexford, Ireland, to impact on Natura 2000 sites.

The Birds Directive (2009/147/EC) and the Habitats Directive (92/42/EEC) put an obligation on EU Member States to establish the Natura 2000 network of sites of highest biodiversity importance for rare and threatened habitats and species across the EU. In Ireland, the Natura 2000 network of European sites includes Special Areas of Conservation (SACs, including candidate SACs) and Special Protection Areas (SPAs, including proposed SPAs). SACs are selected for the conservation of Annex I habitats (including priority types which are in danger of disappearance) and Annex II species (other than birds). SPAs are selected for the conservation of Annex I birds and other regularly occurring migratory birds and their habitats. The annexed habitats and species for which each site is selected correspond to the qualifying interests of the sites and from these the conservation objectives of the site are derived. The Birds and Habitats Directives set out various procedures and obligations in relation to nature conservation management in Member States in general, and of the Natura 2000 sites and their habitats and species in particular. A key protection mechanism is the requirement to consider the possible nature conservation implications of any plan or project on the Natura 2000 site network before any decision is made to allow that plan or project to proceed. Not only is every new plan or project captured by this requirement but each plan or project, when being considered for approval at any stage, must take into consideration the possible effects it may have in combination with other plans and projects when going through the process known as Appropriate Assessment (AA).

The obligation to undertake Appropriate Assessment (AA) derives from Article 6(3) and 6(4) of the Habitats Directive, and both involve a number of steps and tests that need to be applied in sequential order. Article 6(3) is concerned with the strict protection of sites, while Article 6(4) is the procedure for allowing derogation from this strict protection in certain restricted circumstances. As set out in Section 177U of the Planning and Development Act 2000 as amended, a screening for appropriate assessment of an application for consent for the proposed development must be carried out by the competent authority to assess, in view of best scientific knowledge, if the proposed development, individually or in combination with another plan or project is likely to have a significant effect on any European site. Each step in the assessment process precedes and provides a basis for other steps. The results at each step must be documented and recorded carefully so there is full traceability and transparency of the decisions made.

1.2 Aim of this Report

The purpose of this report is to inform the AA process as required under the Habitats Directive (92/43/EEC) in instances where a plan or project may give rise to adverse effects on the integrity of Natura 2000 sites. This report aims to inform the Appropriate Assessment process in determining whether the development, both alone and in combination with other plans or projects, are likely to have an adverse effect on the integrity of Natura 2000 sites in the study area, in the context of their conservation objectives and specifically on the habitats and species for which the sites have been designated.

Documentation/guidelines of relevance to this NIS include the following:

- European Commission, 2001. Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Articles 6(3) and (4) of the Habitats Directive 92/43/EEC. Office for Official Publications of the European Communities, Brussels (EC, 2001);
- European Commission, 2000a. Communication from the Commission on the Precautionary Principle., Office for Official Publications of the European Communities, Luxembourg (EC, 2000a);
- Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC Office for Official Publications of the European Communities, Luxembourg (EC, 2018);
- Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC – Clarification of the concepts of: alternative solutions, imperative reasons of overriding public interest, compensatory measures, overall coherence, opinion of the commission; (EC, 2007);
- Appropriate Assessment of Plans and Projects in Ireland. Guidance for Planning Authorities. Department of the Environment, Heritage and Local Government, Dublin (DEHLG, 2010a);
- Department of Environment Heritage and Local Government Circular NPW 1/10 and PSSP 2/10 on Appropriate Assessment under Article 6 of the Habitats Directive – Guidance for Planning Authorities (DEHLG, 2010b);
- Interpretation Manual of European Union Habitats. Version EUR 28. European Commission (EC, 2013);
- Applications for approval for Local Authority Developments made to An Bord Pleanála under 177AE of the Planning and Development Act, 2000, as amended (Appropriate Assessment): Guidelines for Local Authorities. An Bord Pleanála, Dublin (ABP, 2013);
- Relevant case law.

1.3 Authors of Report

This report was prepared by Carl Dixon MSc. (Ecological Monitoring) and Ian McDermott MSc. (Ecological Monitoring). Carl is a senior ecologist who has over 20 years' experience in ecological and water quality assessments with particular expertise in freshwater ecology. He also has experience in mammal surveys, invasive species surveys and ecological supervision of large-scale projects. Projects in recent years include the Waste to Energy Facility Ringaskiddy, Shannon LNG Project, supervision of the Fermoy Flood Relief Scheme, Skibbereen Flood Relief Scheme, Upgrade of Mallow WWTP Scheme and the Douglas Flood Relief Scheme. He has carried out ecological surveys and prepared AA/NIS reports for a range of projects.

Ian McDermott MSc (Ecology) is an experienced ecologist with particular expertise in surveying for invasive species, mammal and bird surveys. He carries out ongoing water quality surveys for a range of projects including quarries and wastewater treatment plants. Likewise, he has carried out ecological surveys and prepared NIS reports for a range of projects including industrial developments, pipelines, quarries and agricultural units. CVs for the authors are attached as Appendix 8.

2. Regulatory Context and the Appropriate Assessment Procedure

2.1 Regulatory Context

The Habitats Directive (Council Directive 92/43/EEC on the *Conservation of Natural Habitats and of Wild Fauna and Flora*) aims to maintain or restore the favourable conservation status of habitats and species of community interest across Europe. The requirements of these directives are transposed into Irish law through a variety of legislative instruments, including the European Communities (Birds and Natural Habitats Regulations; S.I. No. 477 of 2011) and the Planning and Development Acts 2000 to 2019.

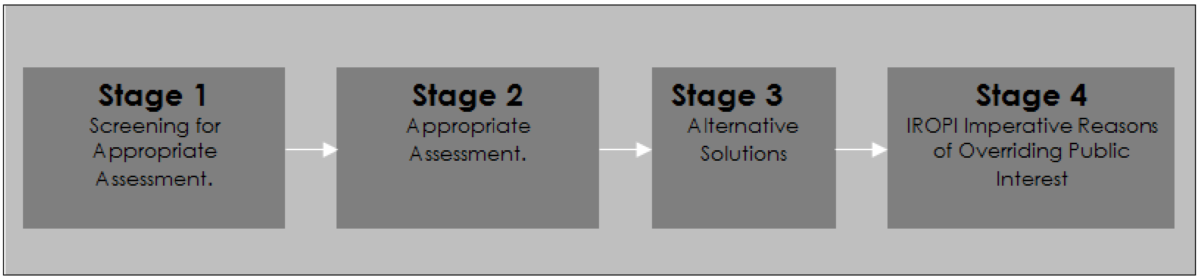
Under the Directive a network of sites of nature conservation importance have been identified by each Member State as containing specified habitats or species requiring to be maintained or returned to favourable conservation status. In Ireland the network consists of SACs and SPAs, and also candidate sites, which form the Natura 2000 network.

Article 6(3) of Council Directive 92/43/EEC of 21 May 1992 on the *Conservation of Natural Habitats and of Wild Fauna and Flora* (as amended) (hereafter 'the Habitats Directive') requires that, any plan or project not directly connected with or necessary to the management of a designated site, but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. A competent authority (e.g. the OPW or Local Authority) can only agree to a plan or project after having determined that it will not adversely affect the integrity of the site concerned.

The possibility of a significant effect on a designated or "European" site has generated the need for an appropriate assessment to be carried out by the competent authority for the purposes of Article 6(3). A Stage Two Appropriate Assessment is required if it cannot be excluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on a European site. The first (Screening) Stage for appropriate assessment operates merely to determine whether a (Stage Two) Appropriate Assessment must be undertaken on the implications of the plan or project for the conservation objectives of relevant European sites.

2.2 Appropriate Assessment Procedure

The assessment requirements of Article 6(3) establish a stage-by-stage approach. This assessment follows the procedures outlined in the 2001 European Commission publications “Assessment of plans and projects significantly affecting Natura 2000 sites: methodological guidance on the provisions of Articles 6(3) and 6(4) of the Habitats Directive 92/43/EEC” (2001) and Managing Natura 2000 Sites: the provisions of Article 6 of the ‘Habitats’ Directive 92/43/EEC (Draft) Office for Official Publications of the European Communities, Luxembourg (EC, 2015);



The stages are as follows:

Stage One: Screening — the process which identifies any appreciable impacts upon a Natura 2000 site of a project or plan, either alone or in combination with other projects or plans, and considers whether these impacts are likely to be significant. It is noted that measures intended to avoid or reduce impacts cannot (and are not for this project) considered at the screening stage;

Stage Two: Appropriate assessment — the consideration of adverse effects on the integrity of the Natura 2000 site of the project or plan, either alone or in combination with other projects or plans, with respect to the site’s structure and function and its conservation objectives. Additionally, where there are adverse effects, Stage Two includes an assessment of the potential mitigation of those effects;

Stage Three: Assessment of alternative solutions: The process which examines alternative ways of achieving the objectives of the project or plan that avoid adverse effects on the integrity of the Natura 2000 site.

Stage Four: Assessment where no alternative solutions exist and where adverse impacts remain — an assessment of compensatory measures where, in the light of an assessment of imperative reasons of overriding public interest (IROPI), it is deemed that the project or plan should proceed (it is important to note that this guidance does not deal with the assessment of imperative reasons of overriding public interest).

It is the responsibility of the competent authority, in this instance An Bord Pleanála, to make a decision on whether or not this proposed development should be approved, taking into consideration any potential adverse effects on the integrity of Natura 200 sites within its zone of influence.

3. Description of Development

3.1 Introduction

Greenlink Interconnector Limited (GIL) is proposing to develop an electricity interconnector (Greenlink) linking the existing electricity grids in Ireland and Great Britain. Greenlink will consist of two converter stations, one close to the existing substation at Great Island in County Wexford (Ireland) and one close to the existing substation at Pembroke in Pembrokeshire (Wales). The converter stations will be connected by underground cables (onshore) and subsea cables (offshore). Refer to **Figure 1** for an overview of the proposed development (which comprises the onshore elements of the project in Ireland).

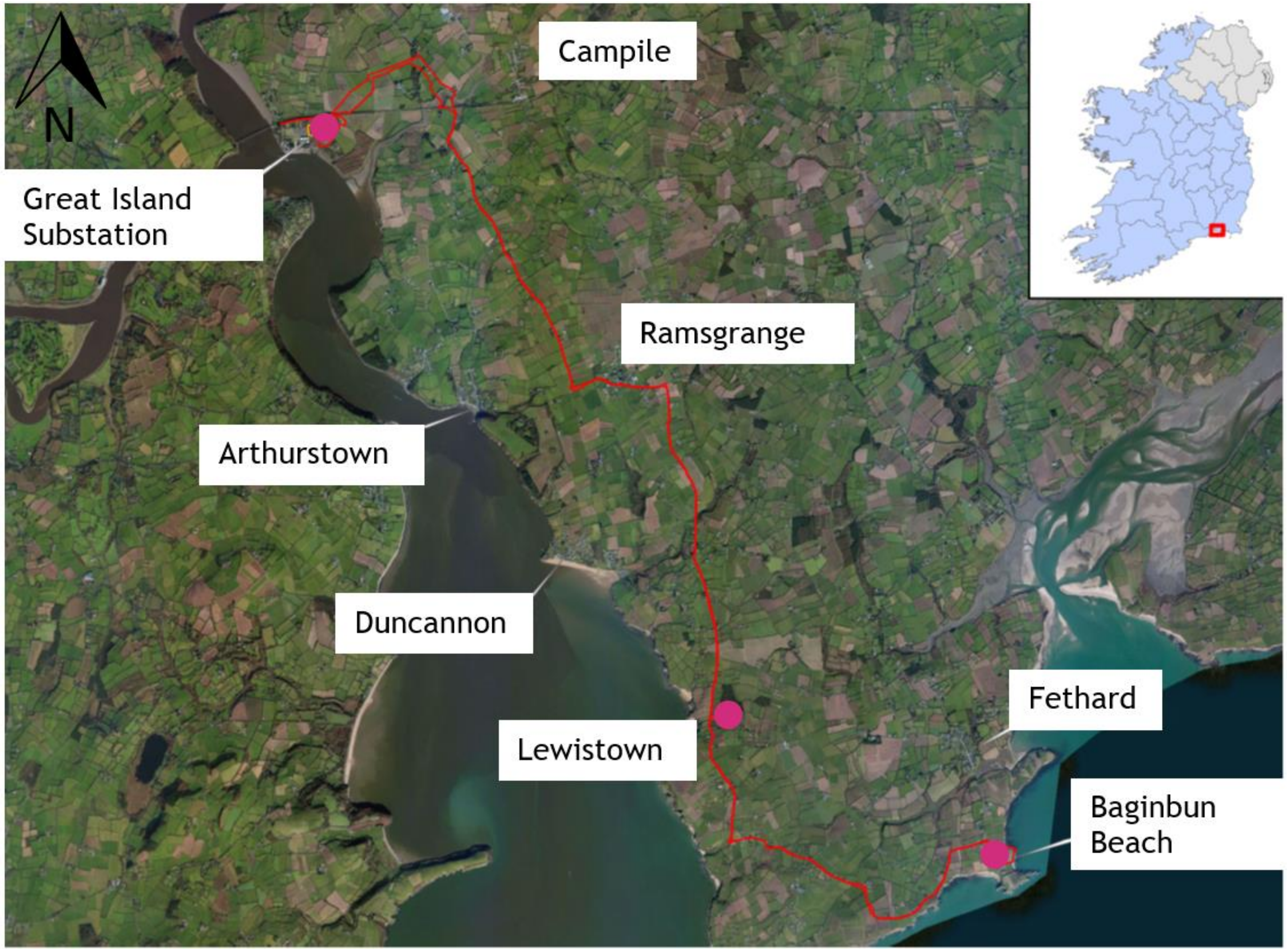


Figure 1: Overview of the proposed development- construction compounds indicated as ● | not to scale [background mapping Bing © Microsoft 2020]

Greenlink is designated as a European Union Project of Common Interest (PCI), under the provisions of European Union Regulation No. 347/2013 on guidelines for Trans-European Network for Energy ('TEN-E Regulation'). It has been given project reference number 1.9.1. GIL has received funding for Greenlink under the Connecting Europe Facility (CEF).

The proposed development considered in this Natura Impact Statement (NIS) is the onshore elements of the overall Greenlink project, with the definition of 'onshore' Ireland being the land above the foreshore, i.e. the land above the high-water mark of ordinary or medium tides, indicated as HWM on Ordnance Survey Maps. The proposed development will comprise the following permanent and temporary elements:

- **Landfall Compound** – a temporary landfall compound at Baginbun, where the high voltage direct current (HVDC) cable will be installed underground, below the beach and cliff at Baginbun Beach, by horizontal directional drilling (HDD);
- **HVDC Cables** – two HVDC electricity cables with a nominal capacity of 500 megawatts (MW), installed underground from the landfall at Baginbun to the converter station, including jointing bays and ground level marker posts at intervals along the route;
- **Converter Station** – a converter station situated close to the existing Eirgrid 220kV Great Island substation in Wexford;
- **Tail Station** - a 220kV Loughtown substation located beside the converter station. The Loughtown tail station connects the HVAC 220kV cable into the 220kV grid via the existing Eirgrid Great Island substation;
- **MV Substation** – an ESB substation will be located outside the converter station and tail station perimeter fences but within the landholding. This substation will provide the MV and LV connections required for the development;
- **Converter Station Construction Compound** - temporary compound for the construction of the converter station and tail station at Great Island;
- **Cable Contractor Compounds** – three temporary cable contractor compounds will be required (i) at the landfall site close to Baginbun Beach (ii) at the proposed converter station and (iii) one along the onshore route in the townland of Lewistown;
- **HDD Compounds** – temporary HDD contractor compounds are required. One will be located close to the cable contractor compound at Baginbun Beach with another HDD compound located at either side of the Campile River Estuary crossing;
- **High Voltage Alternating Current (HVAC) Cables** – one 220 kV HVAC electricity cable circuit consisting of three cables, installed underground connecting the converter station via the Loughtown tail station to the existing EirGrid Great Island substation;
- **Fibre Optic Cables** – fibre optic cables for operation and control purposes, laid underground with the HVDC and HVAC cables; and

- **Community Gain Roadside Car Parking near Baginbun Beach** – in consultation with Wexford County Council, circa 54 roadside car parking spaces will be constructed; and

- **Community Gain in Ramsgrange Village** – in consultation with Wexford County Council, extension to existing footpaths, four new streetlights and a speed activated sign at Ramsgrange.

3.2 Main Elements of the Proposed Development

A description of the of the proposed development is provided below in terms of:

- HVAC Grid Connection
- Tail Station
- Converter Station
- HVDC Cable
- Landfall

3.2.1 HVAC Grid Connection

The HVAC grid connection will be made from the existing Great Island 220kV substation, to the proposed converter station, via the proposed 220kV Loughtown tail station. The proposed converter station, tail station and existing Great Island substation are adjacent to each other and the connection will be made by an underground 220kV cable.

The HVAC cable route will be approximately 420 metres long. The typical cross section of this AC cable configuration is shown in **Figure 2**.

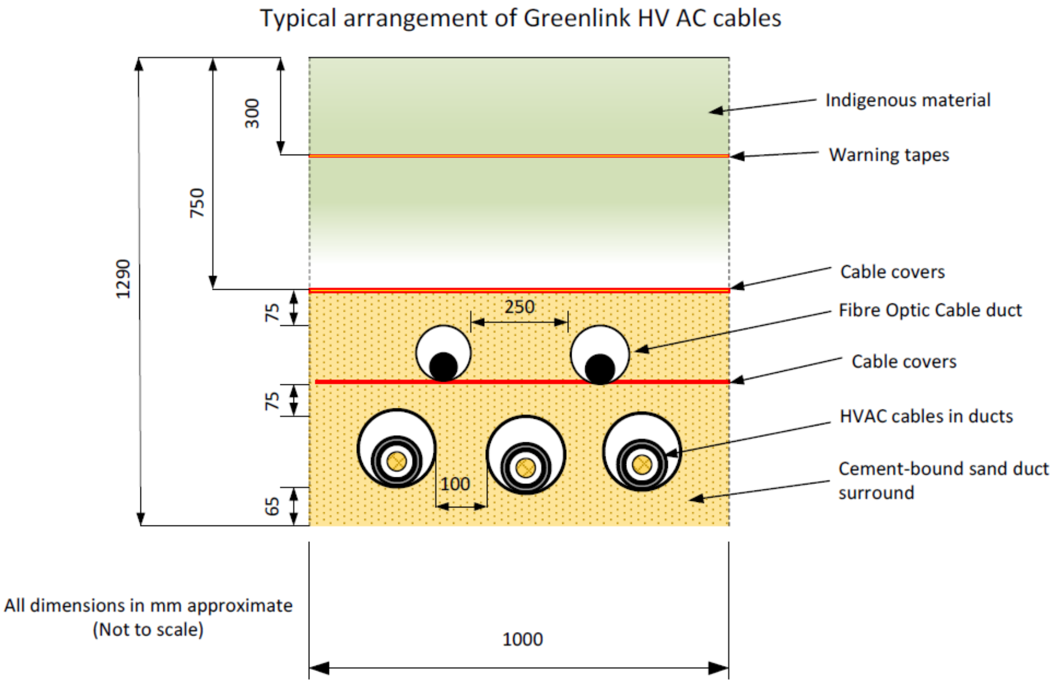


Figure 2 Typical HVAC Trench Cross-Section (source: WSP | not to scale)

3.2.2 Tail Station

The HVAC cables will connect the existing Great Island substation to a small new substation, located adjacent to the proposed converter station. This new substation will be referred to as the 'tail station'. The tail station as illustrated in **Figure 3** will have a footprint of 33m by 35m and the building will be approximately 11m in height. The levelled platform for the tail station will be at the same elevation as the converter station platform.

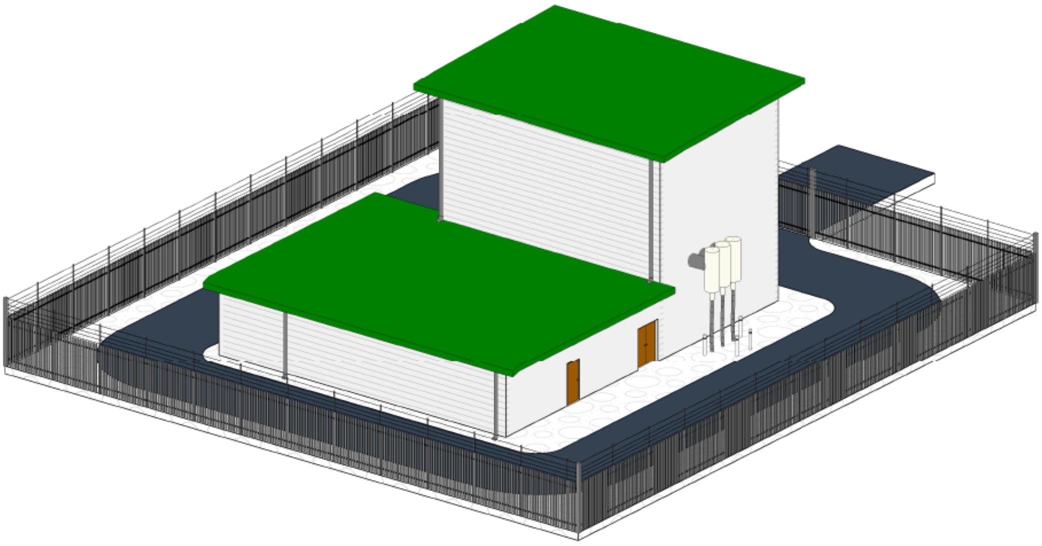


Figure 3 Tail Station 3-D View (source: WSP | not to scale)

Eirgrid will operate the tail station and it will operate continuously. It will be unmanned and operated remotely, with Eirgrid staff visiting infrequently to inspect equipment. There will also be an annual maintenance visit of several days' duration.

3.2.3 Converter Station

The converter station site is located to the east of the SSE Great Island Power Station site, in County Wexford, see Figure 1 for site location. The site is located to the north of the River Barrow Estuary and south of the disused Waterford to Rosslare Harbour railway line. The nearest village is Campile, approximately 3km to the east. New Ross is located circa 17km to the north. The site is accessed from local roads off the R733, which runs in a north-south direction, approximately 1km to the east of the site.

The converter station site is located within an area of pasture adjacent to the existing Great Island substation, within a single field. The site is of low ecological interest. The site will be re-graded to form a level platform, at an elevation of 23mOD, for the converter station and tail station footprint.

The converter station site footprint will be 1.85 hectares. This footprint will accommodate a 500MW nominal capacity station, for the conversion between HVAC and HVDC electrical currents. Within that footprint, two alternative converter station configurations are currently being considered by Greenlink Interconnector Ltd. The exact configuration will be chosen by the (one of two) contractor that will be awarded the design/build contract. The two converter station configurations and equipment will function in the same manner, and both will comply with strict guidelines when operating.

The alternative converter station configurations are illustrated in **Figure 4** and **5**.

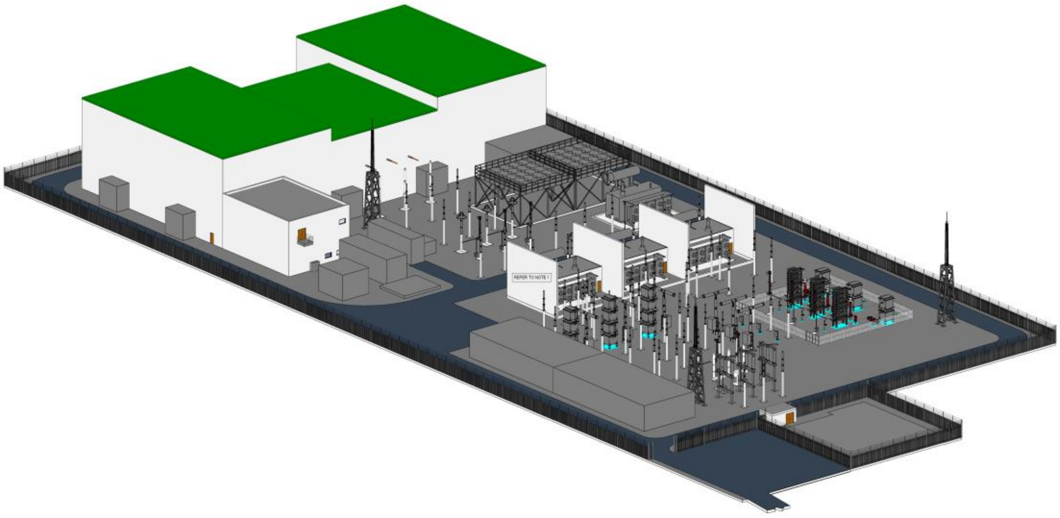


Figure 4 Converter Station Alternative Configuration 1 3-D View (source: WSP | not to scale)

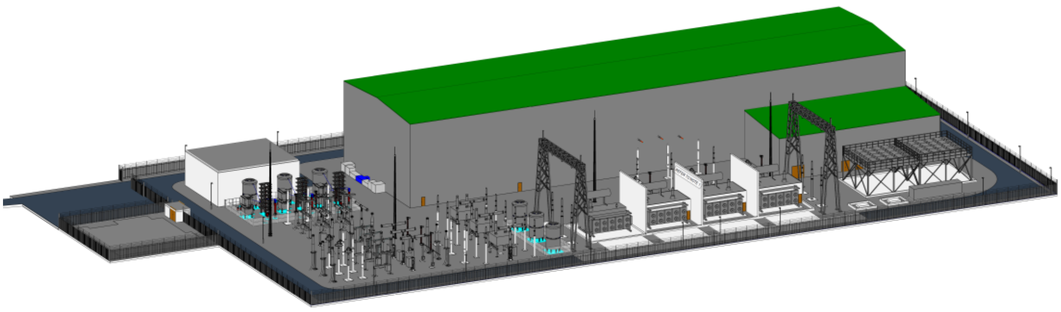


Figure 5 Converter Station Alternative Configuration 2 3-D View (source: WSP | not to scale)

The converter station will include various buildings, apparatus and equipment. These will include a converter hall, converter transformers, AC switchgear and busbars, harmonics filters, lighting towers, ancillary plant such as cooling bank and a diesel generator, and a control building. The tallest components will be the lighting towers at c. 26 metres high and the converter hall, which will be up to 21 metres high at its apex. The converter hall and main building will be one continuous building with roofs at different heights. Refer to **Figures 4** and **5**.

Within the large field that accommodates the converter station site and tail station, a comprehensive landscaping scheme will be implemented, incorporating significant earthworks, berming, planting of approximately 15,000 native mixed-woodland trees, and zones of grassland meadow.

Converter Hall

The proposed building will be a rectangular, shallow pitch (typically 4°-6°), single storey piled structure to provide a weatherproof enclosure over the electrical plant, instrumentation and switchgear. Internally, the building will be divided into the reactor hall, valve hall and DC hall. The DC hall will be separated from the valve hall by a fire rated, light weight, stud partition wall. Due to the building functionality and electrical clearance requirement, internal columns will be minimised. Furthermore, in addition to standard live and dead load on the roof, the roof structure may include beams capable of lifting at least 10 tonnes of equipment and these beams can be integrated into the roof truss structure. To aid installation and removal of large equipment, lifting beams will be supported from the roof structure at appropriate positions.

The lateral stability of the structure in both directions will be provided by horizontal wind girders located at roof level. The wind girders will connect into vertical braced bays of the building, transferring wind loads down to the foundations. Roof cladding will be standing seam roof cladding on cold formed purlins supported from primary roof beams which will be a suitable system for the shallow pitch roof construction adopted.

Wall cladding will be an appropriate composite wall cladding on cold formed rails supported form primary steel columns. The cladding design will give the appearance of an 'ordinary' industrial building. The ground floor will be designed as suspended in-situ concrete piled raft to suit the design loading and usage requirement.

Control Building

The control building comprises a single storey piled structure (approximately 740 square metres for Alternative 1 or approximately 280 square metres for Alternative 2) with a cable basement and a lightweight roof with no permanent access/access for maintenance only. Each floor will be divided by lightweight but durable metal stud partition to provide dedicated spaces for batteries, panels, etc.

The control building and converter halls will have a common superstructure and substructure due to their very close proximity.

The stability of the structure will be provided in both directions by horizontal wind girders located at roof level with the floors acting as diaphragm and braced down to foundation level to reduce the horizontal deflections. The wind girders and floor plate connect into vertical braced bays in both directions of the building transferring the loads down to the foundations.

The below ground cable basement will be designed as a fully reinforced retaining wall with appropriate penetrations to suit LV cables and valve cooling pipes. The perimeter retaining wall will be designed for an appropriate surcharge loading, for the permanent design condition. The retaining wall will be designed and constructed as a water retaining structure on which the crack width will be limited to 0.2mm.

A composite roof cladding system suitable for 8° roof pitch on cold formed purlins supported from primary roof beams will be adopted.

Wall cladding will be of an appropriate composite on cold formed rails supported form primary steel columns.

The basement floor slab will be designed as a suspended in-situ concrete piled raft to suit design loading and usage requirement.

Spare Parts Building

The spare parts building will house the equipment that will be used to replace worn or faulty equipment (Alternative 1 has an area of approximately 360 square metres and a height of 8.4m, while Alternative 2 has an area of approximately 320 square metres and a height of 5.6m and a separate cable store of approximately 300 square metres and a height of 6.1m).. It will be a duo pitched piled portal frame structure to suit the project requirements.

A composite roof cladding system suitable for 8° roof pitch on cold formed purlins supported from primary roof beams will be adopted.

Wall cladding will be an appropriate composite on cold formed rails supported form primary steel columns. The cladding design will be developed in such a way to give the appearance of an industrial building.

The ground floor will be designed as suspended in-situ concrete piled raft to suit the design loading and usage requirement.

Transformer and Bunds

Transformers will be sited within a reinforced concrete bund which will be linked to an underground oil dump tank.

The location of the converter transformers on site will be in accordance with fire design and electrical clearance requirement. 9.0m high precast fire walls with 4 hours fire resistance will be provided, where appropriate, to provide adequate separation between adjacent transformers and electrical circuits.

Transformer bunds will be designed as waterproof structures in accordance with BS EN 1992-3. The bunds will be tested in accordance with standard bund testing requirements.

The height of all oil retaining area walls will be a minimum of 450mm above the finished substation ground level or the support plinth(s) of the associated contacting equipment, whichever is greater, to provide a physical barrier preventing possible vehicular contact with transformers.

Rainwater or other surface water shall permeate through a flame trap. Once permeated through the stone fire trap, the water will be collected in a common dump tank. It will then be pumped out of the dump tank via a bund water control pump to a manhole, before flowing by gravity to an oil separator prior to final discharge into the surface water drainage system.

The oily water system will incorporate penstocks to close off the system.

The hydrocarbon interceptor system will include a Class 1 full retention unit in accordance with BS EN 858-1, incorporating a coalescer automatic closure device and high oil level alarm. The separator shall be fully capable of isolating all upstream oil flow in the event that the high-level oil alarm is activated. The interceptor will be sized to suit the storm intensity flow rates from the transformer bunds and any other designated oil containment area.

The converter station will also include the following:

- Coolant storage (distilled water or glycol) in standby tanks located in the storage building
- Standby generator, c. 2000 kVA, self-contained with 2 days of fuel storage
- Site access road, to provide access and egress from the site, connecting to the existing Great Island Substation road, and site surfacing (other than the site access road) comprising clean, hard 30 mm natural gravel or crushed stone to a compacted thickness of 150 mm and lightly rolled;
- Services and utilities:
    - Potable water – new watermain connected to existing watermain outside site
    - Foul drainage - foul wastewater generated will be minimal (2 personnel stationed at the converter station). Foul wastewater will be collected from the welfare facilities in the converter station and tail station. It will be contained in the units and removed from site periodically, by a licensed service provider, to a local sewage treatment plant, which has adequate capacity.
    - Surface water - surface water from the proposed access road will connect to the existing Great Island sub-station road drainage. Surface water run-off from yard areas and the building roofs of the converter station and tail station, will discharge through proposed filter drains and surface water sewers, through a bypass interceptor, to a proposed attenuation pond, to be constructed in the south-eastern part of the site. The attenuation pond will provide c. 800 m^3 of storage. Discharges from the attenuation pond will be controlled to greenfield rates and will be to the existing stream in the southern part of the site.

- Telecoms and electrical supply – connections from existing utility services adjacent to the site. A new MV substation building of approximately 9.0m by 4.5m, and 3.0m in height, will be located outside the converter station and tail station perimeter fences, connecting the electrical supply to the converter station site and to the Loughtown tail station. All the MV and LV electrical connections on the site will be made by underground cable.

- Security fencing and lighting –
    - Two security fences, 2.4m and 3.4m in height, one inside the other (with approximately 0.3m separation), will be installed around the perimeter of the Converter Station with access through security gates.
    - Security lighting (normally switched off during hours of darkness)
- Surface water on site will be collected in a new surface water drainage system.

The converter station will operate on a 24/7 basis. There will be two personnel stationed at the converter station at all times, operating the interconnector. On an annual basis, the converter station will undergo maintenance work (typically four consecutive days per year) which will be on a shift pattern to allow 24-hour working.

The converter station and tail station will be decommissioned when Greenlink ceases operation. The design life of these assets will be 40 years. The current trend is to refurbish HVDC equipment at the end of its operational lifetime and extend the lifetime of the interconnector.

When it becomes appropriate to decommission the interconnector, each item of equipment in the converter station and tail station will be removed for appropriate management, based on the waste regulations at the time of decommissioning. All above ground structures within the proposed converter station and tail station footprint will be removed and the site will be returned to its previous state. It is not proposed to remove landscaping berms and planting. The attenuation pond will be filled in with some subsoil from the original site works, used to form the landscape berm, and then top-soiled.

3.2.4 HVDC Cable Route

The cable route between the converter station and the landfall site at Baginbun beach is approximately 23 kilometres long. The entire route will be located underground, approximately 1m below ground level. The onshore cables are routed along local roads, apart from the portions of the route closest to the landfall location, the converter station, and where it is necessary to divert the route off- road for engineering reasons.

For approximately the first 2.7 kilometres at Great Island / Campile, the cables will be laid off-road under agricultural lands also passing under a disused railway line along the route and the Kilmannock Stream/Newtown River. The preferred method to cross the stream is a HDD using a mini-rig. The non-preferred alternative is an open-cut methodology. For the open-cut method the watercourse will be temporarily dammed to allow for cable installation.

At the stream crossing, the cable trenching detail will not differ, however, a one metre separation between the protective measures and the bed of the watercourse will be maintained to account for any future erosion.

This section of the route also includes a trenchless (HDD) crossing of the Campile River Estuary, downstream of Dunbrody Bridge. The cables will be a minimum of ten metres below the river bed at this location.

From the trenchless crossing at the Campile Estuary, the cable is generally laid along rural roads, in a south-easterly direction, before turning northeast near Templetown towards the landfall at Baginbun beach.

Where the cable is laid outside the roadway, it is generally to negotiate difficult road bends. In agricultural land, a 30m working strip of land will be fenced-off for construction.

Along the cable route, there are a number of existing services that will be crossed, including telecoms, watermains and electrical services. The route of the cable is shown on **Figure 1**.

3.2.5 Onshore Cable Technology and Installation Techniques

The nominal HVDC voltage of the onshore cables will be +320 kV. The maximum continuous current will be 810A, while the maximum overload current will be 1,134A.

The HVAC cable will be 220kV rated. The maximum continuous current will be approximately 1,362A, while the maximum overload current will be approximately 1,907A.

HVDC Cables Typical Trench Detail

The two HVDC onshore cables will be buried underground in a single trench with a typical depth of cover of 850mm to 1000mm. The standard depth of burial for cables buried in agricultural land will be 1050 mm to the top of the cable ducts. The cables will be installed in plastic duct to simplify the construction process. It is usual for the two ducts to be positioned close together (approximately 300mm). A protective cover and warning tape are also buried along with marker posts at regular intervals at ground level, refer to **Figure 6**.

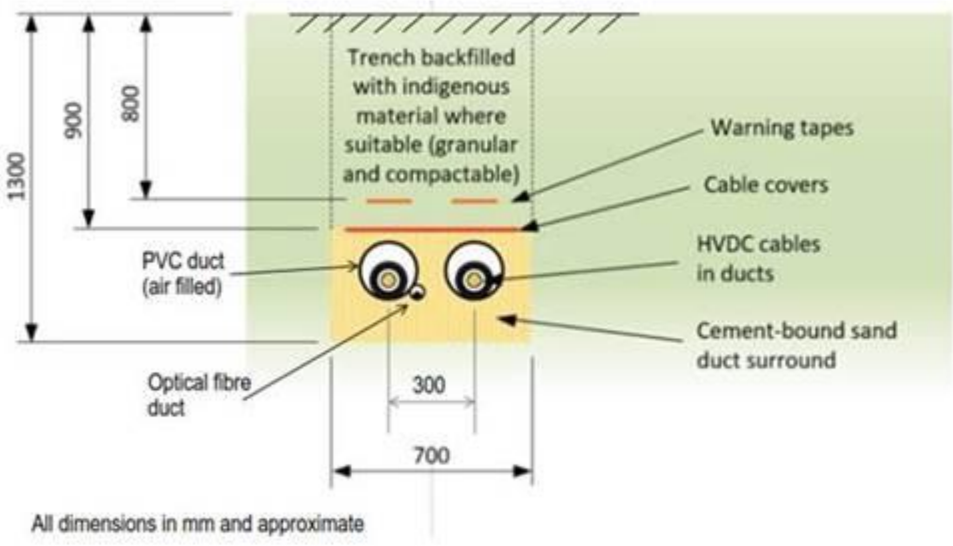


Figure 6 Typical HVDC Trench Cross-Section (source: WSP | not to scale)

Cables at Greater Depth

Where cables need to be buried at a greater depth (i.e. to avoid existing services or at a HDD), it will be necessary to increase the cable spacing to maintain the cable rating. The cable axial spacing at various depths is dependent upon the conductor size selected. A typical depth spacing curve for an 800 mm^2 aluminium conductor cable design is presented in **Figure 7**.

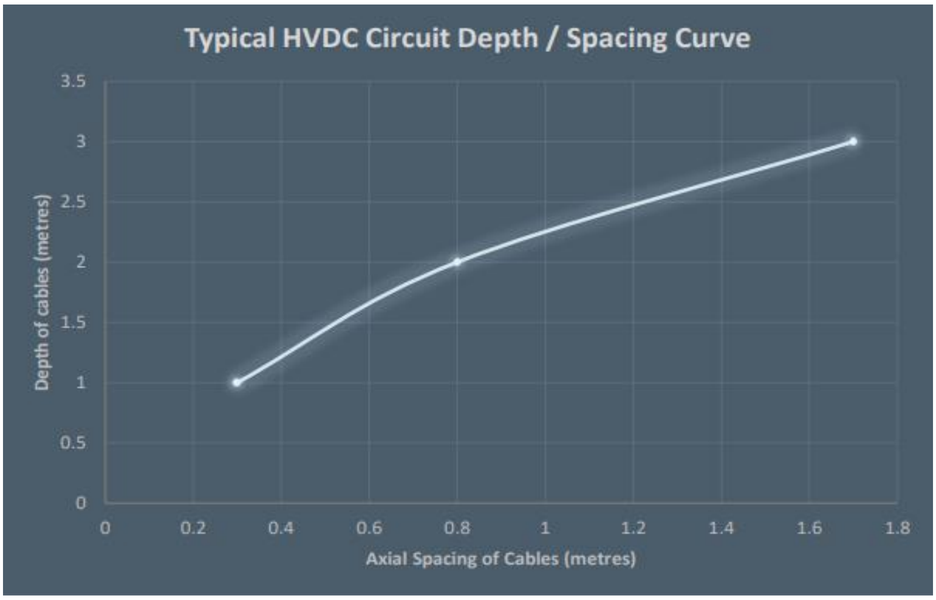


Figure 7: Typical HVDC Circuit Depth/Spacing Curve

Cable details

XLPE insulated cables will be used for both the HVDC and HVAC circuits. The cable ducts will be plastic (i.e. either PVC or PE). It is anticipated that the duct will have an internal diameter of approximately 200mm.

The protection measures required for the cables are listed below. Note that some of these protective measures may not be practical at some locations (e.g. HDDs under the Campile River Estuary).

- The cables will be installed in plastic cable ducts;
- Around the cable ducts there will be a thermally suitable compactable granular material such as cement-bound sand (CBS or weak concrete mix);
- Above the cable backfill there will be cable covers for the full trench width;
- Above the protective covers there will be a warning tape;
- At joint-bays a concrete slab will be positioned at the bottom of each joint-bay;
- At joint-bays, above the joints and the thermal backfill there will be protective covers fitted across the full joint-bay; and
- At crossings (such as road and service crossings) the cable ducts will be embedded in concrete.

Cable Surround Material

For onshore cables typical burial depths for HDDs will be in the range of 5 metres to 10 metres. When cables are installed at a greater depth it will be necessary to increase the cable spacing to maintain the rating of the cables. Typically, the axial spacing between ducts will be in the range of 5 metres to 10 metres. The depth of the HDD will be dependent on the ground profile and the cable spacing will be dependent upon the cable ratings. The maximum axial spacing between HDDs will be 10 metres. At this spacing, each cable can be regarded as thermally independent.

For onshore cables the expected outer diameter of the HDD will be in the range of 200mm to 250mm.

For virtually the complete route the duct surround will be a granular well-compacted thermally suitable material (e.g. cement bound sand) up to the protective covers. This material will have the required thermal properties (i.e. a thermal resistivity of 1.2 Km/W) and ensure that no drying out of the indigenous soil occurs within the 50°C isotherm. For HDD locations it is not possible to have a special backfill around the cables and therefore the ducts will be installed at a greater spacing to improve heat dissipation and ensure no drying out of the indigenous soil occurs.

The trench back-fill above the protective covers will also be well compactable and thermally suitable. Most types of soil will be thermally suitable. However, ground types and material that will not be thermally suitable are as follows:

- Fuel ash;

- Made ground and rubble; and
- Peat.

The cable route will avoid areas that contain the materials listed above. The suitability of a cable route will be confirmed by trial holes, and it is considered there is sufficient scope for micro-routeing of the cables, within the permanent wayleave and red line boundary, to achieve a route through suitable material.

Marker Posts

Marker posts will be put in place at the following locations:

- Along railways or at railway crossings.
- At road crossings.
- Across agricultural land
- At joint locations.
- At change of direction of the cable route.

Joint Bays

Typically, up to 1.8km of HVDC cable can be carried on a single reel. This results in at least one jointing bay being required every 1.8km of a cable installation and often more to reflect the complexity of the final cable route. A jointing bay provides a temporary safe and clean environment for an engineer to work in while connecting two cable ends during the installation process. A jointing bay can take many forms from a small tent to a shipping container. The form a jointing bay takes will depend on the amount of space available to work in, ground conditions and the type of joint being made. Once the joint has been made the cable will be buried in the same manner as the rest of the underground cable.

Typical joint-bay dimensions for one 320 kV HVDC circuit are shown in Error! Reference source not found.**Figure 8.**

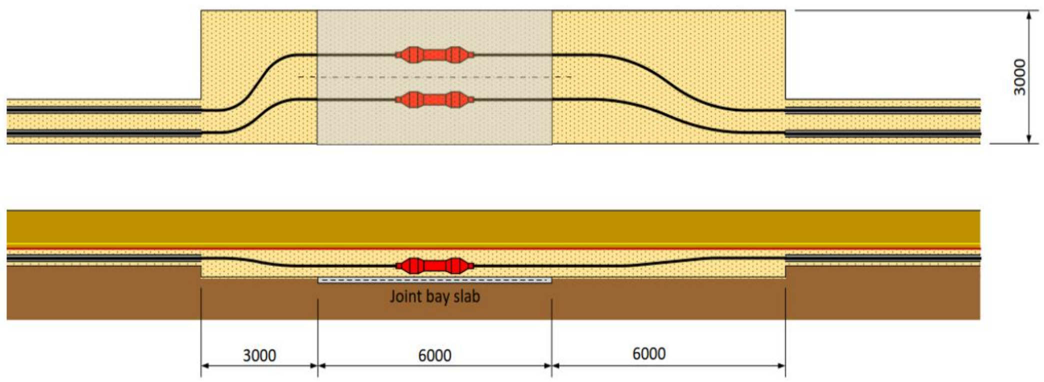


Figure 8: **Typical Joint-Bay Dimensions** [source: WSP | not to scale]

Adequate room will be provided in front and behind each joint-bay location to accommodate cable drums and pulling equipment. Error! Reference source not found.**Figure 9** shows a cable drum at a joint-bay location. Typical dimensions of the cable drum would be 4.5m high and 3m wide with a mass of 20 to 30 tonnes.

Figure 9: Cable Drum at Joint-bay location

The arrangements shown in **Figure 9**, where the cable is being pulled directly from the low loader, will be used, and with this arrangement will minimise the space required at each joint-bay location because no additional space would be required to off-load from the low loader and to manoeuvre the cable drum on to drum stands. The basic requirements for joint-bays locations along a road are as follows:

- Positioned on a straight section of road;
- Does not restrict access to properties;
- Adequate road width to accommodate the joint-bay width and have a minimum safety gap of 1.5m between traffic flow and the edge of any excavation (i.e. 3m + 1.5m = 4.5m);
- Adequate road width to limit road closures;
- Suitable road width to allow cable pulling;
- Adequate space along the road for parking, welfare facilities, generator etc.; and
- Adequate space for locating and accessing link-pillar (only at certain joint-bays).

Additional requirements for locating joint-bays for the proposed development are as follows:

- Joint-bays will be kept away from access points e.g. driveways, entrances etc.;

- Adequate room will be provided in front of and behind each joint-bay location to accommodate cable drums and pulling equipment (i.e. winches);
- Ground conditions at joint-bay locations will be proven by trial trenches;
- The selection of joint-bays will take account of the maximum calculated pulling forces and tensions;
- Joint-bay positions will avoid unnecessary road closures and traffic management;
- Associated communication chambers and link boxes will be installed off the carriageway where possible;
- Space will be allowed for parking cars, welfare facilities, generator, fuel etc. This required space will be located adjacent to the joint-bay area or short distance from the joint-bay; and
- For joint-bays located in road-ways a clearance of at least 1.5 m will be allowed for between the edge of the excavation and an active lane with traffic, for safety and to protect the excavation from surcharges.

Link Boxes

Link boxes will be located along the route at approximately 5km intervals. They will be located in a pit close to the joint-bay (typically less than 10m). There will be bonding leads (i.e. lower voltage cables) running from the link-boxes to the joints. **Figure 10** illustrates a typical link boxes. They will need to be accessed occasionally (i.e. approximately every 2 years) to allow the outer PE layer of the cable to be tested for integrity.

Figure 10: Link box (typical dimensions: 1m long x 0.8m wide x 0.5m deep)

3.2.6 Landfall

The landfall site is located directly adjacent to Baginbun Beach. The site, which is a large field, marks the point where the onshore cables will be connected, via HDD, to the offshore cables. The offshore cables will be to a specification which will be different from the cables to be used onshore. In a field inland from the beach, a horizontal directional drill (HDD) will be made, connecting to the offshore element of the project at a point below the low-tide mark on the seabed.

The land cables will be connected to the marine cables in a Transition Jointing Bay (TJB) buried in the ground in the field inland from Baginbun Beach and a line of low cliffs. The TJB at the sea-land interface will contain the following:

- 2 no. armour clamps (fixed to a concrete block);
- 2 no. HVDC cables joints;
- Concrete plinth;
- A fibre joint;
- A link-box or link-pillar; and

There will be an earthing strip around the periphery of the joint-bay.

Typical burial depths for HDDs will be in the range of 5m - 10 m. When cables are installed at a greater depth then to maintain the rating of the cables it will be necessary to increase the cable spacing. Typically, the axial spacing between ducts will be in the range of 5m – 10m. The depth of the HDD will be dependent on the ground profile and the cable spacing will be dependent upon the cable ratings. The expected outer diameter of the HDD at the sea/land interface will be in the range of 350mm to 450mm.

3.2.6 Maintenance and Decommissioning of Cables

Maintenance of the cables will comprise an inspection inside the link boxes, which will be located at every 5th jointing bay, every two years.

The HVDC, HVAC and fibre optic cables will be decommissioned when Greenlink ceases operation, at the same time as decommissioning of the converter station and tail station. The current trend is to refurbish HVDC equipment at the end of its operational lifetime and extend the lifetime of the interconnector.

When it becomes appropriate to decommission the interconnector, the HVDC and HVAC cables will remain in-situ as there would be more environmental impact in removing the cables than can be justified by the recycle value of cable material. However, the link boxes and fibre optic joints will be removed, and their locations reinstated.

3.2.7 Land Use Requirements

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. Small areas of additional land will be required where the cable route goes off-road

3.3 Overview of Works

3.3.1 Duration and Phasing

A large infrastructure project such as Greenlink takes several years from concept to construction, including technical design, obtaining the relevant permits and consultation with a variety of stakeholders.

Subject to obtaining planning approval and the relevant permits and licences, on-site construction of the proposed development will commence in 2021. Greenlink is expected to be fully operational in 2023. Whilst the general requirements detailed in this section will be followed, the Contractor, when appointed, will ultimately be responsible for the sequencing and implementation of the works in a safe and secure manner and in accordance with all statutory requirements.

The timeline in **Table 1** sets out the outline programme for the construction of the converter station and tail station. Construction will commence in 2021.

Table 1 : Outline Construction Programme – Converter Station Site

Activity	Timing
System design	0-6 months
Detailed design and equipment procurement	0-15 months
Manufacturing (converter equipment)	15-27 months
Early works (ground work and access)	14-20 months
Civil work	21-30 months
Installation	27-32 months
Commissioning	32-37 months
Trial operation	37-40 months

For the onshore cable route, the cable will be installed on a rolling basis. It is expected that progress rates for the trench excavation and installation of ducts will be up to:

- 200 metres per day in farm land and with full road closure,
- 120m/day on road with single lane closure
- 70m/day on road maintaining two-way traffic.

These rates may be exceeded under favourable conditions and if very few obstructions are encountered.

The expected programme for each cable section (of up to 1km) is presented in **Table 2**.

Table 2: Outline Construction Programme – Onshore Cable Route (per cable section of up to 1km)

Excavation/Ducting	2-3 weeks Or, a typical HDD crossing requires 4-6 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 1km cable section of trench. Or, at least 10 weeks if there is an HDD within the section.

The HDD at the Campile River Estuary is currently scheduled to take circa 25 days and is planned to be undertaken between March and May 2022. The landfall HDD at Baginbun Beach is currently scheduled to take a total of 3 months and is planned to be undertaken between January and March 2022.

3.3.2 Employment

Greenlink is anticipated to provided employment to 250 people in Ireland during the construction phase. A breakdown of the number of workers on site during the construction phase is presented in **Table 3**.

Table 3: Estimate of workforce required for the installation of each of the three sections of the onshore cable

Project stage	Estimate no. of people	Comments
Initial stage	Approx. 10	Typically, project manager, environmental manager, SHEQ manager, project engineers, planner, CAD resources, admin.
Civil construction	30-40	Site supervision increases, the civil contractor joins the project with their project manager, supervisors and installation crew.
Cable installation and jointing	40-50	Cable jointing supervisors and jointers increase the team numbers.
Testing and commissioning	Approx. 25	Some sub-contractors and most cable jointing staff leave site. Cable test managers arrive.
Final commissioning and reinstatement	Approx. 20	Staff dealing with all the final document, snagging issues and reinstatement of hedgerows etc.

Up to 190 will be employed on site on the construction of the converter station and tail station. Circa 10 will be employed on the landfall HDD construction and the Campile River Estuary HDD.

3.3.3 Working Hours

The timing of construction activities, core working hours and the rate of progress of construction works are a balance between efficiency of construction and minimising nuisance and significant effects.

The core construction working hours for the proposed development will be:

- 7am – 7pm: Monday to Friday; and
- 8am – 2pm: Saturday.

The hours above correspond to the current construction programme.

Underground activities (i.e. tunnelling works to lay cables) will occur 24-hours a day, 7-days a week for the duration of the contract. Daytime noise limits will be set for 7am to 7pm, and lower permissible noise levels are stipulated outside these hours.

All rock breaking/fracturing activities will be undertaken during daytime hours. The removal of waste material off site by road and regular deliveries to site would be generally confined to daytime hours but outside of peak traffic hours (i.e. 10am to 4pm).

It may be necessary in exceptional circumstances to undertake certain activities outside of the core construction working hours. Any construction outside of the core construction working hours will be agreed in advance with Wexford County Council and scheduling of such works will have regard to nearby sensitive receptors.

3.3.4 Site Access

Dedicated construction access to the site will be required at each of the construction compounds. All accesses will be temporary and used solely during the construction period.

All site access routes will be connected to the existing local road network. Minor road works may occur such as removal of existing kerbs, paving and a small amount of excavation prior to replacement of paving and realigned kerbs.

3.3.5 Construction Compounds

Cable Contractor Compounds

Three construction compounds/lay down areas for the cable contractors will be required. There will be one at each end of the route (i.e. at the proposed converter station site and at the landfall site close to Baginbun Beach) and one will be located in the townland of Lewistown, close to Dollar Bay.

The cable construction compounds/lay down areas will provide the following:

- Space for materials lay down;
- Road access;
- Securely fenced site;
- Space for parking;
- Wheel wash, all water from the wheel wash will be collected, contained on-site, and dispatched for off-site disposal at an appropriately permitted facility;
- Construction waste storage;
- Bunded area (110%) for storage of oils and fuels;
- Site Offices;
- Electricity supplied by mains at the three compounds;
- IT/telecommunication connection;
- Water supplied from the watermain at the Great Island compound, water supplied by a bowser at for Baginbun and Lewistown; and
- Welfare facilities at the three sites, with foul sewage disposed of by removal off-site.

The construction compounds/lay down areas will be used for the external storage of plant, ducts, protective tiles, warning tapes, duct surround materials etc.

Most deliveries will be made to the lay down areas, within the compounds, during normal working hours. The HVDC and HVAC cables and accessories will be held in the three cable compounds and will be delivered to the cable installation site on the day of the cable pull.

After the construction is completed, all structures and facilities will be removed, and the cable construction compounds/lay down areas will be reinstated to their original condition.

HDD Contractor Compounds

There will be a compound for the HDD contractor adjacent to Baginbun Beach and another at either end of the Campile River Estuary crossing. Only one of the Campile HDD compounds will be required, but which one it will be, is not known at this stage, such that both are assessed herein. The HDD construction contractor will decide which compound location suits its construction strategy.

The HDD compounds will provide the following:

- Space for materials and equipment lay down;
- Space for two HDD rigs aligned with the cable;
- Road access;
- Securely fenced site;
- Space for parking;
- Wheel wash, all water from the wheel wash will be collected, contained on-site, and dispatched off-site for disposal at an appropriately permitted facility;

- Construction waste storage;
- Bunded area (110%) for the storage of fuels/oils;
- Site Offices;
- Electricity supplied by a generator;
- IT/telecommunication connection;
- Water supplied by a bowser; and
- Welfare facilities, with foul sewage disposed of by removal off-site.

Converter Station Construction Compound

A cable contractor compound, main contractor compound and main contractor plant and equipment laydown area will be put in place within the existing boundary of the Great Island substation. These areas will impact on low value recolonising bare ground and low value scrub habitat. A HVAC cable route, within the existing Great Island substation site and will impact on a small area of planted, immature deciduous trees of low ecological value.

The converter station contractor's compound will be established to the north of the existing Great Island 220kV substation, to the west of the proposed converter station site at Great Island. The compound will provide facilities and lay down areas for the construction of the converter station and tail station. It will have similar facilities but will be on a larger scale than the cable contractor's compound.

3.3.6 Typical Construction Methods

Enabling works, which will be undertaken at the HDD compounds and Lewistown and Baginbun cable compounds, and which are typical for a development of this type, will be as follows:

- Establish a construction traffic management plan for each working area;
- Establish and implement a surface water management plan;
- Construct temporary site access from the existing road network;
- Install secure hoarding and/or fencing (2.4m in height as a minimum) around each of the compounds that would remain in-situ for the duration of the construction works;
- Remove vegetation and strip and store topsoil;
- Create a reasonably level platform using crushed stone;
- Install vehicle set down and material storage areas;
- Install the site offices and welfare facilities.
- Undertake all required utility services connections and diversions.

Advantage will be taken of the fact that the Great Island construction compounds were used previously to support construction projects. Enabling works at these compounds will be similar to the above in addition to the following:

- Reinstate the surface water management plan

- Reinstate fencing (2.4 metres in height as a minimum) around each of the compounds that will remain in-situ for the duration of the construction works;
- Minor works to existing crushed stone platform.

3.3.7 Construction Phase of the Proposed Converter Station Site

Construction compounds, which will include welfare facilities, vehicle parking, site offices, equipment storage, local power and water supplies and spoil/waste containment will be set up at this stage.

The construction compounds are likely to have a total footprint of approximately 100m x 100m. All vegetation will be removed in these areas and some earthworks may be required to create a level platform, which will be covered with up to 400 mm of crushed stone. This area will be in use for the duration of the construction and commissioning stages. Following the commissioning of the interconnector, the ground will be restored to its original condition.

An outline construction methodology for the construction of the access road, converter station and associated construction compound is presented **Table 4** below.

Table 4: Construction Methodology for access road, converter station and associated construction compound

Permanent Access Road and Converter Station Construction Compound	
Temporary drainage including silt busting/ interception	• Measures will be provided to ensure only clean water is discharged from site i.e. de-silting and temporary oil interceptor. These will be subject to daily inspection to ensure they remain adequate and effective. The discharge will be to the same watercourse as the permanent drainage.
Permanent Drainage: attenuation pond, outfall	• The proposed attenuation pond will be formed by excavating material from the existing embankment to the south of the converter station platform • The excavation will be carried out using a 35 tonne 360 degree tracked excavator, to a depth of approximately 2m. • The base of the excavation will be formed and proof rolled by small plant machinery. • A HDPE liner and protective geotextile will be included in the pond build up. • The precast concrete inlet and outlet headwalls and associated pipework will be positioned into place and the pond excavation landscaped prior to commissioning.

Carrier Drains, filter drains, manholes including penstock chambers.	• Ground Support will be by trench sheets/trench boxes/manhole boxes. • Excavation will be by a 360° tracked excavator, sized to suit the drainage being carried out, typically 13 to 25 tonnes. • An excavator will be used to place pipes. • Safe access into excavations will be maintained.
Storm water drainage, road gullies	• Below ground drainage will be installed prior to erection of the building superstructure/roof drainage. Final connection will be made when down pipes are installed to ensure accurate positioning. • Road gullies and connections to carriers will be installed during road construction, prior to trimming sub base, and surfacing. Gullies will be finished once the binder course has been installed.
Installation of earthing grid	• The earthing grid will be progressed in conjunction with drainage/ ducts/ troughs and foundations to ensure it is progressed safely and efficiently. As far as possible open excavations will be avoided and will be backfilled the same day. Any open excavations will be barriered. • Ground will be tested for resistivity and pH levels to ensure the grid works efficiently. • Joints and connections will be carefully recorded. • A small tracked excavator will be used.
Duct and trough Installation	• A small tracked excavator will be used. • The sequence of installation will be carefully planned with the drainage and foundations installation to ensure that it can be carried out safely and efficiently. • Ducts and chambers will be installed in shallow excavations. As far as possible open excavations will be avoided and will be backfilled the same day. Any open excavations will be barriered. • Excavations for cable troughs will be benched to avoid the need for additional ground support. Base of excavation will be prepared to design detail, typically mass concrete. Precast concrete trough units will be placed using mechanical lifting – using a small tracked excavator (lift plan required). Excavations will be backfilled as soon as possible. Precast covers will be placed progressively to avoid fall hazard of open

	troughs. Whenever covers are removed or omitted, edge protection/barriers will be provided.
Converter Station Drainage, temporary drainage, interceptors, ducts, troughs, earthing grid	
Service Protection and Access	• Mobile welfare – either mobile welfare vans, towed units, or self-contained units will be used until facilities in the construction compound have been established. • Initial works will be carried under temporary traffic management (lane closure under traffic signal control). • Any area to be excavated will be subject to utilities searches, GPR (ground penetrating radar) survey and CAT (cable avoidance tool) scanning. • Services – if any, subject to utilities searches and investigation during design, will be exposed using intrinsically safe excavation methods i.e. vacuum excavation. Protection methods (subject to design and agreement with service owner, such as steel plating, concrete slab etc.) will be installed. • A 25 tonne 360° tracked excavator, with nine tonne forward tipping dumpers, and ride-on twin rollers will typically be used for earthworks. Similar plant will be used for compound construction and construction of the temporary access road. • Topsoil and arisings will be segregated. The design intent is that all material will be reused on-site. • Segregated walking routes will be established and maintained. • Permanent signage will be installed, prior to the removal of temporary traffic management. • Permanent access gates will be installed to ensure access control. • Vehicle movements on site will be controlled by a Plant and Vehicle Marshal(s) (PVM).
Establishment of the converter station construction compound	• Perimeter fencing will be installed; segregated pedestrian access routes will be established and maintained. • Security will be maintained by a combination of: the gate being permanently staffed during working hours; random out of hours security patrols; remotely monitored “smart” security.

	• Topsoil and subsoils will be stripped, separated and stockpiled for future reinstatement. All stockpiles will be covered and surrounded with silt fencing • Construct stone blanket with geotextile for site compound suitable for access, plus crane/telehandler loadings. • Footings will be constructed for temporary accommodation. • Secure bunded areas will be constructed for fuel storage and chemicals, and generators. • Permanent connections for site services (electricity, water, telecoms) to mains will be established. • Welfare facilities with holding tank, which will be emptied by disposal off-site. • Temporary cabins will be placed using a loader crane or mobile crane. • Asphalt surfacing to the car park area will be placed. The equipment required for this includes an asphalt paving machine, ride-on rollers, floor saw and planers. • Surfacing to the site entrance and first 50 metres of road. • Complete signage, fencing, compound lighting, and services to cabins.
Temporary Road Construction *To provide initial access along the route of the permanent access, a temporary road will first be constructed.*	• Topsoil and subsoil will be stripped, plus excavation of soft spots. Soils will be separated and stockpiled. All stockpiles will be covered and surrounded by silt fencing. • Capping and geotextile reinforced sub base layers will be placed and compacted. • All plant movements will be controlled by a qualified PVM; works will be zoned by barriers ensuring segregation. • Temporary Signage will be installed at intervals (speed limits, passing places, overhead services, etc). GS6 “goal posts” will be provided where overhead services cross the route.
Permanent Road Construction	• The top surface of the temporary road will be graded off, and excess material will be retained as general fill material.

	• The sub-base layers will be topped up and trimmed. • Road drainage will be installed • The kerb raft will be constructed with in situ concrete, and precast concrete (PCC) kerbs and place backing will be installed. Mechanical lifting will be used to lift and place the PCC kerbs. • Verge fill will be placed behind kerbs, with the batters trimmed and shaped. • Surfacing to roads will be placed: the construction will be base/binder/surface course to a total depth of between 200 and 300mm. The surface course will be omitted at this stage. The equipment used will include an asphalt paving machine, ride-on rollers, floor saw, and planers.
Finishing	• Lines, and permanent signage will be installed. • The surface course will be placed prior to handover, when use of the road for site construction traffic has finished.
Ground Improvements to Convertor Station Site, Haul Roads, Piling	
Haul roads and access routes	• Suitably graded imported stone will be delivered to site and stockpiled until required for haul roads and access routes. • The converter station site will be excavated in a cut and fill manner to eliminate the requirement for bulk removal of excavated material from site. • Topsoil will be removed and stockpiled in site to be reused during the landscaping phase. All stockpiles will be covered and surrounded by silt fencing. Stone will be placed using a dozer or excavator. • Rock will be excavated, ripped or broken out as required, to achieve the required levels. Blasting may be required. The noise levels associated with blasting (if it is deemed necessary) will not exceed those predicted for rock-breaking. • Where required, the stone blanket will be reinforced with geotextile materials. • Access roads will be designed and installed to ensure that water is dispersed into drainage channels. • Segregated pedestrian routes will be provided.

Installation of precast piling	• Precast piling will be installed. The precast piles will only penetrate as far as the weathered top of the bedrock, not into the intact rock. • Piles will be delivered to site on articulated trucks and offloaded using the piling rig or a mobile crane and stored as required. • Piles will be installed using a piling rig. • It is expected that there will be up to three piling rigs operating simultaneously during the scheme. • To minimise the general effect of noise, the piling rigs, where practical, will be situated with the rear of the rig located to minimise and shield off-site locations from the noise sources. Timber packers will be used between the pile and the hammer to reduce the noise level.
Converter Station Site Perimeter	
Establish perimeter fence	• Earthworks to the footprint of the convertor site will be completed within a perimeter secured by temporary fencing – 'heras' type or similar. Permanent fencing will be installed following completion of earthworks.
Establish permanent and temporary roads and walking routes.	• Permanent roads, temporary roads and pedestrian access routes will be established within the site perimeter, ensuring ongoing safe and efficient access. Temporary routes will be reviewed regularly as construction progresses and changed and developed as required. Temporary safety and information signage will be provided. Pedestrian routes and designated crossing points will be well marked. Permanent road construction will be built up to and including asphaltic layers, but surface course will be omitted until completion of site construction vehicles and plant. The equipment required will include an asphalt paving machine, ride-on rollers, floor saw, and planers.
Converter Station and Tail Station Reinforced concrete foundations and slabs	
	• The equipment to be used will include a tracked excavator, mobile crane/crawler crane/tower crane/pedestrian tower crane, and concrete pumps.

Excavation, blinding, pile trimming	• All excavations will be barriered and fenced. • Excavations will be by appropriately sized excavator – typically 20 or 25 tonnes for larger structures, and 13 tonnes for smaller structures. Excavations will be benched or battered, and temporary stairs will be provided for safe access into excavations. Formation will not be left open in poor weather: blinding will be placed as the excavation progresses over several days, or a protective surcharge will be left for final trim. • Blinding will be placed using a machine bucket, or crane and skip, or by concrete pump. • Hydraulic crushers/mounted excavators will be used to break down piles, final trim using hand held breakers.
Deep structures: foundations, Control Building basement	• The sheet piled ground support system will be installed. • The foundation will be excavated from outside the footprint. • The Control Building basement will be excavated from inside the footprint, leaving an earth ramp for access, which will be removed as the excavation is completed.
Steel Fixing	• Where possible cages will be prefabricated. • Where fixed in situ, reinforcement will be craned onto the blinding. • Reinforcement will be fixed progressively across the blinding, using tying wire and hand tools. Strips of rubber matting will be placed to provide safe access to reduce trip hazard on reinforcement mats. Protection will be provided to starter bars and any projecting steel.
Shuttering and preparation for pour	• Prior to erection, panels will be inspected to ensure they are clean and free from damage. Shutter oil will be applied. • Panels will be placed using mechanical lift assistance. Kickers and bolt hanging jigs etc. will be completed in timber and ply. • Cast in bolts and ducts will be installed during shutter erection.

	• Prior to placement of concrete, the pour will be checked, and debris will be blown out or removed by hand.
Placement, compaction, finishing and curing for concrete	• Concrete will be placed by crane and skip, or by concrete pump, working progressively across the pour in layers, to ensure the working front is kept "live". • Concrete will be compacted using portable vibrating poker units. • Unformed surfaces will be tamped off to the required level, before being floated to the required finish. Some slabs may require a power float finish. Curing will be achieved by polythene covers or by sprayed on curing membranes. Protection from rain or cold may be required in adverse weather.
Striking formwork, finishing works	• The sequence for striking will be planned, and temporary propping for stability will be provided. • Formwork will be stuck when the concrete is sufficiently cured and has gained sufficient strength. • On striking formwork, defects and tie holes will be made good, and any rubbing up/finishing will be carried out. Surface treatments (if any) to surfaces will be applied, and foundations will be backfilled as soon as possible.
Converter Station and tail station steel superstructure erection, wall cladding, roof installation, gutters and rainwater pipes	
Steel Erection	• Equipment to be used will include: 200 or 250 tonne crawler cranes, 120 or 160 tonne mobile cranes. Mobile Elevated Work Platform (MEWP) access. • The sequence of operations will be carefully planned, ensuring that the structures are built progressively to maintain access, and ensuring temporary stability. Temporary bracing may be required to ensure stability. • Large span roof trusses will be assembled at ground level in two parts, which will be connected by an "air splice" to avoid tandem lifts.
Wall Cladding and Roof installation	• Equipment to be used will include: mobile cranes. MEWP access, scissor lifts, scaffold and tower access, fall arrest netting.

	• The sequence of operations will be carefully planned to ensure the installation is progressed safely and efficiently.
Converter station and tail station fit out	
Floor screeds and finishes	• Floor Screeds and finishes will comprise a pumped floor screed and specialist concrete floor paints.
Internal walls and partitions	• Once the building envelope is water tight, internal walls will be constructed using a metal stud partition system. Plywood patresses will be installed where items are to be fixed to the walls. All walls will be painted. First and second fix joinery will be installed. • A specialist subcontractor will install fire stopping which will undergo a very stringent monitoring system.
Converter station and tail station finishes and surfacing	
Road Surfacing	• When site construction traffic is no longer a risk to finished surfaces, road surfacing will be completed. • Top surface of binder will be thoroughly cleaned, and tack coat will be applied to the binder layer, prior to placing the surface course by the surfacing contractor.
Lining and Signage	• Road markings will be applied as soon as possible after the surface course has been placed. Equipment to be used will include an asphalt paving machine, ride-on rollers, floor saw, and planers. • Permanent Road Signage will be installed.
Substation Surfacing “chippings”	• The sub-base will be placed as structures are completed and backfilled. • When areas are no longer subject to site traffic, the sub base will be trimmed and sub-station surfacing – chippings – will be placed and compacted.

3.3.8 Onshore Cable Construction

General details on the HVDC cable are discussed previously in **Section 3.2.4 and 3.2.5.**

Duct Installation in Roads, Footpaths and Verges

A section of route (road) approximately 300m long will be fenced-off at the start of a week, the road excavated, the cable ducts installed, and the trench backfilled with duct surround material (cement-bound sand or concrete, and compacted aggregate) each day. At the end of the week, the road base and wearing courses would then be reinstated over the completed trench.

Typical plant used will be:

- Road saw(s);
- Excavator, with hydraulic 'pecker' to break the road courses;
- 4-axle lorry, for removing excavated material; and
- Dumper(s), to take the excavated material to the 4-axle lorry, if it is not possible to locate the lorry at the end of the trench, and to deliver trench backfill materials.

A mobile welfare unit will be located nearby.

In general, because the full-depth trench will only be open for less than 24 hours, and the ground is well-compacted, internal supports will not be required.

Where possible, the construction easements will consist of the trench, safe clearance on either side, and a 3m corridor for the lorry and dumpers.

The spoil from the road courses will be disposed of, if it is not suitable for reuse. Likewise, the material excavated from the trench, which will be replaced by the ducts and surrounds will be removed. It may be possible to reinstate some of the crushed stone aggregate material that will be excavated from the trench, provided it is suitable.

Installation of Ducts

Ducts are usually delivered to site in 6m sections. The ducts can be forced into bends, typically of 10m diameter, after they have been connected, but care will be taken to ensure that local over-bending does not occur at the connections. Pre-formed bends are available, at 3900mm radius for ducts of diameters suitable for this development, and bends at other radii may also be custom-made, if required.

Due to the way push-fit ducts are connected, with a considerable length of interference (i.e. the 'male' part is inserted at approximately 175mm) the ducts will be installed in a continuous process. Trying to insert ducts in gaps in the route e.g. at road crossings, requires a considerable length of duct to be lifted in order to provide the spare length to accommodate the interference, and there is a risk of disturbing good duct connections at either side of the gap.

For this reason, it is essential that the whole of each cable section is available and accessible before duct installation commences, and that one crew works from one end to the other. Multiple crews working on the same section is not practicable and will not be carried out.

The push-fit joints are designed to present minimum interference to the cable when pulled in one direction through the joint, from the 'male' end of one duct into the 'female' part of the next duct. Therefore, the installation of the cables will be planned before the ducts are installed, to ensure that the orientation suits the proposed pulls.

Cables can be pulled in the opposite direction, but additional scuffing of the cable oversheath, and increased pulling tensions, should be expected.

A rope, usually a 6mm or 12mm nylon rope, will be left in each section of duct to enable cleaning equipment and the pulling bond to be pulled into the duct.

Duct Proving after Completion of Cable Section

The ducts will be installed in such a manner that the cables can be pulled into them without serious damage. Some scuffing of the oversheath is to be expected during any cable installation. The purpose of this part of the cable is to provide mechanical protection to the metallic sheath and the cable core.

A small excavation, typically 2m^2, will be left open at each end of a cable section, i.e. at joint bay locations.

The ducts will be cleaned of any debris and water by a series of brushes and rubber discs, usually pulled trough as a ‘train’.

The pulling tension will be recorded for two reasons:

1. Validating assumptions regarding coefficients of friction between the bond wire and the unlubricated duct; and
2. Increases in pulling tension, compared with calculated values, can indicate local obstructions, ovality (caused by ducts being crushed during installation) or deviations from the designed route.

As the ducts will be proved immediately after installation, to allow time for any remedial works, it must be assumed that the excavation of the joint bays and the installation of the cables will not happen immediately afterwards. The pits will therefore be re-instated.

A schematic arrangement of the construction activities, within the working width, required for the portions of the cable route which traverse farmland is presented in **Figure 11**.

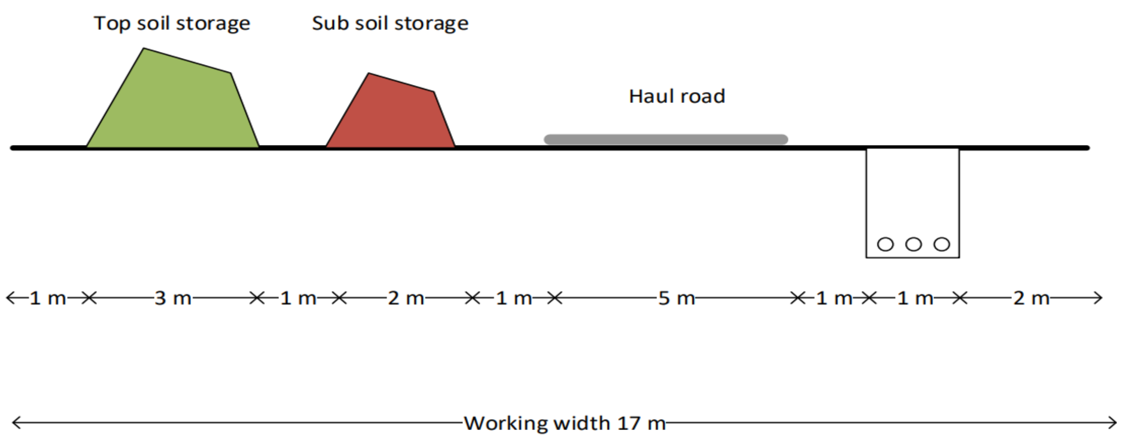


Figure 11: Working Corridor for AC Cables

Duct Installation via HDD

A typical space for a HDD set-up is up to 50m x 50m, providing room for the drilling rig, bentonite pumping plant and drill sections (refer to **Figure 12**).

Figure 12: Typical HDD Drill Rig

The drilling of the pilot bore may be performed by a specialist sub-contractor, working for the HDD contractor, using wire-guiding techniques to set the profile of the crossing. The space required for the drilling exits is small, as the HDD drill can be guided to within 0.5m. an area of 10m x 10m will be adequate. The bore will then be reamed to the required diameter.

The ducts are welded together and laid in a single length at one end of the crossing, to be pulled in a continuous process. Once commenced, the HDD activity may operate continuously over a 24-hour period until each bore is complete. The HDD may require a drilling fluid to cool and lubricate the drill head. Typically, bentonite is used, which comprises 95% water and 5% bentonite clay which is a non-toxic, natural substance. The bentonite effectively seals the bore maintaining a closed system throughout the drill. The bentonite drilling fluid is circulated down through the drill rods and back up the outside the rods in the annulus of the borehole.

Watercourse crossings

The onshore cable route between Baginbun Beach and Great Island crosses the Campile River Estuary. It is proposed to use HDD under the Campile River Estuary to make the crossing. The depth of the ducts will be greater than 10m below the river bed.

The cable corridor crosses a watercourse (Kilmannock Stream/Newtown River) northeast of the converter station. The preferred method to cross the stream is a HDD using a mini-rig. The non-preferred alternative is a trench crossing and it is considered highly improbable that this methodology will be required.

The cable trenching detail will not differ, however, a one metre separation between the protective measures and the bed of the watercourse will be maintained to account for any future erosion.

Temporary works will be required to enable the cable duct installation. The watercourse is likely to be temporarily dammed immediately upstream and downstream of the cable installation. Overpumping will be employed, subject to IFI approval, to ensure continuous flow in the watercourse and pollution prevention measures installed to avoid any downstream siltation impacts. Once reinstatement of the cable trench is complete, the temporary dams will be removed and overpumping ceased (approximately one day's work). No haul road is proposed at the watercourse crossing; plant will utilise existing accesses used by landowners to avoid further works within the watercourse and adjacent soft ground.

With the preferred HDD crossing, the stream would not need to be dammed, no instream works would take place and a duct block would not be required for extra cable protection.

3.3.9 Landfall Technology and Installation Techniques

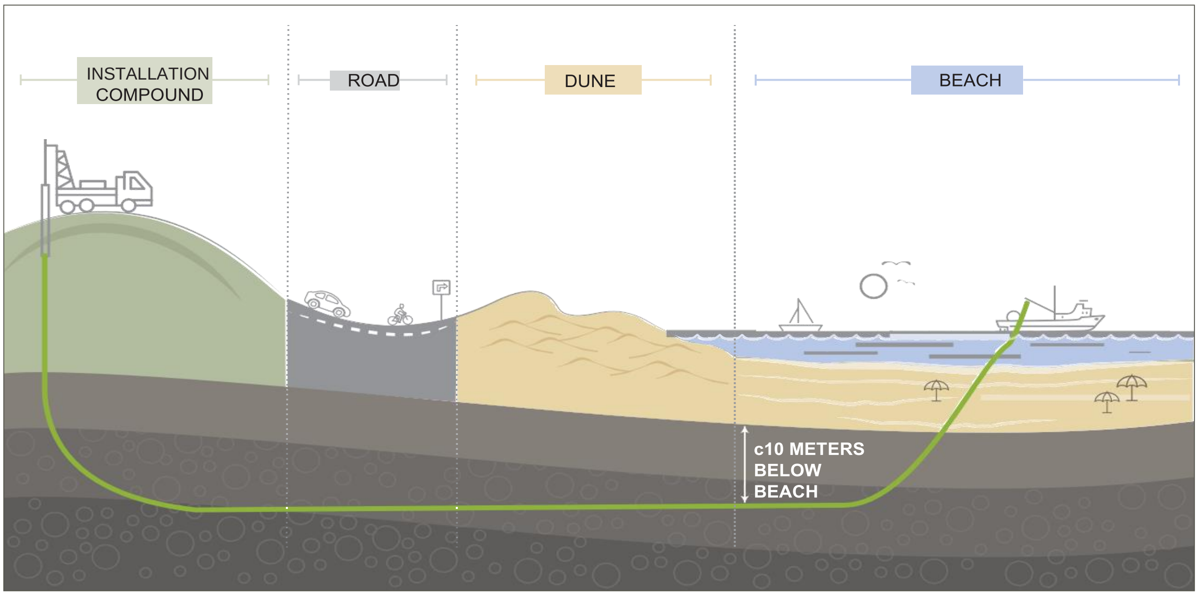
The onshore cables will be connected to the marine cables in a Transition Jointing Bay (TJB) buried underground in the field inland from Baginbun Beach. The TJB at the sea-land interface will contain the following:

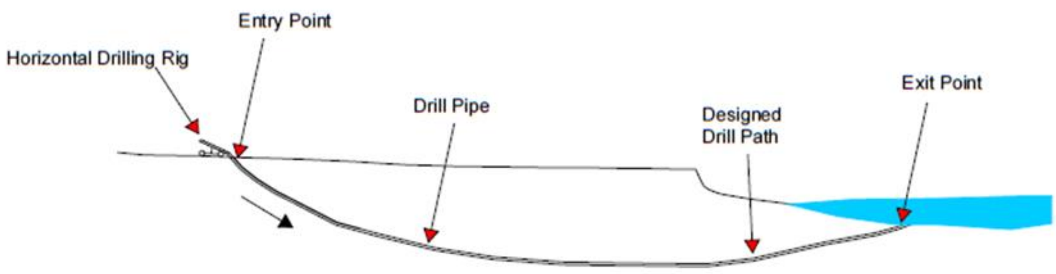
- 2 no. armour clamps (fixed to a concrete block);
- 2 no. HVDC cables joints;
- A fibre joint;
- A link-box or link-pillar; and
- There will be an earthing strip around the periphery of the joint-bay.

The dimensions of the sea/land TJB will be larger than a standard joint-bay, which is to allow for the additional space required for the armour clamps. Typically, the dimensions of the joint-bay will be 20 m long, 3 metres wide and 2 metres deep.

HDD is the preferred method of installation at the landfall site inland from Baginbun Beach. See **Figure 13**. HDD is a technique whereby a hole is drilled from shore under any sea defences, cliffs, dune systems or sensitive features, to a point at a suitable distance offshore, usually several hundred metres. A pipe is inserted into the drilled hole which is then used as a duct into which the cables are installed.

HDD Landfall Installation Overview





A small diameter pilot hole is drilled from the entry point, under the sea bed, to the exit point.

HDD Landfall Installation Overview

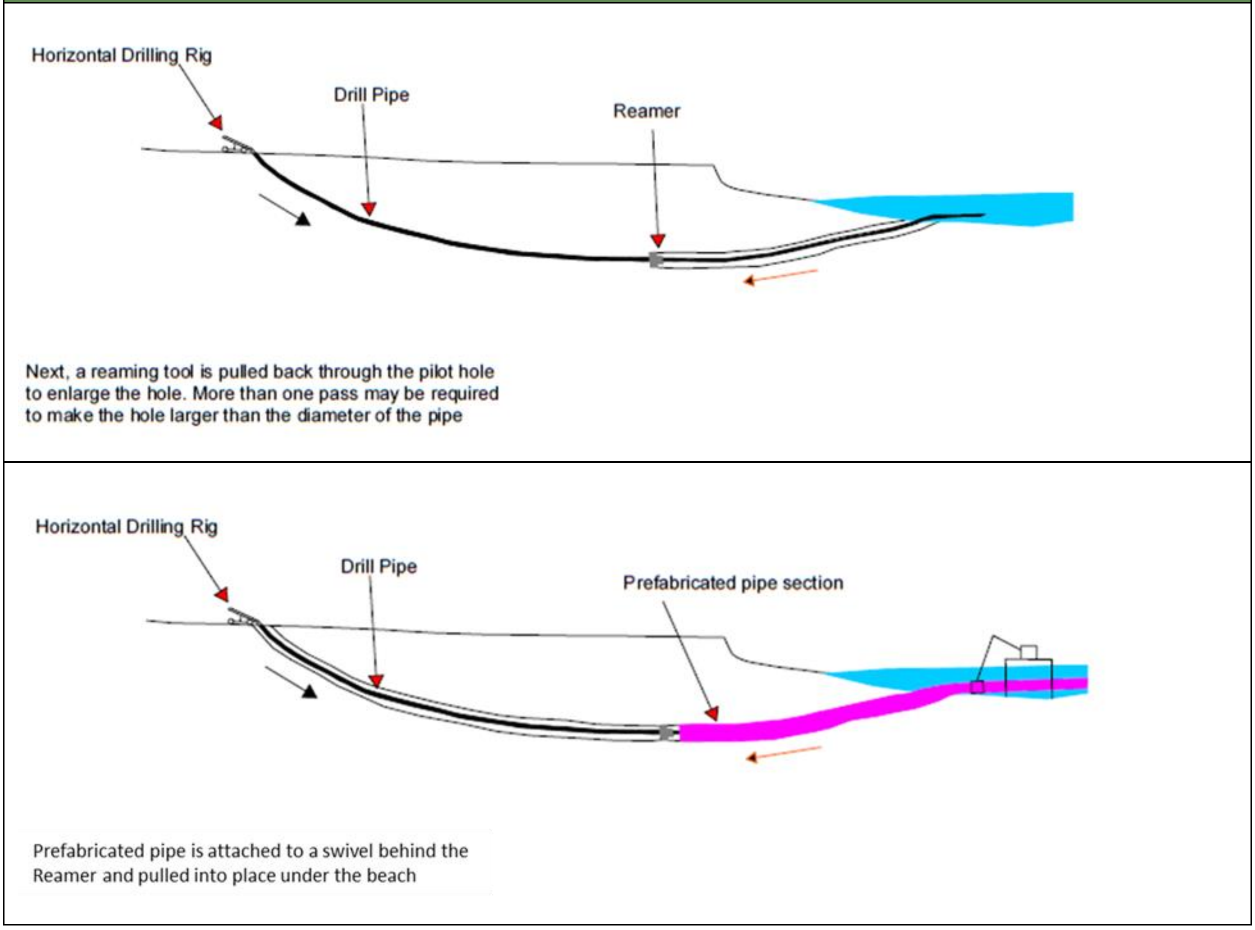


Figure 13: Overview of HDD Technique | not to scale

Lengths of cables in HDDs can be limited by the maximum pulling tension of the cable and this shall vary depending upon the cable mass, conductor cross-section, conductor material and for the submarine cables the design of the cable armouring. Also, the length of cable that can be delivered to the HDD location is another limiting factor.

For on-shore cables, a typical maximum length for cables in HDDs will be in the range 700m - 1000m.

For offshore cables, a typical maximum length at the sea/land interface will be in the range of 1000m - 1500m. Very long HDDs (i.e. in excess of 1500m) at the sea/land interface could result in cables with a special armouring design (i.e. a double layer of armour wires).

Typical burial depths for HDDs will be in the range of 5m - 10 m. When cables are installed at a greater depth then to maintain the rating of the cables it will be necessary to increase the cable spacing. Typically, the axial spacing between ducts will be in the range of 5m – 10m. The depth of the HDD will be dependent on the ground profile and the cable spacing will be dependent upon the cable ratings.

3.3.10 Roadside car parking area near Baginbun Beach

As a community gain measure, to improve access to and facilitate parking for Baginbun Beach for existing traffic, the north side of the road approaching the beach will be widened to an overall width of 12m. There will be a 3m wide parking bay on both sides and two 3m wide vehicular lanes. Approximately 54 parking spaces will be provided, with parallel parking along both sides of the road. The 6m wide carriageway will allow two cars to pass comfortably. The road widening will extend from the junction at the western end of the road to a point approximately 35m west of the edge of the cliff, behind the beach. Stormwater run-off from the additional car-parking spaces at Baginbun Beach will continue to naturally infiltrate on both sides of the road in accordance with Wexford County Council's requirements.

3.3.11 Improvements to Pedestrian Amenity in Ramsgrange Village

As part of the public engagement with residents in Ramsgrange, the potential was identified for the provision of community gain in the form of improvements to pedestrian amenity in the village. In consultation with Wexford County Council, it was agreed that a footpath would be provided on the southern side of the R733 eastbound, between the village centre and the recently-constructed housing development at the eastern edge of the village. In addition, a short length of footpath will be provided on the northern side of the road, opposite the housing development. The new footpaths will have dropped kerbs which will be provided at each entrance.

Four new streetlights will be provided on the northern side of the road, to the east of the existing school entrance, and a new speed-activated sign will be provided at the western approach to the village. Surface water drainage will be connected to the existing surface water network, and a power cable will be installed to power the proposed street lighting.

3.3.12 Excavated Materials

Excavated material as part of the construction works will generally consist of:

- Rock; mainly from the converter station platform;
- Topsoil and subsoil; and
- Made ground.

The ground level of the converter station platform has been chosen to balance the volume of excavated material with the volume of fill where feasible. Excavated material will be used in the screening berms, which will be located to the south and the east of the converter station platform. Thus, the export of spoil will be avoided. Up to an additional 20,500m^3 of crushed stone structural fill will be imported for the converter station and tail station site.

Surplus excavation material, from other working areas, will be removed off site by an authorised waste Contractor to an appropriately licensed/permitted waste facility.

Where asbestos is uncovered, the Asbestos Containing Material will be double-bagged, stored, collected and removed from site by a competent contractor and disposed of in accordance with the relevant procedures and legislation. As requested by Wexford County

Council the appointed contractor will have a sufficient stock of pipe on site in order to minimise the repair time by the local authority.

A Construction Waste Management Plan, will be included as part of the Construction Environmental Management Plan (CEMP).

3.3.13 Materials Storage

The storage of materials in working area construction compounds will be limited to materials required in the short term. The main construction compounds, located at the proposed converter station site, Lewistown and the landfall site, will be used as the primary location for storage of materials, plant and equipment, site offices, welfare facilities and car parking. No stockpiling will be permitted in any other areas, apart from in the immediate vicinity of the cable route, where excavated material will be stored temporarily, while the trench is open.

A Surface Water Management Plan, which will be included in the CEMP, will be implemented at all working areas. These measures will prevent any silt-laden run-off, including that from stockpiles, entering nearby watercourses.

The following construction management measures will be implemented at all construction compounds and at the proposed car parking area at Baginbun Beach.

- Potential polluting materials such as fuels and oils will be stored in a bunded area (110% capacity) protected from flood damage and inundation;
- All bunded storage areas will be a minimum distance of 10m away from any watercourse;
- A designated bunded refuelling area on an impermeable surface will be provided at all construction compounds, again at a minimum distance of 10m away from any watercourse.

3.4 Environmental Management

Measures have been included in the design and construction methodology to ensure significant environmental effects will be avoided.

The CEMP will comprise all of the construction mitigation measures and any additional measures which are required by the conditions attached to the planning decision. Implementation of the CEMP will ensure disruption and nuisance are kept to a minimum.

The CEMP has regard to the guidance contained in the handbook published by Construction Industry Research and Information Association (CIRIA) in the UK; Environmental Good Practice on Site Guide, 4th Edition (CIRIA, 2015). The CEMP has been developed in accordance with industry best practice and will be effective for the duration of the construction works. It will be reviewed and updated as construction progresses.

Specific environmental control measures for construction run off, dewatering, over pumping and accidental spills to prevent the risk of the pollution of waters or the contamination of groundwater are outlined below for both the converter station site and the onshore cable route.

It is noted that these measures relate primarily to impacts on general and/or local ecology rather than European sites specifically. However, they are included to provide an overview of the measures that will be implemented during construction.

3.4.1 Converter Station Site

Steps will be taken to reduce the probability of an incident occurring and to also reduce the magnitude of any incident from a combination of good site environmental management procedures, including additional precautions when operating machinery close to watercourses, soil management, staff training, contingency equipment and emergency plans.

Key measures identified to reduce erosion and sedimentation which will be implemented include:

- Secure oil and chemical storage in over-ground bunded areas (110% capacity), limited to the minimum volume required to serve immediate needs with specified delivery and refuelling areas;
- Emergency spill kits retained onsite at sensitive locations;
- Cessation of work and development of measures to contain and/or remove pollutant should an incident be identified;
- Silt traps will be employed and maintained in appropriate locations;
- Temporary interception bunds and drainage ditches will be constructed up slope of excavations to minimise surface runoff ingress and in advance of excavation activities; and
- Excavation and earthworks will be suspended during and immediately following periods of heavy rainfall in order to minimise sediment generation and soil damage.

3.4.2 Onshore Cable

The cables will be installed in ducts, so the only section of trench that will be open is that which is being excavated and in which ducts are being installed. Typically, 50m of trench will be fully open at any time, with up to 200m of trench backfilled to the level of the asphalt courses, that will then be reinstated at the end of each week.

Any groundwater or rainwater that collects in a trench will be pumped into locations agreed with the landowners and local authorities. Typically, this will be onto adjacent land, not directly into waterways, and through a filter medium, to avoid the build-up of silt, as some granular material will, inevitably, be pumped out with the water. The pump flowrates will match that of the water into the trench, as it must be kept generally free of water. A single pump with a 75mm hose will usually be adequate to deal with rainwater running into a trench. A similar arrangement will apply at joint bays, where a sump will be cast into the concrete base for a pump.

For the HDDs, any groundwater or rainwater that collects in a HDD drilling pit will be pumped away as described above. Any bentonite (or similar HDD drilling head lubrication material) will be handled and removed by the drilling contractor. The volume of bentonite (or similar material) will be subject to ground conditions encountered and length of HDD. Typically for a land-based HDD the volume of bentonite would be approximately 5 cubic metres per shift, and for the landfall HDD the volume of bentonite would be approximately 15 cubic metres per shift.

3.5 Further Information

Further information regarding the following elements can be found in **Appendix 1,** (**Chapter 4** *Construction Strategy* from the Environmental Impact Assessment Report).

- Utilities and Services
- Hoarding
- Services and Site Lighting
- Deliveries to Site
- Cranage
- Community Liaison During Construction
- Construction Materials Requirements
- Safety Management
- Emergency Response Provisions.

4. Screening Assessment

This section of the report determines whether Appropriate Assessment is necessary. It does this by assessing, in view of best scientific knowledge, if the development, individually or in combination with another plan or project is likely to have a significant effect on Natura 2000 sites. It is noted that the project description outlined above in section 3 includes mitigation measures which have been incorporated into the project design. These mitigation measures were not taken into account during the screening assessment. Therefore, this screening assessment determines the potential for the development to have an adverse effect on European sites in the absence of mitigation and is based on potential impact pathways.

The aim of the screening assessment is to:

- Provide information on and assess the potential for the proposed development to significantly impact on Natura 2000 Sites (also known as European sites).
- Determine whether the proposed development is directly connected with, or necessary to the conservation management of any Natura 2000 sites.
- Determine whether the proposed development, alone or in combination with other projects, is likely to have significant effects on Natura 2000 sites in view of their conservation objectives.

4.1 Desktop Study

A desktop review facilitates the identification of the baseline ecological conditions and key ecological issues relating to Natura 2000 sites and facilitates an evaluation assessment of potential in-combination impacts. Sources of information used for this report include reports prepared for County Wexford and information from statutory and non-statutory bodies. The following sources of information and relevant documentation were utilised:

- National Parks & Wildlife Service (NPWS) - www.npws.ie including qualifying interests and conservation objectives for Natura 2000 sites.
- Environmental Protection Agency (EPA) – www.epa.ie
- National Biodiversity Data Centre – www.biodiversityireland.ie
- Information on the status of EU protected habitats in Ireland (National Parks & Wildlife Service, 2013a & 2013b)
- BirdWatch Ireland - http://www.birdwatchireland.ie/
- County Wexford Biodiversity Action Plan 2013-2018[1]
- Greenlink Marine Environmental Impact Assessment Report – Ireland (2019)
- Greenlink Interconnector Limited (2019) Greenlink Marine Environmental
- Greenlink Ireland Onshore Environmental Impact Assessment Report (2020).

4.2 Study Area and Zone of Influence

Natura 2000 sites (European sites) are only at risk from significant effects where a source-pathway-receptor link exists between a proposed development and a Natura 2000 site(s). This

[1] This Plan, although not current, is considered relevant for desktop review purposes

can take the form of a direct impact (e.g. where the proposed development and/or associated construction works are located within the boundary of the Natura 2000 site(s) or an indirect impact where impacts outside of the Natura 2000 site(s) affect ecological receptors within (e.g. impacts to water quality which can affect riparian habitats at a distance from the impact source).

In the case of the proposed development, it is clear that the project is not directly connected with or necessary to, the conservation management of any of the European sites.

It is often considered appropriate to examine all European sites within 15 km as a starting point for this type of assessment. Therefore, as a starting point, all European sites within 15 km of the proposed development were examined Each of these Natura 2000 sites were examined against the potential zone of influence of the proposed development in terms of source-pathway-receptor linkage and associated risks in order to determine which sites may experience potential impacts.

Considering the Natura 2000 sites present in the region, their Qualifying Interests (QIs) and conservation objectives, and any potential impact pathways that could link those sites to the proposed development area, a distance of 15km was considered appropriate to encompass all Natura 2000 sites potentially within the Zone of Influence (ZoI) of the proposed development.

Thus, any appreciable direct, indirect or cumulative impacts which could arise from the proposed development in relation to the designated sites within this zone were considered.

4.3 Natura 2000 Sites

4.3.1 Designated sites within a 15km radius

In accordance with the European Commission Methodological Guidance (EC2001), a list of Natura 2000 Sites that can be potentially affected by the proposed development has been compiled. All candidate SACs (cSAC) and SPA sites potentially affected by the proposed development have been identified, see **Table 5 and Figure 14**.

Table 5: Designated sites and location relative to the proposed development area.

Site	Code	Distance at the closest point (approx.).
Special Area of Conservation (SAC)		
River Barrow & River Nore	002162	0m. The crossing point downstream of Campile under the Campile River Estuary is located within this SAC. HDD compounds are outside the SAC boundary. The southern HDD compound is located approximately 10m from the SAC boundary and approximately 50m from the estuary channel. The northern HDD compound is located 150m from the SAC boundary and the estuary channel.

		The Kilmannock/ Newtown River flows into the SAC approximately 375m downstream of the proposed crossing point. The construction compound at Lewistown is located approximately 340m east of the SAC. The stormwater discharge point from the converter station site, to the Newtown River, is approximately 150 m east and upstream of the SAC.
Hook Head	000764	10m. The offshore cable to the landfall site is located within Hook Head SAC. The HDD compound is located 162m from the SAC boundary. and the proposed carpark is approximately 10m west of the SAC boundary.
Bannow Bay	000697	300m north of onshore cable route near Baginbun Beach.
Lower River Suir	002137	1.2km west of the proposed converter station.
Ballyteige Burrow	000696	8.7km east of Baginbun beach in Coolcull townland.
Saltee Islands	000707	9.7km south east of Baginbun Beach landfall site.
Tramore Dunes and Backstrand	000671	11.6km west of the onshore cable route
Special Protection Area (SPA)		
Bannow Bay	004033	1km north of Baginbun Beach landfall site.
Keeragh Islands	004118	6.2km east of Baginbun Beach landfall site.
Ballyteige Burrow	004020	9.2km east of Baginbun beach in Coolcull townland.
Tramore Back Strand	004027	11.7km west of the onshore cable route

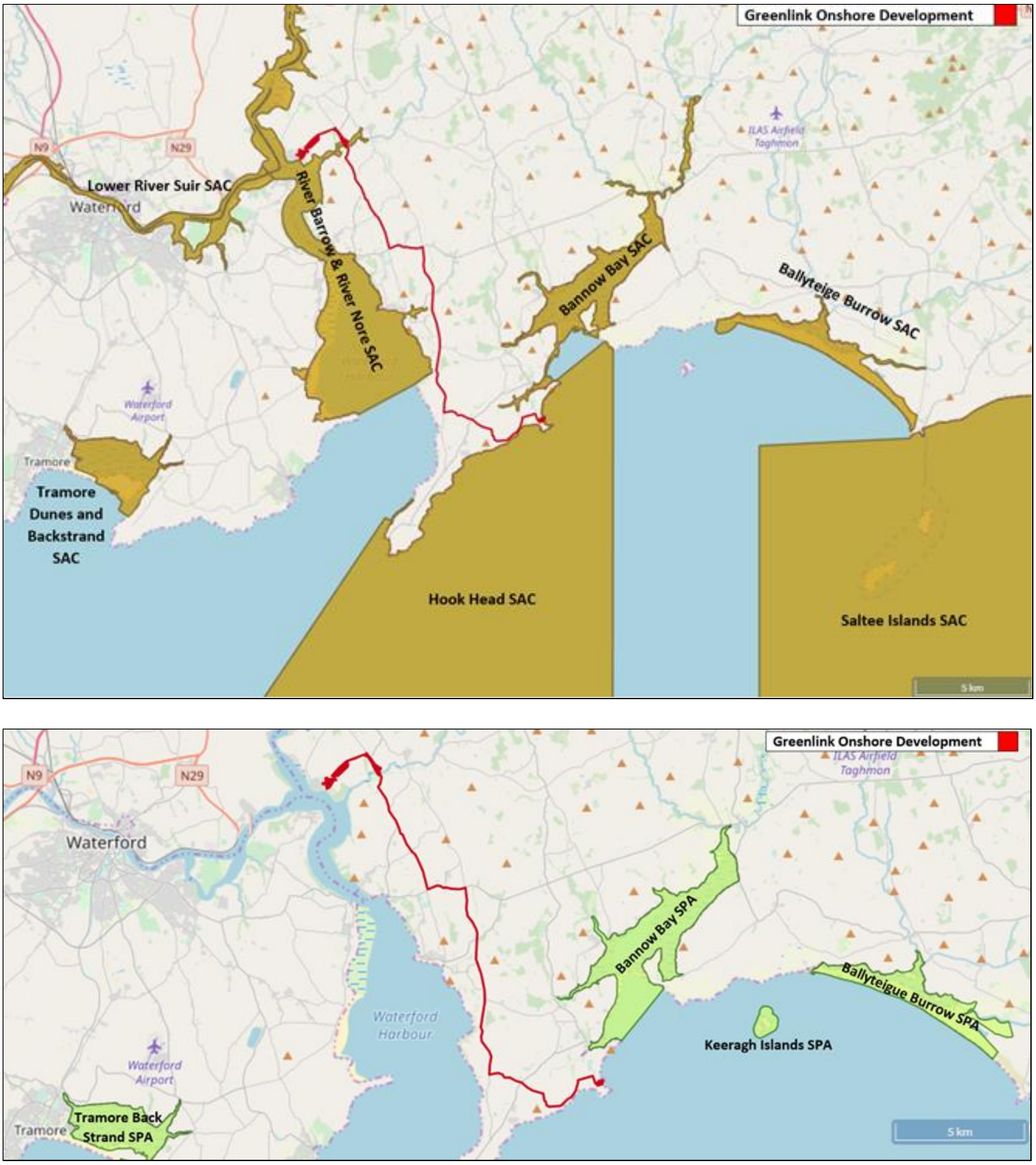


Figure 14: Natura 2000 sites within 15km of the proposed development | not to scale

After an initial review of all Natura 2000 sites it was considered that no pathway exists by which the proposed development could impact upon the following Natura 2000 sites due to the distances involved and the lack of hydraulic or any other connections:

- Ballyteige Burrow SAC
- Saltee Islands SAC

- Keeragh Islands SPA
- Ballyteige Burrow SPA
- Tramore Dunes and Backstrand SAC
- Tramore Backstrand SPA

Thus, the potential impacts on the following Natura 2000 sites, which are considered of relevance for the purposes of this report, are the River Barrow & River Nore SAC, Hook Head SAC, Bannow Bay SAC, Lower River Suir SAC and the Bannow Bay SPA.

Overall, the River Barrow & River Nore SAC, Hook Head SAC, Bannow Bay SAC, Lower River Suir SAC and the Bannow Bay SPA are of conservation significance for the occurrence of good examples of habitats and of populations of plant and animal species that are listed on Annexes I and II of the E.U. Habitats Directive and being recognised under the E.U. Birds Directive as being of international importance. Further relevant information on Qualifying Interests and Conservation Objectives for the River Barrow & River Nore SAC, Hook Head SAC, Bannow Bay SAC, Lower River Suir SAC and the Bannow Bay SPA is provided below, with full site synopses for these sites included in **Appendix 2** of this NIS**.**

River Barrow & River Nore SAC

This site consists of most of the freshwater stretches of the Barrow/Nore River catchments. The Barrow is tidal as far upriver as Graiguenamanagh while the Nore is tidal as far upriver as Inishtioge. The site also includes the extreme lower reaches of the River Suir and all of the estuarine component of Waterford Harbour extending to Creadan Head. The larger of the many tributaries include the Lerr, Fushoge, Mountain, Aughavaud, Owenass, Boherbaun and Stradbally Rivers of the Barrow and the Delour, Dinin, Erkina, Owveg, Munster, Arrigle and King's Rivers on the Nore. Both rivers rise in the Old Red Sandstone of the Slieve Bloom Mountains. They traverse limestone bedrock for a good proportion of their routes, though the middle reaches of the Barrow and many of the eastern tributaries run through Leinster Granite. A wide range of habitats associated with the rivers are included within the site, including substantial areas of woodland (deciduous, mixed), dry heath, wet grassland, swamp and marsh vegetation, salt marshes, a small dune system, biogenic reefs and intertidal sand and mud flats. Areas of improved grassland, arable land and coniferous plantations are included in the site for water quality reasons.

The site supports many Annexed habitats including the priority habitats of alluvial woodland and petrifying springs. Quality of habitat is generally good. The site also supports a number of Annex II animal species - *Salmo salar, Margaritifera margaritifera, M.m. durrovensis, Alosa fallax fallax, Austropotamobius pallipes, Petromyzon marinus, Lutra lutra, Lampetra fluviatilis* and *L. planeri*. Annex I Bird species include *Anser albifrons flavirostris, Falco peregrinus, Cygnus cygnus, Cygnus columbianus bewickii, Limosa lapponica, Pluvialis apricaria* and *Alcedo atthis*. A range of rare plants and invertebrates are found in the woods along these rivers and rare plants are also associated with the saltmarsh.

Hook Head SAC

The Hook peninsula is a long, narrow, low-lying headland which protrudes into the sea in a south-south-west direction on the eastern side of Waterford Harbour. The site includes Baginbun Head. There is c.15 km of coastline, most of which has cliffs above a bedrock or boulder beach shoreline. The cliffs are mostly low, usually not more than 10-20 m, though they reach up to 30 m at Baginbun. The geology of the area is of high interest, being an excellent example of the junction between Devonian Old Red Sandstone and overlying Carboniferous Limestone. Fossils are a feature of the limestone rock formations. A large area of the surrounding sea is included in the site. Under the surface of the water, the reef has a north-east/south-west orientation and is typically strewn with boulders, cobbles and patches of sand and gravel. It is exposed to prevailing wind and swells from the west. Tidal streams tend to be moderate but are strong in some areas.

The site has an important example of low-lying south-eastern cliffs of both clay and rock. It is of high geological importance and a noted fossil site. It is of particular importance for marine habitats. Infralittoral bedrock communities are species rich (81 and 84 species in the upper infralittoral and 81 and 82 species in the lower infralittoral). Rare to scarce species include the sponge *Stryphnus ponderosus*; the hydroids *Aglaophenia kirchenpaueri* and *Gymnangium montagui*; the anemone *Isozoanthus sulcatus*; the nudibranch *Crimora papillata*; the ascidians *Distomus variolosus* and *Stolonica socialis*; and the red alga, *Schizymenia dubyi*. Of particular interest is *Schizymenia dubyi*, since Irish populations of this species appear to be concentrated in the south-east of the country. Circalittoral reef communities have good examples of Axinellid sponge communities. Notable species present are: *Axinella dissimilis, Aglaophenia kirchenpaueri, Gymnangium montagui, Alcyonium glomeratum, Eunicella verrucosa* and *Crimora papillata*. Sublittoral sediments populated by the burrowing sea cucumber *Neopendactyla mixta* are noteworthy because this type of community was only recorded seven times by the BioMar survey and the *Amphiura securigera* was only recorded at the Kenmare River in Co. Kerry and at Hook Head and the Saltee Islands in Co. Wexford. Has breeding *Falco peregrinus* and *Pyrrhocorax pyrrhocorax*, and a small seabird colony (mostly *Uria aalge*).

Bannow Bay SAC

The Bannow Bay SAC is a relatively large estuarine site on south-east coast of Ireland. It is a typical coastal estuary with large areas of mud and sand and restricted access to the sea. Small rivers and streams to the north and south-west flow into the bay. The southern end of the site supports a mosaic of sand dune types, sea cliffs of clay, and rock and extensive sandy beaches. Northern end supports freshwater habitats of marsh, wet woodland and non-tidal reedbed. The geology of the site is mainly Ordovician slate rocks with some Cambrian slate at the south-east.

The Bannow Bay SAC is important for presence of eleven habitats listed on Annex I of Habitats Directive. *Halophilous* scrub at the site is one of only two examples in the country. The legally protected *Arthrocnemum perenne* is found there. The site includes an important SPA. Internationally important numbers of *Branta bernicla hrota* found and nationally important numbers of *Tadorna tadorna, Anas acuta, Calidris, Vanellus vanellus, Calidris alpina, Limosa limosa islandica, L. lapponica, Tringa totanus* and *Plurialis apricaria Egretta garzetta, Alcedo atthis* and *Sterna albifrons* are found and possibly breed in the site. A substantial heronry is located at south-west of site.

Lower River Suir SAC

The Suir River system flows through the counties of Tipperary, Kilkenny and Waterford. The site consists of all of the freshwater stretches of the Suir immediately south of Thurles, the tidal stretches as far as the confluence with the Barrow/Nore immediately east of Cheekpoint in Co. Waterford, and many of the tributaries including the Clodiagh, the Lingaun, Anner, Nier, Tar, Aherlow and Multeen. Much of the system flows through Carboniferous limestone, though towards Waterford the geology changes to Old Red Sandstone and Ordovician bedrocks. The site supports a diverse range of habitats, including marsh, reedbeds, wet and dry grasslands, broad-leaved semi-natural woodlands, salt marshes, tidal rivers and estuarine channels. Substantial areas of improved grassland and arable lands are included for water quality reasons.

This site contains a range of Annex I habitats, including floating river vegetation, eutrophic tall herbs, alluvial forest, old oak woods, yew woods and salt meadows. The site is very important for the presence of a number of scarce and specialised Annex II animal species with particularly important populations of the fish species *Salmo salar* and *Alosa fallax fallax. Lutra lutra* is widespread on the system, as is *Austropotamobius pallipes*. The site supports two Annex I priority and five non-priority Annex I habitats. There are four Annex I species of birds present within the site. The rare lichen *Lobaria pulmonaria*, an ancient woodland indicator, occurs at Portlaw Oak Woods, within the site

Bannow Bay SPA

Bannow Bay is a large, very sheltered, estuarine system with a narrow outlet to the sea. Very extensive intertidal mud and sand flats are exposed at low tide, with an average width of about 2 km. A number of small to medium sized rivers flow into the site, the principal being the Owenduff and the Corock which enter at the top end of the estuary. The sediments have a rich macroinvertebrate fauna, with such species as *Scrobicularia plana, Hediste diversicolor* and *Arenicola marina* being frequent. Salt marshes are well developed in the sheltered areas of the site. The main landuse within the site is shellfish farming. The site is surrounded by agricultural land of moderate to high intensity.

Bannow Bay supports an excellent diversity of wintering waterfowl and is one of the most important sites in the south-east. Of particular note is an internationally important population of *Branta bernicla hrota*. It also supports nationally important numbers of a further 12 species, which includes 3.4% of the national total for *Tadorna tadorna*, 3.0% of the total for *Limosa limosa*, 2.6% of the total for *Limosa lapponica* and 2.6% of the total for *Anas acuta*. The intertidal sand and mud flats provide excellent feeding for waterfowl species, while suitable roosts are provided by the salt marshes and other shoreline habitats. Habitats are generally of good quality. Part of site is a Wildfowl Sanctuary. The site has been well monitored since the 1970s.

4.3.2 Natura 2000 sites – Features of Interests and Conservation Objectives.

The EU Habitats Directive contains a list of habitats (Annex I) and species (Annex II) for which SACs must be established by Member States. Similarly, the EU Birds Directive contains lists of important bird species (Annex I) and other migratory bird species for which SPAs must be established. Those that are known to occur at a site are referred to as 'qualifying interests' and are listed in the Natura 2000 forms which are lodged with the EU Commission by each Member State. A 'qualifying interest' is one of the factors (such as the species or habitat that is present) for which the site merits designation. The NPWS are responsible for the designation of SACs and SPAs in Ireland.

The conservation objectives for the site are detailed in:

- NPWS (2011) Conservation Objectives: River Barrow and River Nore SAC 002162. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
- NPWS (2012) Conservation Objectives: Bannow Bay SAC 000697. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
- NPWS (2011) Conservation Objectives: Hook Head SAC 000764. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
- NPWS (2017) Conservation Objectives: Lower River Suir SAC 002137. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.
- NPWS (2012) Conservation Objectives: Bannow Bay SPA 004033. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network. European and national legislation places a collective obligation on Ireland and its citizens to maintain at favourable conservation status sites designated as Special Areas of Conservation and Special Protection Areas. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level. Favourable conservation status of a habitat is achieved when its natural range, and area it covers within that range, is stable or increasing, and the ecological factors that are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when population data on the species concerned indicate that it is maintaining itself, and the natural range of the species is neither being reduced or likely to be reduced for the foreseeable future, and there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis. The species and habitats listed as qualifying interests for the River Barrow & River Nore SAC, Hook Head SAC, Bannow Bay SAC, Lower River Suir SAC and the Bannow Bay SPA and specific conservation objectives are included in **Table 6** to **Table 12**.

Table 6: Qualifying habitats for the River Barrow and River Nore SAC

Habitat Code	Habitat	Conservation objective
1130	Estuaries	Maintain
1140	Mudflats and sandflats not covered by seawater at low tide	Maintain
1310	*Salicornia* and other annuals colonizing mud and sand	Maintain
1330	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	Restore
1410	Mediterranean salt meadows (*Juncetalia maritimi*)	Restore
3260	Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	Maintain
4030	European dry heaths	Maintain
6430	*Hydrophilous* tall herb fringe communities of plains and of the montane to alpine levels	Maintain
7220	* Petrifying springs with tufa formation (Cratoneurion)	Maintain
91A0	Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles	Restore
91E0*	*Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)	Restore

Restore = Restore favourable conservation condition,
Maintain = Maintain favourable conservation condition

Table 7: Qualifying species for the River Barrow and River Nore SAC

Species code	Species	Scientific name	Conservation objective
[1029]	Freshwater Pearl Mussel	*Margaritifera margaritifera*	Under Review[2]
[1016]	Desmoulin's whorl snail	*Vertigo moulinsiana*	Maintain
[1092]	White-clawed crayfish	*Austropotamobius pallipes*	Maintain
[1095]	Sea Lamprey	*Petromyzon marinus*	Restore
[1096]	Brook Lamprey	*Lampetra planeri*	Restore
[1099]	River Lamprey	*Lampetra fluviatilis*	Restore
[1103]	Twaite shad	*Alosa fallax*	Restore
[1106]	Salmon (only in freshwater)	*Salmo salar*	Restore
[1355]	Otter	*Lutra lutra*	Restore
[1421]	Killarney Fern	*Trichomanes speciosum*	Maintain
[1990]	Nore freshwater pearl mussel	*Margaritifera durrovensis*	Restore

Restore = Restore favourable conservation condition,

[2] The conservation objective for the 'Freshwater Pearl Mussel' is currently 'under review' according to the Conservation Objectives document available on the NPWS website - https://www.npws.ie/protected-sites/sac/002162

Maintain = Maintain favourable conservation condition

Table 8: Qualifying habitats for the Bannow Bay SAC

Habitat Code	Habitat	Conservation objective
1130	Estuaries	Maintain
1420	Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*)	Restore
1140	Mudflats and sandflats not covered by seawater at low tide	Maintain
1210	Annual vegetation of drift lines	Maintain
1310	Salicornia and other annuals colonizing mud and sand	Restore
1330	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	Restore
1410	Mediterranean salt meadows (*Juncetalia maritimi*)	Restore
2110	Embryonic shifting dunes	Restore
2130	*Fixed coastal dunes with herbaceous vegetation (grey dunes)	Restore
1220	Perennial vegetation of stony banks	Maintain
2120	Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)	Restore

Restore = Restore favourable conservation condition,
Maintain = Maintain favourable conservation condition

Table 9: Qualifying habitats Hook Head SAC

Habitat Code	Habitat	Conservation objective
1160	Large shallow inlets and bays	Maintain
1170	Reefs	Maintain
1230	Vegetated sea cliffs of the Atlantic and Baltic coasts	Maintain

Restore = Restore favourable conservation condition,
Maintain = Maintain favourable conservation condition

Table 10: Qualifying habitats for the Lower River Suir SAC

Habitat Code	Habitat	Conservation objective
1330	Atlantic Salt Meadows (*Glauco-Puccinellietalia maritimae*)	Restore
1410	Mediterranean Salt Meadows (*Juncetalia maritimi*)	Restore
3260	Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	Maintain
6430	*Hydrophilous* tall herb fringe communities of plains and of the montane to alpine levels	Maintain
91A0	Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles	Restore
91E0*	*Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)	Restore
91J0*	**Taxus baccata* woods of the British Isles	Restore

Restore = Restore favourable conservation condition,
Maintain = Maintain favourable conservation condition

Table 11: Qualifying species of the Lower River Suir SAC

Species code	Species		Conservation objective
1029	Freshwater Pearl Mussel	*Margaritifera margaritifera*	Restore
1092	White-clawed crayfish	*Austropotamobius pallipes*	Maintain
1095	Sea Lamprey	*Petromyzon marinus*	Restore
1096	Brook Lamprey	*Lampetra planeri*	Restore
1099	River Lamprey	*Lampetra fluviatilis*	Restore
1103	Twaite shad	*Alosa fallax*	Restore
1106	Atlantic Salmon	*Salmo salar*	Restore
1355	Otter	*Lutra lutra*	Maintain

Restore = Restore favourable conservation condition,
Maintain = Maintain favourable conservation condition

Table 12: Qualifying species for the Bannow Bay SPA

Species code	Species	Scientific name	Conservation objective
A046	Light-belied Brent Goose	*Branta bernicla hrota*	Maintain
A048	Shelduck	*Tadorna tadorna*	Maintain
A054	Pintail	*Anas acuta*	Maintain
A130	Oystercatcher	*Haematopus ostralegus*	Maintain
A140	Golden Plover	*Pluvialis apricaria*	Maintain
A141	Grey Plover	*Pluvialis squatarola*	Maintain
A142	Lapwing	*Vanellus vanellus*	Maintain
A143	Knot	*Calidris canutus*	Maintain
A149	Dunlin	*Calidris alpina*	Maintain
A156	Black-tailed Godwit	*Limosa limosa*	Maintain
A157	Bar-tailed Godwit	*Limosa lapponica*	Maintain
A160	Curlew	*Numenius arquata*	Maintain
A162	Redshank	*Tringa totanus*	Maintain
A999	Wetlands		Maintain

Restore = Restore favourable conservation condition,
Maintain = Maintain favourable conservation condition

4.4. Potential Impacts

All potential significant effects on Natura 2000 sites were considered including direct, indirect impacts and cumulative impacts. It is noted that there will be no direct works within the boundary of Natura 2000 sites with the exception of HDD works at the Campile Estuary and Baginbun Beach. HDD methodology effectively minimises any potential impact on ecology. Following a review of potential adverse effects on Natura 2000 sites it was determined that the following impacts could potentially occur or require further discussion.

- Impact-loss of habitat and in-direct effects on habitats
- Impacts on migratory fish species and fish biomass as prey for otter Impacts from lighting, noise, vibration and disturbance on qualifying species
- Impacts on water quality and aquatic ecology
- Impact from spread of invasive species
- Cumulative Impacts.

4.4.1 Natura 2000 Sites - Screening of Qualifying Interests

River Barrow & River Nore SAC

The western and southern boundary lines of the Great Island substation overlap the River Barrow & River Nore SAC boundary lines. As part of the proposed development a converter station and tail station will be constructed in close proximity to the existing substation at Great Island. The proposed development footprint is located approximately 100m north of the SAC boundary. The proposed surface water discharge from the converter station site (to the Newtown River) is approximately 150 m east and upstream of the SAC boundary.

In addition, as part of the onshore cable route it is proposed to use horizontal directional drilling (HDD) under the Campile River Estuary, at a depth of >10m below the riverbed, in order to avoid any impacts of the river itself. This section of the Campile River is part of the River Barrow and River Nore SAC. The southern HDD compound is located approximately 10m from the SAC boundary and 50m from the estuary channel. The northern HDD compound is located approximately 150m from the SAC boundary and the estuary channel.

The Newtown River will also be crossed north of the proposed converter station site. The Newtown River flows into the the River Barrow & River Nore SAC approximately 375m downstream of the proposed crossing point.

As part of the proposed onshore cable route, a construction compound will be constructed in the townland of Lewistown near Dollar Bay within an agricultural field. The proposed compound will be located approximately 340m east of the River Barrow & River Nore SAC.

If significant levels of silt and hydrocarbons were to enter these watercourses during construction via inadvertent contamination of surface water run-off, it could potentially alter the ecology of the habitats within the SAC. Impacts on habitats could potentially have knock on effects on qualifying species. Additionally, potential impacts during operation of the proposed converter station could also impact the ecology of the SAC via inadvertent contamination of surface water and/or groundwater.

HDD drilling has the potential to release drilling fluids into the surface environment through frac-outs, whereby drilling fluids are released through fractured bedrock into the surrounding rock and sand and travels toward the surface. However as drilling fluids consist of a betonite clay-water mixture they are not classified as toxic of harzardous substances. Whilst this mixture could potentially have an adverse impact on fish and macroinvertebrates the effect will not be significant due to the high level of dilution provided in the estaurine and marine environment and the fluctuations in silt levels that naturallly arise in these environments.

The cable will be laid predominantly within existing roads which cross small bridges or culverts are various locations. The following small watercourses are crossed by roads within which the cable will be laid and these watercourses (Saltmills, Ballyhack, Clonsharragh and Curroughmore) ultimately discharge to the estuary within the River Barrow and River Nore SAC. Given the low risk associated with works within the road network, and the dilution provided within the estuarine environment, no risk of significant effects on the River Barrow & River Nore SAC has been identified.

Potentially impacts from the spread of invasive species could also occur. Potential impacts from lighting, noise, vibration and disturbance may also arise during construction and operation. Therefore, potential source-pathway-receptor links have been identified between the source (the proposed development) and the receptor (River Barrow & River Nore SAC).

Hook Head SAC

The proposed landfall site is located at Baginbun Beach which forms part of the Hook Head SAC. HDD drilling under the cliffs is proposed with the launch and reception pits located outside the SAC. Further, additional car parking spaces will be constructed and will provide additional capacity to the existing public cark park at Baginbun Beach. The HDD compound is located 162m from the SAC boundary.   and the proposed carpark is approximately 10m west of the SAC boundary.

It is noted that the habitat 'Vegetated sea cliffs of the Atlantic and Baltic coasts' is a qualifying interest for the Hook Head SAC. Accidental damage during construction could potentially occur due to destabilisation of cliffs. If of sufficient severity, high levels of silt and hydrocarbons in surface water run off from the works area including a proposed car park could impact on vegetated sea cliffs and on upper shoreline habitats. Frac out could potentially occur however no significant effects on vegetation will occur due to the non-toxic nature of the drilling fluids and the low risk of frac out occurring.

It is noted that impacts on marine habitats are directly addressed in the Greenlink Marine Natura Impact Statement[3], which can be found on the Greenlink website www.greenlink.ie.

[3] https://www.greenlink.ie/file-share/fe15f228-6718-45e3-afb3-6e978c40c9ed

Therefore, potential source-pathway-receptor links have been identified between the source (the proposed development) and the receptor (Hook Head SAC).

Bannow Bay SAC

The Bannow Bay SAC is located 332m north of the onshore cable route at Baginbun Beach. The proposed cable route will primarily impact on existing public roads. Roads are man-made features with minimal ecological value and the usage of existing roads will ensure that ecological impacts are minimised.

The cable will be laid predominantly within existing roads which cross small bridges or culverts are various locations. The Graigue Little and Garigue Great watercourses are crossed by the proposed route and ultimately discharge to estuary within the Bannow Bay SAC. Given the low risk associated with works within the road network, and the dilution provided within the estuarine environment, no risk of significant effects on the Bannow Bay SAC has been identified.

Theoretically, impacts from the spread of invasive species could also potentially occur. However, a source-pathway-receptor link does exist between the proposed development and the receptor (Bannow Bay SAC) via the potential contamination of surface water during construction.

Lower River Suir SAC

The Lower River Suir SAC is located approximately 4.3km upstream of the proposed Campile River Estuary crossing and 2.7km upstream of the proposed Newtown River crossing. The proposed converter station site is located 1.4km east of the Lower River Suir SAC. Due to mixing within estuarine water and tidal movements within the estuary impacts on water quality within the estuary could potentially impacts on qualifying habitats for the Lower River Suir SAC. Migratory species listed as qualifying interests for the Lower River Suir (Sea Lamprey, River Lamprey, Atlantic Salmon) which migrate through the estuary could potentially be impacted by water quality impacts on the estuary. Impact on these species could potentially reduce prey availability for otter. Therefore, potential source-pathway-receptor links have been identified between the source (the proposed development) and the receptor (Lower River Suir SAC).

Bannow Bay SPA

The Bannow Bay SPA is located 1.3km north of Baginbun Beach landfall site. Given the distance involved disturbance from light, noise and vibration during the construction phase will not impact on foraging birds within the SPA during the winter period. However potentially impacts on these species feeding outside of the SPA boundary and in particular at Baginbun Beach could potentially occur. Impacts on water quality during construction could potentially impact on water quality which in turn could impact on foraging resources for bird species within the SPA. Therefore, source-pathway-receptor links do exist between the proposed development and the receptor (Bannow Bay SPA).

Potential impacts, although improbable, have been identified for the River Barrow & River Nore SAC, Hook Head SAC, Bannow Bay SAC, Lower River Suir SAC and the Bannow Bay

SPA. Screening conclusions with regard to the qualifying species and habitats for these Natura 2000 sites is provided below in **Table 13.**

Table 13: Screening conclusions

Natura 2000 Site	Qualifying Interest	Potential Impacts	Screened In/Out
River Barrow and River Nore SAC	• Estuaries • Mudflats and sandflats not covered by seawater at low tide • Salicornia and other annuals colonising mud and sand • Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) • Mediterranean salt meadows (*Juncetalia maritimi*)	Potential pathway identified due to hydrological link i.e. as part of the onshore cable route it is proposed to use horizontal directional drilling (HDD) under the Campile River Estuary, at a depth of >10m below the river bed, in order to avoid any impacts of the river itself. The primary risk to water quality, although minimal, is from hydrocarbon/chemical spillage and/or break out of bentonite during HDD drilling works. This section of the Campile River is part of the River Barrow and River Nore SAC. The Newtown River will also be crossed north of the proposed converter station site. The Newtown River flows through the River Barrow & River Nore SAC approximately 375m downstream of the proposed crossing point. The western and southern boundary lines of the Great Island substation overlap the River Barrow & River Nore SAC boundary lines. As part of the proposed development, a converter station will be constructed close to the existing substation at Great Island. The surface water discharge to the Newtown River from the converter station will be located approximately 150 m east and upstream of the SAC.	**Screened In**

		As part of the proposed onshore cable route, a construction compound at Lewistown will be built approximately 340m east of the River Barrow & River Nore SAC. Impacts from frac out could potentially arise. Silt and hydrocarbon impacts on surface water could inadvertently alter the ecology of these habitats. Given the distance involved, the minimal risk of significant leaks of hydrocarbons from construction machinery and the dilution provided in the estuarine environment no impact on these habitats will occur via potential groundwater contamination.	
	• European dry heaths • *Hydrophilous* tall herb fringe communities of plains and of the montane to alpine levels • Petrifying springs with tufa formation (Cratoneurion) • Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles • Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae*)	These are terrestrial habitats which do not occur within or in proximity to the development footprint. Therefore, no potential impacts on these habitats have been identified.	**Screened Out**
	• Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	The EU (2003) definition of the habitat water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation is very broad. This habitat does not occur in	**Screened Out**

		estuarine or tidal habitats and thus no potential impact on this habitat has been identified.	
	• *Trichomanes speciosum* (Killarney Fern)	Killarney Fern belongs to the Filmy Fern family (*Hymenophyllaceae*). Killarney fern generally requires specific habitat requirements which are found in dripping caves, cliffs, crevices and gullies by waterfalls, crevices in woodland, and occasionally on the floor of damp woodland - all deeply shaded humid habitats. No potential impact on this species has been identified.	**Screened Out**
	Desmoulin's whorl snail (*Vertigo moulinsiana*)	Desmoulins' Whorl Snail lives on the stems of plants in wetland habitats i.e. Rich fen and flush (PF1), Reed and large sedge swamps (FS1), Tall-herb swamps (FS2), Marsh (GM1), Canals (FW3) and Riparian zone. No habitats suitable for this species were recorded within the proposed works areas. Thus, no potential impacts on the Desmoulin's whorl snail has been identified.	**Screened Out**
	• Freshwater pearl mussel (*Margaritifera margaritifera*) • Nore freshwater pearl mussel (*Margaritifera durrovensis*) • White clawed Crayfish (*Austropotamobius pallipes*) • Brook Lamprey (*Lametra planeri*)	These species only occur in freshwater and as the proposed development adjoins an estuarine section of the SAC at the Campile River Estuary and the Newtown River is tidal where it will be potentially affected, no potential impact on these species has been identified.	**Screened Out**
	• Sea Lamprey (*Petromyzon marinus*) • River Lamprey (*Lampetra fluviatilis*) • Twaite shad (*Alosa fallax*) • Salmon (*Salmo salar*) • Otter (*Lutra lutra*)	Given the distance involved, the minimal risk of significant leaks of hydrocarbons from construction machinery and the dilution provided in the estuarine environment no impact on these habitats will occur via potential groundwater contamination.	**Screened In**

		These species inhabit and/or migrate through estuarine waters and thus could be affected by impacts on surface water quality. Impacts on prey availability and increased lighting, noise and vibration could potentially impact on otter.	
Bannow Bay SAC	• Estuaries • Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*) • Mudflats and sandflats not covered by seawater at low tide • Annual vegetation of drift lines • Salicornia and other annuals colonizing mud and sand • Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) • Mediterranean salt meadows (*Juncetalia maritimi*) • Embryonic shifting dunes • Fixed coastal dunes with herbaceous vegetation (grey dunes) • Perennial vegetation of stony banks • Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)	The Bannow Bay SAC is located approximately 332m north of onshore cable route at Baginbun Beach. Surface water emissions and emissions to groundwater associated with the construction of the onshore cable route could potentially impact on marine and estuarine habitats via increased silt levels in surface water run-off and inadvertent hydrocarbon contamination from spillages of fuel and hydraulic fluid. However, given the; • low risk of significant accidental discharges, • the limited potential for significant contamination by silt or hydrocarbons, • the distance involved, • the high level of dilution provided in the estuarine/marine environment • the natural fluctuations of silt in the receiving environment • the robust nature of these habitats, • the presence of buffers i.e. agricultural land, hedgerows, treelines etc. • the fact the proposed cable route will primarily impact on existing public roads No potential impact been identified. It is possible that the Qualifying Interest 'Reef' in the nearshore	**Screened Out**

		area could be disturbed by cable trenching and rock protection. The deposition of external cable protection or cutting of the rock has the potential to reduce the extent and distribution of the Qualifying Interest. Therefore, exclusion zones have been established around the habitat, to avoid significant adverse effects. Implementation of the exclusion zones will result in the pressure pathway to the habitat being removed and subsequently there will be no adverse effects on the conservation objectives of the Qualifying Interest. **Conclusion – No Adverse Significant Effect to Qualifying Interest** Overall, given the absence of significant aquatic construction discharges, no potential impact on qualifying habitats for this SAC have been identified.	
Hook Head SAC	• Large shallow inlets and bays • Reefs	These are marine habitats which are specifically addressed within the Greenlink Marine Natura Impact Statement[3] The Greenlink Marine Natura Impact Statement concluded that *It is possible that the Qualifying Interest 'Reef' in the nearshore area could be disturbed by cable trenching and rock protection. The deposition of external cable protection or cutting of the rock has the potential to reduce the extent and distribution of the Qualifying Interest. Therefore, exclusion zones have been established around the habitat, to avoid significant adverse effects. Implementation of the*	**Screened Out**

		exclusion zones will result in the pressure pathway to the habitat being removed and subsequently there will be no adverse effects on the conservation objectives of the Qualifying Interest. Conclusion – No Adverse Significant Effect to Qualifying Interest The Greenlink Marine Natura Impact Statement concluded that *It is possible that the extent of the Qualifying Interest 'Shallow inlets and bays' could be marginally reduced by the deposition of external cable protection at the HDD exit point. Therefore, the preference is to bury the HDD duct exit and all cables in sediment to the required depth of lowering. Project Specific Mitigation has been developed to reduce the likelihood of the contingency being required (e.g. locating the potential HDD exit in water depths greater than 9m where the sediment unit it thicker, requiring the Installation Contractor to consider alternatives). If the contingency is required then measures have been proposed to reduce the footprint. However, as it is unknown whether the footprint can be reduced, the assessment has concluded that there still remains a chance that there will be a negligible reduction in habitat. This reduction will not significantly affect the conservation objectives for the site.* *Conclusion – No Adverse Significant Effect to Qualifying Interest*	

		It was concluded that in relation to both these qualifying interests for the Hook Head SAC that "*No Adverse Significant Effect to Qualifying Interest*" were found. No potential cumulative impacts will occur. In respect of the onshore element of the works given the; • low risk of significant accidental discharges, • the limited potential for significant contamination by silt or hydrocarbons, • the set back distance for the HDD compound, • the high level of dilution provided in the marine environment • the natural fluctuations of silt in the receiving environment • the location of habitats in relation to the proposed development • the robust nature of these habitats, No potential impact on this habitat due to the onshore elements of the works have been identified.	
	• Vegetated sea cliffs of the Atlantic and Baltic coasts	The offshore cable to the landfall site is located within Hook Head SAC. HDD will be used for installation with the associated launch and reception pits located outside Hook Head SAC. Impacts on this habitat could potentially occur due to destabilisation of cliff faces or frac out. Any run-off from the car park will not impact on sea cliffs due to local topography.	**Screened In**
Lower River Suir SAC	• Atlantic salt meadows (*Glauco-*	Surface water emissions and groundwater emissions	**Screened Out**

	Puccinellietalia maritimae) • Mediterranean salt meadows (*Juncetalia maritimi*)	associated with the construction and operation of the proposed development could potentially impact the estuarine habitats via increased silt levels in surface water run-off and inadvertent hydrocarbon contamination from spillages of fuel and hydraulic fluid. Mixing of water within estuarine habitats could potentially allow contaminants arising during construction works to impact on habitats within the Lower River Suir SAC. However, given the; • low risk of significant accidental discharges, • the limited potential for significant contamination by silt or hydrocarbons, • the distance involved, • the high level of dilution provided in the estuarine environment • the natural fluctuations of silt in the receiving environment • the location of habitats in relation to the proposed development • the robust nature of these habitats, No potential impact been identified. Overall, given the absence of significant aquatic operational discharges or construction related impacts on water quality no potential impact on estuarine qualifying habitats for this SAC have been identified. Similarly, no potential impacts from discharges of surface water during operation have been identified.	
	• Water courses of plain to montane levels with the *Ranunculion*	This habitat does not occur in estuarine or tidal habitats and	**Screened Out**

	fluitantis and *Callitricho-Batrachion* vegetation	thus no potential impact on this habitat has been identified.	
	• *Hydrophilous* tall herb fringe communities of plains and of the montane to alpine levels • Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles • Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae*) • *Taxus baccata* woods of the British Isles	The proposed development is not located within the Lower River Suir SAC. Therefore, no potential impacts on these habitats have been identified.	**Screened Out**
	• Freshwater pearl mussel (*Margaritifera margaritifera*) • White clawed Crayfish (*Austropotamobius pallipes*) • Brook Lamprey (*Lametra planeri*)	These species occur only in freshwater and as the proposed development adjoins an estuarine section of the SAC no potential impact on these species has been identified.	**Screened Out**
	• Sea Lamprey (*Petromyzon marinus*) • River Lamprey (*Lampetra fluviatilis*) • Twaite shad (*Alosa fallax*) • Salmon (*Salmo salar*) • Otter (*Lutra lutra*)	Inhabit and/or migrate through the Suir Estuary and thus could be affected by impacts on water quality. Impacts on prey availability could impact on otter.	**Screened In**
Bannow Bay SPA	• Light-bellied Brent Goose (*Branta bernicla hrota)* • Shelduck (*Tadorna tadorna)* • Pintail (*Anas acuta)* • Oystercatcher (*Haematopus ostralegus)* • Golden Plover (*Pluvialis apricaria)* • Grey Plover (*Pluvialis squatarola)*	Impacts on water quality during construction could potentially impact on water quality and estuarine habitats which in turn could impact on foraging resources for species within the SPA. Theoretically impacts on these species feeding outside of the SPA boundary and in particular at Baginbun Beach could potentially occur.	**Screened In**

	• Lapwing (*Vanellus vanellus)* • Knot (*Calidris canutus)* • Dunlin (*Calidris alpine)* • Black-tailed Godwit (*Limosa limosa)* • Bar-tailed Godwit (*Limosa lapponica)* • Curlew (*Numenius arquata)* • Redshank (*Tringa tetanus)* • Wetlands		

4.5 Screening Conclusion

Arising from the considerations detailed above, it is concluded that significant effects on the conservation objectives for the following European sites can be ruled out:

- Ballyteige Burrow SAC
- Saltee Islands SAC
- Keeragh Islands SPA
- Ballyteige Burrow SPA
- Tramore Dunes and Backstrand SAC
- Tramore Backstrand SPA

These sites are not considered further.

It is necessary to proceed to Stage 2 of the Appropriate Assessment process in respect of the potential for significant effects on the particular conservation objectives (screened in in **Table 13** above) of the following European sites:

- River Barrow & River Nore SAC
- Hook Head SAC
- Bannow Bay SAC
- Lower River Suir SAC
- Bannow Bay SPA

5. NIS

5.1 Introduction to NIS

Having identified the potential for significant effect on certain conservation objectives of a number of European sites, it is necessary to consider the potential effects of the proposed development on the integrity of these sites, either alone or in combination with other projects or plans, with respect to the site's structure and function and its conservation objectives. Additionally, where there are adverse impacts, an assessment of the potential mitigation of those impacts is required.

5.2 River Barrow and River Nore SAC - Habitats

5.2.1 Estuaries

The habitat Estuaries [1130] defined by the Interpretation Manual of European Union Habitats - EUR28 as follows;

"*Downstream part of a river valley, subject to the tide and extending from the limit of brackish waters. River estuaries are coastal inlets where, unlike 'large shallow inlets and bays' there is generally a substantial freshwater influence. The mixing of freshwater and sea water and the reduced current flows in the shelter of the estuary lead to deposition of fine sediments, often forming extensive intertidal sand and mud flats. Where the tidal currents are faster than flood tides, most sediments deposit to form a delta at the mouth of the estuary*.".

Estuaries are habitat complexes which comprise an interdependent mosaic of subtidal and intertidal habitats, which are closely associated with surrounding terrestrial habitats. Many of these habitats, such as Mudflats and sandflats not covered by sea water at low tide [1140], saltmarshes, Sandbanks which are slightly covered by sea water all the time [1110] and Reefs [1170], are identified as Annex I habitat types in their own right.

Estuaries are considered to be the transitional water body area as defined by the EPA under the Water Framework Directive. The inner boundary of the estuary is taken to be at New Ross and the outer boundary occurs between Creaden Head and Broomhill Point.

Table 14: QI habitats for which a potential impact has been identified – specific targets

Habitats	Attribute	Measure	Target
Estuaries	Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes
	Community distribution	Hectares	The following sediment communities should be maintained in a natural condition: Muddy estuarine community complex; Sand to muddy fine sand community complex; Fine sand with *Fabulina fabula* community
	Community extent	Hectares	Maintain the natural extent of the *Sabellaria alveolata* reef, subject to natural process

5.2.2 Mudflats and sandflats not covered by seawater at low tide

The River Barrow and River Nore SAC is designated for the marine Annex I qualifying interest Mudflats and sandflats not covered by seawater at low tide. The Interpretation Manual of European Union Habitats - EUR28 defines the habitat as '*Sands and muds of the coasts of the oceans, their connected seas and associated lagoons, not covered by sea water at low tide, devoid of vascular plants, usually coated by blue algae and diatoms. They are of particular importance as feeding grounds for wildfowl and waders. The diverse intertidal communities of invertebrates and algae that occupy them can be used to define subdivisions of 11.27, eelgrass communities that may be exposed for a few hours in the course of every tide have been listed under 11.3, brackish water vegetation of permanent pools by use of those of 11.4*.'

This Annex I habitat occurs intertidally between the mean low water mark (MLWM) and the mean high-water mark (HMWM), its seaward boundary is defined by the Ordnance Survey mean low water boundary. Expanses of sandflat are recorded in the southern margins of the site; it occurs from Creaden Head to Passage East on the western shore and from Black Point to Duncannon Fort on the eastern shore. Mudflat is present as a narrow band on the western shore and on the eastern shore broad areas occur at Shelbourne Bay and Fishertown Flats, thereafter it continues north as a narrow band (NPWS, 2011a).

Within the River Barrow and River Nore SAC a number of biological communities are recorded, whose species composition overlaps significantly. These communities are defined as; Muddy Estuarine Community Complex and Sand to Muddy Fine Sand Community Complex (NPWS, 2011a).

The specific conservation objectives for Mudflats and sandflats not covered by seawater at low tide in River Barrow and River Nore SAC (**Table 15**) is to maintain a favourable conservation condition.

Table 15: QI habitats for which a potential impact has been identified – specific targets

Habitats	Attribute	Measure	Target
Mudflats and sandflats not covered by seawater at low tide	Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes
	Community distribution	Hectares	The following sediment communities should be maintained in a natural condition: Muddy estuarine community complex; Sand to muddy fine sand community complex

5.2.3 *Salicornia* and other annuals colonising mud and sandflats

This pioneer saltmarsh vegetation colonises intertidal mud and sandflats in areas protected from strong wave action and is an important precursor to the development of more stable saltmarsh vegetation. It develops at the lower reaches of saltmarshes where the vegetation is frequently flooded by the tide, and can also colonise open creek sides, depressions or pans within saltmarshes, as well as disturbed areas of upper saltmarshes. The overall objective for

'*Salicornia* and other annuals colonising mud and sand' in the River Barrow and River Nore SAC is to 'maintain the favourable conservation condition'.

Table 16: QI habitats for which a potential impact has been identified – specific targets

Habitats	Attribute	Measure	Target
***Salicornia* and other annuals colonising mud and sand**	Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For the one sub-site mapped: Ringville - 0.03ha.
	Habitat distribution	Occurrence	No decline, subject to natural processes
	Physical structure: sediment supply	Presence/absence of physical barriers	Maintain or where necessary restore natural circulation of sediments and organic matter, without any physical obstructions
	Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime
	Physical structure: creeks and pans	Occurrence	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession
	Vegetation structure: zonation	Occurrence	Maintain range of saltmarsh habitat zonations including transitional zones, subject to natural processes including erosion and succession
	Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward
	Vegetation structure: vegetation cover.	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated
	Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub- communities with typical species listed in Saltmarsh Monitoring Project (McCorry & Ryle, 2009).
	Vegetation structure: negative indicator species: *Spartina anglica*	Hectares	No significant expansion of *Spartina*. No new sites for this species and an annual spread of less than 1% where it is

5.2.4 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) and Mediterranean salt meadows (*Juncetalia maritimi*)

Saltmarshes are stands of vegetation that occur along sheltered coasts, mainly on mud or sand, and are flooded periodically by the sea. They are restricted to the area between mid-neap tide level and high-water spring tide level.

Both Atlantic and Mediterranean salt meadows occur within the River Barrow and River Nore SAC. As is the case on the majority of Irish saltmarshes, Atlantic salt meadows is the dominant saltmarsh habitat within the Barrow/Nore area, where it occurs in a mosaic with other saltmarsh habitats, including 'Salicornia and other annuals colonising mud and sand' and 'Mediterranean salt meadows' (NPWS, 2011b).

During the Saltmarsh Monitoring Project (SMP) the area around Dunbrody Abbey at the Campile River Estuary crossing, was surveyed, mapped and assessed (McCorry & Ryle, 2009). Both the Annex I habitats, Atlantic salt meadows (ASM) and Mediterranean salt meadows (MSM) were recorded. Atlantic salt meadows are the more common Annex I habitat present. This habitat is mainly found in small low-lying patches of consolidated mud that have developed along the Campile River Channel. Several small 'islands' in the river channel along Dunbrody Abbey contain patches of ASM surrounded by *Spartina* sward. There are also small areas of ASM/Spartina sward mosaic (NPWS, 2011b).

It was noted that Atlantic salt meadows are less prominent between the railway bridge and the Dunbrody road bridge. The proposed HDD crossing point of the Campile River will be located under this section of the river channel. The lower abundance of Atlantic salt meadows at this point of the river is probably due to two factors, namely the relatively large area of saltmarsh reclaimed along the southern side in the past 50 years and an earth embankment built close to the river bank. Grassland, dominated by twitch grass is now dominant along the railway embankment. This vegetation has been classified and mapped as CM2 or other Non-Annex saltmarsh vegetation in accordance with the SMP project classification. Common Cordgrass has also colonised along the edge of the Twitch in places and clumps have consolidated into Spartina swards (NPWS, 2011b).

The overall objective for 'Atlantic salt meadows' and 'Mediterranean salt meadows' in the River Barrow and River Nore SAC is to 'restore the favourable conservation condition'.

Table 17: QI habitats for which a potential impact has been identified – specific targets

Habitats	Attribute	Measure	Target
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) & Mediterranean salt meadows	Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. ASM - For sub-sites mapped: • Dunbrody Abbey - 1.25ha, • Killowen - 2.59ha,

(*Juncetalia maritimi*)			• Rochestown - 17.50ha, • Ringville - 6.70ha MSM - For sub-sites mapped: • Dunbrody Abbey - 0.08ha, • Rochestown - 0.04ha, • Ringville - 6.70ha
	Habitat distribution	Occurrence	No decline, subject to natural processes
	Physical structure: sediment supply	Presence/absence of physical barriers	Maintain or where necessary restore natural circulation of sediments and organic matter, without any physical obstructions
	Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime
	Physical structure: creeks and pans	Occurrence	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession
	Vegetation structure: zonation	Occurrence	Maintain range of saltmarsh habitat zonations including transitional zones, subject to natural processes including erosion and succession
	Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward
	Vegetation structure: vegetation cover.	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated
	Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub-communities with typical species listed in Saltmarsh Monitoring Project (McCorry & Ryle, 2009).
	Vegetation structure: negative indicator species: *Spartina anglica*	Hectares	No significant expansion of *Spartina*. No new sites for this species and an annual spread of less than 1% where it is already known to occur

5.3 River Barrow & River Nore SAC and Lower River Suir SAC – Species

7.3.1 Otter (*Lutra lutra*)

Otters, along with their breeding and resting places are protected under the provisions of the Wildlife Act 1976, as amended by the Wildlife (Amendment) Act, 2000. Otters have additional protection because of their inclusion in Annex II and Annex IV of the Habitats Direct which is transposed into Irish law in the European Communities (Natural Habitats) Regulations (S.I 94 of 1997), as amended. Otters are also listed as requiring strict protection in Appendix II of the Berne Convention on the Conservation of European Wildlife and Natural Habitats and are included in the Convention on International Trade of Endangered species (CITES). Although rare in parts of Europe, they are widely distributed in the Irish countryside in both marine and freshwater habitats. This species is a qualifying interest for both the River Barrow and River Nore SAC and Lower River Suir SAC.

Otters are solitary and nocturnal and as such are rarely seen. Thus, surveys for otters rely on detecting signs of their presence. These include spraints (faeces), anal gland secretions, paths, slides, footprints and remains of prey items. Spraints are of particular value as they are used as territorial markers and are often found on prominent locations such as grass tussocks, stream junctions and under bridges. In addition, they are relatively straightforward to identify.

Otters occasionally dig out their own burrows but generally they make use of existing cavities as resting placing or for breeding sites. Suitable locations include eroded riverbanks, under trees along rivers, under fallen trees, within rock piles or in dry drainage pipes or culverts etc. If ground conditions are suitable the holt may consist of a complex tunnel and chamber system. Otters often lie out above ground especially within reed beds where depressions in the vegetation called "couches" are formed. Generally, holts or resting areas can be located by detecting signs such as spraints or tracks.

In contrast natal holts which are used by breeding females can be extremely difficult to locate. They are often located a considerable distance from any aquatic habitats and otters may also use habitats adjoining small streams with minimal or no fish populations. In addition, natal holts are usually carefully hidden and without obvious sprainting sites. Otters do not have a well-defined breeding season.

It is noted that otters are largely nocturnal, particularly in areas subject to high levels of disturbance as evidenced by the presence of otters in the centre of Irish cities. Thus, otters are able to adapt to increased noise and activity levels; however, breeding holts are generally located in areas where disturbance is lower.

A review of existing records within the 10km radius grid squares (S61, S71, S70, S80) showed that otter or signs of otter have been recorded on numerous occasions. A review of existing records within the 10km radius grid squares (S61, S71, S70, S80) showed that otter or signs of otter have been recorded on 109 occasions. Otter activity was recorded near sections of the cable route i.e. at Baginbun Beach, at Cheekpoint and at Barrow Bridge close to the existing Great Island Power Station.

Surveys by DixonBrosnan recorded otter spraints at three locations in proximity to the Campile River Estuary. A live otter was recorded during a bat survey at Dunbrody Bridge which is located 50m from the southern HDD compound. Fresh otter tracks were noted along Baginbun Beach in March 2019. No holts or couches were recorded in proximity to the proposed site works. However, no holts or resting places/couches were recorded. (See **Appendix 3:** ***Chapter 9*** *Biodiversity* from the EIAR).

Table 18: QI species for which a potential impact has been identified – specific targets River Barrow and River Nore SAC and Lower River Suir SAC

Species	Attribute	Measure	Target
Otter	Distribution	Percentage positive survey sites	No significant decline
	Extent of terrestrial habitat	Hectares	No significant decline. River Barrow and River Nore SAC - Area mapped and calculated as 122.8ha above high water mark (HWM); 1136.0ha along river banks / around ponds. Lower River Suir SAC - Area mapped and calculated as 116.17ha above high water mark (HWM) and 726.61ha along river banks
	Extent of marine habitat	Hectares	No significant decline. River Barrow and River Nore SAC - Area mapped and calculated as 857.7ha. Lower River Suir SAC - Area mapped and calculated as 712.27ha
	Extent of freshwater (river) habitat	Kilometres	No significant decline. River Barrow and River Nore SAC - Length mapped and calculated as 616.6km. Lower River Suir SAC - Length mapped and calculated as 382.31km
	Extent of freshwater (lake) habitat	Hectares	No significant decline. River Barrow and River Nore SAC - Area mapped and calculated as 2.6ha
	Couching sites and holts	Number	No significant decline
	Fish biomass available	Kilograms	No significant decline

5.3.2 Lamprey species (*Petromyzon marinus & Lampetra fluviatilis*)

Lamprey species are of high conservation value and all three Irish species (Sea Lamprey (*Petromyzon marinus)*, River Lamprey (*Lampetra fluviatilis)* and Brook Lamprey (*Lampetra planeri*) are listed on Annex II of the EU Habitats Directive. As brook lamprey is confined to freshwater no potential impact on this species has been identified. River lamprey and sea lamprey have an anadromous life cycle (i.e. anadromous fish spend most of their adult lives in salt-water and migrate to freshwater rivers and lakes to reproduce). The sea lamprey is the largest of the Irish lampreys. Sea lamprey are listed in Appendix II, and River lamprey is listed in both Appendices II and IV of the Habitats Directive. Both species are listed in Appendix III of the Berne Convention.

Stream flow, water temperature and streambed composition can have a major effect on the distribution of spawning sea lamprey (Haro & Kynar 1997). Physical barriers can impact on sea lamprey and river lamprey which are anadramous. The distribution of larvae is affected most by the location of spawning sites, stream flow, water temperature, streambed pollution and downstream migrations.

A survey conducted to determine the status and distribution of lamprey in the River Barrow and Nore SAC (King, 2006) found that 52% of the quantitative sampling sites generated negative results, with no juvenile lamprey recorded. Direct observation indicated than many tributaries contained a low proportion of the habitat features required by juvenile lamprey, particularly in regard to the occurrence of areas of deposition of fine-grained bed material. The vast majority of juvenile lamprey encountered was attributed to the genus *Lampetra*. Juveniles of *Petromyzon*, the sea lamprey, were taken at four stations, in four separate tributary channels. In all cases, numbers of *Petromyzon* were very low. A single survey site on the Campile River yielded a small number of ammocoetes of the genus *Lampetra*. No sea lamprey were recorded (King, 2006).

Lampreys are widely distributed in the Suir catchment with the main channel having optimal lamprey habitat. River/brook lampreys are present at a favourable status in the Suir catchment while the status of sea lampreys in the catchment is unfavourable (O’Connor, W. (2007)).

River Lamprey and Sea Lamprey will migrate through the estuarine sections of the River Suir and Barrow. Maitland and Campbell (1992) list the threats to lamprey as water pollution, barriers to migration and habitat degradation. In Ireland the single biggest factor limiting the distribution of anadromous lamprey are upstream barriers. Although the data available to date are limited, the impact of artificial barriers on the distribution of lampreys on a number of major rivers is evident.

Table 19: QI species for which a potential impact has been identified – specific targets- River Barrow and River Nore SAC and Lower River Suir SAC

Species	Attribute	Measure	Target
Sea Lamprey	Distribution: extent of anadromy	% of river accessible	Greater than 75% of main stem length of rivers accessible from estuary
	Population structure of juveniles	Number of age/size groups	At least three age/size groups present
	Juvenile density in fine sediment	Juveniles/m²	Juvenile density at least 1/m²

	Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds
	Availability of juvenile habitat	Number of positive sites in 3rd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive
River lamprey	Distribution: extent of anadromy	% of river accessible	River Barrow and River Nore SAC - Greater than 75% of main stem and major tributaries down to second order accessible from estuary. Lower River Suir SAC - Access to all water courses down to first order streams
	Population structure of juveniles	Number of age/size groups	At least three age/size groups of brook/river lamprey present
	Juvenile density in fine sediment	Juveniles/m²	Mean catchment juvenile density of brook/river lamprey at least 2/m²
	Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds
	Availability of juvenile habitat	Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive

5.3.3 Atlantic salmon (*Salmo salar*)

Atlantic salmon is listed under Annexes II and V of the EU Habitats Directive and Appendix III of the Berne Convention and are listed as qualifying interest for both the River Barrow and River Nore SAC. Tributaries including relatively minor watercourses provide important spawning and nursery habitat.

Salmon are anadromous migratory fish. Adult fish migrate from the sea to river/stream spawning areas, where the young fish live out their juvenile life stages before migrating as adults to the sea. Atlantic Salmon migrate through the tidal sections of River Barrow and River Nore SAC and Lower River Suir SAC.

The River Barrow is primarily a salmon grilse fishery and is currently open for catch and release only. During a fish stock assessment of the River Barrow Catchment in 2015, excellent juvenile salmon numbers were recorded in the upper reaches of the main channel of the River Barrow (Delanty et. al. 2015). The River Nore is a salmon fishery and considered the 4th largest 'functioning' Atlantic salmon river in Ireland (Sullivan, 2007). The upper stretches of the River Nore are important for salmon spawning.

Table 20: QI species for which a potential impact has been identified – specific targets- River Barrow and River Nore SAC and ower River Suir SAC

Species	Attribute	Measure	Target
Atlantic Salmon	Distribution: extent of anadromy	% of river accessible	100% of river channels down to second order accessible from estuary
	Adult spawning fish	Number	Conservation limit (CL) for each system consistently exceeded
	Salmon fry abundance	Number of fry/5 minutes electrofishing	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 minutes sampling
	Out-migrating smolt abundance	Number	No significant decline
	Number and distribution of redds	Number and occurrence	No decline in number and distribution of spawning redds due to anthropogenic causes
	Water quality	EPA Q value	At least Q4 at all sites sampled by EPA

5.3.4 Twaite shad (*Alosa fallax*)

Twaite shad is an anadromous fish which enters large estuaries in late April or May to spawn in gravels near the end of the freshwater reaches. The spawning population of twaite shad occurs in the upper tidal limit of the River Nore. In the River Barrow, they are impeded by the navigation weir at St. Mullins (IFI website).

The River Suir is one of only three known spawning grounds in the country for Twaite Shad. The shad has a substantial capacity to migrate long distances from the sea into freshwater however, in spite of this, there are no records of Twaite shad migrating up into the Suir and its tributaries.

The conservation status of Twaite shad has been assessed in Ireland as "Bad". The conservation objectives for this species in the Lower River Suir SAC is to restore its favourable conservation condition, while the objective within the River Barrow and River Nore SAC is to maintain or favourable conservation status.

This species is likely to occur or utilise areas downstream of the proposed development within the River Barrow and River Nore SAC. Potential impacts on water quality from the proposed development can therefore not be ruled out with potential for likely significant adverse effects.

Table 21: QI species for which a potential impact has been identified – specific targets Twaite Shad

Species	Attribute	Measure	Target
Twaite shad	Distribution: extent of anadromy	% of river accessible	Greater than 75% of main stem length of rivers accessible from estuary
	Population structure: age classes	Number of age classes	More than one age class present
	Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning habitats
	Water quality: oxygen levels	Milligrammes per litre	No lower than 5mg/l
	Spawning habitat quality: Filamentous algae; macrophytes; sediment Occurrence	Occurrence	Maintain stable gravel substrate with very little fine material, free of filamentous algal (macroalgae) growth and macrophyte (rooted higher plants) growth

5.4 Hook Head SAC - Habitat

5.4.1 Vegetated sea cliffs of the Atlantic and Baltic coasts

Sea cliffs on the Irish coast approximately correspond to the EU Annex I habitat Vegetated sea cliffs of the Atlantic and Baltic coasts (1230). Sea cliffs are defined as "*a steep or vertical slope located on the coast, the base of which is in either the intertidal (littoral) or subtidal (sublittoral) zone. The cliff may be composed of hard rock such as basalt, or of softer substrate such as shale or boulder clay. Hard cliffs are at least 5m high, while soft cliffs are at least 3m high. The cliff top is generally defined by a change to an obvious less steep gradient. In some cases the cliff may grade into the slopes of a hillside located close to the coast. In these cases the cliff is defined as that part of the slope which was formed by processes of coastal erosion, while the cliff top is where there is the distinct break in slope. Both the cliff and the cliff top may be subject to maritime influence in the form of salt spray and exposure to coastal winds. A cliff can ascend in steps with ledges, and the top of the cliff is taken to occur where erosion from wave action is no longer considered to have been a factor in the development of the landform. The cliff base may be marked by a change in gradient at the bottom of the cliff. Where the base is exposed it can be characterised by scree, boulders, a wave - cut platform or sand, among other substrates. …….. A cliff is considered to have reached its end point where it is no longer over 5m high (hard cliffs) of 3m high (soft cliffs), or no longer has a steep slope. …….. Sea cliffs may support a range of plant communities such as grassland, heath, scrub and bare rock communities, among others*" (Barron, et al. ,2011).

Sea cliffs can be broadly divided into two categories: hard (or rocky) cliffs and soft (or sedimentary) cliffs, both of which are covered by the Annex I habitat 'vegetated sea cliffs of the Atlantic and Baltic coasts'. Hard cliffs are composed of rocks such as limestone, sandstone, granite or quartzite which are hard and relatively resistant to mechanical erosion. Soft cliffs are composed of softer rock, such as shale, or unconsolidated material, such as glacial till. Vegetation of hard sea cliffs in exposed situations exhibits a strong maritime influence and is relatively stable. Soft cliff habitats are more prone to slope failure, which results in the presence of fast-colonising pioneer species.

The proposed landfall is at Baginbun Beach. The beach is flanked by sea cliffs to the west and south. The southern cliff faces that extends along Baginbun Head are categorised as hard cliffs (CS1); as the cliff moves north along the western periphery of the beach, the cliff transitions to a soft (sedimentary) cliff (CS3). HDD drilling is proposed under a section of the cliff face at Baginbun, which has the potential to impact on this habitat. The overall objective for 'Vegetated sea cliffs of the Atlantic and Baltic coasts' within the River Barrow and River Nore SAC is to 'restore the favourable conservation condition'.

Table 22: QI habitats for which a potential impact has been identified – specific targets

Habitats	Attribute	Measure	Target
Vegetated sea cliffs of the Atlantic and Baltic coasts	Habitat length	Kilometres	Area stable, subject to natural processes, including erosion. For sub-sites mapped: Loftushall - 0.55km; Hook Head - 2.36km; and Baginbun Head - 9.20km
	Habitat distribution	Occurrence	No decline, subject to natural processes
	Physical structure: functionality and hydrological regime	Occurrence of artificial barriers	No alteration to natural functioning of geomorphological and hydrological processes due to artificial structures
	Vegetation structure: zonation	Occurrence	Maintain range of sea cliff habitat zonations including transitional zones, subject to natural processes including erosion and succession
	Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward
	Vegetation composition: typical species	Percentage cover at a representative sample of	Maintain range of sub- communities with typical species listed in the Irish Sea Cliff Survey (Barron et al., 2011)

	and sub-communities	monitoring stops	
	Vegetation composition: negative indicator species	Percentage	Negative indicator species (including non-natives) to represent less than 5% cover
	Vegetation composition: bracken and woody species	Percentage	Cover of bracken (*Pteridium aquilinum*) on grassland and/or heath less than 10%. Cover of woody species on grassland and/or heath less than 20%

5.5 Bannow Bay SPA Species

The Bannow Bay SPA covers an area of 1,363 hectares in size with 92% of that being composed of marine area. Bannow Bay is a large, very sheltered, estuarine system with a narrow outlet to the sea. Very extensive intertidal mud and sand flats are exposed at low tide, with an average width of about 2 km. A number of small to medium sized rivers flow into the site, the principal being the Owenduff and the Corock which enter at the top end of the estuary. The sediments have a rich macroinvertebrate fauna, with such species as *Scrobicularia plana*, *Hediste diversicolor* and *Arenicola marina* being frequent. Salt marshes are well developed in the sheltered areas of the site. The main land use within the site is shellfish farming. The site is surrounded by agricultural land.

Table 23: Species listed as Special Conservation Interests of the Bannow Bay SPA and their Conservation status.

Species		**Birds Directive Annex**			**BOCCI**	
		I	**II**	**III**	**Red List**	**Amber List**
Branta bernicla hrota	Light-bellied Brent Goose					X
Calidris canutus	Knot					X
Numenius arquata	Curlew		X		X	
Limosa limosa	Black-tailed Godwit					X
Limosa lapponica	Bar-tailed Godwit	X				X
Tringatotanus	Redshank				X	
Vanellus vanellus	Lapwing		X		X	
Haematopus ostralegus	Oystercatcher					X
Tadorna tadorna	Shelduck					X
Anas acuta	Pintail		X	X	X	
Pluvialis apricaria	Golden Plover	X	X	X	X	
Pluvialis squatarola	Grey Plover					X
Calidris alpina	Dunlin	X			X	
Symbol	**Description**					

I	**Annex 1**: species and sub-species are particularly threatened. Member States must designate Special Protection Areas (SPAs) for their survival and all migratory bird species.
II	**Annex 2**: bird species can be hunted. However, the hunting periods are limited and hunting is forbidden when birds are at their most vulnerable: during their return migration to nesting areas, reproduction and the raising of their chicks.
III	**Annex 3**: overall, activities that directly threaten birds, such as their deliberate killing, capture or trade, or the destruction of their nests, are banned. With certain restrictions, Member States can allow some of these activities for species listed here.

These species are listed as Special Conservation Interests for the Bannow Bay SPA for the following reasons:

- During winter the site regularly supports 1% or more of the biogeographical population of Light-bellied Brent Geese (*Branta bernicla hrota*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 561 individuals.
- During winter the site regularly supports 1% or more of the all-Ireland population of Dunlin (*Calidris alpina*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 3,038 individuals.
- During winter the site regularly supports 1% or more of the biogeographical population of Black-tailed Godwit (*Limosa limosa*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 546 individuals.
- During winter the site regularly supports 1% or more of the biogeographical population of Bar-tailed Godwit (*Limosa lapponica*). The mean peak number of this Annex I species within the SPA during the baseline period (1995/96 – 1999/00) was 471 individuals.

Additional Special Conservation Interests for Bannow Bay SPA are as follows:

- During winter the site regularly supports 1% or more of the all-Ireland population of Shelduck (*Tadorna tadorna*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 500 individuals.
- During winter the site regularly supports 1% or more of the all-Ireland population of Pintail (*Anas acuta*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 52 individuals.
- During winter the site regularly supports 1% or more of the all-Ireland population of Oystercatcher (*Haematopus ostralegus*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 711 individuals.
- During winter the site regularly supports 1% or more of the all-Ireland population of Golden Plover (*Pluvialis apricaria*). The mean peak number of this Annex I species within the SPA during the baseline period (1995/96 – 1999/00) was 1,955 individuals.

- During winter the site regularly supports 1% or more of the all-Ireland population of Grey Plover (*Pluvialis squatarola*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 142 individuals.
- During winter the site regularly supports 1% or more of the all-Ireland population of Lapwing (*Vanellus vanellus*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 2,950 individuals.
- During winter the site regularly supports 1% or more of the all-Ireland population of Knot (*Calidris canutus*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 508 individuals.
- During winter the site regularly supports 1% or more of the all-Ireland population of Curlew (Numenius arquata). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 891 individuals.
- During winter the site regularly supports 1% or more of the all-Ireland population of Redshank (Tringa totanus). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 377 individuals.
- The wetland habitats contained within Bannow Bay SPA are identified of conservation importance for non-breeding (wintering) migratory waterbirds. Therefore, the wetland habitats are considered to be an additional Special Conservation Interest.

Table 24: QI species for which a potential impact has been identified – specific targets

Species/Habitats	Attribute	Measure	Target
Light-bellied Brent Goose Knot Curlew Black-tailed Godwit Bar-tailed Godwit Redshank Lapwing Oystercatcher Shelduck Pintail Golden Plover Grey Plover Dunlin	Population trend	Percentage change	Long term population trend stable or increasing
	Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by each species, other than that occurring from natural patterns of variation
Wetlands	Habitat area	Hectares	The permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 1,364ha, other than that occurring from natural patterns of variation

6. Water Quality data

6.1 EPA Water Quality Data

The Environmental Protection Agency (EPA) carries out a biological assessment of most river channels in the country on a regular basis. The assessments are used to derive Q values, indicators of the biological quality of the water. The biological health of a watercourse provides an indication of long-term water quality. As the proposed development site adjoins estuarine and coastal areas, no freshwater biological monitoring data is available for sites downstream of the proposed development. There is no monitoring data available for the Newtown/Kilmannock River, which will be crossed by the proposed cable route.

6.2 River Basin Management Plan for Ireland 2018 – 2021 (2nd Cycle)

The Water Framework Directive (WFD) sets out the environmental objectives which are required to be met through the process of river basin planning and implementation of those plans. Specific objectives are set out for surface water, groundwater and protected areas. The challenges that must be overcome in order to achieve those objectives are very significant. Therefore, a key purpose of the River Basin Management Plan (RBMP) is to set out priorities and ensure that implementation is guided by these priorities.

The second-cycle RBMP aims to build on the progress made during the first cycle. Key measures during the first cycle included the licensing of urban waste-water discharges (with an associated investment in urban waste-water treatment) and the implementation of the Nitrates Action Programme (Good Agricultural Practice Regulations). The former measure has resulted in significant progress in terms both of compliance levels and of the impact of urban waste-water on water quality. The latter provides a considerable environmental baseline which all Irish farmers must achieve and has resulted in improving trends in the level of nitrates and phosphates in rivers and groundwater. It is acknowledged, however, that sufficient progress has not been made in developing and implementing supporting measures during the first cycle.

Overall, RBMP assesses the quality of water in Ireland and presents detailed scientific characterisation of our water bodies. The characterisation process also takes into account wider water quality considerations, such as the special water-quality requirements of protected areas. The characterisation process identifies those water bodies that are *At Risk* of not meeting the objectives of the WFD, and the process also identifies the significant pressures causing this risk. Based on an assessment of risk and pressures, a programme of measures has been developed to address the identified pressures and work towards achieving the required objectives for water quality and protected areas. Data relating to the watercourses within the study area is provided in **Table 25**. It is noted that the proposed development falls within two waterbody catchments; the Barrow catchment and Ballyteigue-Bannow catchment.

Table 25: Water Framework Directive Data – Relevant data

Catchment: Barrow (Code 14) – 2nd Cycle			
This catchment includes the area drained by the River Barrow upstream of the River Nore confluence and all streams entering tidal water between the Barrow railway bridge at Great Island and Ringwood, Co. Kilkenny, draining a total area of 3,025km². The largest urban centre in the catchment is Carlow. The other main urban centres in this catchment are New Ross, Graiguenamanagh, Athy, Portlaoise, Mountmellick, Portarlington, Monasterevin and Kildare. The total population of the catchment is approximately 188117 with a population density of 62 people per km². The Barrow catchment is underlain in its flat northern area by limestones of varying purity which continue down the western side of the catchment and sustain good groundwater resources in places. On the eastern side of the catchment, granites dominate, culminating in the summits of the Blackstairs Mountains. The Barrow Catchment Assessment 2010-2015 (HA 14) notes that there are no coastal water bodies in the Barrow catchment. The significant pressure affecting the greatest number of transitional water bodies is agriculture. It is noted that information regarding the New Ross Port is outlined in the Nore Catchment Assessment, which states that three transitional water bodies in the catchment are At Risk of not meeting their water quality objectives. Of these three the New Ross Port and the Lower Suir Estuary (Little Island - Cheekpoint) are relevant to the proposed development.			
Catchment: Ballyteigue-Bannow (Code 13) – 2nd Cycle			
This catchment includes the area drained by all streams entering tidal water between Greenore Point and Railway Bridge, Great Island, Co. Wexford, draining a total area of 654km². There are no large urban centres in the catchment. The only urban centres in this catchment are Lady's Island, Kilmore Quay, Bridgetown, Wellingtonbridge, Duncannon, and Campile. The total population of the catchment is approximately 26,593 with a population density of 41 people per km². The catchment has an undulating topography and is underlain by a series of volcanic and metamorphic rocks. The Ballyteigue-Bannow Catchment Assessment 2010-2015 (HA 13) notes that there are ten transitional and coastal (TraCs) water bodies in the Ballyteigue-Bannow catchment. Of these ten, there are three Not at Risk TraC water bodies which require no additional investigative assessment or measures to be applied, other than those measures that are already in place. Both the Barrow Suir Nore Estuary and Eastern Celtic Sea (HAs 13;17) are considered not at risk. Waterford Harbour and Bannow Bay are under review.			
Transitional & Coastal Waterbodies relevant to the proposed development			
Waterbody	**Status**	**Risk**	**Objective**
Barrow Suir Nore Estuary	Good	Not at risk	2027
New Ross Port	Moderate	At risk	2027
Lower Suir Estuary (Little Island - Cheekpoint)	Moderate	At risk	2027

Eastern Celtic Sea (HAs 13;17)	Unassigned	Not at risk	2027
Bannow Bay	Unassigned	Under review	2027
Waterford Harbour	Good	Under review	2027

Source: wfdireland map system & www.catchments.ie

7. Ecological Surveys

7.1 Habitats

Site surveys were carried out from March 2018 to December 2019 to identify the habitats, flora and fauna present at the site. The surveys consisted of walking systematically through the site and recording habitats. The terrestrial and aquatic habitats within or adjacent to the proposed development site were classified using the classification scheme outlined in the Heritage council publication *A Guide to Habitats in Ireland* (Fossitt, 2000) and cross referenced with Annex 1 Habitats where required. No rare floral species were noted.

A detailed description of the habitats found within the proposed development site and an assessment of their ecological value is provided in the **Chapter 9** *Biodiversity* of the EIAR which is attached as **Appendix 3**. Habitat maps for the main works areas are provided below as **Figures 16 - 20.** Habitats noted within the proposed development area are shown below in **Table 26**.

Table 26: Habitats potentially affected by the proposed works

Proposed Works Sites	Habitat
Converter Station and Tail Station Site and Adjacent Lands	Buildings and artificial surfaces (BL3)
	Recolonising bare ground ED3/ Buildings and artificial surfaces BL3/ Scrub WS1
	Improved agricultural grassland (GA1)
	Immature woodland (WS2)
	Scrub (WS1)
	Hedgerow (WL1)/Scrub (WS1)/ Dry meadow and grassy verge (GS2)
	Mixed broadleaved woodland (WD1)/Scrub WS1 Treeline (WL2)
	Tidal River CW2/Earthbank BL2
Northern Off-Road Area Between Great Island and the Campile Estuary	Improved agricultural grassland (GA1)
	Arable crop (BC1)
	Hedgerow (WL1)/Treeline WL2
	Dry meadow and grassy verge (GS2) (of insufficient size to be mapped)
	Buildings and artificial surfaces (BL3)
	(Mixed) broadleaved woodland (WD1)/Treeline WL2
	Stone walls and other stonework (BL1)/ Spoil and other bare ground (ED2)
	Drainage ditch (FW4)
	Tidal river (CW2)/ Earthbanks (BL2)
Campile River Estuary Crossing	Tidal rivers (CW2)
	Upper salt marsh (CM2)
	Mixed broadleaved woodland (WD2)/conifer woodland (WD3)

Proposed Works Sites	Habitat
	Mixed broadleaved Woodland (WD1)/ Treelines (WL2)/ Hedgerows (WL1)/ Scrub (WS1)
	Improved agricultural grassland (GA1)
	Recolonising bare ground (ED3)/ Scrub (WS1)
	Embankment (BL2)
Baginbun Beach Landfall Site and Car Parking	Improved agricultural grassland (GA1)
	Rocky sea cliffs (CS1) / Sedimentary sea cliffs (CS3)
	Sand shores (LS2)
	Buildings and artificial surfaces (BL3) / Spoil and bare ground (ED2)
	Improved agricultural grassland (GA1)
	Arable crop (BC1)
	Scrub (WS1)
Minor Off-Road Areas adjacent to Roads	Arable crop (BC1)
	Improved agricultural grassland (GA1)
Cable Route Within Roads, Footpaths and Verges	Buildings and artificial surfaces (BL3)/ Stone walls and other stonework (BL1)
	Hedgerows (WL1)/ Treelines (WL2)

Figure 16: Overview of habitats at the proposed Converter Station and Tail Station site | not to scale

Green: Improved agricultural grassland GA1, Red: Immature broadleaved woodland WS2, Yellow: Scrub WS1, Black: Buildings and artificial surfaces BL3, Pink: Treeline WL2/ Mixed broadleaved woodland WD1/ Scrub WS1, Orange: Recolonising bare ground ED3/ Buildings and artificial surfaces BL3/ Scrub WS1, Purple: Hedgerow WL1/ Scrub/ WS1/ Dry meadows and grassy verge GS2, Blue: Tidal river CW2.

Figure 17: Overview of habitats at the proposed northern off-road area between Great Island and the Campile River Estuary | not to scale

Dark green: Improved agricultural grassland GA1, Yellow: Arable crops BC1, Red: Hedgerow WL1/ Treeline WL2, Light green: Mixed broadleaved woodland WD1/ Treeline WL2, White: Stone walls and other stonework BL1/ Spoil and bare ground ED2, Light blue: Tidal river CW2/ Earthbank BL2, Blue dashed line: Drainage ditches FW4, Black: Buildings and artificial surfaces BL1, small pockets of Dry meadows and grassy verge GS2 of insufficient size to be mapped.

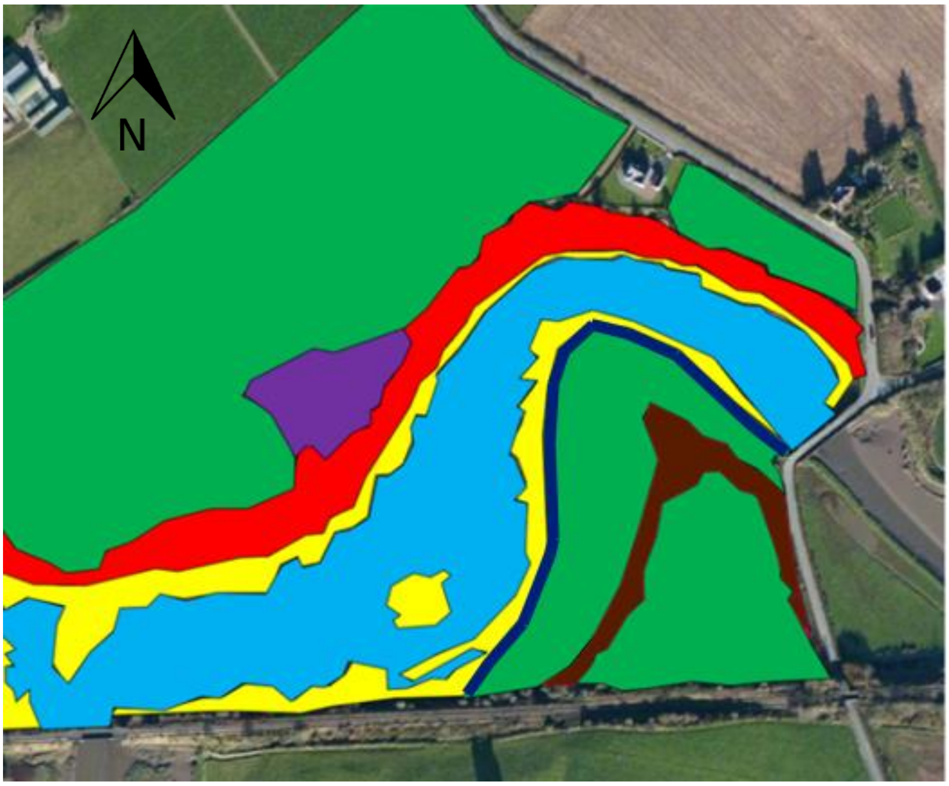


Figure 18: Overview of habitats at Campile River Estuary | not to scale

Light blue: Tidal river CW2, Yellow: Upper salt marsh CM2, Red: Mixed broadleaved/ Conifer Woodland WD2, Purple: Recolonising bare ground ED3/ Scrub WS1, Brown: Mixed broadleaved woodland WD1, Treelines W2, Hedgerows WL1/ Scrub WS1, Dark green: Improved agricultural grassland GA1, Dark blue: Embankment BL2.

Figure 19: General overview of terrestrial/ intertidal habitats at Baginbun Beach | not to scale

Red: Rocky sea cliff CS1/ Sedimentary sea cliff CS3, Yellow: Sand shores LS2, Orange: Buildings and artificial surfaces BL3/ Spoil and bare ground ED2, Green: Improved agricultural grassland GA1, Purple: Arable crops BC1.

Figure 20 showing proposed road-side parking area near Baginbun Beach | not to scale
Yellow=Improved agricultural grassland GA1, Pink= Scrub WS1

7.2 Mammals

Mammal surveys were carried out at all of the off-road diversion areas in conjunction with habitat surveys on the 29th March, 20th April, 23rd May, 19th June, 18th of September 2018, 1st February and 24th May and 16th December 2019.

Further detail on mammal surveys is provided in **Chapter 9** *Biodiversity* (**Appendix 3**). The main focus of the mammal survey was to establish if otter which is listed as qualifying species for the River Barrow and River Nore SAC and the Lower River Suir SAC utilise the proposed works areas or areas in immediate proximity to them. The value of the Newtown River was also assessed as potential fish habitat as part of this process, as fish within this river could potentially provide food resources for otter.

7.2.1 Otter (*Lutra lutra*)

Otter surveys covering a radius of a minimum of 150m from the works area in areas where potential otter habitat was identified ie. Campile, Baginbun Beach and Newtown River. Higher search effort was focused in areas that typically have a higher probability of otter activity i.e. mature riparian treelines, bridge abutments, embankments, areas bounded by scrub, open grassy promontories, mud & sand habitat.

Otter which is listed on Annex II of the Habitats Directive and is listed as a conservation objective for the River Barrow and River Nore SAC and the Lower River Suir SAC was recorded along the Campile River. Otter spraints were recorded at the locations shown in **Figure 21**. A live otter was recorded at Dunbrody Bridge. Fresh otter tracks were noted along Baginbun Beach in March 2019 (**Photograph 1**). It is concluded therefore that otters occur within a radius of 150m from the proposed development at Campile and Banginbun Beach however no holts or couches were recorded. No evidence of otter was recorded at the proposed open cut crossing location or surface water discharge location at the Newtown River or within 150m of same.

Figure 21: Locations of otter spraint (blue shade) near and along the Campile River Estuary | not to scale

Photograph 1: Otter tracks recorded on Baginbun Beach

7.3 Birds

Winter bird counts were carried out by Dixon.Brosnan during the appropriate time period in the 2015/2016 season in order to assess winter bird usage of coastal sites which had been identified as landfalls for the proposed development. Three sites were initially chosen (Booley Bay, Boyces Bay and Baginbun Bay) with an additional site (Sandeel Bay) added in December 2015. All of these locations were initially considered as possible landfall sites. Vantage points were chosen to provide maximum visual coverage of habitats potentially of value for winter birds.

The winter bird surveys were undertaken on the following dates: 23th November 2015, 15th December 2015, 21st January 2015, 10th February 2015, 3rd March 2016 and 23rd March 2016. The survey methodology was based on that used by the British Trust for Ornithology (BTO), Wetland Bird Survey (WeBS) and also that for the Irish Wetland Bird Survey (I-WeBS), as outlined in Gilbert et al. (1998).

The winter bird survey was undertaken using Nicon ProStaff-7 10X42 binoculars and a Safari 20-60 X 80 spotting scope. Ninety-minute counts were undertaken at either high tide, mid tide or low tide. Tides and weather conditions for each day were recorded.

It is noted that many of these birds were recorded overflying the channel and that the survey covered a radius of approximately 300m from each vantage point. Trawlers fishing for sprat offshore attracted large numbers of sea birds. Thus, during the periods when trawlers were present numbers were elevated above the expected normal level. A total of 48 bird species were recorded during the site surveys. Two species listed as qualifying interests for the

Bannon Bay SPA i.e. Oystercatcher and Redshank, were recorded at Baginbun Beach. Both were recorded in low numbers.

None of the waterbirds recorded by vantage point counts in proximity to Baginbun Bay were recorded in high numbers and numbers were low in-comparison to the figures which would be considered nationally significant (i.e. 1% or more of the all-Ireland population of an Annex I species or 1% or more of the bio-geographical population of a migratory species). More detail on the methodology and the results of the survey are provided in **Appendix 4: Winter Bird Survey.**

A winter bird survey was also undertaken by Dixon.Brosnan on six separate occasions; October 2018 to March 2019 (refer to **Appendix 4: Winter Bird Survey**). These surveys focused on the preferred route for this project. The survey methodology was based on that used by the British Trust for Ornithology (BTO), Wetland Bird Survey (WeBS) and also that for the Irish Wetland Bird Survey (I-WeBS), as outlined in Gilbert et al. (1998) and the low tide waterbird surveys (Lewis, L. J. et. al. 2014). The winter bird survey was undertaken using 8.5×45 binoculars and a Swarovski ATX30-70x95 spotting scope. Ninety-minute counts were undertaken at each survey location at either high tide, mid tide and low tide.

Particular attention was paid to three locations within the study area, which are of particular relevance to the proposed development, as follows:

- The coastal waters and beach at Baginbun Beach which is a proposed landfall option;
- A proposed cable crossing of the Campile River Estuary south of the railway line;
- A proposed cable crossing of the Campile River Estuary north of the railway line (This has been spilt into two vantage point locations due to sightlines):
  - North of the railway line
  - West of Dunbrody Bridge.

The survey locations were based on information gathered during the original site walkover and the location of the proposed works. Boundaries of the count areas were selected primarily to delineate patches of relatively homogenous habitat within the study area in order to compare bird usage of these habitats and spatial areas; but were also selected to be easily perceived by the observer. This was done by use of sight-lines to prominent landmarks such as permanent marker buoys, coastal features and features on the horizon. Survey vantage point locations for the winter bird counts are shown in **Figure 22.**

Figure 22 Vantage point locations for the winter bird counts | not to scale

Where possible the survey covered a radius of approximately 300m from the proposed works area. A radius of 300m was used based information gathered by Borgmann (2011) stating that establishing set-back distances of 250 m from waterfowl, diving ducks, wading birds, and shorebirds may lessen the impacts to the most sensitive species. In addition, in most instances a visual stimulus will create a disturbance effect before any associated noise starts to have an effect e.g. a flight response might be expected by many species if approached to within c. 100-150m across a mudflat (Cutts et. Al, 2013).

A total 26 species were recorded from the site visits during the winter bird survey as detailed below in **Table 27**. Seven species were recorded within all 3 survey sites i.e. Black-headed Gull, Little Egret, Curlew, Black-tailed Godwit, Greenshank, Redshank and Teal.

Table 27: Species recorded along with their conservation status

Species		Birds Directive Annex			BOCCI		European Birds of Conservation Concern - Ireland		
		I	II	III	Red List	Amber List	SPEC 1	SPEC 2	SPEC 3
Larus ridibundus	Black-headed Gull				X				
Larus canus	Common Gull					X			
Larus argentatus	Herring Gull				X			X	
Larus marinus	Great black-backed Gull					X			
Larus fuscus	Lesser black-backed Gull					X			
Egrettagarzetta	Little Egret	X							
Ardea cinerea	Grey Heron								
Numenius arquata	Curlew		X		X		X		
Phalacrocorax carbo	Cormorant					X			
Phalocrocorax aristotelis	Shag					X		X	
Alca torda	Razorbill					X	X		
Uria aalge	Guillemot					X			
Tringa ochropus	Green Sandpiper								
Gallinago gallinago	Snipe		X	X		X			X
Limosa limosa	Black-tailed Godwit					X	X		
Haematopus ostralegus	Oystercatcher					X	X		
Tringatotanus	Redshank				X			X	
Tringa nebularia	Greenshank								
Calidris alpina	Dunlin	X			X				X
Arenaria interpres	Turnstone								
Alcedo atthis	Kingfisher	X				X			X
Anas penelope	Wigeon		X	X	X				
Anas crecca	Teal		X	X		X			
Tachybaptus ruficollis	Little Grebe					X			
Gavia stellata	Red-throated Diver	X				X			X

Gavia immer	Great Northern Diver	X				X			
Anas crecca	Teal		X	X		X			
Arenaria interpres	Turnstone								
Anas penelope	Wigeon		X	X	X				

Only one Special Protection Area (Bannow Bay SPA, Site Code 004033) is deemed relevant to the proposed development. A total of five species listed as qualifying interests for the Bannow Bay SPA were recorded utilising the survey sites, namely, Dunlin, Curlew, Black-tailed Godwit, Oystercatcher and Redshank. Two species listed as qualifying interests were recorded at Baginbun Beach i.e. Redshank and Oystercatcher while four species were recorded in proximity to the Campile River Estuary crossing i.e. Redshank, Curlew, Dunlin and Black-tailed Godwit. None of these species were recorded in high abundance which would be considered important at a national level.

The peak numbers recorded by Dixon.Brosnan during the 2018/2019 winter bird survey represent a fraction of the mean peak number of these species within the SPA during the baseline period (1995/96 – 1999/00). It is noted that the survey area for the SPA, which was used during the baseline period and the survey area used by Dixon.Brosnan for winter bird surveys do not coincide as the surveys carried out by DixonBrosnan focused on smaller, specific areas of particular relevance to this project whereas baseline surveys assess the overall value of the SPA for wintering bird species from different count locations. Although a direct comparison is not possible, the baseline data provides a benchmark for the birds recorded during DixonBrosnan surveys.

The peak number for each species represented as a percentage of the mean peak for each species during the baseline period was calculated as follows:

- Dunlin - <1%
- Curlew – 2.5%
- Black-tailed Godwit – 5.9%
- Oystercatcher - <1%
- Redshank – 6.9%

Overall, six Annex I bird species were recorded i.e. Little Egret, Dunlin, Kingfisher, Merlin, Red-throated Diver and Great Northern Diver. Six Red Listed species were recorded, namely Black-headed Gull, Herring Gull, Redshank, Wigeon, Dunlin and Curlew. Merlin was recorded roosting at Baginbun Head on a single occasion.

The mudflat habitat along the Campile River estuary is of local value for waders e.g. Curlew, Black-tailed Godwit, Greenshank and Redshank all of which were recorded during the winter bird survey. A high tide roost of Redshank was recorded south of the railway, along the river bank.

Overall, none of the waterbirds recorded by vantage point counts were recorded in high numbers and numbers were low in-comparison to the figures which would be considered nationally significant (i.e. 1% or more of the all-Ireland population of an Annex I species or 1% or more of the bio-geographical population of a migratory species). The results were also consistent with the previous 2015/ 2016 surveys.

7.4 Invasive Species

The non-native and invasive species Japanese Knotweed (*Fallopia japonica*) was recorded in proximity to the proposed works area. Rhododendron (*Rhododendron ponticum*) were recorded in proximity to and within the proposed works area.

Regulations 49 and 50 of the European Communities (Birds and Natural Habitats) Regulations 2011 make it an offence to plant, disperse, allow dispersal or cause the spread of certain species e.g. Japanese knotweed, Himalayan balsam and Rhododendron, keep the plant in possession for purpose of sale, breeding, reproduction, propagation, distribution, introduction or release, keep anything from which the plant can be reproduced or propagated from the species, without a granted licence and keep any vector material for the purposes of breeding, distribution, introduction or release. Regulation 49 deals with the '*Prohibition on introduction and dispersal*' while Regulation 50 deals with the '*Prohibition on dealing with and keeping certain species*'. Regulation 50 has yet to be brought into Irish law. Regulation 74 is a transitional provision in relation to Regulation 49 and 50.

The Wildlife (Amendment) Act 2000 states that anyone who plants or otherwise causes to grow in a wild state in any place in the State any species of (exotic) flora, or the flowers, roots, seeds or spores of (exotic) flora shall be guilty of an offence.

There is a statutory obligation under S.I. 477 of 2011 of the European Communities (Birds and Natural Habitats) Regulations 2011 to address invasive species in Ireland. Rhododendron, Three Cornered Leek and Japanese Knotweed are listed under the *3rd Schedule: Part 1 – Plants; Non-native species subject to restrictions under Regulations 49 & 50*.

The non-native and invasive species Japanese Knotweed (*Fallopia japonica*), Rhododendron (*Rhododendron ponticum*) and Three Conered Leek (*Allium triquetrum*) were recorded within or in proximity to the proposed works area. All three species are listed on both the "Most Unwanted: Established Threat" and on the "High Risk: Recorded Species" list compiled by Invasive Species Ireland a joint initiative by the Northern Ireland Environment Agency and NPWS. All invasive species listed are also included in the NRA Guidelines on the Management of Noxious Weeds and Non-native Species on National Roads (NRA, 2010) as these species have been shown to have an adverse impact on landscape quality, native biodiversity or infrastructure; and are likely to be encountered during road schemes. The location of Japanese knotweed, Three Cornered Leek and Rhododendron within the or in proximity to the proposed development area is shown in **Figures 23** to **25**. The Amber listed species Winter Heliotrope was recorded within the works area and is ubiquitous along roadside verges in this area and was too prevalent to effectively map.

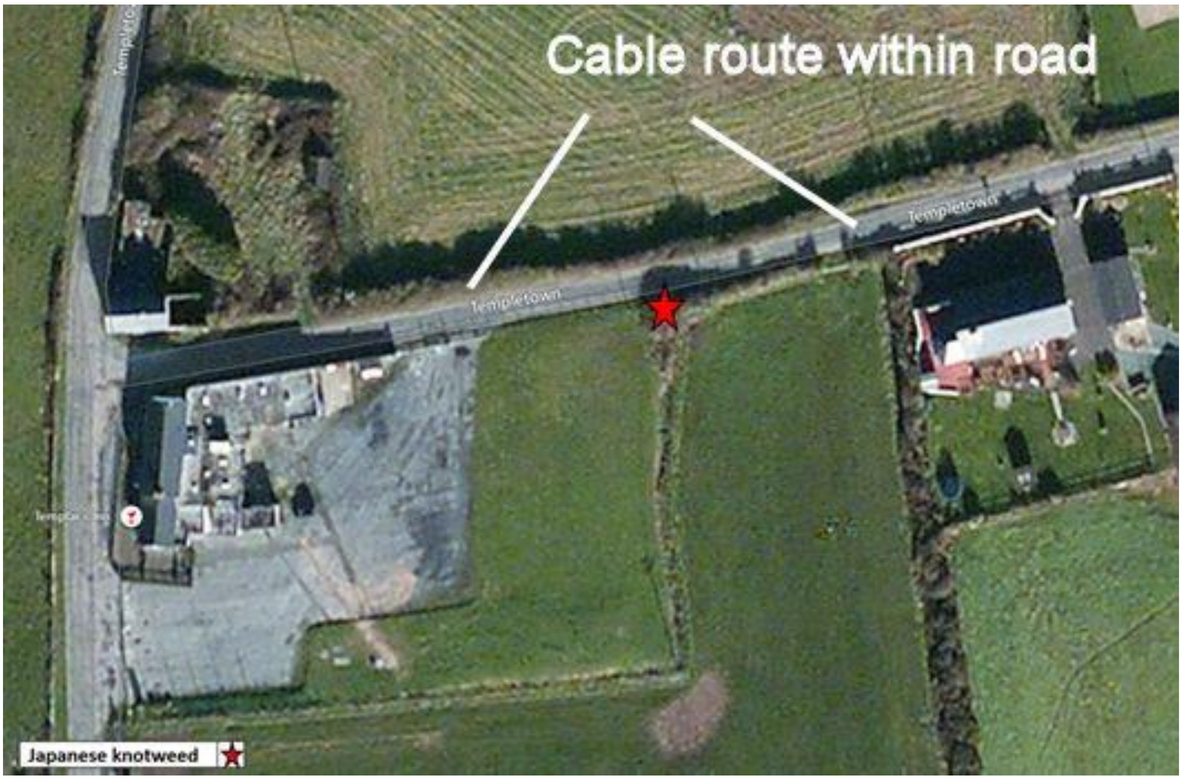


Figure 23. Location of the high-risk invasive species Japanese knotweed. A mature stand of Japanese knotweed was recorded approximately 35m east of the Templars Inn carpark, within a hedgerow habitat along the road verge (grid reference N52˚10'49.0", W006˚53'37.1"). The cable trench will be constructed in the road to the north of this hedgerow

Figure 24 Location of Rhododendron | not to scale. Rhododendron was recorded growing within the understory of woodland and treeline/ hedgerow habitats at various locations within and in proximity to proposed works, at the Campile River Estuary Crossing.

Figure 25: Location of Three-cornered Leek | not to scale This species was recorded approximately 86m from the proposed car parking area, which is the closest point of the proposed development at Baginbun Beach

8. NIS: Assessment of Potential Impacts

Based on the EC Article 6 Guidance Document (2001) and IEEM guidelines '*Guidelines for Ecological Impact Assessment'* (IEEM, 2018) impacts are assessed, using a combination of professional judgement and criteria or standards where available. The potential impacts associated with the proposed development are discussed in the following section with respect to their likelihood to have adverse effects on the integrity of Natura 2000 sites.

As part of the assessment direct, indirect and cumulative impacts were considered. Direct impacts refer to habitat loss or fragmentation arising from land-take requirements for development. Indirect and secondary impacts do not have a straight-line route between cause and effect.

As part of the assessment the potential for impacts associated with the development were reviewed to identify advere effects on the intergrity of Natura 2000 sites. Works will impact on habitats which are not located within Natura 2000 sites. A HDD methodology will be employed at sensitive locations at the Campile Estuary and Baginbun Beach. Based on a detailed assessment of potential impacts during construction, operation and decommissioning, the following potential impacts were identified and are assessed in detail below:

- Impact-loss of habitat and indirect impacts on habtiats
- Impacts on migratory fish species and fish biomass as prey for otter
- Impacts from lighting, noise, vibration and disturbance on qualifying species
- Impacts on water quality and aquatic ecology
- Impact from spread of invasive species
- Cumulative Impacts.

8.1 Loss of habitat

8.1.1 Loss of terrestrial and estuarine habitats

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. An ecological appraisal of the proposed development areas indicate that they support common habitats that do not correspond to Annex I or qualifying habitats for Natura 2000 sites. No adverse effects on the intergrity of Natura 2000 sites due to impacts on habitats outside of the boundary of Natura 2000 sites will occur.

8.1.2 Loss of terrestrial, marine and estuarine habitats at the Campile River Estuary crossing and landfall/ car parking sites at Baginbun Beach

With regard to the Campile River Estuary crossing and landfall site at Baginbun Beach, horizontal directional drilling (HDD) is the proposed method of installation. HDD facilitates the avoidance of any direct impacts on habitats within Natura 2000 sites or estuarine habitats. It is noted that the proposed launch sites for the HDD for the Campile River Estuary crossing and the Baginbun Beach site are outside the boundaries of Natura 2000 sites. All HDD onshore sites are within low value agricultural land that do not correspond to Annex I or qualifying habitats for Natura 2000 sites. The proposed parking area at Baginbun Beach will impact on common habitats which do not correspond to Annex I or qualifying habitats for Natura 2000 sites.

Indirect effects could arise due to potential for frac out during HDD drilling. This could potentially have indirect effects on vegetation on sea cliffs at Baginbun Beach and could impact on water qualy at Baginbun Beach, Campile Estuary and the Newtown River.

The conceptual design for Baginbun has its minimum depth of cover at the base of the cliffs where the cover is 18m. The conceptual HDD design for Campile Estuary has 16m depth of cover beneath the bed of the estuary.

In the unlikely event that there was a loss of drilling fluid the effects would be difficult to discern because of the natural silt content in the estuary/marine environment. Bentonite drilling fluid is composed of approximately 30kg of bentonite clay, a natural occurring clay, per 1m^3 of fresh water. Depending on ground conditions, polymer additives may be added. The polymer additives (e.g. polyacrylamide (PHPA) and polyanionic cellulose (PAC)) are organic, usually starch or sugar based. These compounds are biodegradable. The environmental risk from bentonite is that in freshwater environments they are not readily dispersed and, having a higher SG than water, cover the bottom of the watercourse, smothering benthic flora and breeding sites for fauna. In saltwater environments the bentonite drilling fluid is quickly degraded by to ionic exchange between the salts in the seawater and the bentonite clays in the fluid. The bentonite flocculates and is dispersed by currents and wave action with turbidity (discolouration) the only noticeable effect. Given the non-toxic nature of the drilling fluids and the low potential for frac out no significant effect on habitats will occur. Given the non-toxic nature of the drilling fluids and that fluctuations in silt levels naturally occur within the estuarine environment due to tidal movements and storm surges and the robust nature of estuarine habitats, no significant effect on estuarine habitats will occur. Frac out could potentially impact on sea cliffs at Baginbun Beach, however no significant effects on vegetation would occur due to the non-toxic nature of the drilling fluids.

The conceptual design for Baginbun has its minimum depth of cover at the base of the cliffs where the cover is 18m. No significant risk of cliff destabalisation has been identified. Construction activities have the potential to generate elevated dust levels which may be deposited on vegetation or into the aquatic environment. Given the distance of the proposed works from Natura 2000 sites and the limited potential for signficant dust emissions during construciton, no impact from fugitive dust emissions will occur.

8.1.3 Loss of estuarine habitat at the crossing of the Newtown River

It is proposed that a tidal section of the Newtown River will be crossed via an open cut method which will result in loss of tidal river habitat for the duration of this element of the proposed works. This river is not located within a Natura 2000 site. A visual survey of the Newton River was carried out to assess habitat value for fish as this watercourse will be directly affected by site works and thus there could be an impact prey availability. At the crossing point, which will be crossed via an open cut methodology, the river is tidal with a mud substrate. It is a small stream, part of a network of drains within this area, which has been highly modified and has very low potential as fish habitat. It is noted that detailed fish stock assessments of tidal habitats are not carried out as standard as they do not provide habitats for sensitive receptors such as salmonid spawning habitat or juvenile lamprey habitat. The distribution of certain estuarine species, such as Grey Mullet and Flounder which are not QIs for Natura 2000 sites but which may be prey of otters. will vary with the tidal cycle. Taking the worst-case scenario, the crossing of the Newtown River will result in a temporary loss of potential habitat for common fish species not listed as qualifying species for Natura 2000 sites. Frac out during a HDD crossing could potentially impact on aquatic habitats.Given the non-toxic nature of the drilling fluids and that fluctuations in silt levels that naturally occur within the estuarine environment due to tidal movements and storm surges and the robust nature of estuarine habitats, no significant effect on estuarine habitats will occur.

8.2 Impacts on migratory fish species and fish biomass as prey for otter

8.2.1 Impacts on migratory fish species

It is intended tht the Newtown River will be crossed via HDD, however measure the use of an open cut methodology has been considered as a precautionary measure. The open cut crossing on the Newtown River, in the unlikely event that it is required, will create a temporary barrier to fish movement. The Newtown River is highly modified and culverted and is of insufficient size and lacks suitable habitat for Annex 2 migratory species Salmon, Twaite Shad, Sea Lamprey and River lamprey which are listed as qualifying interests for the River Barrow and River Nore SAC and Lower River Suir SAC**.**

8.2.2 Noise and vibration

Noise and vibration associated with the HDD crossing of the Campile River could potentially create vibration impacts which could impact on Salmon, Twaite Shad, Sea Lamprey and River lamprey moving through the Campile Estuary. Fish species that lack a gas-filled cavity, and deep-sea species, are not as vulnerable to trauma from extreme sound pressure changes as fish with a gas-filled space. The possible effects of sound upon behavior include communication between conspecifics and detection of predators and prey Such effects may have consequences at the population-level and may affect the viability of the species (Hastings et al, 2005). A range of responses has been observed when the behavior of wild fishes has been studied in the presence of man-made sounds. Some fishes have shown changes in swimming behavior and orientation, including startle reactions (Pearson et al, 1992).

There is limited information or standard noise criteria for possible impacts on fish, however the United States National Marine Fisheries Service (NMFS) developed a set of interim injury and disturbance criteria, which have been broadly adopted [Popper et al., 2014]. The criteria are based on very sparse information from limited field studies, and as such should be treated with caution, however it is thought that the current criteria are overly conservative, and as such the assessment can be taken as the worst case [Popper et al., 2014].

Auditory injury and disturbance criteria of fish.

Effect	Exposure Limit (db re 1uPa)
Onset of physical injury in fish.	206
Onset of behavioural disturbance	150

It is noted that most studies have focused on works such as piling which have the potential to create more noise and vibration disturbance. Nedwell et al. [2012] details the findings of underwater noise monitoring conducted during HDD operations in a shallow riverine environment, while drilling was taking place directly below the riverbed. The environment was quiet, with no other potential noise sources, and the resulting underwater noise levels are reported as 129.5dB re 1μPa on the riverbed. This is below the figure of 150 db re 1uPa noted above. This would be analogous to the crossing of the Campile Estuary via HDD although the depth at which drilling will take place will be different. Although the impact of underwater noise and vibration will depend on the species and their method of hearing, HDD is not generally considered a significant source of underwater noise and vibration.

It is noted that HDD works are temporary and it is proposed to use HDD at a depth of more than 10m below the river bed. Therefore, no barriers to movement have been identified and there will be no impact on Annex 2 migratory species Salmon, Twaite Shad, Sea Lamprey and River lamprey which are listed as qualifying interests for the River Barrow and River Nore SAC and Lower River Suir SAC.

8.2.3 Impact from Electromagnetic Fields (EMF).

The following details of the Greenlink development are relevant to potential Electromagnetic Fields (EMF). The nominal HVDC voltage of the onshore cables will be +320 kV. The maximum continuous current will be 810A, while the maximum overload current will be 1,134A. The HVAC cable will be 220kV rated. The maximum continuous current will be approximately 1,362A, while the maximum overload current will be approximately 1,907A. In addition, as part of the onshore cable route it is proposed to use horizontal directional drilling (HDD) under the Campile River Estuary, at a depth of >10m below the riverbed, in order to avoid any impacts of the river itself. The focus of research on the impacts of EMF has been on sub-sea cabling for windfarms. Reviews of sub-sea cable EMF are provided by CMACS (2003), Gill et al. (2005) and Normandeau Associates *et al.* (2011). The following summary is based on these reviews.

There is no evidence that lampreys respond to magnetic B fields (Gill & Bartlett 2011). A number of researchers have shown physiological responses to electric fields (Normandeau Associates 2011). Chung-Davidson *et al.* (2008) examined the behavioural and neuroendocrine responses of adult sea lampreys to weak electric fields. Wild-caught adult sea lampreys, captured during the spawning migration, exhibited little active behaviour during exposure to weak electric fields and spent the most time attached to the wall of the testing arena near the cathode. This may suggest attraction. Hormonal responses of males and females differed and the authors suggested that electroreception may modulate the reproductive systems in adult male sea lampreys. They also suggested that electrical stimuli mediate different behaviours from feeding-stage and spawning-stage sea lampreys.

Empirical data demonstrating an ability in salmonids to respond to EMFs are sparse. Nevertheless, it has been shown experimentally that sockeye salmon, which have magnetite in their nose area, can respond to DC magnetic fields (Walker *et al.* 1988; Putman et al. 2014). If altered magnetic fields are detectable by Atlantic salmon they may be perceived as attractive, adverse, confusing or neutral stimuli. However, the ability of any organism to sense a stimulus does not necessarily mean it will respond behaviourally to that stimulus in any or all situations. Studies to date suggest that while Atlantic Salmon in laboratory conditions can detect changes in EMF, this does not translate to changes in behaviour is field based studies (Swedpower 2003; Armstrong *et al.* 2016).

A number of engineering solutions can be applied to mitigate against the potential impact of EMF on migratory fish. These are outlined in detail in Normandeau *et al.* (2011). There are a variety of aspects of the design and installation of submarine cables that affect magnetic field levels in the cable vicinity. These aspects include current flow, cable configuration, conductivity and permeability of sheathing and armouring materials, the cable's orientation in the geomagnetic field (DC cables only), and distance from cables (including burial depth).

The proposed development will use a combination of all the mitigation measures specified above, i.e. sheathing/armour, 10m burial depth, cables close together to effectively reduce any EMF emitted from the proposed cabling. Given that the following measures will be implemented and the limited timer period that migratory fish spcies will be present within the estuary, no significant effect on migratory species within the Campile River Estuary is expected to occur.

8.2.4 Impacts on migratory fish species and fish biomass as prey for otter

As a HDD methodology will be employed at the Campile River and Baginbun Beach there will be no direct loss of foraging or breeding habitat for otter. A tidal section of the Newtown River may be crossed via an open cut methodology. Although no signs of otter were recorded at along this watercourse, a visual survey of the Newton River was carried out to assess habitat value for fish as this watercourse will be directly affected by site works and thus there could be an impact prey availability. At the crossing point, which will be crossed via an open cut methodology, the river is tidal with a mud substrate. It is a small stream, part of a network of drains within this area, which has been highly modified and has very low potential as fish habitat. It is noted that detailed fish stock assessments of tidal habitats are not carried out as standard as they do not provide habitats for sensitive receptors such as salmonid spawning habitat or juvenile lamprey habitat. The distribution of certain estuarine species, such as Grey

Mullet and Flounder, will vary with the tidal cycle. Taking the worst-case scenario, the crossing of the Newtown River will result in a temporary loss of potential habitat and a temporary barrier to fish movement.

The Newtown River is a small, tidal and highly modified habitat which does not provide high value habitat for fish species and a fish stock assessment was not considered necessary. Likewise given the limited scale of the potential impact from the discharge of surface water via an attenuation pond and the strongly tidal nature of the receiving environment no significant impact on the Newtown River at the discharge location for surface water during operation will occur. This was discussed and agreed with Inland Fisheries Ireland (Donnachadh Byrne IFI pers. Comm. December 2019).

The presence of Kingfisher along the Newtown River indicates that there may be some fish stocks within the overall river. Some species such as Stickleback may occur. Although stocks of European Eel are threatened this species still commonly occurs in small drains and streams. The habitat value for brown trout is low although the presence of occasional individuals cannot be completely discounted It is noted that post construction there will be no residual ecological impact on fisheries habitat. A salvage operation will be carried out during construction and if fish are captured during the crossing works fish will be safely relocated.

In conclusion there will be no impacts on otter habitat at the Campile River and Baginbun Beach. No evidence of otter was recorded along the Newtown River and the loss of potential feeding habitat will be negligible. The temporary works associated with the open cut crossing will have no significant effect on fish stocks within a small, tidal and heavily modified watercourse. The discharge of surface water via the attenuation pond which will not significantly impact on water quality. No significant effect on habitat for otter or prey availability for otter will occur.

8.3 Impacts from lighting, noise, vibration and disturbance during construction

Sections of the proposed development are located in proximity to the River Barrow & River Nore SAC and thus direct impacts on otter which is listed as a qualifying interest for same could potentially occur.

The Bannow Bay SPA is located 1km north of Baginbun Beach landfall site and proposed car parking area. Given the distance involved, lighting, noise and vibration during the construction phase will not impact on foraging birds within the SPA boundary. Theoretically impacts on these species feeding outside of the SPA boundary and in particular at Baginbun Beach could potentially occur. Potentially increased lighting, noise, vibration and disturbance associated with the site works could cause disturbance/displacement of fauna. If of sufficient severity and duration, there could be impacts on reproductive success. Fauna listed as qualifying interests for Natura 2000 sites (wintering birds and otter) are associated with aquatic habitats and therefore the following elements of the project could potentially have an impact on qualifying species for Natura 2000 sites.

- Landfall Compound – a temporary landfall compound at Baginbun, where the high voltage direct current (HVDC) cable will be installed underground, below the beach and cliff at Baginbun Beach, by horizontal directional drilling (HDD);
- Converter Station – a converter station situated close to the existing Great Island substation in Wexford;
- Tail Station - a 220kV substation located beside the converter station. The Loughtown tail station connects the HVAC 220kV cable into the 220kV grid via the existing Great Island substation;
- Converter station construction compound: temporary compound for the construction of the converter station and tail station at Great Island;
- Cable Contractor compound (i) at the landfall site close to Baginbun Beach (ii) at the proposed converter station
- HDD Compounds – temporary HDD contractor compounds are required. One will be located close to the cable contractor compound at Baginbun Beach with another HDD compound located at either side of the Campile River Estuary crossing;
- Car Parking near Baginbun Beach – 54 car parking spaces beside the existing road to the beach; and
- Construction of discharge pipeline to Newtown River
- Open cut crossing of Newtown River.

During the construction phase, the potential noise and vibration impacts are associated with site preparation works at the converter station and tail station site, trench and HDD excavation, foundation construction activities, other construction activities and construction vehicle movements.

The highest noise levels will be generated during the site preparation, excavation and foundation stage. There is potential for vibration impacts to occur during the construction phase. At the converter station site, rock will be excavated using either rock splitting or blasting, or a combination of both techniques. Rock crushing may be required to reuse the excavated material. The noise levels associated with blasting (if it is deemed necessary) will not exceed those predicted for rock-breaking.

During construction lighting will typically be provided by tower mounted 1000W metal halide floodlights that will be cowled and angled downwards to minimise spillage. The primary area of concern is the potential impact at the Campile River Estuary and Baginbun Beach HDD sites. There will be no directional lighting focused towards the estuary or shoreline habitats respectively and cowling and focusing lights downwards will minimise light spillage.

8.3.1 Potential impacts from lighting, noise, vibration and disturbance on Otter

Potential impacts could arise due to disturbance of otter as a result of increased lighting, noise, vibration and activity during site works. This could potentially lead to changes in feeding behaviour which if of sufficient severity and duration could impact on reproductive success. Disturbance of breeding otter could also have an impact on overall populations within the River Barrow & River Nore SAC and the Lower River Suir SAC. As detailed in **Table 18,** NPWS conservation objectives for the River Barrow and River Nore SAC and Lower River Suir SAC lists specific targets with respect to the Otter species. Relevant targets relate to distribution, extent of terrestrial habitats, extent of marine habitat, extent of freshwater (river) habitat, extent of freshwater (lake) habitat, couching sites and holts and fish biomass available.

8.3.2 Potential Impacts on breeding/resting habitat

No holts or couches were recorded during site surveys and thus no impact on breeding/resting habitat for otter will occur.

8.3.3 Potential Impacts on otter feeding habitat during construction

Otter utilise aquatic habitats for feeding and otter were recorded at the Campile River and at Baginbun Beach where a HDD methodology will be employed. No signs of otter were recorded at the Newtown River - where an open cut methodology and a discharge location for surface water is proposed - however taking a worst-case scenario they could potentially occur.

Otters are largely nocturnal and although works will generally be confined to daylight hours, underground activities (i.e. HDD tunnelling works to lay cables) will occur 24-hours a day, 7-days a week for the duration of the tunnelling activity. All rock breaking/fracturing activities will be undertaken during daytime hours.

If is noted that otters commonly occur in areas subject to high levels of disturbance as evidenced by the presence of otters in the centre of Irish cities. Significant noise emissions during the construction phase will be short-term, and generally limited in duration at any given location along the cable route. Whilst piling and horizontal directional drilling has the capacity to increase short term disturbance, it will be sporadic and will not have a significant impact.

The works with the potential to generate the most noise and disturbance, namely rockbreaking and blasting at the proposed converter station will take place during daylight hours and no evidence of otter were recorded along the Newtown River during site surveys. Whilst otter could potentially occur along this river it is small and will not provide critical feeding resources for this species.

Whilst works could potentially disrupt feeding patterns, given the short-term nature of the disturbance, the ability of otter to move away from disturbance, the distance from the HDD launch pits to aquatic habitats there will be no significant impact on the feeding behaviour of this species.

Given the distance involved between the HDD sites and potential otter habitat, the limited duration of site works and the lack of any holts or resting areas within 150m of the proposed works no impact from lighting during construction will occur.

8.3.4 Impacts on otter during operation.

Potential impacts could arise due to disturbance of otter as a result of increased lighting, noise, vibration and activity during operation of the site There will be no ongoing noise and disturbance associated with the cable route apart from occasional maintenance works. There will be long-term increase in noise and activity at the converter station during operation. No signs of otter were recorded along the Newtown River within 150m of the proposed locations for these elements, however assuming a worst-case scenario, this species could potentially occur.

It is noted that the converter station will be located in proximity to the existing Great Island Power Station and therefore existing levels of noise and activity will already be relatively high. It is also noted that noise mitigation measures are integrated into the design. Given the absence of any signs of otter within 150m of the converter station and tail station, the existing levels of noise and activity in this general area, the ability of otter to habitualise to increased levels of light, noise and activity no impact on otter will occur.

8.3.5 Impacts on otter during decommissioning

As noted in **Chapter 8** of the EIAR noise and vibration will be generated by the decommissioning activities and they will be similar to many of the proposed construction activities, albeit less intensive and for shorter durations. Given the absence of any signs of otter within 150m of the converter station and tail station, the existing levels of noise and activity in this general area, the ability of otter to habitualise to increased levels of light, noise and activity no impact on otter will occur.

8.3.6 Potential impacts from lighting, noise, vibration and disturbance on winter birds listed as qualifying interests for Natura 2000 sites

The Bannow Bay SPA is located 1.3km north of Baginbun Beach landfall site. Given the distance involved disturbance from light, noise and vibration during the construction phase will not impact on foraging birds within the SPA during the winter period. However potentially impacts on these species feeding outside of the SPA boundary and in particular at Baginbun Beach which is the closest point of the proposed works to the SPA, could potentially occur. Overall, none of the waterbirds recorded by vantage point counts were recorded in high numbers and numbers were low in-comparison to the figures which would be considered nationally significant (i.e. 1% or more of the all-Ireland population of an Annex I species or 1% or more of the bio-geographical population of a migratory species).

It is noted that the works with the potential to generate the greatest noise and vibration impacts (blasting and rock breaking) will take place at the converter station site which is located 11.5km from the Bannow Bay SPA.

The potential effects and impacts of disturbance have been widely recognised in wildlife conservation legislation, as has the need to develop conservation measures for birds whilst taking human activities into account. Article 4.4 of the Bird's Directive (79/409/EEC) requires member states to "*take appropriate steps to avoid… any disturbances affecting the birds, in so far as these would be significant having regard to the objectives of this Article*". This specifically relates to conservation measures concerning Annex I species.

Optimal foraging theory is a useful basis from which to understand likely effects of disturbance on feeding. Many studies have shown that birds concentrate where feeding is best. If birds are forced temporarily or permanently to leave these places, then there is an increased risk that their foraging ability will suffer. However, the severity of this type of situation and the way is which birds respond; vary in a very complex way. The multiplicity of variables underlying the observed interactions between birds and people makes it difficult to assess the cause and implications of a particular instance of disturbance. The magnitude of disturbance to birds may arise from synergistic effects of more than one activity.

Burger (1981), in a study of a coastal bay, found that birds were present 42% of the time when people were present, but birds were present 72% of the time when people were absent. Human activities such as jogging or grass mowing, which involved rapid movement or close proximity to roosting birds, usually caused them to flush (fly away). Slow-walking birdwatchers and clammers did not usually cause birds to flush. Gulls and terns were least affected and usually returned to where they had been; ducks usually flushed and flew to the centre of the pond; and herons, egrets and shorebirds were most disturbed and flushed to distant marshes.

The magnitude and predictability of impacts as a result of disturbance ranges between species, seasons, weather, source and duration of disturbance, degree of previous exposure of the individuals to disturbance and the occurrence of additional disturbances. Most disturbances to wetland birds result in an interruption to normal activity and the displacement of birds over variable distances, often into sub-optimal habitats. This can be critical during severe winters and can lead to a reduction in the carrying capacities of important wintering wetland sites. However, in general studies show that most bird species have the ability to habituate to regular and continual sources of noise and visual disturbance.

Migratory birds generally have to cope with narrow physiological and energetic balances and are often bound to fixed time-schedules (e.g. Piersma, 1994). Hence, they heavily depend on the resources they find at their stop-over sites en route between breeding- and wintering areas, and any serious disturbance or other human impact may easily disturb the precarious balance the birds are subject to. Eventually winter survival and breeding success, and thus population levels, might be affected as well (e.g. Madsen & Fox, 1995).

It is noted that the proposed development site is outside the Bannow Bay SPA boundary and is located predominately within an agricultural landscape and along roadways. During the construction stage, there will be short-term increases in noise, vibration, lighting and disturbance. Blasting and rock breaking which have the potential to cause the highest levels of disturbance will only be carried out at the proposed converter station which is located approximately 11.5 m from the Bannow Bay SPA.

In general studies show that most bird species have the ability to habituate to regular and continual sources of noise and visual disturbances. While there may be some temporary displacement of bird species, there will not be a significant negative effect on their overall survival rate due to the close proximity of identical habitat, roosting and foraging resources e.g. high value mudflats with high densities of macro-invertebrates in relation to the Campile River Estuary. Also, peripheral habitats including woodland, treelines and hedgerows provide a visual screen between the site works and birds utilising the nearby Bannow Bay SPA.

Works in close proximity to the Campile River Estuary, which provides habitat for wintering birds, will take place outside the peak season for wintering birds which runs from October to

March inclusive. This will minimise the disturbance to any wintering/migratory bird species utilising the sites during this period.

The construction phase of the proposed development, in particular the HDD works, will increase noise and disturbance in proximity to the aquatic habitat of potential value to wintering birds, however given the value of adjoining habitats for birds, visual screening of the HDD sites, the availability of alternative habitat and the short-term nature of the works, the impact on wintering birds will be minor and short-term.

The existing Great Island Power Station adjoins the River Barrow Estuary and thus area is subject to considerable noise and disturbance. The Converter Station site is visually screened from the estuary by the existing power plant and by vegetation and will be located approximately 265m ffom the estuary. As this area is already subject to high levels of background disturbance including boat traffic and given the degree of visual screening, the construction of the converter station will not have a significant impact on birds utilsing feeding habitat within the River Barrow Estuary.

Overall, given the scale and temporary nature of the works, the distances involved, existing disturbance factors and avoidance of works in key areas during the bird wintering period, there will be no impact on bird populations listed as qualifying interests for the Bannow Bay SPA.

8.3.7 Impacts on winter birds during operation.

There will be no ongoing noise and disturbance associated with the cable route apart from occasional maintenance works. There will be long-term increase in noise and activity at the converter station during operation. It is noted that the converter station will be located in proximity to the existing Great Island Power Station and therefore existing levels of noise and activity will already be relatively high. It is also noted that noise mitigation measures are integrated into the design. Given the distance from the Bannow Bay SPA, the existing levels of noise and activity in this general area, the ability of winter birds to habitualise to increased levels of light, noise and activity no impact on winter birds listed as qualifying interests for the Bannow Bay SPA will occur.

8.3.8 Impacts on winter birds during decommissioning

As noted in Chapter 8 (Noise) of the EIAR Noise and vibration will be generated by the decommissioning activities and they will be similar to many of the proposed construction activities, albeit less intensive and for shorter durations. Given the distance from the Bannow Bay SPA, the absence of significant bird habitat in proximity to the proposed works and the existing levels of noise and activity in this general area, no impact on winter birds will occur.

8.4 Impacts on Water Quality

8.4.1 Impacts on Water Quality during Construction

Surface water and ground emissions associated with the construction phase of the proposed Greenlink development could impact on aquatic habitats via increased silt levels in surface water run-off and inadvertent spillages of potential pollutants.

Inadvertent spillages of hydrocarbon and/or other chemical substances during construction could introduce toxic chemicals into the aquatic environment via direct means, surface water run-off or groundwater contamination. Cement pollution of waters results in high alkalinity and raises the pH, which can be toxic to aquatic life. Some hydrocarbons exhibit an affinity for sediments and thus become entrapped in deposits from which they are only released by vigorous erosion or turbulence. Oil products may contain various highly toxic substances, such as benzene, toluene, naphthenic acids and xylene which are to some extent soluble in water; these penetrate into the fish and can have a direct toxic effect. The lighter oil fractions (including kerosene, petrol, benzene, toluene and xylene) are much more toxic to fish than the heavy fractions (heavy paraffins and tars). In the case of turbulent waters, the oil becomes dispersed as droplets into the water. In such cases, the gills of fish can become mechanically contaminated and their respiratory capacity reduced. However, given that the likely volumes (localised storage at work areas only) any such spills, in the unlikely event of their occurrence, would be minor in the context of the available dilution in the Campile River, Newtown River, River Suir and Celtic Sea.

Hydrocarbon contamination, if of significant magnitude, could potentially impact on water quality and thus could impact on aquatic qualifying species for the River Barrow & River Nore SAC and the Lower River Suir SAC namely Sea Lamprey, River Lamprey, Twaite shad and Atlantic Salmon. Significant impacts on fish stocks could impact on otter due to a reduction in prey availability.

A range of mitigation measures have been specified in **Section 9** to minimise the risk of such spills occurring and measures have been specified to effectively deal with such spills were they to occur. It is also noted that any spills would be minor in the context of the dilution provided riverine/estuarine/marine environment. No impact on water quality from hydrocarbons or other chemical spills during construction and thus on the aquatic qualifying interests and conservation objectives will occur.

High levels of silt can impact on fish species, in particular spawning salmonids. If of sufficient severity, adult fish could be affected by increased silt levels as gills may become damaged by exposure to elevated suspended solids levels. If of sufficient severity, aquatic invertebrates may be smothered by excessive deposits of silt from suspended solids. In areas of stony substrate, silt deposits may result in a change in the macro-invertebrate species composition, favouring less diverse assemblages and impacting on sensitive species. Cement can also affect fish, plant life and macroinvertebrates by altering pH levels of the water. Silt can have a particularly detrimental impact on spawning habitat for salmon and lamprey species.

Aquatic plant communities may also be affected by increased siltation. Submerged plants may be stunted, and photosynthesis may be reduced. Qualifying habitats which are estuarine or terrestrial in nature will not be affected.

Increased silt levels, if significant, could potentially impact on water quality and thus could impact on aquatic qualifying species for River Barrow & River Nore SAC and the Lower River Suir SAC namely Sea lamprey, River Lamprey, Twaite shad and Atlantic Salmon

Significant impacts on fish stocks could impact on otter due to a reduction in prey availability Impacts on water quality could also impact on fish stocks which in turn could impact on populations of piscivorous birds. Reduced visibility may impact on feeding success for piscivorous birds.

Habitats which are estuarine in nature (Estuaries, Mudflats and sandflats not covered by seawater at low tide, Salicornia and other annuals colonising mud and sand, Atlantic salt meadows (Glauco-Puccinellietalia maritimae) and Mediterranean salt meadows (Juncetalia maritimi).) are very unlikely to be affected. It is noted that due to the dilution provided in the estuarine and marine environment, the naturally fluctuating levels of silt and robust nature of these habitats, impacts are only likely to arise from significant levels of siltation which will not arise as a result of this project.

During construction of the proposed converter station site, temporary measures will be provided including de-silting and temporary oil interceptor. These will be subject to daily inspection to ensure they remain adequate and effective. (See Construction Environmental Management Plan (CEMP) **Appendix 5).**

During installation of the onshore cables, a pump will be used to deal with any groundwater or rainwater that collects within the trench. This will be pumped into locations agreed with the landowners and local authorities. Typically, this will be onto adjacent land, not directly into waterways, and through a filter medium. A similar arrangement will apply at joint bays, where a sump will be cast into the concrete base for a pump.

For the HDDs, any groundwater or rainwater that collects in a HDD drilling pit shall be pumped away as described above. Any bentonite (or similar HDD drilling head lubrication material) shall be handled and removed by the drilling contractor. The volume of bentonite (or similar material) shall be small and given its non-toxic nature, will not pose a significant risk to surrounding habitats.

Due to the location and nature of the proposed development, there is the potential for silt in surface water run-off to impact on surrounding watercourses. However, a range of standard mitigation procedures will be employed during construction to prevent the potential for impacts on water quality. Specific non-standard measures have also been specified in relation to the river crossing in particular i.e. Horizontal directional drilling. These mitigation methods will effectively prevent impacts from silt and hydrocarbons. Following the implementation of mitigation measures, no impact on water quality and thus on the aquatic qualifying interests and conservation objectives for qualifying interests during construction is predicted to occur.

8.4.2 Impacts on Water Quality during Operation

Chemical contaminants such as hydrocarbons could potentially impact on water quality and thus could impact on aquatic qualifying species for the River Barrow and River Nore SAC which migrate through or occur within the estuary (Sea lamprey (*Petromyzon marinus)*, River Lamprey (*Lampetra fluviatilis)*, Twaite Shad (*Alosa fallax)* and Salmon (*Salmo salar*)).

Impacts on water quality could also impact on fish stocks which in turn could impact on populations of otter (*Lutra lutra).* Impacts on qualifying habitats which are estuarine in nature (Estuaries, Mudflats and sandflats not covered by seawater at low tide, Salicornia and other annuals colonizing mud and sand, Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) and Mediterranean salt meadows (*Juncetalia maritimi*) could potentially occur.

Surface water run-off from yard areas and the building roofs of the converter station site, will discharge through proposed filter drains and surface water sewers, through a bypass interceptor, to a proposed attenuation pond, to be constructed to the south-eastern part of the site. Discharges from the attenuation pond will be controlled to greenfield rates. Water from the attenuation pond will be discharged to the Newtown River in the eastern part of the site.

Foul wastewater will be collected from the welfare facilities in the converter station and tail station. It will be contained in the units and removed from site periodically, by a licensed service provider, to a local sewage treatment plant, which has adequate capacity.

Transformers will be sited within a reinforced concrete bund which will be linked to an underground oil dump tank. Transformer bunds will be designed as waterproof structures in accordance with BS EN 1992-3 and the crack width will be limited to 0.2mm with appropriate water bars. The bunds will be tested in accordance with standard bund testing requirements. Rainwater or other surface water shall permeate through a flame trap. Once permeated through the stone fire trap, the water will be collected in a common dump tank. It will then be pumped out of the dump tank via a bund water control pump to a manhole, before flowing by gravity to an oil separator prior to final discharge into the surface water drainage system. The oily water system will incorporate penstocks to close off the system.

The oil separator shall be a Class 1 full retention unit in accordance with BS EN 858-1, incorporating a coalescer automatic closure device and high oil level alarm. The separator shall be fully capable of isolating all upstream oil flow in the event that the high-level oil alarm is activated. The interceptor will be sized to suit the storm intensity flow rates from the transformer bunds and any other designated oil containment area.

A range of mitigation measures will be implemented as part of the operation of the proposed converter station site. In general, the estuarine habitats listed as qualifying interests for the River Barrow and River Nore SAC (Mudflats and sandflats not covered by seawater at low tide, Salicornia and other annuals colonizing mud and sand, Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) and Mediterranean salt meadows (*Juncetalia maritimi*)) are robust. Given the comprehensive mitigation measures to be implemented as part of the proposed development, the dilution provided in the estuarine environment and the qualifying habitats in question, any impacts on water quality will not significantly impact on qualifying habitat interests for the River Barrow and River Nore SAC.

Sea lamprey (*Petromyzon marinus)*, River Lamprey (*Lampetra fluviatilis)*, Twaite Shad (*Alosa fallax)* and Salmon (*Salmo salar*) will occur in the lower estuary but these migratory species will only move through the estuary and thus will only be present for a limited time period. Given the comprehensive mitigation measures to be implemented as part of the proposed development, the dilution provided in the estuarine environment and the qualifying habitats in question, any impacts on water quality will not significantly impact on qualifying species for the River Barrow and River Nore SAC.

There is a possibility that populations of birds for which the Bannow Bay SPA is designated, utilise the estuary on occasions to supplement foraging resources. In the absence of significant predicted impacts on water quality, or significant impacts on macroinvertebrate populations on which bird's species listed as qualifying interests for the Bannow Bay SPA feed, no impact on these bird species will occur

8.4.3 Impacts on water quality during decommissioning

The mitigation measures, described above for the construction phase, updated to reflect best practice at the time, will be implemented for the decommissioning phase. In the absence of significant predicted impacts on water quality, or significant impacts on macroinvertebrate populations on which bird's species listed as qualifying interests for the Bannow Bay SPA feed, no impact on these bird species will occur

8.5 Impacts from the spread of Invasive Species

There is potential during the construction phase and operational phase of the proposed works for invasive species to be spread to Natura 2000 sites, thus impacting negatively on qualifying habitats. The risk from the spread of invasive species is low given the distance from Natura 2000 sites, the limited potential for the spread of invasive species over large distances. An Invasive Species Management Plan which provides additional detail is included as **Appendix 9.**

Three Cornered Leek occurs outside the works area and will be avoided. Based on surveys to date Japanese Knotweed occurs outside the works area and avoidance is the preferred methodology. Where this is not possible excavation and removal to a licenced facility under licence will be carried as detailed in the Invasive Species Management plan based on up to date survey data.

Rhododendron occurs within the red line boundary, however avoidance may be possible. Where avoidance is not possible, the ISMP provides methodologies for its successful eradication within the works area and biosecurity protocols.

There are no high risk invasive species (Japanese Knotweed, Rhododendron, Three Cornered Leek) within the proposed works area and therefore no significant risk of impacts on Natura 2000 sites has been identified. The Amber listed species Winter Heliotrope was recorded within the works area and is ubiquitous along roadside verges in this area. It does not create a significant risk to Natura 2000 sites and be treated by standard herbicide treatment post construction.

The invasive species management plan will be updated by the supervising ecologist, based on up to date data and in consultation with the contractor. No impediment to the removal of these species within proposed development area. as part of a detailed invasive species management plan, have been identified. No risk to local ecology has been identified from the spread of invasive species.

The ISMP provides detailed methodologies for the effective avoidance of invasive species and treatment of same if required. . Overall, no impact on the qualifying interests and conservation objectives for European sites from the spread of invasive species will occur.

8.6 Cumulative Impacts

Cumulative impacts refer to a series of individually impacts that may, in combination, produce a significant impact. The underlying intention of this in combination provision is to take account of cumulative impacts from existing or proposed plans and projects and these will often only occur over time. Other plans relevant to the proposed development and potential cumulative impacts are listed in **Table 28**, and **Table 29**.

Table 28. Other plans and programmes with potential cumulative impacts

Plans and Key Policies/Issues/Objectives Directly Related to the Conservation of the European Network		
Greenlink Project – Marine Impacts	Marine habitats which are specifically addressed within the Greenlink Marine Natura Impact Statement[3]	Impacts relating to the qualifying marine habitats for the Hook Head SAC ('Reef' and 'Large shallow inlets and bays') are specifically addressed in the Greenlink Marine Natura Impact Statement[3]. This report concluded that "*there will be no adverse effects on the conservation objectives of the Qualifying Interest*" in relation to reef habitats and that there will be "*No Adverse Significant Effect to Qualifying Interest*" in relation to large shallow inlets and bays. In the absence of any significant adverse effect in relation to the terrestrial and marine components of the project no significant adverse effect on qualifying interests and conservation objectives for Natura 2000 sites has been identified.

River Basin Management Plan 2018-2021	The project should comply with the environmental objectives of the Irish RBMP which are to be achieved generally by 2021. • Ensure full compliance with relevant EU legislation • Prevent deterioration • Meeting the objectives for designated protected areas • Protect high status waters • Implement targeted actions and pilot schemes in focus sub-catchments aimed at: targeting water bodies close to meeting their objective and addressing more complex issues which will build knowledge for the third cycle.	The implementation and compliance with key environmental policies, issues and objectives of this management plan will result in positive in-combination effects to European sites. The implementation of this plan will have a positive impact for the biodiversity. It will not contribute to in-combination or cumulative impacts with the proposed development.
Inland Fisheries Ireland Corporate Plan 2016 -2020 **The Inland Fisheries Act 2010.**	To ensure that Ireland's fish populations are managed and protected to ensure their conservation status remains favourable. That they provide a basis for a sustainable world class recreational angling product, and that pristine aquatic habitats are also enjoyed for other recreational uses. To develop and improve fish habitats and ensure that the conditions required for fish populations to thrive are sustained and protected. To grow the number of anglers and ensure the needs of IFI's other key stakeholders are being met in a sustainable conservation focused manner. EU (Quality of Salmonid Waters) Regulations 1988. All works during development and operation of the project must aim to conserve fish and other species of fauna and flora habitat; biodiversity of inland fisheries and ecosystems and protect spawning salmon and trout.	The implementation and compliance with key environmental issues and objectives of this corporate plan will result in positive on-combination effects to European sites. The implementation of this corporate plan will have a positive impact for biodiversity of inland fisheries and ecosystems. It will not contribute to in-combination or cumulative impacts with the proposed works.

Irish Water Capital Investment Plan 2014-2016	Proposals to upgrade and secure water services and water treatment services countrywide.	Likely net positive impact due to water conservation and more effective treatment of water.
Water Services Strategic Plan (WSSP, 2015)	Irish Water has prepared a Water Services Strategic Plan (WSSP, 2015), under Section 33 of the Water Service No. 2 Act of 2013 to address the delivery of strategic objectives which will contribute towards improved water quality and biodiversity requirements through reducing: • Habitat loss and disturbance from new / upgraded infrastructure; • Species disturbance; • Changes to water quality or quantity; and • Nutrient enrichment /eutrophication.	The WSSP forms the highest tier of asset management plans (Tier 1) which Irish Water prepare, and it sets the overarching framework for subsequent detailed implementation plans (Tier 2) and water services projects (Tier 3). The WSSP sets out the challenges we face as a country in relation to the provision of water services and identifies strategic national priorities. It includes Irish Water's short, medium and long-term objectives and identifies strategies to achieve these objectives. As such, the plan provides the context for subsequent detailed implementation plans (Tier 2) which will document the approach to be used for key water service areas such as water resource management, wastewater compliance and sludge management. The WSSP also sets out the strategic objectives against which the Irish Water Capital Investment Programme is developed. The current version of the CAP outlines the proposals for capital expenditure in terms of upgrades and new builds within the Irish Water owned assets. The overarching strategy was subject to AA and highlighted the need for additional plan/project environmental assessments to be carried out at the tier 2 and tier 3 level.

		Therefore, no likely significant in-combination effects are envisaged.
WWTP discharges	Fethard-on-Sea and Environs WWTP, Duncannon WWTP, Campile WWTP, New Ross WWTP, Graignuenamanagh Tinnahinch WWTP, Borris Waste Water Works, Goresbridge WWTP, Muinebheag and Leighlinbridge WWTP, Carlow WWTP, Athy WWTP, Stradbally Agglomeration WWTP, Monasterevin Town, WWTP, Portarlington WWTP, Thomastown WWTP, Bennettsbridge WWTP, Kilkenny City and Environs WWTP, Castlecomer WWTP, Clogh – Moneenroe WWTP, Durrow WWTP, Waterford city WWTP, Portlaw WWTP, Carrick-on-Suir WWTP, Fiddown WWTP, Kilsheelan WWTP, Clonmel WWTP etc.	Discharges from municipal WWTPs are required to meet water quality standards. Irish Water Capital Investment Plan 2014-2016 and 2017 – 2021 proposes to upgrade water treatment services countrywide. Discharges from municipal WWTPs are required to meet water quality standards Given that no significant effect on water quality is predicted from this proposed project no significant cumulative effects on water quality will occur.
Great Island Power Station		Discharges from and noise levels relating to the Great Island Power Station are governed by strict limits to ensure compliance with quality standards. No cumulative impact will occur

Table 29. Other projects with potential cumulative impacts

Other Projects that may give rise to cumulative effects		
Great Island – Kilkenny 110kV Line Uprate Project	Permission was sought for the development at the existing Great Island to Kilkenny 110 kV overhead line which is approximately 49 kilometres long. Approximately 2.6km of the existing circuit is located within the functional area of Wexford County Council with approximately 46.4lm located within County Kilkenny. The development will consist of the uprate of the Great Island Kilkenny 110 kV overhead line which will primarily include: re-stringing the conductor with a higher capacity conductor, replacement of a large proportion of existing structures, breaking out and reconstruction of the concrete foundation and shear blocks of metal masts, painting of mast structures, replacement of insulators, crossarms, stays and/or fittings on existing structures; and the fitting/replacement of bird flight diverters. No additional structures are proposed along the existing circuit. Any replacement structures will be reconstructed at or immediately adjacent to the existing structures they will replace and will be of a generally similar height and appearance. Associated temporary site development works to gain access to the existing structures include clearance of vegetation, disassembly and reassembly of stone walls and gate posts and removal and reinstatement of existing fencing. The proposed development [4]includes all other temporary associated and ancillary site development works required for the uprate of the existing circuit, including the installation of silt traps, silt fences, stone roads, bog mats and clean span bridges. No additional structures, no alteration to the nature, extent, alignment, character or voltage of the existing electricity infrastructure is proposed.	The Natura Impact Statement for this project was reviewed (Tobin Consulting Engineers, 2018). Given the nature and location of this project, no significant cumulative effects will occur. If the construction of this project is concurrent with the bulk excavation works on the site of the converter there is potential for cumulative effects, as the sites are located adjacent to each other. Should this situation arise, construction activities will be planned and phased, in consultation with the construction management team for the energy storage system project. The uprate project has sufficient physical separation from the site of the proposed development to reduce the potential for cumulative noise and vibration effects and to a negligible level. Given the location of this project, together with the implementation of best practice standard construction environmental measures, the CEMP for the proposed development and the Construction Traffic Management Plan, as detailed, no significant cumulative effects on Natura 2000 sites will occur.

[4] The term 'proposed development' in Table 29 refers to Greenlink Ireland Onshore

Great Island Energy Storage System	Permission for the development of a grid system services facility within a total site area of up to 1.15 hectares, to include 1 no. TSO compound including 1 no. single storey TSO electrical substation building and 1 no. single storey customer substation, electrical inverter/transformer station modules, containerised battery storage modules on concrete support structures, heating, ventilation and air conditioning units (HVAC units). Access tracks and upgraded site entrance, associated electrical cabling and ducting, security gates, perimeter security fencing, CCTV security monitoring system, landscaping works and all associated ancillary infrastructure on land.	An AA Screening report for this development was prepared by Wexford County Council (2018), and this was reviewed to identify potential interactions and cumulative effects. This project is located adjacent to the site of the proposed converter and tail station and surrounded on three sides by the red-line boundary of the proposed development. With the implementation of the mitigation measures outlined above for the proposed development, no significant cumulative effects on Natura will occur. If the construction of the energy storage system is concurrent with the bulk excavation works on the site of the converter there is potential for cumulative effects, as the sites are located adjacent to each other. Should this situation arise, construction activities will be planned and phased, in consultation with the construction management team for the energy storage system project. Given the location of this project, together with the implementation of best practice standard construction environmental measures, the CEMP for the proposed development and the Construction Traffic Management Plan, as detailed, no significant cumulative effects on Natura 2000 sites will occur.

In the absence of any significant potential impacts on the qualifying interests and conservation interests for the surrounding Natura 2000 sites and in the absence of significant impacts on its overall integrity, no potential cumulative impacts have been identified.

9. Mitigation Measures

The proposed mitigation measures will function effectively. The mitigation measures have been drawn up in line with current best practice and include an avoidance of sensitive habitats at the design stage and mitigation measures will function effectively in preventing significant ecological impacts. The following mitigation measures will be implemented:

9.1 Guidelines

A Construction and Environmental Management Plan (CEMP) has been prepared for the proposed development and is included as **Appendix 5.** This CEMP provides details of all proposed mitigation measures. At a minimum, all measures outlined in the CEMP will be implemented during the construction phase.

The principal mitigation measures are detailed below:

Construction best practice measures (of relevance in respect of any potential ecological impacts) will be implemented throughout the proposed development, including the preparation and implementation of detailed method statements. The works will incorporate the relevant elements of the guidelines outlined below:

- NRA (2010) *Guidelines for the Management of Noxious Weeds and Non- Native Invasive Plant Species on National Roads*. National Roads Authority, Dublin.
- IFI (2016) *Guidelines on protection of fisheries during construction Works in and adjacent to waters* (IFI, 2016)
- H. Masters-Williams et al (2001) *Control of water pollution from construction sites. Guidance for consultants and contractors (C532).* CIRIA.
- E. Murnane, A. Heap and A. Swain. (2006) *Control of water pollution from linear construction projects. Technical guidance (C648). CIRIA.*

All personnel involved with the proposed development will receive an on-site induction relating to operations and the environmentally sensitive nature of European sites and to re-emphasise the precautions that are required as well as the precautionary measures to be implemented. Site managers, foremen and workforce, including all subcontractors, will be suitably trained in pollution risks and preventative measures.

All staff and subcontractors have the responsibility to:

- Work to agreed plans, methods and procedures to eliminate and minimise environmental impacts,
- Understand the importance of avoiding pollution on-site, including noise and dust, and how to respond in the event of an incident to avoid or limit environmental impact;
- Respond in the event of an incident to avoid or limit environmental impact;

- Report all incidents immediately to the site manager;
- Monitor the work place for potential environmental risks and alert the site manager if any are observed; and
- Co-operate as required, with site inspections.

9.2. Mitigation during Construction

9.2.1 Construction Works – Water Quality (General)

As part of the assessment of the required construction mitigation, best practice construction measures which will be implemented for the proposed development were considered. A summary of the measures relevant to hydrology are provided as follows and are in accordance with Construction Industry Research and Information Association (CIRIA) guidance – Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors (Masters-Williams et al, 2001). Further detail is provided in the CEMP which is attached as Appendix 5 and in Chapter 13 of the EIAR (Water and Hydrology) which is attached as Appendix 7.

To minimise the potential for elevated silt levels in surface water run-off, the working area used during construction will be clearly outlined prior to the commencement of works and will be kept to the minimum area necessary to effectively complete the works. Vegetation will be retained where possible.

A set of standardised emergency response procedures will govern the management of emergency incidents. These are provided in the CEMP (which is a live document which will be updated/added to as construction progresses), together with the Emergency Incident Response Plan.

A detailed spillage procedure will be put in place and all will be trained with respect to the relevant procedures to be undertaken in the event of the release of any sediment, hydrocarbons into a watercourse. Spill kits will be maintained on site and relevant staff will be trained in their effective usage. All site personnel will be trained and aware of the appropriate action in the event of an emergency, such as the spillage of potentially polluting substances. In the event of spillage of any polluting substance and/or pollution of a watercourse, Wexford County Council, Inland Fisheries Ireland and the NPWS shall be notified. Further measures include:

- Material storage locations will be set back from watercourses and surrounded with silt fencing. There will be no material storage in floodplains or areas at risk of pluvial flooding. Material excavated from trenches along the roads will be loaded onto trucks and removed from the site;
- A monitoring regime/programme for water quality will be put in place;
- All works undertaken will be fully consolidated to prevent run-off of silt;
- Silt fences/swales shall be provided at all locations where surface water run-off may enter/leave the working areas, and adjacent to the haul roads;

- There will be no tracking of machinery within watercourses;
- Dewatering, where required, will incorporate the use of filter media;
- Self-contained wheel wash facilities will be provided to protect watercourses from the carriage of silt on vehicles with the waste liquid contained on site, and dispatched off-site for disposal at an appropriately permitted facility;
- The length of trench excavation at any particular section of the cable route will be limited to ensure that the trench will not act as a conduit for stormwater run-off.
- Access/haul roads shall be set back from watercourses by at least 10m where possible.
- Refuelling of vehicles will take place at designated locations at a distance of 15m or greater from the nearest watercourse;
- Any fuel stored on site will be stored in double skinned, bunded containers and will be located in a designated work compound;
- No vehicles will be left unattended when refuelling;
- A spill kit including an oil containment boom and absorbent pads will be on site at all time;
- All vehicles will be regularly maintained, washed and checked for fuel and oil leaks;
- Concreting works will be carried out in dry conditions where possible and concrete works will be strictly controlled and monitored.
- No concrete washout will be allowed to discharge to watercourses. Wash out of concrete trucks will not be permitted on site;
- There will be no direct pumping of contaminated water from the works to a watercourse at any time; and

The following construction management measures will be implemented at all construction compounds, onshore cable routes and the converter station site;

Contractor Compounds

- All construction compounds will be in areas that are at low risk of flooding (outside 1:100 year flood zone);
- Any containers of potential polluting materials such as fuels and oils will be stored in a bunded area (110% capacity) protected from flood damage and inundation;
- All bunded storage areas will be a minimum distance of 10m away from any watercourse;
- A designated bunded refuelling area on an impermeable surface will be provided at all construction compounds, again at a minimum distance of 10m away from any watercourse.

Converter Station Site

- Secure oil and chemical storage in over-ground bunded areas (110% capacity), limited to the minimum volume required to serve immediate needs with specified delivery and refuelling areas;
- Emergency spill kits retained onsite at sensitive locations;
- Cessation of work and development of measures to contain and/or remove pollutant should an incident be identified;
- Temporary measures (de-silting and temporary oil interceptor) will be provided. These will be subject to daily inspection to ensure they remain adequate and effective;
- Interceptor/dump/attenuation tanks will be secured at designated points, strapped down to the concrete slab. Backfill will be carefully controlled, ensuring this is balanced and even around all sides of the tank, while the tank is gradually filled internally with water, to avoid distortion or damage from external backfill pressures. Interceptor washdown slab will be constructed in-situ concrete by FRC subcontractor. Interceptors will be commissioned by a specialist contractor;
- Silt traps will be employed and maintained in appropriate locations;
- Temporary interception bunds and drainage ditches will be constructed up slope of excavations to minimise surface runoff ingress and in advance of excavation activities;
- Excavation and earthworks will be suspended during and immediately following periods of heavy rainfall in order to minimise sediment generation and soil damage;
- Below ground drainage will be installed prior to erection to completion of building superstructure/roof drainage. Final connection will be made when down pipes are installed to ensure accurate positioning;
- The treated water will discharge directly into the surface water drainage system as it is suitable for direct discharge into the local watercourses, having passed through the oil separator.

<u>Surface Water Drainage from the Converter Station</u>

- Oily water is classified as rainwater runoff and/or surface wash down which may potentially contain small amounts of low hydrocarbon concentrates in oil containment areas. This is to be treated directly by oil separator facilities on site.

- It is proposed to include a Class 1 full retention oil separator unit for the oily water system. Oil storage volume will be provided by the separator and the separator shall be fully capable of isolating all upstream oil flow in the event that the high-level oil alarm is activated. Oil resistant nitrile rubber seals will be employed throughout the oily water drainage systems. The oil separator will be vented in accordance with the manufacturer's recommendations, with vents located clear of all site operating areas, a minimum of 2000mm above ground level. Vent pipes will be supported by means of a concrete post and protected from vehicular traffic by means of spaced concrete bollards, if required.

- The treated water will discharge directly into the surface water drainage system as it is suitable for direct discharge into the local watercourses, having passed through the oil separator described above.

Onshore Cable Route

- Any groundwater or rainwater that collects in a trench will be pumped into locations agreed with the landowners and local authorities. Typically, this will be onto adjacent land, not directly into waterways, and through a filter medium, to avoid the build-up of silt, as some granular material will, inevitably, be pumped out with the water. A similar arrangement will apply at joint bays, where a sump will be cast into the concrete base for a pump.
- The flowrates will have to match that of the water into the trench, as it must be kept generally free of water. A single pump with a 75mm hose will usually be adequate to deal with rainwater running into a trench.
- No surface water will be discharged to any drain or watercourse which connects directly or indirectly to any European Site.
- For the HDDs, any groundwater or rainwater that collects in a HDD drilling pit shall be pumped away as described above. Any bentonite (or similar HDD drilling head lubrication material) shall be handled and removed by the drilling contractor. Typically for a land based HDD the volume of bentonite would be approximately 5 cubic metres per shift, and for the landfall HDD the volume of bentonite would be approximately 15 cubic metres per shift.

Watercourse crossing - Newtown River

- The preferred method to cross the Newtown River is a HDD using a mini-rig. The non-preferred alternative is an open-cut methodology. For the open-cut method the watercourse will be temporarily dammed to allow for cable installation. At the stream crossing, the cable trenching detail will not differ, however, a one metre separation between the protective measures and the bed of the watercourse will be maintained to account for any future erosion. If the open-cut methodology is required the Newtown River watercourse will be temporarily dammed immediately upstream and downstream of the cable installation. Over-pumping will be employed to ensure continuous flow in the watercourse.
- The watercourse is of sufficient size to support fish species such as stickleback, eel and brown trout. A fish salvage operation will therefore be conducted prior to damming under the provisions of a Section 14 licence. Standard biosecurity protocols will be implemented, and fish will be translocated to similar habitat upstream of the works area.
- Appropriate silt control measures such as silt fences will be employed where required. Once reinstatement of the cable trench is complete, the temporary dams will be removed and over pumping ceased. No haul road is proposed at the watercourse crossing; plant will utilise existing accesses used by landowners to avoid further works within the watercourse.
- Turbidity monitoring will be carried out to ensure that sediment levels are not significantly elevated above baseline levels.

Foul Drainage

The temporary foul drainage at the construction compounds will cater for welfare facilities including a canteen, toilets, showers and hand wash basin only, and will comprise self-contained sanitary facilities, with wastewater stored and tankered off-site to appropriately licensed disposal facilities.

9.2.2 Flooding

The following best practice construction measures relevant to the hydrological regime and flooding will be implemented for the duration of the construction phase. Further detail is provided in the CEMP which is attached as Appendix 5 and in Chapter 13 of the EIAR (Water and Hydrology) which is attached as Appendix 7.

- All construction compounds shall be in areas that are at low risk of flooding (outside 1:100 year flood zone);
- Material storage locations will be set back from watercourses and surrounded with silt fencing. There will be no material storage in floodplains or areas at risk of pluvial flooding. Material excavated from trenches along the roads will be loaded onto trucks and removed from the site;
- Weather warnings will be monitored during construction;
- Temporary works (including haul roads) will be designed so as not to affect the connectivity between the relevant channel and the floodplain to maintain adequate flood storage during the construction phase;
- Where the proposed works encounter an existing drainage line, arrangements will be made to reinstate the existing drainage system. This will mitigate the risk of excess run-off from the proposed works. All road and drainage system modifications are to be designed following relevant best practice guidelines; and
- Road run-off will be channelled during excavation works for the cable, to avoid potential ponding on roads or flooding of adjacent lands during construction.

9.2.3. Stockpiled Material and Site Compounds – Mitigation

In relation to the proposed converter station site, excavated material will be used in the screening berms, which will be located to the south and the east of the converter station platform. Thus, the export of spoil, or import of fill, will be avoided. Further detail is provided in the CEMP which is attached as Appendix 5 and in Chapter 13 of the EIAR (Water and Hydrology) which is attached as Appendix 7.

The storage of materials in working area construction compounds will be limited to materials required in the short term. The main construction compounds, located at the proposed converter station site, Lewistown and the landfall site, will be used as the primary location for storage of materials, plant and equipment, site offices, welfare facilities and car parking. No stockpiling will be permitted in any other areas, apart from in the immediate vicinity of the cable route, where excavated material will be stored temporarily, while the trench is open. Surplus excavation material will be removed off site by an authorised waste Contractor to an appropriately licensed/permitted waste facility.

The cable contractor and construction compounds/lay down areas will be used for the storage of plant, ducts, protective tiles, warning tapes, duct surround materials etc.

9.2.5 Construction Works – Waste Management

A Construction Waste Management Plan (CWMP) has been prepared as part of the CEMP (Appendix 5) and is a live document and will be further developed prior to construction works commencing on site. This Plan meets the requirements of the DoEHLG Best Practice Guidelines on the Preparation of Waste Management Plans for Construction & Demolition Projects.

All wastes generated as part of the construction process will be controlled and managed to ensure environmental protection. All site wastes (hazardous and non-hazardous), will be stored in designated areas within the three compound sites and taken off-site regularly to prevent large quantities accumulating. Careful ordering of materials will be undertaken to minimise quantities present on-site.

The removal of waste material off site by road and regular deliveries to site would be generally confined to daytime hours but outside of peak traffic hours (i.e. 10am to 4pm).

Removal of any surplus materials off site will be managed in accordance with the construction traffic management measures included in the CEMP, which is attached as Appendix 5, to ensure that there will be no queuing of trucks on public roadways around the working areas. Removal of materials will be limited to outside peak hours.

Wastes which cannot be recycled will be removed from site by a licensed waste contractor to an appropriate licensed landfill facility ensuring adherence to the Environmental Protection (Duty of Care) Regulations 1991.

Segregated waste for recycling will be removed from site to an appropriate Materials Recycling Facility for reprocessing.

9.2.6 Construction works – Noise

Best practice noise and vibration control measures will be employed by the contractor. The best practice measures set out in BS 5228 (2009) Parts 1 and 2 will be complied with. This includes guidance on several aspects of construction site environmental measures, including, but not limited to the following:

- The Contractor will take specific noise abatement measures and comply with the recommendations of BS 5228-1 and 2:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites: Noise and vibration* (BSI, 2014) and the *European Communities (Noise Emission by Equipment for Use Outdoors) Regulations, 2001* (EC, 2001);
- The following specific measures will be implemented during the construction phase to ensure noise and vibration effects are minimised;
- Site representatives shall be appointed to be responsible for matters relating to noise and vibration;
- Unnecessary revving of engines will be avoided and equipment will be switched off when not required;
- Internal haul routes will be well maintained;
- Rubber linings shall be used in chutes and dumpers etc. to reduce impact noise;
- Drop heights of materials will be minimised;

- Plant and vehicles will be started sequentially rather than all together;
- Construction plant and activities to be employed on site will be reviewed to ensure that they are the quietest available for the required purpose;
- Generators will be located away from sensitive receivers and will be enclosed;
- Where required, improved sound reduction methods e.g. enclosures shall be used;
- Site equipment will be located away from noise sensitive areas, as much as is feasible;
- Regular and effective maintenance by trained personnel will be carried out to reduce noise and/or vibration from plant and machinery;
- Acoustic barriers shall be provided around construction works to minimise the effects of noise and vibration generating activities
- Typically, site activities shall be limited to 7am – 7pm, Monday to Friday; and 7am – 2pm, Saturday; Underground activities (i.e. tunnelling works to lay cables) may occur 24-hours a day, 7-days a week for the duration of the HDD contract. The permissible noise levels are detailed in Chapter 8 Noise and Vibration from the EIAR (attached as Appendix 6) where 'daytime' noise limits are defined as 7am to 7pm, and lower permissible noise levels are stipulated outside these hours;
- To minimise the general impact of noise, the piling rigs, where practical, will be situated with the rear of the rig located to minimise and shield off-site locations from the noise sources. Timber packers will be used between the pile and the hammer to reduce the noise level.

9.2.7 Lighting during construction

Potential impacts during construction and operation, from lighting, will be mitigated by the following measures:

- Floodlights will be cowled and angled downwards to minimise spillage;
- Lighting will be provided with the minimum luminosity sufficient for safety and security purposes;
- Lighting will be positioned and directed as not to unnecessarily impact on designated sites or woodland habitats.

9.2.8 Construction Works - Invasive Species

- A survey for invasive species will be carried out prior to the commencement of works. This is to confirm the extent of infestations as identified by invasive species surveys to date, and to determine whether any new infestations have established in the intervening period. A step by step procedure for the management of invasive species is set out in the draft ISMP (Appendix 9). This includes undertaking up to date surveys prior to commencement of construction and based on the results, proposed methodologies, in accordance with codes of practice and guidelines, for the elimination of these species. No significant effects on Natura 2000 sites will occur. However as invasive species are present within the overall study area and given their invasive nature, repeat surveys will be carried out and mitigation implemented.

- To prevent Japanese knotweed or other invasive species from outside the site being inadvertently being brought in to the site, the contractor will be required to inspect, clean and wash down vehicles within a specific area within the site compound before using them on site.
- Prior notification will be given to all contractors that parts of the site are contaminated with Japanese knotweed, Rhododendron and Three-Cornered Leek and that they must adhere to this protocol to avoid the spread of the plant within and more importantly, outside of the works area. This includes any site investigation works in advance of commencement of excavation works.
- The location of the invasive species will be clearly delineated with hazard tape in a manner visible to machine operators prior to the commencement of works. Appropriate signage will be put in place to deter any entrance by people or machinery into the areas within which the invasive species are growing.
- The invasive species management plan which will be further developed by the Contractor, following the pre-construction surveys, will ensure that risks are minimised. This includes any site investigation works which may proceed the commencement of site works. The management plan will include all provisions for site hygiene and appropriate disposal of contaminated soil and subsoil.
- If contaminated material is to be removed off site it will require a licence from the National Parks and Wildlife Service in advance of any removal, in accordance with the European Communities (Birds and Natural Habitats) Regulations 2011 (SI 477).
- At each location a specialised wash down area will be created for machinery and footwear. All machinery and equipment (including footwear) should be power washed prior to leaving the contaminated works area within this wash down area. All water from the wheel wash will be collected, fully contained, and dispatched for treatment and disposal off-site. They will also be visually checked for clods of soil, bits of vegetation etc. and particular care is required with tracked machinery;
- Should stockpiling of contaminated material be required, the areas will be clearly marked out on site. These areas will not be within 50m of the seashore or within a flood zone.

9.2.9 Mitigation Measures – Ecology

- Works will comply with The IFI's Guidelines on protection of fisheries during construction works in and adjacent to waters (IFI, 2016) and IFI will be consulted with regard to any proposed overpumping at the Newtown River crossing.
- The Wildlife Amendment Act 2000 (S.46.1) provides that it is an offence to cut, grub, burn or destroy any vegetation on uncultivated land or such growing in any hedge or ditch from the 01st of March to the 31st of August. Exemptions include the clearance of vegetation in the course of road or other construction works or in the development or preparation of sites on which any building or other structure is intended to be provided. Where possible, vegetation will be removed outside of the breeding season and in particular, removal during the peak-breeding season (April-June inclusive) will be avoided. This will also minimise the potential disturbance of breeding birds outside of the proposed development site boundary.

- Works in close proximity to the Campile River Estuary will take place outside the peak season for wintering birds which runs from October to March inclusive. This will prevent any disturbance to wintering species utilising the sites during this period.
- To prevent incidental damage by machinery or by the deposition of spoil during site works, any habitats earmarked for retention in close proximity to the proposed works will be identified and will be securely fenced or sign posted early in the construction phase. These will be clearly visible to machine operators. Hedgerow, tree and scrub vegetation that are to be retained which are located in close proximity to working areas will be clearly marked and fenced off to avoid accidental damage during excavations and site preparation.
- Habitats that are damaged and disturbed will be left to regenerate naturally or will be rehabilitated and landscaped once construction is complete. Disturbed areas will be seeded or planted using appropriate native grass or species native to the areas where necessary. Within the large field that accommodates the converter station site, a comprehensive landscaping scheme will be implemented, incorporating significant earthworks, berming, planting of approximately 15,000 native mixed-woodland trees, and zones of grassland meadow.
- Construction activities at the Newtown River will be undertaken during daylight hours only. This will ensure that there is potential for undisturbed fish passage at night. The works will be temporary and will not create a significant long-term barrier to fish movement.
- A preconstruction survey for otter will be carried out at Baginbun Beach, the Campile River Estuary crossing and the crossing on the Kilmannock/Newtown Stream immediately prior to the commencement of work.
- If otter holts or resting areas were to be located within 150m of the proposed works, then work would be halted and where possible this area would be avoided. If this is not possible the supervising ecologist will determine the appropriate means of minimising impacts i.e. avoidance, moving works, timing of works etc. If required the ecologist will obtain a derogation license from the NPWS, to facilitate licensed exclusion of the breeding or resting site in accordance with a plan approved by the NPWS.

9.3 Mitigation during Operation

- There will be two personnel stationed at the converter station at all times operating the interconnector, with only infrequent visits by personnel to the tail station, foul wastewater generated will be minimal. Foul wastewater will be collected from the welfare facilities in the converter station and tail station. It will be contained in the units and removed from site periodically, by a licensed service provider, to a local sewage treatment plant, which has adequate capacity.
- Surface water on site will be collected in a new surface water drainage system. Surface water from the proposed access road will connect to the existing Great Island sub-station road drainage.
- Surface water run-off from yard areas and the building roofs of the converter station and tail station, will discharge through proposed filter drains and surface water sewers,

through a bypass interceptor, to a proposed attenuation pond, to be constructed to the south-eastern part of the site. The attenuation pond will provide c. 800 m^3 of storage.

- Transformers will be sited within a reinforced concrete bund which will be linked to an underground oil dump tank.
- Transformer bunds will be designed as waterproof structures in accordance with BS EN 1992-3. The bunds will be tested in accordance with standard bund testing requirements.
- The height of all oil retaining area walls will be a minimum of 450mm above the finished substation ground level or the support plinth(s) of the associated contacting equipment, whichever is greater, to provide a physical barrier preventing possible vehicular contact with transformers.
- Rainwater or other surface water shall permeate through a flame trap. Once permeated through the stone fire trap, the water will be collected in a common dump tank. It will then be pumped out of the dump tank via a bund water control pump to a manhole, before flowing by gravity to a hydrocarbon interceptor prior to final discharge into the surface water drainage system.
- The oily water system will incorporate penstocks to close off the system.
- The hydrocarbon interceptor system will include a Class 1 full retention unit in accordance with BS EN 858-1, incorporating a coalescer automatic closure device and high oil level alarm. The separator shall be fully capable of isolating all upstream oil flow in the event that the high-level oil alarm is activated. The interceptor will be sized to suit the storm intensity flow rates from the transformer bunds and any other designated oil containment area.
- The lighting system will provide adequate illumination within the converter station to allow personnel to move without risk to health and safety. Security lighting will be installed against the building and GRP lighting poles of at least 6m height will be installed for illuminating the external area between buildings, transformer and reactor area and within the perimeter walls.
- Under normal operating conditions, external lighting would be switched off during the hours of darkness, to avoid any unnecessary impacts on fauna including otter. The exception would be for emergency repairs to outdoor equipment, where high-level illumination would be switched on.
- No mitigation measures will be implemented for the operational phase in respect of noise. Some of the plant at the converter station will be housed within buildings, thereby already limiting noise breakout to the atmosphere. Chapter 8 of the EIAR (Noise) noted that no significant residual noise and vibration effects are envisaged during the operational phase.

9.4 Mitigation during Decommissioning

- The converter station and tail station will be decommissioned when Greenlink ceases operation. The design life of these assets will be 40 years. The current trend is to refurbish HVDC equipment at the end of its operational lifetime and extend the lifetime of the interconnector.
- When it becomes appropriate to decommission the interconnector, each item of equipment in the converter station and tail station will be removed for appropriate management, based on the waste regulations at the time of decommissioning. All above ground structures within the proposed converter station and tail station footprint will be removed and the site will be returned to its previous state. It is not proposed to remove landscaping berms and planting. The attenuation pond will be filled in with some subsoil from the original site works, used to form the landscape berm, and then top-soiled.
- Underground cables will remain in-situ as there would be more of an environmental impact in their removal. Above ground structures such as the link boxes and fibre optic joints will be removed, and their locations reinstated.
- Ecology and invasive species surveys will be carried out prior to decommissioning and appropriate mitigation will be provided based on up to date data and in line with up to date guidelines.

10: Assessment of significant effects

Following the implementation of mitigation measures as outlined above the impact on qualifying interests and conservation objectives for relevant species and habitats for Natura 2000 sites was assessed. As detailed below in **Tables 30 to 40,** no impacts on the species and habitats listed as qualifying interests in respect of the individual targets for these species and habitats was identified.

Table 27: Assessment of effects for River Barrow and River Nore SAC – specific targets River Barrow and River Nore SAC Estuaries

Habitats	Attribute	Measure	Target	Assessment of Effects
Estuaries	Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes	The use of HDD techniques will ensure there will be no direct impacts on this habitat within Natura 2000 sites and will prevent impacts on water quality. This is a robust habitat which is adapted to fluctuating silt levels and there is a high degree of dilution available in the aquatic environment. Following the implementation of the mitigation measures. no significant impacts on surface water or groundwater quality will occur. There will no impact in relation to the specific targets for this species and no significant effect on this qualifying species will occur.
	Community distribution	Hectares	The following sediment communities should be maintained in a natural condition: Muddy estuarine community complex; Sand to muddy fine sand community complex; Fine sand with *Fabulina fabula* community	
	Community extent	Hectares	Maintain the natural extent of the *Sabellaria alveolata* reef, subject to natural process	

Table 28: Assessment of effects for River Barrow and River Nore SAC – specific targets River Barrow and River Nore SAC - Mudflats and sandflats not covered by seawater at low tide

Habitats	Attribute	Measure	Target	Assessment of Effects
Mudflats and sandflats not covered by seawater at low tide	Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes	The use of HDD techniques will ensure there will be no direct impacts on this habitat within Natura 2000 sites and will prevent impacts on water quality. This is a robust habitat which is adapted to fluctuating silt levels and there is a high degree of dilution available in the aquatic environment. Following the implementation of the mitigation measures. no significant impacts on surface water or groundwater quality will occur. There will no impact in relation to the specific targets for this species and no significant effect on this qualifying species will occur.
	Community distribution	Hectares	The following sediment communities should be maintained in a natural condition: Muddy estuarine community complex; Sand to muddy fine sand community complex	

Table 29: Assessment of effects on specific targets River Barrow and River Nore SAC Estuaries - *Salicornia* and other annuals colonising mud and sand

Habitats	Attribute	Measure	Target	Assessment of Effects
***Salicornia* and other annuals colonising mud and sand**	Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For the one sub- site mapped: Ringville - 0.03ha.	The use of HDD techniques will ensure there will be no direct impacts on this habitat within Natura 2000 sites and will prevent impacts on water quality. This is a robust habitat which is adapted to fluctuating silt levels and there is a high degree of dilution available in the aquatic environment. Following the implementation of the mitigation measures. no significant impacts on surface water or groundwater quality will occur. There will no impact in relation to the specific targets for this species and no significant effect on this qualifying species will occur.
	Habitat distribution	Occurrence	No decline, subject to natural processes	
	Physical structure: sediment supply	Presence /absence of physical barriers	Maintain or where necessary restore natural circulation of sediments and organic matter, without any physical obstructions	
	Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	

	Physical structure: creeks and pans	Occurrence	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession	
	Vegetation structure: zonation	Occurrence	Maintain range of saltmarsh habitat zonations including transitional zones, subject to natural processes including erosion and succession	
	Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	
	Vegetation structure: vegetation cover.	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated	
	Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub- communities with typical species listed in Saltmarsh Monitoring Project (McCorry & Ryle, 2009).	

	Vegetation structure: negative indicator species: *Spartina anglica*	Hectares	No significant expansion of *Spartina*. No new sites for this species and an annual spread of less than 1% where it is	

Table 33: Assessment of effects on specific targets River Barrow and River Nore SAC Estuaries - Atlantic salt meadows (Glauco-Puccinellietalia maritimae) & Mediterranean salt meadows (Juncetalia maritimi)

Habitats	Attribute	Measure	Target	Assessment of Effects
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) & Mediterranean salt meadows (*Juncetalia maritimi*)	Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. ASM - For sub-sites mapped: • Dunbrody Abbey - 1.25ha, • Killowen - 2.59ha, • Rochestown - 17.50ha, • Ringville - 6.70ha MSM - For sub-sites mapped: • Dunbrody Abbey - 0.08ha, • Rochestown - 0.04ha, • Ringville - 6.70ha	The use of HDD techniques will ensure there will be no direct impacts on this habitat within Natura 2000 sites and will prevent impacts on water quality. This is a robust habitat which is adapted to fluctuating silt levels and there is a high degree of dilution available in the aquatic environment. Following the implementation of the mitigation measures. no significant impacts on surface water or groundwater quality will occur. No significant effect on this qualifying habitat will occur There will no impact in relation to the specific targets for this habitat and no significant effect on this qualifying habitat will occur.

	Habitat distribution	Occurrence	No decline, subject to natural processes	
	Physical structure: sediment supply	Presence/absence of physical barriers	Maintain or where necessary restore natural circulation of sediments and organic matter, without any physical obstructions	
	Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	
	Physical structure: creeks and pans	Occurrence	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession	
	Vegetation structure: zonation	Occurrence	Maintain range of saltmarsh habitat zonations including transitional zones, subject to natural processes including erosion and succession	
	Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	
	Vegetation structure: vegetation cover.	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated	
	Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub-communities with typical species listed in Saltmarsh Monitoring Project (McCorry & Ryle, 2009).	

	Vegetation structure: negative indicator species: *Spartina anglica*	Hectares	No significant expansion of *Spartina*. No new sites for this species and an annual spread of less than 1% where it is already known to occur	

Table 30: Assessment of effects for River Barrow and River Nore SAC on specific targets for Otter

Species	Attribute	Measure	Target	Assessment of Effects
Otter	Distribution	Percentage positive survey sites	No significant decline	Use of a HDD methodology will prevent any direct loss of habitat for otters the Campile River Estuary crossing and Baginbun Beach. No otters were recorded at the crossing point or the discharge point for surface water during operation on the Newtown River which provides low value potential habitat for otter. There will be no significant impact on fish biomass within aquatic habitats due to loss of habitat or water quality impacts.
	Extent of terrestrial habitat	Hectares	No significant decline. River Barrow and River Nore SAC - Area mapped and calculated as 122.8ha above high water mark (HWM); 1136.0ha along river banks / around ponds. Lower River Suir SAC - Area mapped	

			and calculated as 116.17ha above high water mark (HWM) and 726.61ha along riverbanks	Noise, vibration, lighting and disturbance levels will increase during construction and operation however no breeding habitat will be affected and no significant impact on foraging otters will occur. There will no impact in relation to the specific targets for this species and no significant effect on this qualifying species will occur.
	Extent of marine habitat	Hectares	No significant decline. River Barrow and River Nore SAC - Area mapped and calculated as 857.7ha. Lower River Suir SAC - Area mapped and calculated as 712.27ha	
	Extent of freshwater (river) habitat	Kilometres	No significant decline. River Barrow and River Nore SAC - Length mapped and calculated as 616.6km. Lower River Suir SAC - Length mapped and calculated as 382.31km	
	Extent of freshwater (lake) habitat	Hectares	No significant decline. River Barrow and River Nore SAC - Area mapped and calculated as 2.6ha	
	Couching sites and holts	Number	No significant decline	
	Fish biomass available	Kilograms	No significant decline	

Table 35: Assessment of effects for River Barrow and River Nore SAC on specific targets for Sea Lamprey

Species	Attribute	Measure	Targets	Assessment of Effects
Sea Lamprey	Distribution: extent of anadromy	% of river accessible	Greater than 75% of main stem length of rivers accessible from estuary	The use of HDD methodology will prevent any impacts on this species migrating through the Campile River estuary. No habitat for sea lamprey was recorded within the Newtown River. Following the implementation of the mitigation measures. no significant impacts on surface water or ground water quality will occur. There will no impact in relation to the specific targets for this species and no significant effect on this qualifying species will occur.
	Population structure of juveniles	Number of age/size groups	At least three age/size groups present	
	Juvenile density in fine sediment	Juveniles/m²	Juvenile density at least 1/m²	
	Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds	
	Availability of juvenile habitat	Number of positive sites in 3rd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	

Table 36: Assessment of effects for River Barrow and River Nore SAC on specific targets for River Lamprey

Species	Attribute	Measure	Target	Assessment of effects
River lamprey	Distribution: extent of anadromy	% of river accessible	River Barrow and River Nore SAC - Greater than 75% of main stem and major tributaries down to second order accessible from estuary. Lower River Suir SAC - Access to all water courses down to first order streams	The use of HDD methodology will prevent any impacts on this species migrating through the Campile River estuary. No habitat for sea lamprey was recorded within the Newtown River. Following the implementation of the mitigation measures. no significant impacts on surface water or ground water quality will occur. There will no impact in relation to the specific targets for this species and no significant effect on this qualifying species will occur.
	Population structure of juveniles	Number of age/size groups	At least three age/size groups of brook/river lamprey present	
	Juvenile density in fine sediment	Juveniles/m²	Mean catchment juvenile density of brook/river lamprey at least 2/m²	
	Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds	
	Availability of juvenile habitat	Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	

Table 37: QI species for which a potential impact has been identified – specific targets River Barrow and River Nore SAC and Lower River Suir SAC Atlantic Salmon

Species	Attribute	Measure	Target	Assessment of Effects
Atlantic Salmon	Distribution: extent of anadromy	% of river accessible	100% of river channels down to second order accessible from estuary	The use of HDD methodology will prevent any impacts on this species migrating through the Campile River estuary. No habitat for sea lamprey was recorded within the Newtown River. Following the implementation of the mitigation measures. no significant impacts on surface water or ground water quality will occur. There will no impact in relation to the specific targets for this species and no significant effect on this qualifying species will occur. .
	Adult spawning fish	Number	Conservation limit (CL) for each system consistently exceeded	
	Salmon fry abundance	Number of fry/5 minutes electrofishing	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 minutes sampling	
	Out-migrating smolt abundance	Number	No significant decline	
	Number and distribution of redds	Number and occurrence	No decline in number and distribution of spawning redds due to anthropogenic causes	
	Water quality	EPA Q value	At least Q4 at all sites sampled by EPA	

Table 31: QI species for which a potential impact has been identified – specific targets River Barrow and River Nore SAC and Lower River Suir SAC Twaite Shad

Species	Attribute	Measure	Target	Assessment of Effects
Twaite shad	Distribution: extent of anadromy	% of river accessible	Greater than 75% of main stem length of rivers accessible from estuary	The use of HDD methodology will prevent any impacts on this species migrating through the Campile River estuary. No habitat for sea lamprey was recorded within the Newtown River. Following the implementation of the mitigation measures. no significant impacts on surface water or ground water quality will occur. There will no impact in relation to the specific targets for this species and no significant effect on this qualifying species will occur.
	Population structure: age classes	Number of age classes	More than one age class present	
	Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning habitats	
	Water quality: oxygen levels	Milligrammes per litre	No lower than 5mg/l	
	Spawning habitat quality: Filamentous algae; macrophytes; sediment Occurrence	Occurrence	Maintain stable gravel substrate with very little fine material, free of filamentous algal (macroalgae) growth and macrophyte (rooted higher plants) growth	

Table 32: QI habitats for which a potential impact has been identified – specific targets for vegetated sea cliffs of the Atlantic and Baltic coasts

Habitats	Attribute	Measure	Target	Assessment of Effects
Vegetated sea cliffs of the Atlantic and Baltic coasts	Habitat length	Kilometres	Area stable, subject to natural processes, including erosion. For sub-sites mapped: Loftushall - 0.55km; Hook Head - 2.36km; and Baginbun Head - 9.20km	The use of HDD techniques will ensure there will be no direct impact on these habitats within Natura 2000 sites and will prevent impacts on water quality. This is a terrestrial habitat which is not highly susceptible to water quality impacts and following the implementation of the mitigation measures. no significant impacts on surface water quality or ground water quality will occur. No impact from the spread of invasive species will occur. There will no impact in relation to the specific targets for this habitat and no significant effect on this qualifying habitat will occur.
	Habitat distribution	Occurrence	No decline, subject to natural processes	
	Physical structure: functionality and hydrological regime	Occurrence of artificial barriers	No alteration to natural functioning of geomorphological and hydrological processes due to artificial structures	
	Vegetation structure: zonation	Occurrence	Maintain range of sea cliff habitat zonations including transitional zones, subject to natural	

			processes including erosion and succession	
	Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	
	Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub-communities with typical species listed in the Irish Sea Cliff Survey (Barron et al., 2011)	
	Vegetation composition: negative indicator species	Percentage	Negative indicator species (including non-natives) to represent less than 5% cover	
	Vegetation composition: bracken and woody species	Percentage	Cover of bracken (*Pteridium aquilinum*) on grassland and/or heath less than 10%. Cover of woody species on	

			grassland and/or heath less than 20%	

Table 40: QI species for which a potential impact has been identified – specific targets Winter birds and wetlands

Species/Habitats	Attribute	Measure	Target	Assessment of Effects
Light-bellied Brent Goose Knot Curlew Black-tailed Godwit Bar-tailed Godwit Redshank Lapwing Oystercatcher Shelduck Pintail Golden Plover Grey Plover Dunlin	Population trend	Percentage change	Long term population trend stable or increasing	Use of HDD methodology will prevent any direct loss of habitat for wintering birds the Campile River Estuary crossing and Baginbun Beach. Noise, vibration, lighting and disturbance levels will increase during construction and operation. Works in close proximity to the Campile River Estuary will take place outside the peak season for wintering birds which runs from October to March inclusive. This will prevent any disturbance to wintering species utilising the sites during this period. Following the implementation of the mitigation measures. no significant impacts on surface water or ground water quality which could impact on habitats for birds will occur. There will no impact in relation to the specific targets for these bird species and no significant effect on this qualifying species will occur.
	Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by each species, other than that occurring from natural patterns of variation	
Wetlands	Habitat area	Hectares	The permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 1,364ha, other than that occurring from natural patterns of variation	

11. Conclusions

Four Natura 2000 site for which potential significant impacts could occur have been identified i.e. River Barrow and River Nore SAC, Hook Head SAC, Lower River Suir SAC and the Bannow Bay SPA.

Impacts which have the potential to impact on these European sites relate primarily to impacts on water quality, increased lighting, noise and disturbance, invasive species and loss of habitat. Potential cumulative impacts were also considered.

A range of mitigation measures have been incorporated into the project design, and other mitigation measures have been developed and proposed, with the purpose of avoiding impacts on the qualifying interests and conservation objectives for the River Barrow & River Nore SAC, Hook Head SAC, Lower River Suir SAC and the Bannow Bay SPA. The likely success of these measures was also considered and no difficulties in their effective implementation were identified.

The provisions of Article 6 of the 'Habitats' Directive 92/43/EC (2000) defines 'integrity' as the 'coherence of the site's ecological structure and function, across its whole area, or the habitats, complex of habitats and / or population of species for which the site is or will be classified'. The European Commission publication *Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC* (EC, 2018), states that the integrity of the site can be usefully defined as the coherent sum of the site's ecological structure, function and ecological processes, across its whole area, which enables it to sustain the habitats, complex of habitats and/or populations of species for which the site is designated"

Following a comprehensive evaluation of the potential direct, indirect and cumulative impacts on the qualifying interests and conservation objectives for the River Barrow & River Nore SAC, Hook Head SAC, Lower River Suir SAC and the Bannow Bay SPA, it has been concluded that the proposed development will not have an adverse effect on the integrity of these sites or any other Natura 2000 sites.

On the basis of objective scientific information, the proposed development will not, either alone or in combination with other plans or projects, adversely affect any of the constitutive interests of the River Barrow & River Nore SAC, Hook Head SAC, Lower River Suir SAC and the Bannow Bay SPA, in light of these site's conservation objectives.

Accordingly, the following has been concluded:

(i) all aspects of the proposed development have been identified which, in the light of the best scientific knowledge in the field, can by themselves or in combination with other plans or projects, affect the European site in the light of its conservation objectives;
(ii) there are complete, precise and definitive findings and conclusions regarding the identified potential effects on any relevant European site;

(iii) on the basis of those findings and conclusions, the competent authorities are able to determine that no scientific doubt remains as to the absence of the identified potential effects; and
(iv) thus, the competent authorities may determine that the proposed development will not adversely affect the integrity of any relevant European site.

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Appendix 1: Chapter 4 *Construction Strategy* from the Environmental Impact Assessment Report

Contents

4 Construction Strategy

4.1 Introduction

This chapter provides an outline of the general activities associated with the construction of the proposed development. The design, operation and decommissioning of the proposed development are described separately in **Chapter 3**.

This chapter of the EIAR has been prepared in accordance with Part 1 of Annex IV of the EIA Directive (2014/52/EU, amending 2011/92/EU). This section therefore provides the following information:

- The duration and phasing during the construction period;
- Land use requirements to support the construction of the proposed development;
- The activities required to prepare the site and undertake the enabling works to support the construction of the proposed development;
- An overview of employment numbers, hours of working and construction safety measures which will be enforced during the construction of the proposed development;
- An overview of site, materials and environmental management measures associated with the construction of the proposed development; and

The Construction Environmental Management Plan (CEMP), which describes the minimum requirements that will be required to be implemented, is provided in **Appendix 4.1**.

This chapter has been prepared by Simon Grennan and Dan Garvey of Arup, with input from GIL's engineering consultants, WSP, and Arup's civil engineers. A description of the authors' qualifications and experience is presented in **Appendix 1.1**.

4.2 Duration and Phasing

4.2.1 Indicative Construction Programme and Phasing

A large infrastructure project such as Greenlink takes several years from concept to construction, including technical design, obtaining the relevant permits and consultation with a variety of stakeholders.

Subject to obtaining planning approval and the relevant permits and licences, on-site construction of the proposed development will commence in 2021. Greenlink is expected to be fully operational in 2023.

The approach outlined below is considered to represent a reasonable worst-case scenario as to how the proposed development may be constructed in its entirety.

Whilst the general requirements detailed in this section will be followed, the Contractor, when appointed, will ultimately be responsible for the sequencing and implementation of the works in a safe and secure manner and in accordance with all statutory requirements. Notwithstanding this flexibility, Greenlink Interconnector Limited will ensure that the construction activities, and all associated environmental controls are carried out in compliance with the mitigation measures and best construction practice described in this EIAR.

The timeline in **Table 4.1** sets out the outline programme for the construction of the converter station and tail station. Construction will commence in May 2021.

Table 4.1: Outline Construction Programme - Converter Station and Tail Station

Activity	Timing
System design	0-6 months
Detailed design and equipment procurement	0-15 months
Manufacturing (converter equipment)	15-27 months
Early works (ground work and access)	14-20 months
Civil work	21-30 months
Installation	27-32 months
Commissioning	32-37 months
Trial operation	37-40 months

Cable detailed design and procurement will take up to six months. Cable manufacturing will take up to twelve months.

For the onshore cable route, the cable will be installed on a rolling basis. Where no obstacles or constraints exist within or near the cable route, it is expected that progress rates for the trench excavation and installation of ducts will be up to:

- 200 metres per day in farm land and on road sections with full road closure,
- 120m/day on road with single lane closure
- 70m/day on road maintaining two-way traffic.

These rates will reduce where obstructions and underground utility services are encountered.

The first section of the route from the converter station to east of Ramsgrange village is approximately 8.5km long. This runs across farmland, at the northern end, and then along a combination of regional and local roads. The third section from Templars Inn to the landfall site is approximately 5.9km long. This section runs along local roads. The central section from Ramsgrange to Templars Inn is approximately 8.5km long. It runs along the R733 regional road through Ramsgrange village, and on local roads thereafter.

Construction works at the landfall, and along public roads will not be carried out in the period from the first of July to the thirty first of August.

Construction activity in the vicinity of the Campile Estuary crossing, including the HDD, will not be carried out in the period from the first of October to the thirty first of March inclusive.

The current schedule envisaged that trench excavation and installation of ducts on the first and third sections will be undertaken concurrently between September and December 2021, to avoid the summer tourist season. The second section is currently programmed for trench excavation and duct installation after the other two sections, between December 2021 and March 2022. Cable pulling and jointing are currently programmed to be undertaken on the three sections between March and November 2022, but no works will be undertaken at the landfall or on public roads in the months of July and August.

The expected programme for each cable section (of up to one kilometre) is presented in **Table 4.2.**

Table 4.2: Outline Construction Programme – Onshore Cable Route (per cable section of up to one kilometre)

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

The HDD at the Campile River estuary is currently scheduled to take circa 25 days and is planned to be undertaken between March and May 2022. The landfall HDD at Baginbun Beach is currently scheduled to take a total of 3 months and is planned to be undertaken between January and March 2022.

4.3 Land Use Requirements

4.3.1 Overview

Construction of the proposed development will require temporary land take to accommodate construction activities in addition to the permanent land take required to accommodate the above ground elements of the proposed development. Land will be temporarily required to accommodate construction compounds and temporary on-site activities. Provision will be made at Great Island for continuous access to the site of the consented battery storage facility located to the north of the converter station site. Small areas of additional land will be required where the cable route goes off-road. These are described in **Section 4.5.7** below.

4.3.2 Cable Contractor Compounds

Three construction compounds/lay down areas for the cable contractor will be provided. One cable contractor's compound will be located to the north of the SSE Great Island power station and the EirGrid 220kV substation, at the Great Island end of the route. This site was used as a contractor's compound for the construction of the SSE Great Island power station and the EirGrid substation and is an existing hardstand area. A second cable contractor's compound will be located at the landfall site close to Baginbun Beach. The third cable contractor's compound will be located in the townland of Lewistown, along the onshore route. **Figure 4.1** shows the location of the cable contractor's compounds. **Figures 4.2, 4.4 and 4.5** illustrate the Baginbun, Lewistown and Great Island construction compounds, respectively.

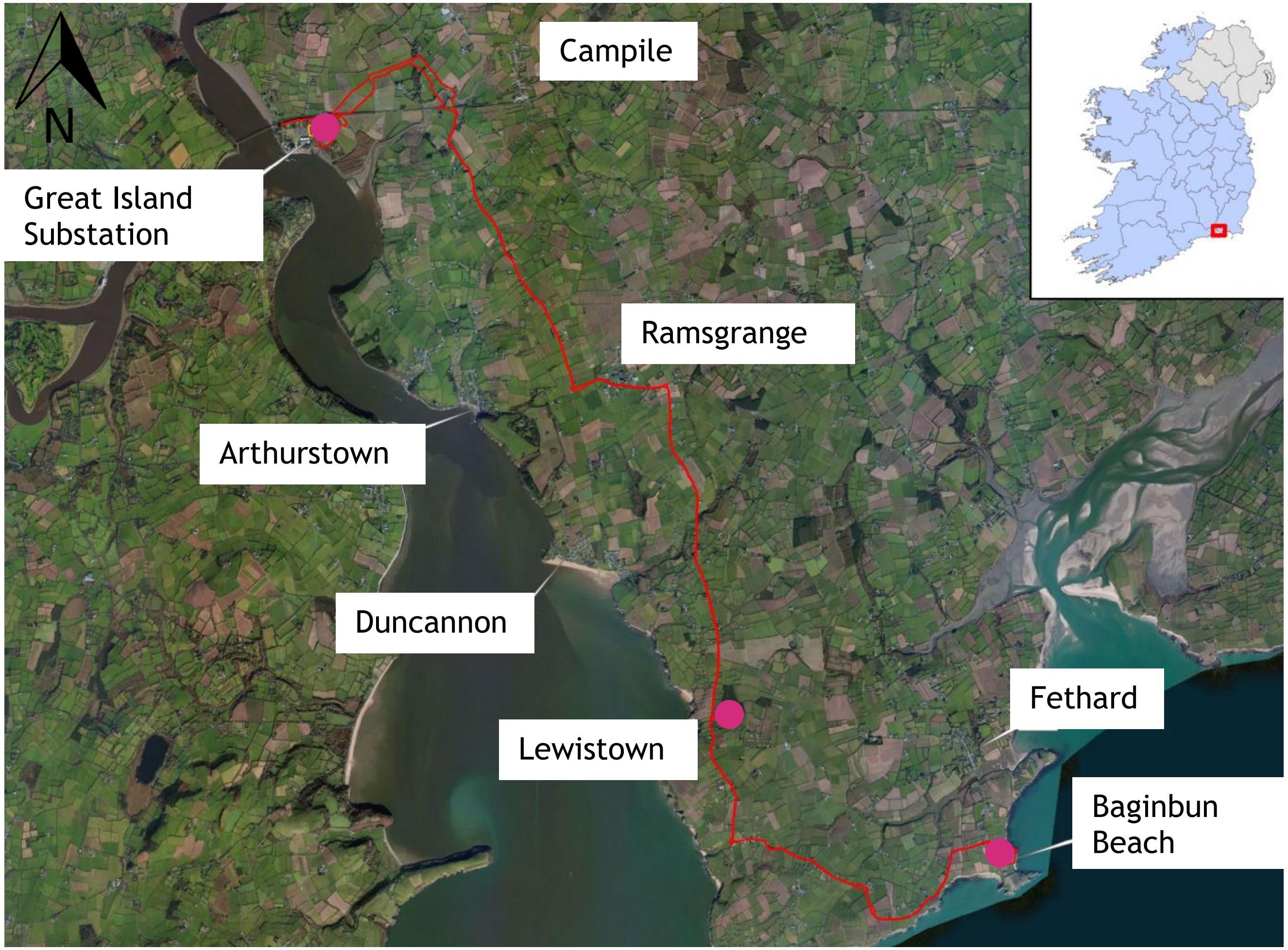


Figure 4.1: Locations of Construction Compounds (indicated thus: ●) (not to scale | background mapping from Bing © Microsoft 2020)

The cable construction compounds/lay down areas will provide the following:

- Space for materials lay down;
- Road access;
- Securely fenced site;
- Space for parking;
- Wheel wash, through which all trucks exiting the construction compounds will be required to pass. All water from the wheel wash will be collected, fully contained, and dispatched for treatment and disposal off-site;
- Construction waste storage;
- Site Offices;
- Electricity supplied by mains at the three compounds;
- IT/telecommunication connection;
- Water supplied from the watermain at the Great Island compound, water supplied by a bowser at for Baginbun and Lewistown; and
- Welfare facilities at the three sites, with foul sewage disposed of by removal off-site.

The construction compounds/lay down areas will be used for the external storage of plant, ducts, protective tiles, warning tapes, duct surround materials etc.

Most deliveries will be made to the lay down areas, within the compounds, during normal working hours. The HVDC and HVAC cables and accessories will be held in the three cable compounds and will be delivered to the cable installation site on the day of the cable pull.

After the construction is completed, all structures and facilities will be removed, and the cable construction compounds/lay down areas will be reinstated to their original condition.

4.3.3 HDD Contractor Compounds

There will be a compound for the HDD contractor adjacent to Baginbun Beach. This compound, which is illustrated in **Figure 4.2**, will be close to the cable construction compound at Baginbun.

The planning application includes two similar HDD compounds at Campile, one at either end of the Campile River Estuary HDD crossing. **Figure 4.3** illustrates the two compounds at the Campile River estuary. The environmental effects of the two compounds have been assessed in this EIAR. The location of the respective entry or exit compound is not known at this stage. The HDD construction contractor will decide which compound location suits its construction strategy.

The HDD compounds will provide the following:

- Space for materials and equipment lay down;

- Space for two HDD rigs aligned with the cable;
- Road access;
- Securely fenced site;
- Space for parking;
- All trucks exiting the construction compounds will be required to pass through a wheel wash. All water from the wheel wash will be collected, fully contained, and dispatched for treatment and disposal off-site;
- Construction waste storage;
- Site Offices;
- Electricity supplied by a generator;
- IT/telecommunication connection;
- Water supplied by a bowser; and
- Welfare facilities, with foul sewage disposed of by removal off-site.

4.3.4 Great Island Converter Station and Tail Station Construction Compound

The converter station and tail station contractor's compound will be established to the north of the Great Island 220kV substation, to the west of the converter station site at Great Island. This compound will be in two adjacent sections. This area was used for the construction of the SSE Great Island power station and the Eirgrid substation. The eastern of the two areas is within the licence boundary of the SSE industrial emission licence P606-03. **Figure 4.5** is a plan of the cable contractor and converter station contractor's compounds at Great Island.

The compound will provide facilities and lay down areas for the construction of the converter station and tail station. It will have similar facilities to the cable contractor's compound at Great Island, described in **Section 4.3.2** above, but will be on a larger scale.

Following the commissioning of the converter station and tail station, the ground of the converter station construction compound will be restored to its original condition.

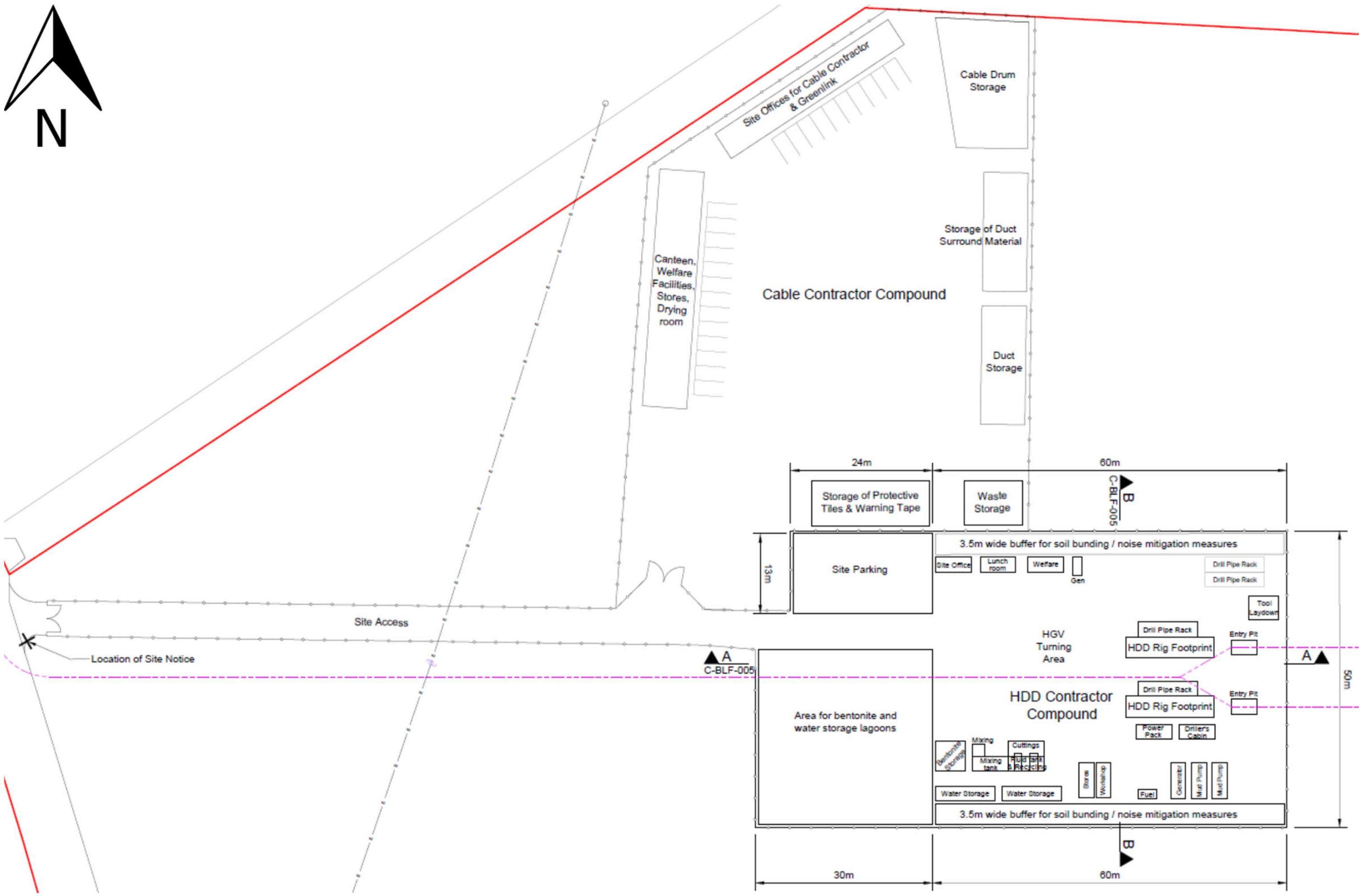


Figure 4.2 Contractors' Compounds near Baginbun Beach | not to scale [cable route shown in magenta]

Figure 4.3 HDD Compounds at Campile Estuary | not to scale [mapping: Bing Maps (c) Microsoft 2020]

Figure 4.4 Contractor's Compound at Lewistown | not to scale

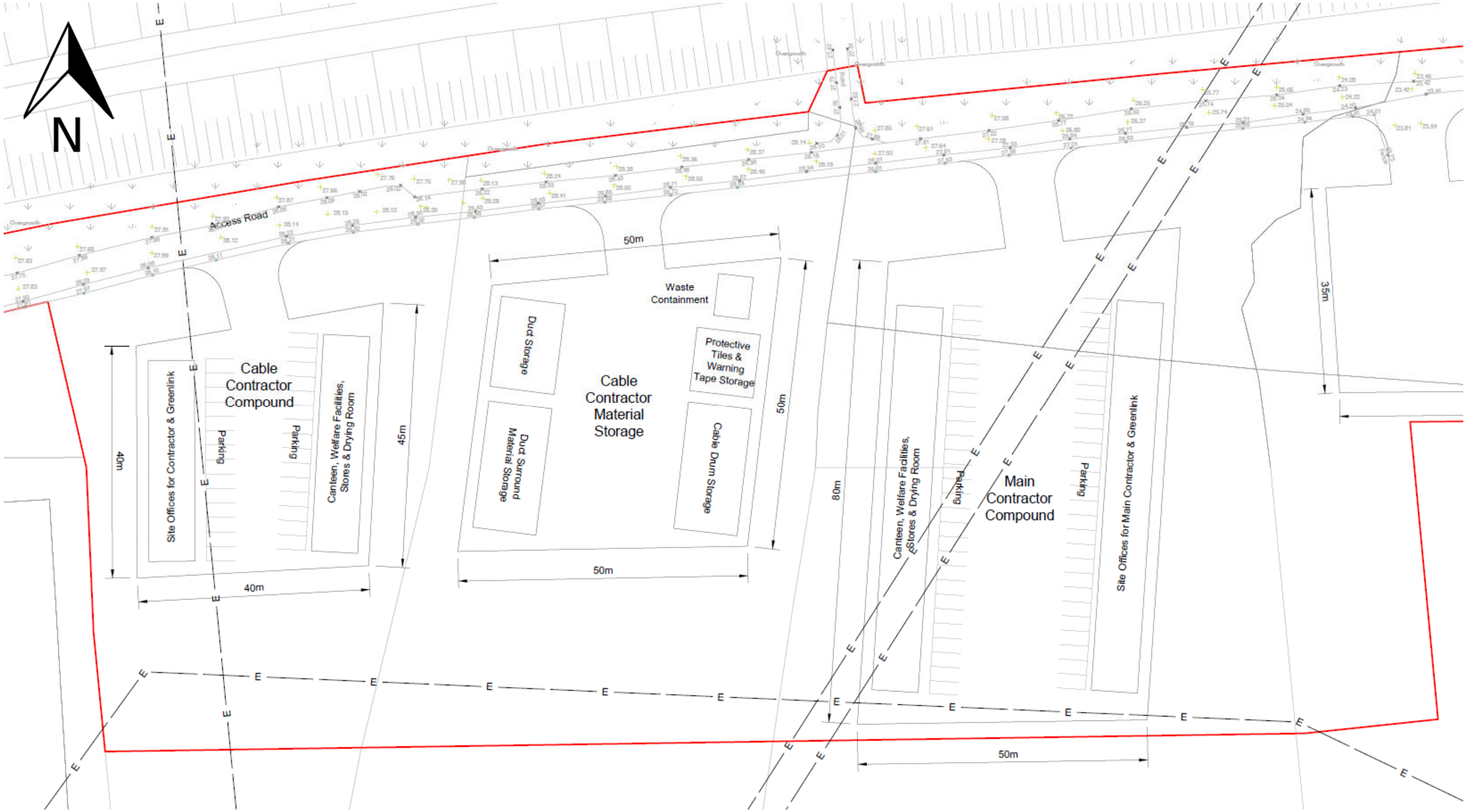


Figure 4.5 Contractors' Compounds at Great Island | not to scale

4.4 Construction Methods

The following sections outline the planned methodology for the main construction elements of the proposed development. The tail station perimeter will be contiguous with the converter station perimeter and they will be constructed at the same time. In the text below, reference to converter station should be read to include the tail station.

4.4.1 Enabling Works and Site Clearance

Enabling works, which will be undertaken at the HDD compounds and Lewistown and Baginbun cable compounds, will be as follows:

- Establish a construction traffic management plan for each construction compound. **Chapter 6** *Traffic and Transportation* provides the details;
- Establish and implement the surface water management strategy at each compound. **Chapter 13** *Water and Hydrology* provides the details;
- Construct temporary site access from the existing road network; the Lewistown cable compound will use the existing yard entrance, which will be upgraded;
- Install secure hoarding or fencing (2.4 metres in height as a minimum) around each of the compounds that will remain in-situ for the duration of the construction works;
- Remove vegetation and strip and store topsoil, ensuring any stockpiles are covered and surrounded with silt fencing;
- Create a reasonably level platform using crushed stone.
- Install vehicle set down and material storage areas as shown on the layout drawings in each of the construction compounds;
- Install the site offices and welfare facilities.
- Undertake all required utility services connections and diversions.

Advantage will be taken of the fact that the Great Island construction compounds were used previously to support construction projects. Enabling works at these compounds will be as follows:

- Establish a construction traffic management plan for each construction compound. **Chapter 6** *Traffic and Transportation* provides the details;
- Reinstate the surface water management strategy at each compound. **Chapter 13** *Water and Hydrology* provides the details);
- Reinstate fencing (2.4 metres in height as a minimum) around each of the compounds that will remain in-situ for the duration of the construction works;
- Minor works to existing crushed stone platform;
- Install vehicle set down and material storage areas as shown on the layout drawings in each of the construction compounds;

- Install the site offices and welfare facilities.
- Undertake all required utility services connections and diversions.

Minor enabling works will also need to take place at locations along the route where trees/hedges need to be removed, suitable access points will be constructed and haul roads installed where applicable. Removal of walls will also be required; however these will be reinstated following the construction works.

4.4.2 Permanent Access Road and Converter Station Construction Compound

The construction of the permanent access road to the converter station site and setting up the construction compounds and converter station site, will be early tasks in the construction schedule. The works will include:

a. Protection of existing services

- Mobile welfare – either mobile welfare vans, towed units, or self-contained units will be used, until the facilities in the construction compound have been established.
- Initial works will be carried under temporary traffic management (lane closure under traffic signal control).
- Any area to be excavated will be subject to utilities searches, GPR (ground penetrating radar) survey and CAT (cable avoidance tool) scanning.
- Services – if any, subject to utilities searches and investigation during design, will be exposed using intrinsically safe excavation methods i.e. vacuum excavation. Protection methods (subject to design and agreement with service owner, such as steel plating, concrete slab etc.) will be installed.
- A 25 tonne 360° tracked excavator, with nine tonne forward tipping dumpers, and ride-on twin rollers will typically be used for earthworks. Similar plant will be used for compound construction and construction of the temporary access road.
- Topsoil and arisings will be segregated. The design intent is that all material will be reused on-site.
- Segregated walking routes will be established and maintained.
- Permanent signage will be installed, prior to the removal of temporary traffic management.
- Permanent access gates will be installed to ensure access control.
- Vehicle movements on site will be controlled by a Plant and Vehicle Marshal(s) (PVM).

b. As stated above, the converter station construction compound will be located on an area used for the construction of the power station.

- Segregated pedestrian access routes from the compounds to the converter station site will be established and maintained.

- Site security will be maintained by a combination of: the gate being permanently staffed during working hours; random out of hours security patrols; remotely monitored “smart” security.
- Foundations will be constructed for temporary accommodation.
- Secure bunded areas will be constructed for fuel storage and chemicals, and generators. Permanent connections for site services (electricity, water, telecoms) to mains will be established.
- Welfare facilities with holding tank, which will be emptied by disposal off-site.
- Temporary cabins will be placed using a loader crane or mobile crane.
- Asphalt surfacing to the car park area will be placed. The equipment required for this includes an asphalt paving machine, ride-on rollers, floor saw and planers.
- Surfacing will be provided to the converter station site entrance and first 50 metres of road.
- Signage, fencing, compound lighting, and services to cabins will be installed.

c. Converter Station Site Temporary Access Road

To provide initial access to the converter station site along the route of the permanent access road, a temporary road will be constructed.

- Topsoil and subsoil will be stripped, and soft spots excavated. Soils will be separated and stockpiled. All stockpiles will be covered and surrounded with silt fencing in a designated area.
- Capping and geotextile reinforced sub base layers will be placed and compacted.
- All plant movements will be controlled by a qualified supervisor; works will be zoned by barriers ensuring segregation.
- Temporary signage will be installed at intervals (speed limits, passing places, overhead services, etc). Warning “goal posts” will be provided where overhead services cross the route.

d. Converter Station Permanent Access Road

- Ducts located under permanent road, for future medium-voltage cables to be pulled through.
- The top surface of the temporary road will be graded off, and excess material will be retained as general fill material.
- The sub-base layers will be topped up and trimmed.
- Road drainage will be installed.
- The kerb raft will be constructed with in situ concrete, and precast concrete (PCC) kerbs and place backing will be installed. Mechanical lifting will be used to lift and place the PCC kerbs.

- Verge fill will be placed behind kerbs, with the batters trimmed and shaped.
- Surfacing to roads will be placed: the construction will be base/binder/surface course to a total depth of between 200 and 300mm. The surface course will be omitted at this stage. The equipment used will include an asphalt paving machine, ride-on rollers, floor saw, and planers.

e. Finishing the permanent access road

- Lines, and permanent signage will be installed.
- The surface course will be placed prior to handover to the client on completion of construction, when use of the road for site construction traffic has finished.

4.4.3 Earthworks on Converter Station Site, Haul Roads, Piling

A level platform circa 2.04ha in area, on which the converter station and tail station will be located, will be created by bulk excavation and filling. The platform will require the excavation of circa 23,000m^3 of rock which will be crushed on site and reused, insofar as is possible. Up to an additional 20,500m^3 of crushed stone structural fill will be imported for the converter station and tail station site.

Precast concrete piles will be used for the building foundations.

These works will be undertaken as follows:

a. Haul roads and access routes and bulk excavation

- Suitably graded imported stone will be delivered to site and stockpiled until required for haul roads and access routes.
- The converter station site will be excavated in a cut and fill manner to eliminate the requirement for bulk removal of excavated material from site. Rock will be excavated using either rock splitting or blasting, or a combination of both techniques. Rock crushing may be required to reuse the excavated material. The noise levels associated with blasting (if it is deemed necessary) will not exceed those predicted for rock-breaking, and specific mitigation measures will be implemented, as set out in **Section 8.5.1** of **Chapter 8** *Noise and Vibration* to ensure that adverse effects on the Gas Networks Ireland transmission pipeline are avoided.
- Topsoil will be removed and stockpiled within the site to be reused during the landscaping phase. All stockpiles will be covered and surrounded by silt fencing. Stone will be placed using a dozer or excavator.
- Rock will be excavated, ripped or broken out as required, to achieve the required levels.
- Where required, the stone blanket will be reinforced with geotextile materials.

- Access roads will be designed and installed to ensure that water is dispersed into drainage channels.
- Segregated pedestrian routes will be provided.

b. Installation of precast piling

- Precast piling will be installed.
- Piles will be delivered to site on articulated trucks and offloaded using the piling rig or a mobile crane and stored as required.
- Piles will be installed using a piling rig.
- It is expected that there will be up to three piling rigs operating simultaneously during the scheme.
- To minimise the effect of noise, the piling rigs, where practical, will be situated with the rear of the rig towards any sensitive receptor. Timber packers will be used between the pile and the hammer to reduce the noise level.

4.4.4 Converter Station Site Perimeter

The earthworks to the footprint of the converter site will be completed within a perimeter secured by temporary fencing – Heras-type or similar. The permanent fencing will be installed following completion of earthworks.

The permanent internal roads, temporary roads and pedestrian access routes will be established within the site perimeter, ensuring ongoing safe and efficient access. Temporary routes will be reviewed regularly as construction progresses and changed and developed as required. Temporary safety and information signage will be provided. Pedestrian routes and designated crossing points will be well marked. Permanent road construction will be built up to and including asphaltic layers, but surface course will be omitted until completion of site construction vehicles and plant. The equipment required will include an asphalt paving machine, ride-on rollers, floor saw, and planers.

4.4.5 Converter Station Site Drainage, Temporary Drainage, Interceptors, Ducts, Troughs, Earthing Grid

For the construction phase, temporary drainage will be installed to control silt run-off. The permanent drainage will be installed later in the construction sequence. The converter station and tail station will each have an earthing grid. This will be installed at the same time as the permanent drainage.

a. Temporary drainage including silt busting/interception

- Measures will be provided to ensure only clean surface water run-off is discharged from site during the construction phase i.e. de-silting and temporary oil interceptor. These will be subject to daily inspection to ensure they remain adequate and effective. The discharge will be to the same watercourse as the permanent drainage.

b. Permanent Drainage: attenuation tanks, interceptors, oil dump tanks

- The proposed attenuation pond will be formed by excavating material from the existing embankment to the south of the converter station platform. The excavation will be carried out using a 35-tonne 360 degree tracked excavator, to a depth of approximately two metres.
- The base of the excavation will be formed and proof-rolled by small plant machinery.
- A HDPE liner and protective geotextile will be included in the pond build-up.
- the precast concrete inlet and outlet headwalls and associated pipework will be positioned into place and the pond excavation landscaped prior to decommissioning.

c. Carrier Drains, filter drains, manholes including penstock chambers.

- Ground Support will be by trench sheets/trench boxes/manhole boxes.
- Excavation will be by a 360° tracked excavator, sized to suit the drainage being carried out, typically 13 to 25 tonnes.
- An excavator will be used to place pipes.
- Safe access into excavations will be maintained.

d. Storm water drainage, road gullies

- Below ground drainage will be installed prior to erection of the building superstructure/roof drainage. Final connection will be made when down pipes are installed to ensure accurate positioning.

  Road gullies and connections to carries will be installed during road construction, prior to trimming sub base, and surfacing. Gullies will be finished once the binder course has been installed.

e. Installation of earthing grid

- The earthing grid will be progressed in conjunction with drainage/ducts/troughs and foundations to ensure it is progressed safely and efficiently. As far as possible open excavations will be avoided and will be backfilled the same day. Any open excavations will be barriered.
- Ground will be tested for resistivity and pH levels to ensure the grid works efficiently.
- Joints and connections will be carefully recorded.
- A small tracked excavator will be used.

f. Duct and trough Installation

- A small tracked excavator will be used.
- The sequence of installation will be carefully planned with the drainage and foundations installation to ensure that it can be carried out safely and efficiently.
- Ducts and chambers will be installed in shallow excavations. As far as possible open excavations will be avoided and will be backfilled the same day. Any open excavations will be barriered.

- Excavations for cable troughs will be benched to avoid the need for additional ground support. Base of excavation will be prepared to design detail, typically mass concrete. Precast concrete trough units will be placed using mechanical lifting – using a small tracked excavator (lift plan required). Excavations will be backfilled as soon as possible. Precast covers will be placed progressively to avoid fall hazard of open troughs. Whenever covers are removed or omitted, edge protection/barriers will be provided.

4.4.6 Converter Station and Tail Station Reinforced Concrete Foundations and Slabs

The converter station and tail station will have reinforced concrete pile caps and floor slabs. There will be miscellaneous reinforced concrete foundations. The works will be undertaken as described below.

- The equipment to be used will include a tracked excavator, mobile crane/crawler crane/tower crane/pedestrian tower crane, and concrete pumps.

b. Excavation, blinding, pile trimming

- All excavations will be barriered and fenced.
- Excavations will be by appropriately sized excavator – typically 20 or 25 tonnes for larger structures, and 13 tonnes for smaller structures. Excavations will be benched or battered, and temporary stairs will be provided for safe access into excavations. Formation will not be left open in poor weather: blinding will be placed as the excavation progresses over several days, or a protective surcharge will be left for final trim.
- Blinding will be placed using a machine bucket, or crane and skip, or by concrete pump.
- Hydraulic crushers/mounted excavators will be used to break down piles, final trim using hand held breakers.

c. Deep structures: foundations, Control Building basement

- The sheet piled ground support system will be installed.
- The foundation will be excavated from outside the footprint.
- The Control Building basement will be excavated from inside the footprint, leaving an earth ramp for access, which will be removed as the excavation is completed.

d. Steel Fixing

- Where possible cages will be prefabricated.
- Where fixed in situ, reinforcement will be craned onto the blinding.
- Reinforcement will be fixed progressively across the blinding, using tying wire and hand tools. Strips of rubber matting will be placed to provide safe access to reduce trip hazard on reinforcement mats. Protection will be provided to starter bars and any projecting steel.

e. Shuttering and preparation for pour

- Prior to erection, panels will be inspected to ensure they are clean and free from damage. Shutter oil will be applied.
- Panels will be placed using mechanical lift assistance. Kickers and bolt hanging jigs etc. will be completed in timber and ply.
- Cast in bolts and ducts will be installed during shutter erection.
- Prior to placement of concrete, the pour will be checked, and debris will be blown out or removed by hand.

f. Placement, compaction, finishing and curing for concrete

- Concrete will be placed by crane and skip, or by concrete pump, working progressively across the pour in layers, to ensure the working front is kept "live".
- Concrete will be compacted using portable vibrating poker units.
- Unformed surfaces will be tamped off to the required level, before being floated to the required finish. Some slabs may require a power float finish. Curing will be achieved by polythene covers or by sprayed on curing membranes. Protection from rain or cold may be required in adverse weather.

g. Striking formwork, finishing works

- The sequence for striking will be planned, and temporary propping for stability will be provided.
- Formwork will be stuck when the concrete is sufficiently cured and has gained sufficient strength.
- On striking formwork, defects and tie holes will be made good, and any rubbing up/finishing will be carried out. Surface treatments (if any) to surfaces will be applied, and foundations will be backfilled as soon as possible.

4.4.7 Converter Station and Tail Station Steel Superstructure Erection, Wall Cladding, Roof Installation, Gutters and Rainwater Pipes

The superstructure of the buildings in the converter station and tail station will be structural steel. The structural steel will be erected, once the foundations have been completed. The wall and roof metal cladding will be fixed, making the buildings weather-tight, when the structural steel frames are in place.

a. Structural Steel Erection

- Equipment to be used will include: 200 or 250 tonne crawler cranes, 120 or 160 tonne mobile cranes. Mobile Elevated Work Platform (MEWP) access.
- The sequence of operations will be carefully planned, ensuring that the structures are built progressively to maintain access, and ensuring temporary stability. Temporary bracing may be required to ensure stability.
- Large span roof trusses will be assembled at ground level in two parts, which will be connected by an "air splice" to avoid tandem lifts.

b. Wall Cladding and Roof installation

- Equipment to be used will include: mobile cranes. MEWP access, scissor lifts, scaffold and tower access, fall arrest netting.
- The sequence of operations will be carefully planned to ensure the installation is progressed safely and efficiently.

4.4.8 Converter Station and Tail Station Fit Out

Once the buildings are weather-tight, the fit-out will be undertaken.

a. Floor screeds and finishes

- Floor Screeds and finishes will comprise a pumped floor screed and specialist concrete floor paints.

b. Internal walls and partitions

- Once the building envelope is water tight, internal walls will be constructed using a metal stud partition system. Plywood patresses will be installed where items are to be fixed to the walls. All walls will be painted. First and second fix joinery will be installed. Electrical equipment and instrumentation will be installed.
- A specialist subcontractor will install fire stopping which will undergo a very stringent monitoring system.

4.4.9 Converter Station and Tail Station Site Finishes and Surfacing

When site construction traffic is no longer a risk to finished surfaces and prior to the completion of the development, road surfacing will be completed, permanent site signage will be erected, unpaved areas within the converter station and tail station permanent fences will be surfaced with stone chippings. The surrounding areas will be landscaped.

a. Road Surfacing

- Top surface of binder will be thoroughly cleaned, and tack coat will be applied to the binder layer, prior to placing the surface course by the surfacing contractor.

b. Lining and Signage

- Road markings will be applied as soon as possible after the surface course has been placed. Equipment to be used will include an asphalt paving machine, ride-on rollers, floor saw, and planers.
- Permanent Road Signage will be installed.

c. Tail station Surfacing “chippings”

- The sub-base will be placed as structures are completed and backfilled.
- When areas are no longer subject to site traffic, the sub base will be trimmed and tail station surfacing – chippings – will be placed and compacted.

4.5 Onshore Cable Construction

4.5.1 Cable Construction Along a Road

4.5.1.1 Duct Installation in Roads, Footpaths and Verges

Schematics of HVDC and the HVAC trench dimensions and details are provided in **Chapter 3** in **Section 3.4**.

A section of route (road) approximately 100 metres long will be fenced-off at the start of a week, the road excavated, the ducts installed, and the trench backfilled with duct surround material (cement-bound sand or concrete, and compacted aggregate) each day. At the end of the week, the road base and wearing courses will then be reinstated over the completed trench.

Typical plant used will be:

- Road saw(s);
- Excavator, with hydraulic ‘pecker’ to break the road courses;
- 4-axle lorry, for removing excavated material; and
- Dumper(s), to take the excavated material to the 4-axle lorry, if it is not possible to locate the lorry at the end of the trench, and to deliver trench backfill materials.

A mobile welfare unit will be located nearby.

In general, because the full-depth trench will only be open for less than 24 hours, and the ground is well-compacted, internal supports will not be required.

Where possible, the construction easements will consist of the trench, safe clearance on either side, and a 5m corridor for the lorry and dumpers.

The spoil from the road courses will be disposed of, if it is not suitable for reuse. Likewise, the material excavated from the trench, which will be replaced by the ducts and surrounds will be removed. It may be possible to reinstate some of the crushed stone aggregate material that will be excavated from the trench, provided it is suitable. The excavated material will be stored adjacent to the trench, while the trench is open. Unsuitable material will be stored separately. Once the trench has been backfilled, any surplus or unsuitable material will be removed by truck, in a planned operation, in which the truck will be summoned to collect a load and will depart immediately, once loaded.

4.5.1.2 Installation of Ducts

Ducts are usually delivered to site in 6m sections. The ducts can be forced into bends, typically of 10m diameter, after they have been connected, but care will be taken to ensure that local over-bending does not occur at the connections. Pre-formed bends are available, at 3900mm radius for ducts of diameters suitable for this development, and bends at other radii may also be custom-made, if required.

Due to the way push-fit ducts are connected, with a considerable length of interference (i.e. the 'male' part is inserted at approximately 175mm) the ducts will be installed in a continuous process. Trying to insert ducts in gaps in the route e.g. at road crossings, requires a considerable length of duct to be lifted in order to provide the spare length to accommodate the interference, and there is a risk of disturbing good duct connections at either side of the gap.

For this reason, it is essential that the whole of each cable section is available and accessible before duct installation commences, and that one crew works from one end to the other. Multiple crews working on the same section is not practicable and will not be carried out.

The push-fit joints are designed to present minimum interference to the cable when pulled in one direction through the joint, from the 'male' end of one duct into the 'female' part of the next duct. Therefore, the installation of the cables will be planned before the ducts are installed, to ensure that the orientation suits the proposed pulls.

Cables can be pulled in the opposite direction, but additional scuffing of the cable oversheath, and increased pulling tensions, could occur.

A rope, usually a 6mm or 12mm nylon rope, will be left in each section of duct to enable cleaning equipment and the pulling bond to be pulled into the duct. The ducts will then be sealed.

4.5.1.3 Duct Proving after Completion of Cable Section

The ducts will be installed in such a manner to ensure the cables can be pulled into them without serious damage. Some scuffing of the oversheath is to be expected during any cable installation. The purpose of this part of the cable is to provide mechanical protection to the metallic sheath and the cable core.

A small excavation, typically two square metres, will be left open at each end of a cable section, i.e. at joint bay locations.

The ducts will be cleaned of any debris and water by a series of brushes and rubber discs, usually pulled trough as a 'train'.

The pulling tension will be recorded for two reasons:

1. Validating assumptions regarding coefficients of friction between the bond wire and the unlubricated duct; and
2. Increases in pulling tension, compared with calculated values, can indicate local obstructions, ovality (caused by ducts being crushed during installation) or deviations from the designed route.

As the ducts will be proved immediately after installation, to allow time for any remedial works, the excavation of the joint bays and the installation of the cables will not happen immediately afterwards. The two square metre pits will therefore be re-instated.

4.5.1.4 Cables and Ducts Trench Construction Off-Road

A schematic of the arrangement of the construction activities, within the working width, which will be used for the construction of the portions of the cable route which traverse farmland is presented in Figure 4.6. A 30m construction working width (centred on the permanent wayleave) has been agreed with the landowners. As shown in **Figure 4.6**, the 30m temporary working width will give sufficient area for the excavation of the trench, storage of topsoil and subsoil arisings plus a temporary haul road for the movement of the excavation equipment and general installation vehicles for the delivery of materials such as ducting, protective covers and bedding.

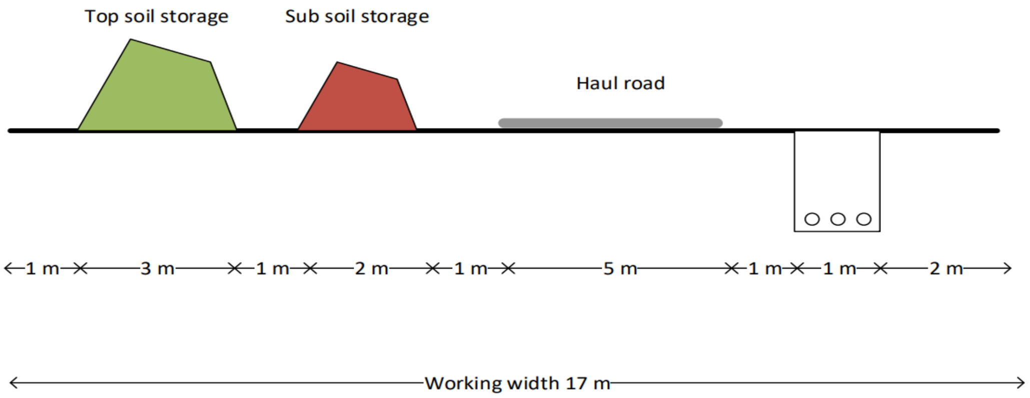


Figure 4.6: Working Corridor for Cables (source: WSP | not to scale)

Existing fences, hedgerows and/or walls will be removed as required for construction and replaced, on completion of the works, with appropriate materials in agreement with the landowner. It is recommended that the vegetation be removed outside of the breeding season. The temporary working areas will be fenced for protection of the public and livestock and to prevent trespass. The fencing will remain in place for the duration of the works and until reinstatement of the land to its original condition has been completed.

Where excavations cross existing farm tracks or roadways, obstruction will be minimised, and arrangements will be made for the safe passage of persons, farm machinery and livestock across the working width, as required by the landowner. All permanent farm tracks and roadways will be restored to their original condition.

Land drains, open drains or water courses, affected by the works, will be maintained until completion of the works and restored to their original condition. Water mains, affected by the works, will be reinstated as soon as is feasible, or an alternative supply provided on a temporary basis until the permanent supply can be reinstated. Where access to drinking troughs for animals are severed by the works, an alternative supply will be provided for the duration of the works.

Farmland will be reinstated to its original condition. Prior to the replacement of the topsoil, the subsoil will be ripped to below the depth of compaction, if possible, and levelled, and any roots, stones, shale and rock will be removed. Topsoil will be replaced, and additional topsoil provided, if required. Grassland will be reseeded, in consultation with the landowner. Vehicle traffic over the land, on which the topsoil has been replaced, with equipment heavier than a standard tractor and trailer, will be avoided.

On completion of the works all temporary buildings, fences, roadways, surplus materials debris, and materials not naturally belonging on the land will be removed.

4.5.2 Duct Installation by Horizontal Directional Drill

HDD is the method of installation of the cable which will be used at the landfall at Baginbun Beach, and the cable crossing of the Campile River Estuary. HDD is the preferred method for the cable crossing of the gas pipeline and the Kilmannock Stream. HDD is a technique whereby a hole is drilled under a feature so that the cable installation avoids disturbance of the feature. At a landfall these features could include sea defences, cliffs, dune systems or sensitive habitat. HDD can also be used to cross features such as railways, motorways or rivers. In the case of a landfall constructed by HDD, the bore would extend to a point at a suitable distance offshore, usually several hundred metres. A pipe is inserted into the drilled hole which is then used as a duct into which the cables are installed. Sufficient space is required behind the HDD bore to string out the HDD ducts to enable a direct feed into the boreholes.

Lengths of cables in HDDs can be limited by the maximum pulling tension of the cable and this will vary depending upon the cable mass, conductor cross-section, conductor material and, for the submarine cables, the design of the cable armouring. Also, the length of cable that can be delivered to the HDD location is another limiting factor.

Horizontal drilling rigs can be classified into three equipment sizes based on their capability: mini-rigs, midi-rigs and maxi-rigs. For HDD lengths exceeding 150m Maxi HDD rigs are required and for HDD lengths in the range 40m to 150m mini-rigs can be used. A maxi-rig will be required for the Campile River Estuary and landfall installation. A mini-rig would be used as the preferred method for the crossings of the gas pipeline and the Kilmannock Stream.

For on-shore cables, a typical maximum length for cables in HDDs will be in the range 700m - 1000m.

For offshore cables, a typical maximum length at the sea/land interface will be in the range of 1000m - 1500m. Very long HDDs (i.e. in excess of 1500m) at the sea/land interface could require cables with a special armouring design (i.e. a double layer of armour wires).

Typical burial depths for HDDs will be in the range of 5m - 10 m. As explained in **Chapter 3**, when cables are installed at a greater depth, then to maintain the rating of the cables, it will be necessary to increase the cable spacing. Typically, the axial spacing between ducts will be in the range of 5m – 10m. The depth of the HDD will be dependent on the ground profile and the cable spacing will be dependent upon the cable ratings.

For the Campile River Estuary crossing, the expected outer diameter of the HDD bore will be in the range of 200mm to 250mm.

The expected outer diameter of the HDD at the sea/land interface will be in the range of 350mm to 450mm.

The typical space required for a maxi-rig HDD entry set-up is up to 50m x 50m, providing room for the drilling rig, bentonite pumping plant and drill sections. **Figure 4.2** above shows the plan of the HDD contractor’s compound at the landfall at Baginbun. **Figure 4.7** shows a maxi-rig HDD drill rig.

For HDD works that have both the entry and exit on land, the space requirement for the exit compound is reduced as it only requires space for storage of the HDD pipe and welding equipment during the pipe fabrication process including the plant and welfare facilities.

Figure 4.7: Photo of Typical maxi-rig HDD Drill Rig

A schematic of a HDD at a typical landfall is shown in **Figure 4.8**. (Note there are no sand dunes at Baginbun). **Figure 4.9** illustrates the stages in a typical HDD duct installation at a landfall. The stages of duct installation will be similar at the Campile River Estuary HDD.

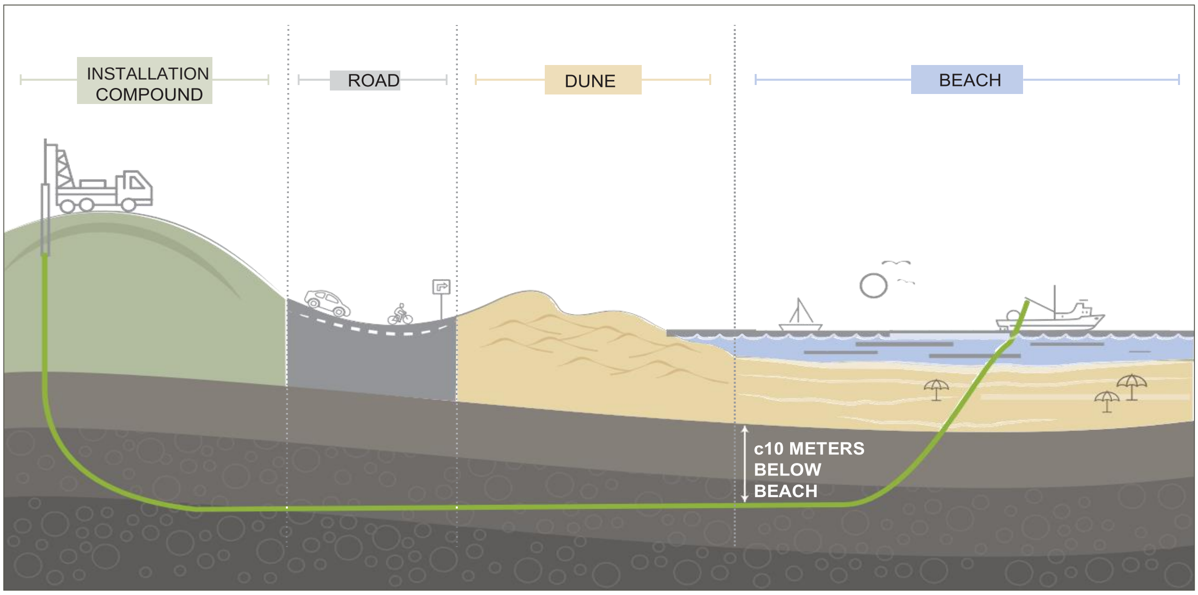
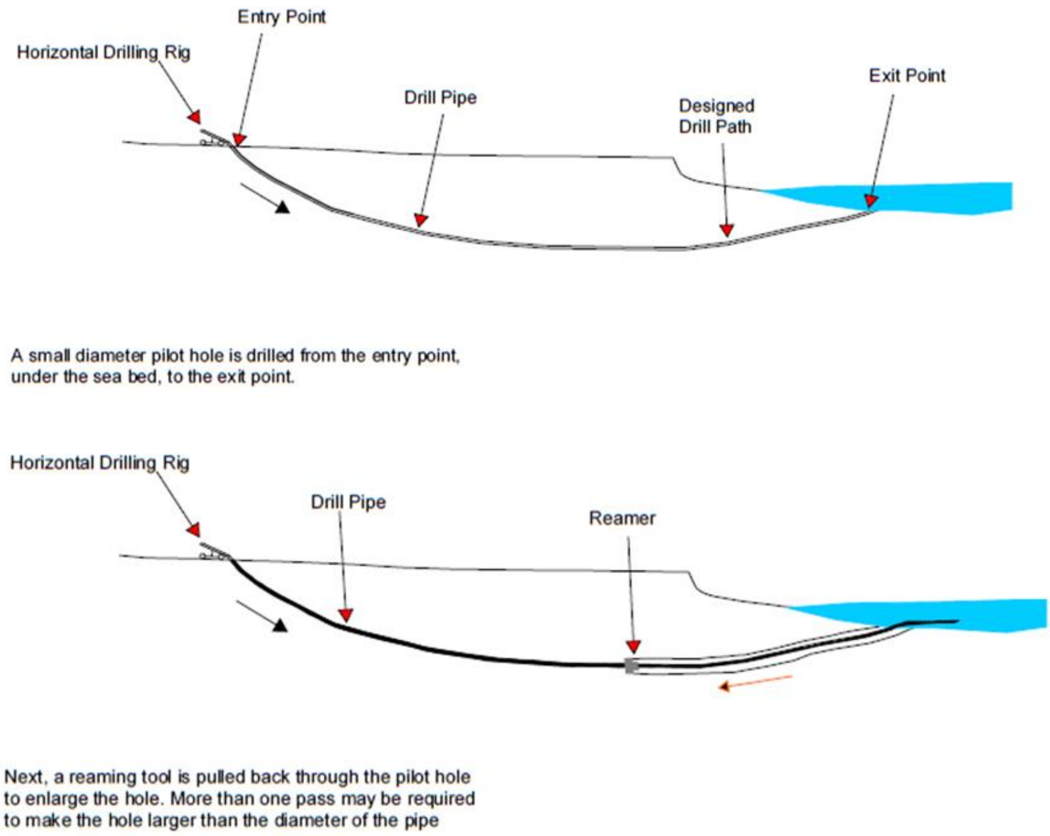


Figure 4.8 Typical HDD Installation at a Typical Landfall | not to scale



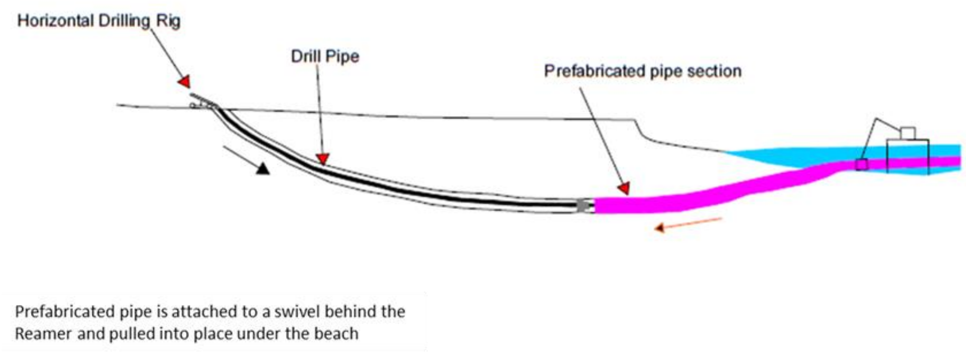


Figure 4.9 Typical Stages in HDD Installation at a Landfall

The drilling of the pilot bore may be performed by a specialist sub-contractor, working for the HDD contractor, using wire-guiding techniques to set the profile of the crossing.

The space required at the drilling exit point is small, as the HDD drill can be guided to within 0.5m. An area of 10m x 10m will be adequate. The bore will then be reamed to the required diameter.

The ducts are welded together and laid in a single length at one end of the crossing, to be pulled in a continuous process.

Once commenced, the HDD activity may operate continuously over a 24-hour period until each bore is complete. Consequently, lighting will be provided to provide a safe working area. Directional lighting will be employed to minimise light spill onto residences and adjacent areas and lighting configured to a minimum to meet health and safety requirements.

The HDD may require a drilling fluid to cool and lubricate the drill head. Typically, bentonite is used, which comprises 95% water and 5% bentonite clay which is a non-toxic, natural substance. The bentonite effectively seals the bore maintaining a closed system throughout the drill. The bentonite drilling fluid is circulated down through the drill rods and back up the outside the rods in the annulus of the borehole.

While the bentonite drilling fluid is non-toxic, if sufficient quantity enters a watercourse it can potentially settle on the bottom, smothering benthic flora and affecting faunal feeding and breeding sites. In saltwater environments the smothering effect is less problematic because seawater degrades the bentonite fluid, causing it to flocculate and allowing faster dispersal. Every endeavour will be made to avoid a breakout (loss of drilling fluid to the surface) and it will be remediated quickly if one occurs.

For landfall projects exiting below sea level, the pilot hole is usually stopped short of the exit point, within the bedrock, so that drilling fluid returns are not lost to the sea. The pilot hole is then enlarged using forward reaming; the reamer / hole opener being advanced from entry towards exit. The drilling fluid is pumped down through the drilling rods onto the cutting face of the reamer and then carries the cuttings back up the hole to the entry pit. From the entry pit the fluid is passed through the recycling unit to remove the cuttings before being pumped downhole again. It is expected that forward reaming will be suitable for Baginbun.

Any bentonite will be managed and removed by the specialist drilling contractor. Either tanked or piped water (local supply or farm water storage) will be utilised for lubrication of the bore, or alternatively suitably bunded settlement ponds may be installed within the site compound to provide the requisite volumes of water. The water used will be non-potable, if a supply is available.

The water or bentonite drilling fluid will be circulated down through the drill rods and back up the outside of the rods in the annulus of the borehole. Exiting into the entry pit, the fluid will then be pumped to the mud recycling unit where hydro-cyclones and shaker screens will remove cuttings. The cuttings will accumulate beneath the shakers and will disposed of at a landfill site as inert fill. The cleaned drilling fluid will be transferred to the active tank ready for circulation through the hole.

Figure 4.10 shows a HDD mini-rig, which would be used as the preferred method for crossing the gas pipeline and the Kilmannock Stream.

Figure 4.10: HDD Mini-Rig

The operation of mini-rigs is similar to that described above. However, mini-rigs utilise a small volume of cutting fluid which is located within a self-contained and small mobile vessel. The HDD mini-rig ancillary equipment is easily mobile on a small footprint with setup significantly quicker than the static equipment used by maxi-rigs. The mini-rig will be set-up and will operate within the normal working width and a separate HDD compound is not required. The trench will provide 1.5m separation between the bed of the watercourse and the cables. In addition, extra cable protection will be provided in the form of a concrete duct block.

For the crossing under the gas pipeline, a Gas Networks Ireland inspector will be present for the duration of the pipeline crossing works, to ensure adherence to Gas Networks Ireland procedures.

4.5.3 Joining of Cables

Typically, up to 1.8km of HVDC cable can be carried on a single reel. This results in one jointing bay being required every 1.8km of a cable installation, at a minimum. However, jointing bay locations depend on the geometry of the cable route. It is expected that there will be joint bays at circa 1km centres. Any works within private land will be agreed with landowners in advance of the works. The provisional locations of these joint bays are indicated in **Figure 4.11.**

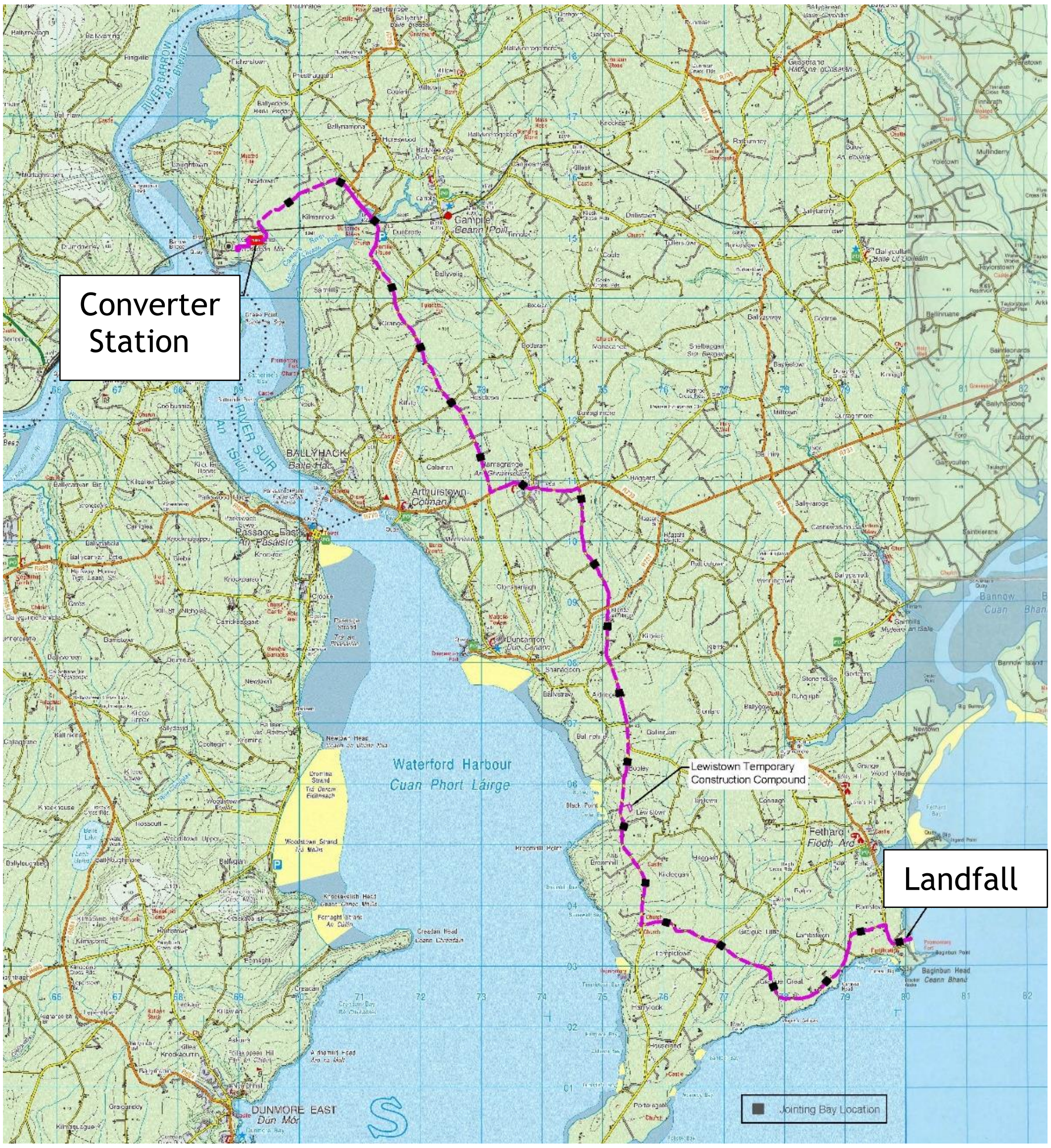


Figure 4.11: provisional Jointing Bay Locations | not to scale

A jointing bay provides a temporary safe and clean environment for an engineer to work in while connecting two cable ends during the installation process. A jointing bay can take many forms from a small tent to a shipping container. The form a jointing bay takes will depend on the amount of space available to work in, ground conditions and the type of joint being made. Once the joint has been made the cable will be buried in the same manner as the rest of the underground cable.

Typical joint-bay dimensions for one 320 kV HVDC circuit are shown in **Figure 4.12**.

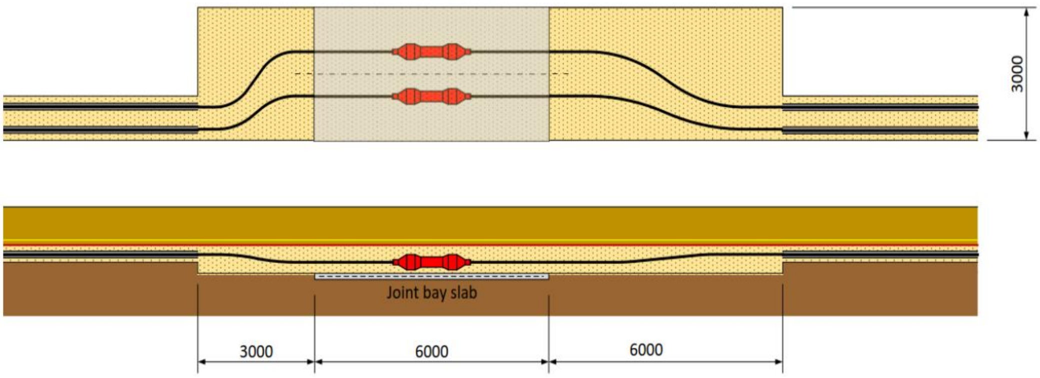


Figure 4.12: Typical Joint-Bay Dimensions (source: WSP | not to scale)

Adequate room will be provided in front and behind each joint-bay location to accommodate cable drums and pulling equipment. **Figure 4.13** shows a cable drum at a joint-bay location. Typical dimensions of the cable drum are 4.5m high and 3m wide, and the typical mass is 20 – 30 tonnes.

Figure 4.13: Cable Drum at Joint-bay location

The arrangements shown in **Figure 4.13**, where the cable is being pulled directly from the low loader, will be used. This arrangement will minimise the space required at each joint-bay location because no additional space would be required to off-load from the low loader and to manoeuvre the cable drum on to drum stands.

The joint-bays locations along a road will:

- Be positioned on a straight section of road;
- Not restrict access to properties;

- Provide adequate road width to accommodate the joint-bay width and have a minimum gap of 1.5m between traffic flow and the edge of any excavation (i.e. 3m + 1.5m = 4.5m);
- Provide adequate road width to limit road closures;
- Provide adequate road width to allow cable pulling;
- Provide adequate space along the road for parking, welfare facilities, generator etc.; and
- Provide adequate space for locating and accessing link-pillar (only at certain joint-bays).

Joint-bay locations will be chosen so that:

- Joint-bays will be kept away from access points e.g. driveways, entrances etc.;
- Adequate room will be provided in front of and behind each joint-bay location to accommodate cable drums and pulling equipment (i.e. winches);
- The ground conditions at all joint-bay locations will be proven by trial trenches;
- The selection of joint-bays will take account of the maximum calculated pulling forces and tensions in the cables being pulled;
- Joint-bay positions will avoid unnecessary road closures and traffic management;
- Associated communication chambers and link boxes will be installed off the carriageway where possible;
- There is adequate space along the road for parking cars, temporary welfare facilities, generator, fuel etc. This required space will be located along the road within the secured construction area; and
- For joint-bays located in road-ways, a clearance of at least 1.5 m will be allowed for between the edge of the excavation and an active lane with traffic, for safety and to protect the excavation from surcharges.

4.5.4 Landfall Transition Jointing Bay

The onshore cables, which will be to a different specification, will be connected to the marine cables at the Transition Jointing Bay (TJB) to be located below ground level in the HDD contractor’s compound adjacent to Baginbun Beach. The TJB at the sea-land interface will contain the following:

- 2 no. armour clamps (fixed to a concrete block);
- 2 no. HVDC cables joints;
- A fibre joint;
- A link-box or link-pillar; and
- There will be an earthing strip around the periphery of the joint-bay.

The dimensions of the sea/land TJB will be larger than a standard joint-bay (to allow for the additional space required for the armour clamps. Typically, the dimensions of the TJB will be 20 m long, 3 metres wide and 2 metres deep.

Following completion of the HDD and jointing activities, all cabling and jointing infrastructure will be below ground. The construction compounds at Baginbun will then be reinstated whereupon it can be returned to arable use.

4.5.5 Watercourse Crossing

The cable corridor crosses a watercourse, Kilmannock Stream, northeast of the converter station. The preferred method to cross the stream is a HDD using a mini-rig. The non-preferred alternative is an open-cut trench crossing.

With a trench crossing, the cable trenching detail at the stream crossing would not differ from the standard. However, the trench would be deeper to provide a 1.5 metre minimum separation between the cable protective measures and the bed of the watercourse. In addition, extra cable protection is required, in the form of a concrete duct block. Temporary works would be required to enable the cable duct installation. The watercourse would be temporarily dammed immediately upstream and downstream of the cable installation. Over-pumping would be employed to ensure continuous flow in the watercourse. Best practice pollution prevention measures, described in **Chapter 13**, would be installed to avoid any downstream siltation impacts. Once reinstatement of the cable trench would be complete, the temporary dams would be removed, and over-pumping ceased.

With the preferred HDD crossing, the stream would not need to be dammed, no instream works would take place and a duct block would not be required for extra cable protection.

No specific haul road is proposed at the watercourse crossing. Plant will utilise existing accesses used by landowners to avoid any potential impacts on the watercourse. Vegetation will not be significantly adversely affected as the access routes from each side of the watercourse will utilise existing gates, laneways and tracks.

If an open-cut trench crossing is required, the excavated material from this activity will be stored outside of the designated flood zone.

4.5.6 Gas Pipeline Crossing

The HVAC cable from the Loughtown tail station to the Eirgrid Great island 220kV substation will be laid under the Gas Networks Ireland high pressure gas pipeline in the SSE power station site. The pipeline is approximately 1.2m below ground level at this location. The pipeline will be located by hand-digging.

A HDD mini-rig, described in Section 4.5.2 above, is the preferred method to install the cables under the gas pipeline. The alternative is a trenched crossing, under the pipeline. In the case of a trenched crossing, once the pipeline had been located, it would be uncovered by hand digging. Protective timbers would be strapped around it. The trench would be deepened to allow the ducts to be installed under the pipeline.

The protective timbers would be removed as the trench would be backfilled carefully by hand. A HDD would install the cables well under the pipeline and hand digging, once the pipeline was located, would not be required.

A Gas Networks Ireland (GNI) inspector will be present for the duration of the pipeline crossing works, regardless of the cable installation method chosen, to ensure that the Gas Networks Ireland procedures are adhered to. GNI has been consulted on the crossing of this pipeline.

4.5.7 Off-Road Locations Along Cable Route

4.5.7.1 General

There are a number of special locations along the cable route, at which the cable diverts from the public road or at which a greater construction area is required. These are described below.

At each of these locations it will be necessary to remove the hedgerow or field boundary and install fencing to secure the area. **Section 4.5.1.4** above describes the measures which will be implemented in farmland during and after the construction phase.

4.5.7.2 Ramstown

In the townland of Ramstown, northeast of the landfall at Baginbun, the road, along which the cable is routed, goes through an almost right-angle bend. In order to facilitate construction, the working area will be extended into farm land on the eastern side of the road at the corner, with the agreement of the landowner. **Figure 4.14** shows the offline locations in Ramstown.

Figure 4.14 Offline Area in Ramstown | not to scale

4.5.7.3 Graigue Great Areas 1 and 2

At two locations in the townland of Graigue Great, in order to facilitate construction, the working area will be extended into farmland to the south and west of the road. **Figure 4.15** shows the offline locations in Graigue Great.

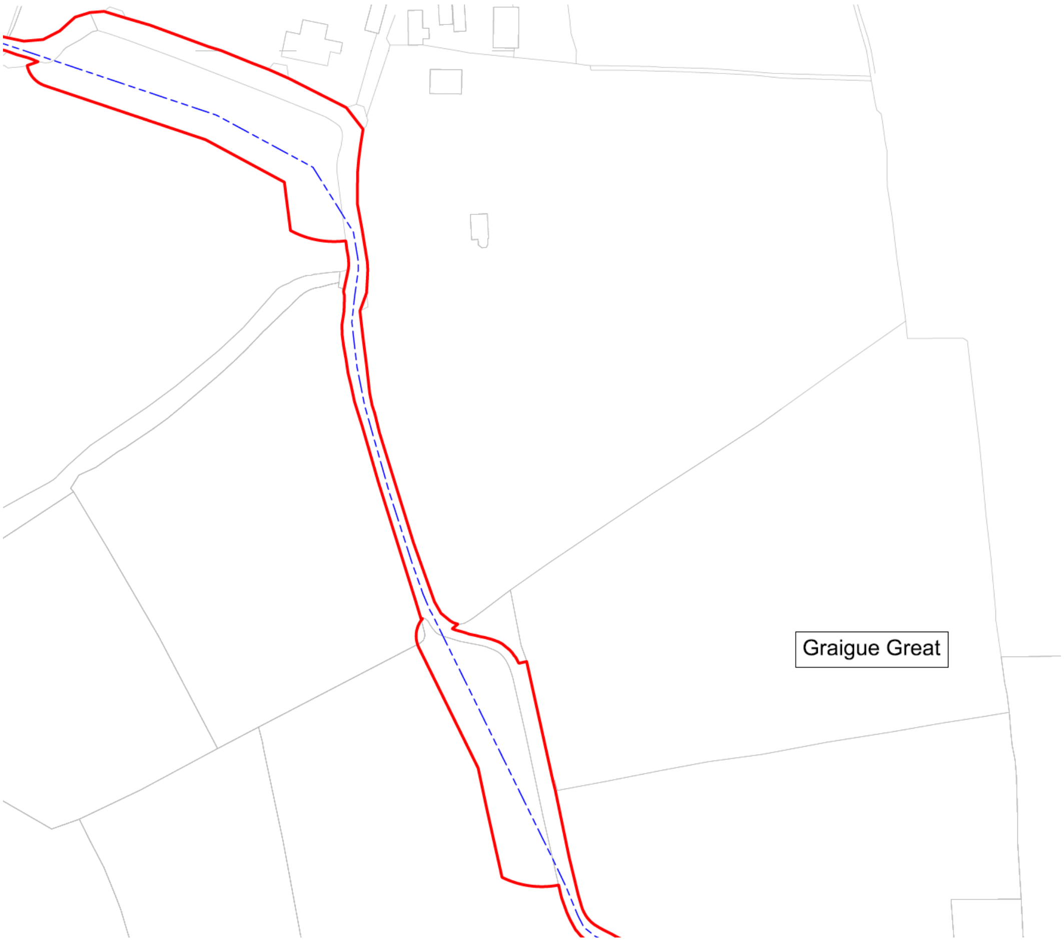


Figure 4.15 Offline Areas in Graigue Great | not to scale

4.5.7.4 Templars Inn

At Templars Inn in the townland of Templetown, the road, along which the cable is routed, goes through an acute angle bend. In order to facilitate construction, the working area will be extended into farm land on the southern side of the road at the corner, which will include the temporary removal and reinstatement of a low level concrete wall, with the agreement of the landowner. **Figure 4.16** shows the offline location in Templetown.

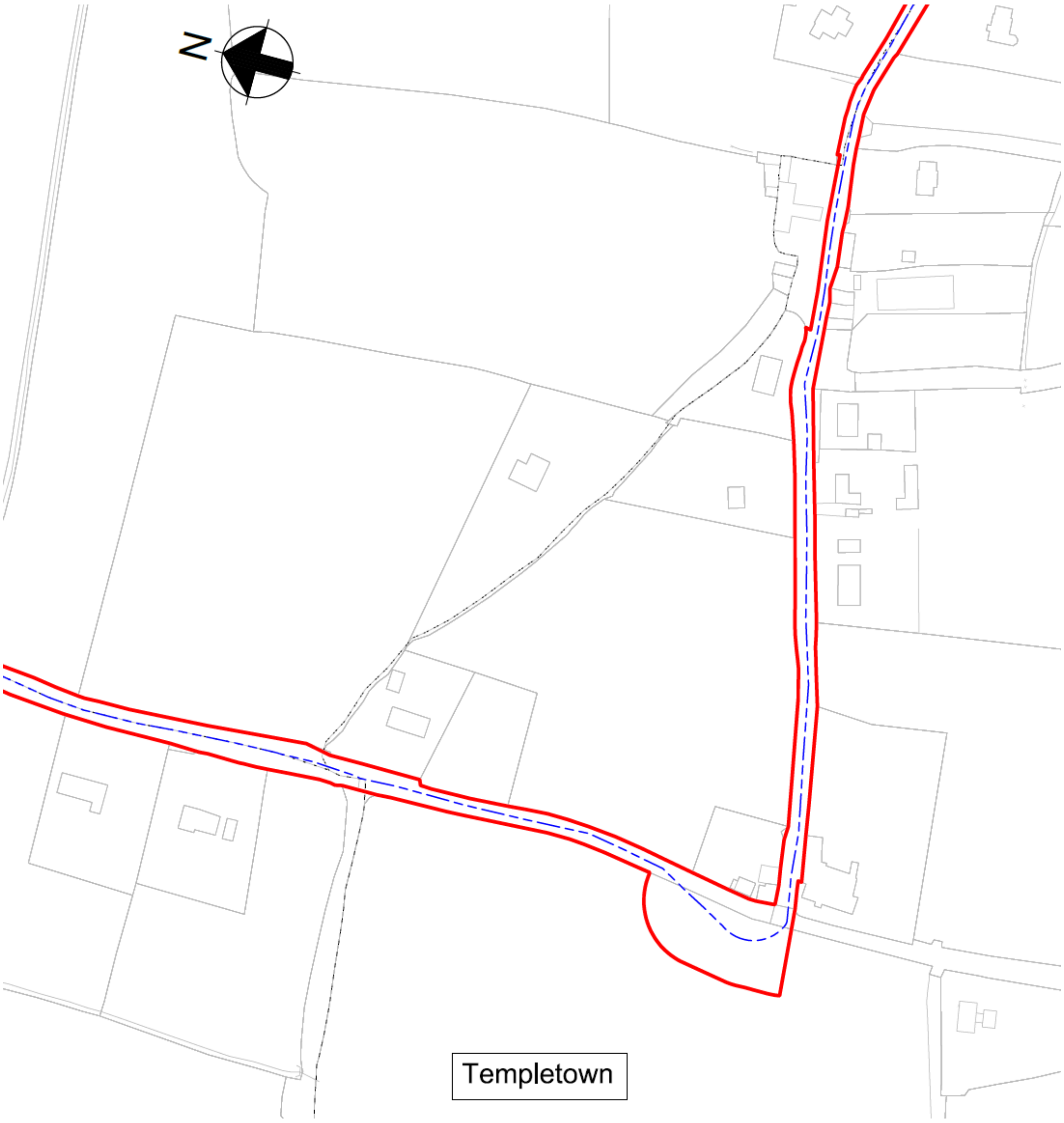


Figure 4.16 Offline Area in Templetown | not to scale

4.5.7.5 Ramsgrange

In the townland of Ramsgrange, on the eastern outskirts of Ramsgrange Village, the cable route goes through an almost right-angle bend. In order to facilitate construction, the working area will be extended into farmland on the southwestern side of the road at the bend, with the agreement of the landowner. **Figure 4.17** shows the offline location at Ramsgrange.

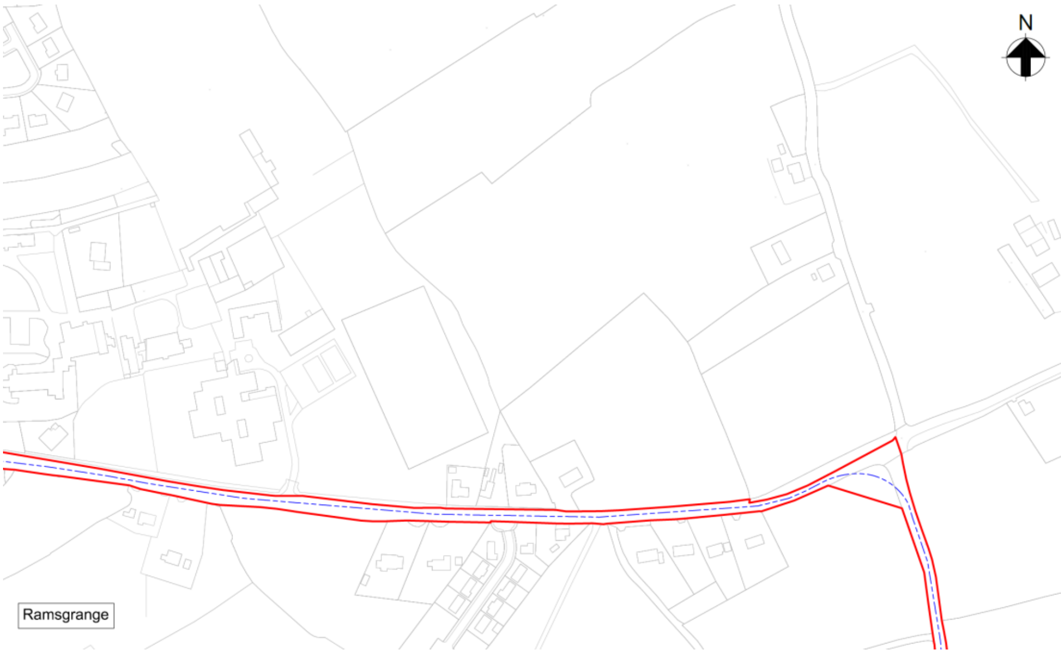


Figure 4.17 Offline Area in Ramsgrange | not to scale

4.5.7.6 Coleman

In the townland of Coleman, on the western outskirts of Ramsgrange Village, the cable route goes through an almost right-angle bend. In order to facilitate construction, the working area may be extended into farmland on the southern and western side of the road at the corner, with the agreement of the landowner. **Figure 4.18** shows the offline area in Coleman.

Figure 4.18 Offline Area in Coleman | not to scale

4.5.7.7 Railway Crossing at the Campile River Estuary

There is a railway line on the eastern side of the Campile River Estuary in the townland of Dunbrody. The railway is carried on a bridge over the road at this location. The cable will be installed in this road. Cable installation will be typical for cable installation in a road which is described in **Section 4.5.1**. Apart from complying with the head height restriction, no special construction issues are anticipated.

4.5.7.8 Campile River Estuary to the Great Island Converter Station Site

From the railway line on the eastern side of the Campile River Estuary to the converter station site at Great Island, the cable will be constructed off-road, across farmland. The Campile River Estuary will be crossed by HDD. As described above, the planning application is for two HDD compounds, one either site of the Estuary. However, it is expected that only one of these compounds will be required. The HDD receiving pit will require a much smaller area, as described in **Section 4.5.2** above. It will be necessary to take down some of the hedgerow on the eastern side of the estuary to access the land for

HDD compound. Access to the off-road working area south of the Campile River Estuary will be via an existing gated farm entrance immediately south of the Dunbrody Bridge. This farm gate may need to be widened to allow heavy goods vehicle access. The cable will be routed under an existing stone wall at this location. The stone wall will be removed and reinstated after completion of the trench works, with the agreement of the landowner.

Access to the off-road working area between Great Island and the western side of the Campile River Estuary will be via an existing farm entrance in the townland of Kilmannock, where the cable route turns onto a western alignment, to the west of the Campile river.

A disused railway line crosses the route in the townland of Great Island. The railway is carried on a bridge over a track at this location. The cable will be routed in this track. Cable installation will be typical for cable installation in a road. Apart from complying with the head height restriction, no special construction issues are anticipated.

4.5.8 Invasive Species Management

The non-native and invasive species Japanese Knotweed (*Fallopia japonica*), Rhododendron (*Rhododendron ponticum*) and Three Conered Leek (*Allium triquetrum*) were recorded within or in proximity to the proposed works area. All three species are listed on both the “Most Unwanted: Established Threat” and on the “High Risk: Recorded Species” list compiled by Invasive Species Ireland a joint initiative by the Northern Ireland Environment Agency and NPWS. The Amber listed species Winter Heliotrope was recorded within the works area and is ubiquitous along roadside verges in this area and was too prevalent to effectively map.

An Invasive Species Management Plan is included as **Appendix 9.6** to this EIAR and includes the following protocols for the management of the aforementioned species.

Japanese Knotweed

- All stands of Japanese Knotweed will be clearly delineated with hazard tape and fenced in a manner visible to machine operators prior to the commencement of works;
- Appropriate signage will be put in place to deter any entrance by people or machinery into the areas within which the Japanese Knotweed is growing;
- At each location a specialised wash down area will be created for machinery and footwear. All machinery and equipment (including footwear) should be power washed prior to leaving the contaminated works area within this wash down area. All water from the wheel wash will be collected, fully contained, and dispatched for treatment and disposal off-site. They will also be visually checked for clods of soil, bits of vegetation etc. and particular care is required with tracked machinery;
- This wash down area will be located in close proximity to existing stands and the wash down area will be included in the post-works treatment programme for Japanese Knotweed; and

- Should stockpiling of contaminated material be required, the areas will be clearly marked out on site. These areas will not be within 50m of the seashore or within a flood zone.

Rhododendron

- The exact treatment details will be outlined in a detailed management plant prepared by the treatment contractor and supervising ecologist will be finalized prior to the commencement of treatment. The following principles/guidelines will be implemented;
- The entire site and adjacent area will be surveyed and the level of infestation assessed and mapped prior to the commencement of treatment works;
- The age, condition and any previous treatments of all stands will be noted and mapped;
- Areas to be treated will be prioritized. However, the objective is complete removal within the works area; and
- An updated Rhododendron Management Plan will be prepared by the contractor with input from the supervising ecologist. The plan will encompass the entire site and include projections over a suitable timeframe. All work to be carried out in the area should be mapped and clearly dated and detailed in an accompanying schedule, along with a timeframe for follow-up work.

4.6 Commissioning Activities

Commissioning of the converter station and tail station will involve the following activities:

- Pre-commissioning;
- Sub-system testing;
- HV energisation;
- Performance testing;

As each item of equipment, sub-system and each system will be tested, it will be an intensive process and will take circa 8 months.

Cable acceptance testing and commissioning will take between one and two months.

4.7 Construction Access, Haul Routes and Abnormal Loads

4.7.1 Road Access, Haul Routes, Transport of Abnormal Loads by Road

Access to the construction compounds and working areas from the local road network, haul routes for equipment including cable drums and provision for the transport to the sites of abnormally large loads by road, are addressed in **Chapter 6**, *Traffic and Transportation*.

4.7.2 Transport of Abnormal Loads by Sea

A number of specialist components will require delivery to site. The largest individual items of equipment are expected to be the four single phase transformers. The maximum transformer dimensions are 8.5m x 5m x 5m. The transformers and other abnormally large loads may be transported by road. The potential impacts of transporting them by road are addressed in **Chapter 6**, *Traffic and Transportation,* **Section 6.5.1**.

During construction of the SSE power station, a number of abnormally large loads were delivered by sea, to a berth on the southern shoreline of the power station site. With the agreement of SSE, this method of delivering abnormal loads to site will be an option for the converter station contractor. A detailed assessment will be undertaken by a specialist logistics contractor during the construction phase; however the feasibility has been determined based upon the transport routes shown in **Figure 4.19**. The preferred route through the power station site is circa 1.6km in length. An alternative route around the perimeter of the site (also shown in **Figure 4.19**) has also been considered. A portion of both these routes is within the boundary of the site covered by SSE industrial emission licence, PO606-03.

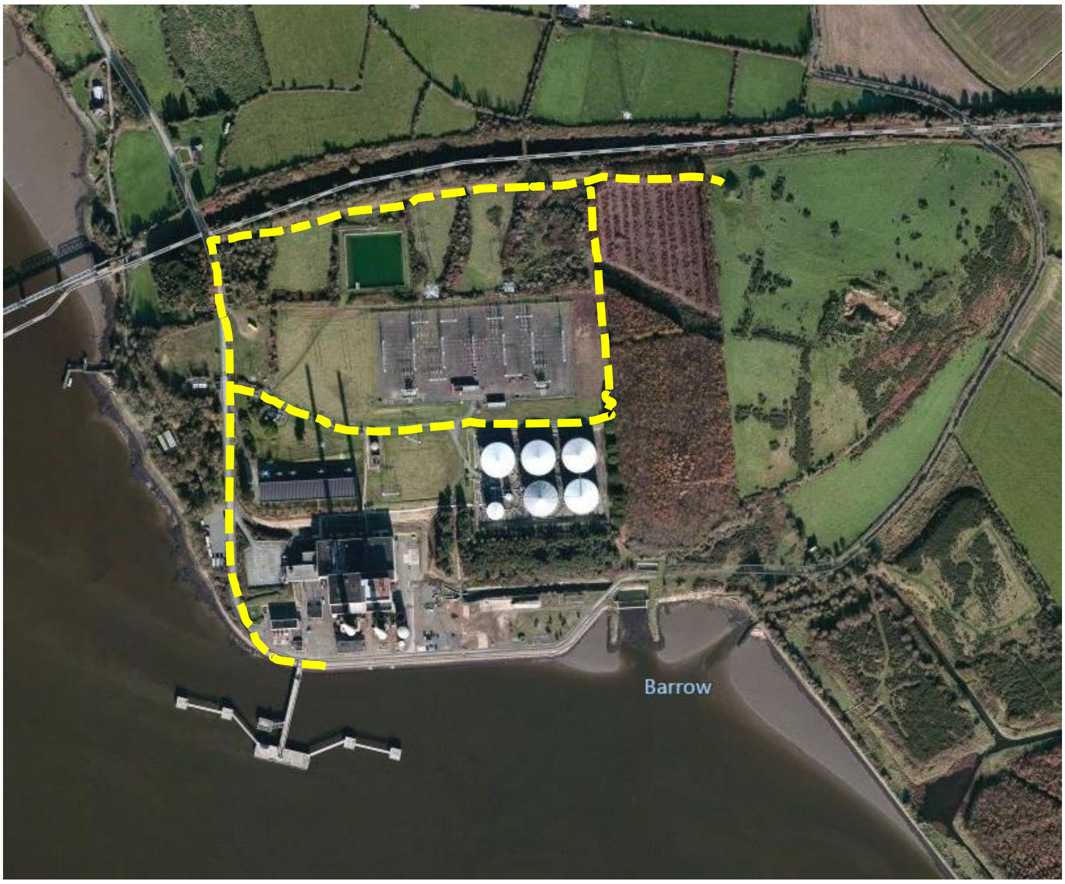


Figure 4.19 Transport Routes from SSE berth to Great Island Converter Station | not to scale [mapping © Microsoft Bing 2020]

The delivery vehicle which has been assessed is a 10 axle 2-file hydraulic trailer with one or two tractor units. An overview is shown in **Figure 4.20**.

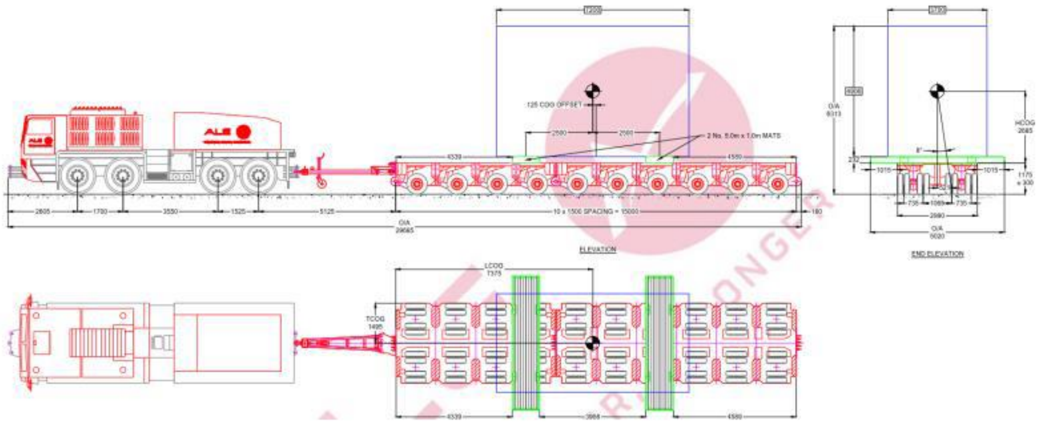


Figure 4.20 10-axle 2-file hydraulic trailer with one or two tractor units | not to scale

Most seagoing vessels are too deep to reach the Great Island power station temporary berth. Therefore, a trans-shipment onto a flat top barge at their port of arrival in Ireland, which is likely to be Belview Port or Rosslare Harbour, will be necessary to enable a roll-off operation at the Great Island power station temporary berth.

Depending upon the specification of the flat top barge, it may be necessary to temporarily remove part of the jetty bridge (this work would not be located in the foreshore). The detail will be discussed and agreed with SSE who have confirmed that similar deliveries have been made with the same quayside apparatus using established and routine methodologies.

The following works will be undertaken ahead of this delivery:

I. the fence at the top of retaining wall (adjacent to the quayside) will need to be removed and reinstated.
II. the existing access road (along the delivery route) will require localised repair and improvement to wearing coarse.

On arrival at the Converter Site, setting the transformers onto the foundation can be either done by jacking and skidding mode or gantry system procedure from hydraulic trailer directly to the place of installation.

Assessments have been carried out to confirm that these activities are feasible.

Provision will be made to ensure continued access to the adjacent site (proposed battery storage facility) during the construction period.

4.8 Site Management

4.8.1 Employment

Greenlink is anticipated to provided employment to 250 people in Ireland during the construction phase.

A breakdown of the number of workers on site for the cable installation during the construction phase is presented in **Table 4.3**.

Table 4.3: Estimate of workforce required for the installation of each of the three sections of the onshore cable

Project stage	Estimated no. of people	Comments
Initial stage	Approximately 10	Typically, project manager, environmental manager, SHEQ manager, project engineers, planner, CAD resources, admin.
Civil construction	30-40	Site supervision increases, the civil contractor joins the project with their project manager, supervisors and installation crew.

Cable installation and jointing	40-50	Cable jointing supervisors and jointers increase the team numbers.
Testing and commissioning	Approximately 25	Some sub-contractors and most cable jointing staff leave site. Cable test managers arrive.
Final commissioning and reinstatement	Approximately 20	Staff dealing with all the final document, snagging issues and reinstatement of hedgerows etc.

Up to 190 will be employed on site on the construction of the converter station and tail station. Circa 10 will be employed on the landfall HDD construction and the Campile River Estuary HDD.

4.8.2 Working Hours

The timing of construction activities, core working hours and the rate of progress of construction works are a balance between efficiency of construction and minimising nuisance and significant effects.

The core construction working hours for the proposed development will be:

- 7am – 7pm: Monday to Friday; and
- 8am - 2pm: Saturday.

The hours above correspond to the current construction programme.

Underground activities (i.e. tunnelling works to lay cables) will occur 24-hours a day, 7-days a week for the duration of the activity. The permissible noise levels are detailed in **Chapter 8** *Noise and Vibration* where 'daytime' noise limits are defined as 7am to 7pm, and lower permissible noise levels are stipulated outside these hours.

Rock breaking/fracturing activities will be undertaken during daytime hours. The removal of waste material off site by road and regular deliveries to site would be generally confined to daytime hours but outside of peak traffic hours (i.e. 10am to 4pm). If blasting is required to excavate rock at the converter station site, the noise levels associated with this activity will not exceed those predicted for rock-breaking, and specific mitigation measures will be implemented to ensure that adverse effects on the Gas Networks Ireland transmission pipeline are avoided.

It may be necessary in exceptional circumstances to undertake certain activities outside of the core construction working hours. Any construction outside of the core construction working hours will be agreed in advance with Wexford County Council and scheduling of such works will have regard to nearby sensitive receptors.

4.8.3 Site Access

Dedicated construction access to the site will be required at each of the construction compounds. All accesses will be temporary and used solely during the construction period.

All site access routes will be connected to the existing local road network. Minor road works may occur such as removal of existing kerbs, paving and a small amount of excavation prior to replacement of paving and realigned kerbs.

4.8.4 Utilities and Services

Surface and sub-surface infrastructure services and utilities which may be temporarily affected during the construction works are as follows:

- Water;
- Foul and surface water drainage;
- Gas;
- Electricity;
- Telecommunications; and
- Utilities owned by stakeholders.

Surface and sub-surface infrastructure services and utilities which may be affected are addressed in **Chapter 16** *Material Assets*.

4.8.5 Hoarding

A site boundary in the form of hoarding or fencing will be established around each of the working areas before any significant construction activity commences, as described above.

The hoarding/fencing will be 2.4m high to provide a secure boundary to what can be a hazardous environment for those that have not received the proper training and are unfamiliar with construction operations.

Site hoarding will also perform an important function in relation to minimising nuisance and effects including:

- Noise emissions (by providing a buffer);
- Visual impact (by screening the working areas, plant and equipment); and
- Dust minimisation (by providing a buffer).

The erection of hoarding will be of a similar nature as to what is carried out on most construction sites. Mounting posts will be erected by using a mini-digger and the posts will be set in concrete. The size and nature of the posts and hoarding will depend on the requirements for any acoustic mitigation as well as preferences that the contractor may have.

Where practicable, hoarding and fencing will be retained and re-configured and re-used between working areas as the construction activities progress.

4.8.6 Services and Site Lighting

Site services will be installed in parallel with the rearrangement and diversion of existing utilities, where relevant. The working areas will be powered by mains supplies or diesel generators where an electrical supply is not available.

Site lighting will typically be provided by tower mounted 1000W metal halide floodlights that will be cowled and angled downwards to minimise spillage to surrounding properties.

4.8.7 Deliveries to Site

Deliveries of materials will be planned and programmed to ensure that the materials are delivered only as they are required at the working areas. Works requiring multiple vehicle deliveries, such as concrete pours, will be planned so as to ensure there will no queuing on the public roadways around the working areas. Deliveries will be limited to outside of peak hours.

4.8.8 Cranage

The construction works will require the use of standard mobile cranes on site. The cranes will be required for the moving of building materials on site such as concrete pipes, formwork for concrete, reinforcement, precast concrete, steelwork, façade, plant and general building materials. Again, the use of mobile cranes may be adopted to assist in the installation of the converter station, the converter station building façade and mechanical plant. Heavy machinery transport on the road network to and from working areas will be restricted to outside of peak hours.

Assessments have been carried out to confirm that these activities are feasible.

4.8.9 Community Liaison During Construction

Greenlink Interconnector Limited recognises the importance of effective community liaison in order to reduce nuisance to residents during the works, to ensure public safety and welfare, and to help ensure the smooth running of construction activities. Important issues in ensuring good relations are:

- Providing information for the public during the construction phase, (particularly nearby sensitive receptors);
- Providing the correct points of contact and being responsive; and
- Ensuring good housekeeping in all aspects of the operations.

A ‘good neighbour’ policy will be implemented, as far as possible. Key aspects of this policy include:

- Early implementation of the policy i.e. from the commencement of construction;
- Reduction of nuisance factors;
- Maintaining access to neighbouring premises;
- Clear and concise information; and

- Undertaking timely liaison with stakeholders.

With regard to liaison, the Contractor will be required to prepare a Community Liaison Plan, which will include details of how the local community, road users and affected residents will be notified in advance of the scheduling of major works, any temporary traffic diversions and the progress of the construction works.

This plan will typically include details of the following:

- Contractor's community relations policy;
- Personnel nominated to manage public relations;
- A methodology for processing observations, queries and complaints from the general public, relevant authorities, the media and emergency services; and
- The strategy for project-wide liaison with all relevant parties.

A liaison manager will be responsible for managing such tasks as the following:

- Briefing neighbours on progress and issues as necessary;
- Liaison with Wexford County Council and emergency services as appropriate;
- Liaison with local Gardaí, particularly in relation to traffic movements and permits where necessary; and
- Contact details for the liaison manager will be posted on all construction site notice boards and on any other information or correspondence, which may be distributed from time to time.

4.9 Materials Management

4.9.1 Excavated Materials

Excavated material as part of the construction works will generally consist of:

- Rock, mainly from the converter station platform;
- Topsoil and subsoil; and
- Made ground.

The ground level of the converter station platform has been chosen to balance the volume of excavated material with the volume of fill, as far as is feasible.

The total volume of excavation will be 70,900m^3. This will be made up of topsoil, subsoil, weathered rock and intact rock. The rock will be crushed to make it suitable for reuse. However, some of the material, which will be excavated, may be unsuitable for use within 500mm to 1 metre of a structure. Therefore, it is possible that up to an additional 20,500 cubic metres of crushed stone structural fill will be imported to ensure suitable foundations for structures on the site. Circa 23,150m^3 of excavated material will be used to create the platform on which the converter station and tail station will be constructed. Up to 47,750m^3 of excavated material will be reused in the landscaping screening berms, which will be located to the south and the east of the converter station platform. Thus, there will be no export of spoil from the converter and tail station site, while the import of fill will be minimised.

The estimated earthworks balance is presented in **Table 4.4** below.

Table 4.4: Earthworks Balance Table (estimated values)

	Quantity	Totals
Total excavation required to create platform	60,650m^3	
This excavated material will consist of topsoil, rock and subsoil		
1. Topsoil	9,050m^3	
2. Intact and weathered rock	23,000m^3	
3. Subsoil	28,600m^3	
Additional excavation for 1m of structural fill under building footprint	10,250m^3	
Total excavation		**70,900m^3**
Maximum structural fill to be imported (1m over building footprint)	(up to) 20,500m^3	
Fill required to create platform	33,400m^3	
1m of structural fill under building footprint	10,250m^3	
Excavated material to be used to create platform	23,150m^3	**23,150m^3**
Excavated material to be used in landscaping		**47,750m^3**
South of converter station	40,000m^3	
East of converter station	7,750m^3	

Transport of material to and from the site will be managed in accordance with the construction traffic management measures outlined **Chapter 6** *Traffic and Transportation* and included in the Construction Environmental Management

Plan (CEMP) to ensure that there will be no queuing of trucks on public roadways around the working areas.

A significant proportion of the surplus excavation material from the landfall site and cable route will consist of uncontaminated soil, stone and naturally occurring material which may be reused in its natural state within the site. This reuse is certain and as such the material is not deemed to be a waste in accordance with Article 2 of the Waste Framework Directive (2008/98/EC) (EC, 2008) and Section 3 (c) of the Waste Management Act 1996 (as amended).

Surplus uncontaminated material from a greenfield site (or equivalent) may be moved off-site as material or a by-product according to criteria as set out in the Directive, and in accordance with EPA guidance. **Chapter 14** *Resource and Waste Management* provides further information.

Any surplus excavated material from the construction of the trench will be taken offsite to a suitably licenced facility immediately by waiting trucks.

In the very unlikely event that asbestos is uncovered, the Asbestos Containing Material will be double-bagged, stored, collected and removed from site by a competent contractor and disposed of in accordance with the relevant procedures and legislation. As requested by Wexford County Council the appointed contractor will have a sufficient stock of pipe on site in order to minimise the repair time by the local authority.

A Construction Waste Management Strategy has been established and is included as part of the CEMP (**Appendix 4.1**).

4.9.2 Construction Materials Requirements

The proposed development will have a requirement for imported materials, primarily concrete, crushed stone, road paving materials and steel, for the construction of the converter station and crushed stone and PVC ducting for the construction of the cables.

Concrete, sand, crushed stone and steel will be imported to site during the construction works, when required. Breakdowns of the volumes of these materials required are presented below:

4.9.2.1 Cable Route

Concrete in Cable Routes

There will be a weak mix concrete (i.e. CBS, a 14:1 sand/cement mix) required for most of the cable route. A standard concrete pad will be required at the base of the joint-bay. Estimated volumes of concrete required for the cable route are provided below.

HVDC Circuit:

- Estimated volume of weak mix concrete (i.e. 14:1 sand/cement mix) per metre of trench = 0.2 m^3.
- Estimated volume of weak mix concrete per route = 4,590 m^3.
- Estimated volume of standard concrete per joint-bay = 7m^3

- Assuming 22 joint-bays, estimate volume of standard concrete = 22 x 7 = 154 m^3.

HVAC Circuit:

- Estimated volume of weak mix concrete (i.e. 14:1 sand/cement mix) per metre of trench = 0.5 m^3.
- Estimated volume of weak mix concrete per route = 210 m^3.

The above values should be regarded as a rough estimate.

Sand

Weak mix concrete is comprised primarily of sand. The estimated volume of sand required for the cable route is approximately 4450m^3.

Cable Materials

Total HVDC cable length will be circa 46000m (based on two cables required within the 22.95kilometre route).

Total HVAC cable length will be circa 1400m (based on three cables required within the 0.45kilometre route).

Total fibre optic cable length will be 23000m.

4.9.2.2 Construction compounds and Converter Station and Tail Station

Crushed Stone - Imported Structural Fill

Approximately 20,500m^3 of crushed stone structural fill will be imported for the converter station and tail station site.

Crushed Stone and Stone Chippings

The temporary HDD compounds, temporary cable contractor compounds, temporary converter station compound, haul roads, and converter station and tail station stone chipping site cover will require approximately 13,100 m^3 of crushed stone.

Concrete in Converter station and Tail Station

The converter station and tail station foundations and the other concrete structures on the site will require circa 4370m^3 of concrete.

Steel Reinforcement

The reinforced concrete elements in the converter station and tail station will require approximately 870tonnes of reinforcing steel.

Steel

The structures on the converter station and tail station site will required circa 460tonnes of structural steel.

Steel Cladding

The buildings on the converter station and tail station site will require approximately 7200m2 of roof and wall cladding.

Road Surfacing – Asphalt and Crushed Stone Sub-base

The permanent site access road and internal roads will require circa 935m^3 of asphalt and 2600m3 of crushed stone sub-base.

4.9.3 Materials Storage

The storage of materials in working area construction compounds will be limited to materials required in the short term. The main construction compounds, located at the proposed converter station site, Lewistown and the landfall site, will be used as the primary location for storage of materials, plant and equipment, site offices, welfare facilities and car parking.

No stockpiling will be permitted in any other areas, apart from in the immediate vicinity of the cable route, where excavated material will be stored temporarily, while the trench is open. Surplus excavation material will be removed off site by an authorised waste Contractor to an appropriately licensed/permitted waste facility. A surface water management strategy, as detailed in the CEMP, which is provided in **Appendix 4.1**, will be implemented at all working areas. These measures will prevent any silt-laden run-off, including that from stockpiles, entering nearby watercourses.

The following construction management measures will be implemented at all construction compounds.

- Any containers of potential polluting materials such as fuels and oils will be stored in a bunded area protected from flood damage and inundation;
- All bunded storage areas will be a minimum distance of 10m away from any watercourse;
- All bulk fuel storage will be integrally bunded or kept within a bunded area;
- A designated bunded refuelling area on an impermeable surface will be provided at all construction compounds, again at a minimum distance of 10m away from any watercourse.

4.10 Safety Management

4.10.1 Health and Safety

The Contractor will be required to ensure all Health & Safety, Fire Safety and security requirements are provided for in co-ordination with Wexford County Council and Greenlink Interconnector Limited. The contractor will prepare a Construction Traffic Management Plan. This is to protect the public in the vicinity of the working areas during the construction phase of the works and will include all suitable temporary signage, barriers and hoarding as necessary. **Chapter 6** provides more information on the issues to be addressed in the Plan.

All construction staff and operatives will be inducted into the security, health and safety and logistic requirements on site prior to commencing work.

All Contractors will be required to progress their works with reasonable skill, care and diligence and to proactively manage the works in a manner most likely to ensure the safety, health and welfare of those carrying out construction works, all other persons in the vicinity of the working areas and interacting stakeholders.

Contractors will also have to ensure that, as a minimum, all aspects of their works and project facilities comply with legislation, good industry practice and all necessary consents.

The requirements of the Safety, Health and Welfare at Work Act 2005 (Government of Ireland, 2005), the Safety, Health and Welfare at Work (Construction) Regulations, 2013 (Government of Ireland, 2013), as amended, (the "Regulations") and other relevant Irish and EU safety legislation will be complied with at all times.

As required by the Regulations, a Health and Safety Plan will be formulated which will address health and safety issues from the design stages through to completion of the construction and maintenance phases. This plan will be reviewed and updated as required, as the development progresses.

In accordance with the Regulations, a 'Project Supervisor Design Process' has been appointed and a 'Project Supervisor Construction Stage' will be appointed as appropriate.

The Project Supervisor Construction Stage will assemble the Safety File as the project progresses.

4.10.2 Emergency Response Provisions

Appropriate site personnel will be trained as first aiders and fire marshals. In addition, appropriate staff will be trained in environmental issues and spill response procedures. Tanks and drums of potentially polluting materials will be stored in secure containers or compounds which will be locked when not in use. Secure valves will be provided on oil and fuel storage facilities. Equipment and vehicles will be locked, have keys removed and be stored in secure compounds.

The Contractor will be required to maintain an emergency response plan which will cover all foreseeable risks i.e. fire, flood, collapse etc.

In preparing this plan the Contractor will be required to liaise with the emergency response services.

4.11 Environmental Management

Every effort will be made to ensure that any significant environmental effects will be avoided, prevented or reduced during the construction phase of the proposed development.

The CEMP, provided in **Appendix 4.1** comprises all the construction mitigation measures and any additional measures which are required by the conditions attached to the planning decision. Implementation of the CEMP will ensure disruption and nuisance are kept to a minimum.

The CEMP has regard to the guidance contained in the handbook published by Construction Industry Research and Information Association (CIRIA) in the UK; Environmental Good Practice on Site Guide, 4th Edition (CIRIA, 2015). The CEMP is in accordance with industry best practice and will be effective for the duration of the construction works. The CEMP will be a live document during the construction phase and will be updated/added to as construction progresses. It includes the following attachments:

- Frac-out Contingency Plan;
- Pollution Prevention and Emergency Response Plan;
- Procedure for Dealing with Silty Water; and
- Environmental Preparedness Plan.

Specific environmental control measures for construction run off, dewatering, over pumping and accidental spills to minimise the risk of the pollution of waters or the contamination of groundwater are outlined below for both the converter station site and the onshore cable route.

4.11.1 Converter Station Site

Steps will be taken to reduce the probability of an incident occurring and to also reduce the magnitude of any incident from a combination of good site environmental management procedures, including additional precautions when operating machinery close to watercourses, soil management, staff training, contingency equipment and emergency plans.

Key measures identified to reduce erosion and sedimentation include:

- Secure oil and chemical storage in over-ground bunded areas, limited to the minimum volume required to serve immediate needs with specified delivery and refuelling areas;
- Emergency spill kits retained onsite at sensitive locations;
- Cessation of work and development of measures to contain and/or remove pollutant should an incident be identified;
- Silt traps will be employed and maintained in appropriate locations;
- Temporary interception bunds and drainage ditches will be constructed up slope of excavations to minimise surface runoff ingress and in advance of excavation activities; and
- Excavation and earthworks will be suspended during and immediately following periods of heavy rainfall to minimise sediment generation and soil damage.

4.11.2 Onshore Cable

The cables will be installed in ducts, so the only section of trench that will be open is that which is being excavated and in which ducts are being installed. Typically, 50m of trench will be fully open at any time, with up to 200m of trench backfilled to the level of the asphalt courses, that will then be reinstated at the end of each week.

Any groundwater or rainwater that collects in a trench will be pumped to locations agreed with the landowners and local authorities. Typically, this will be onto adjacent land, not directly into waterways, and through a filter medium, to avoid the build-up of silt, as some granular material will, inevitably, be pumped out with the water. The pump flowrates will match that of the water into the trench, as it must be kept generally free of water. A single pump with a 75mm hose will usually be adequate to deal with rainwater running into a trench. A similar arrangement will apply at joint bays, where a sump will be cast into the concrete base for a pump. For the HDDs, any groundwater or rainwater that collects in a HDD drilling pit will be pumped away as described above. Any bentonite (or similar HDD drilling head lubrication material) will be handled and removed by the drilling contractor. The volume of bentonite (or similar material) will be subject to ground conditions encountered and length of HDD. Typically for a land-based HDD maxi-rig the volume of bentonite would be approximately 5 cubic metres per shift, and for the landfall HDD maxi-rig, the volume of bentonite would be approximately 15 cubic metres per shift.

4.11.2.1 General mitigation / avoidance of bentonite breakout

Design

The first step in minimising drilling fluid breakout is through correct design of the HDD. The depth of cover of the drill will be maximised but must be balanced with the requirements of the cable, particularly dissipation of heat from the cable. Hydrofracture analysis of the design – comparing drilling fluid pressures to the inherent ground strength along each point of the design – will be used to optimise the design and identify any locations with increased risk of breakout.

Construction

Identification of higher risk locations allows the contractor to instigate additional measures such as optimising the drilling fluid properties and instigating additional hole cleaning to increase the margin of safety against drilling fluid losses. The use of downhole pressure monitoring tools during pilot hole drilling gives the driller live readings of the drilling fluid pressure in the borehole near the drilling bit. This allows early warning of downhole pressures that are higher or lower than a safe working window at any point along the drill. The safe working window is determined by the hydrofracture modelling of the design prior to construction using ground strength parameters determined by testing results in ground investigation boreholes and samples.

The drilling fluid properties can be optimised during the drilling by the drilling fluids engineer. The formulation will be changed to suit the requirements at particular locations; in zones with low risk of bentonite breakout the fluid viscosity will be increased to ensure all cuttings are removed from the hole, thereby increasing the cross sectional area available for fluid flow resulting in a reduction in the drilling fluid pressure in the hole.

Campile Estuary

The conceptual HDD design for Campile Estuary has 16m depth of cover beneath the bed of the Estuary. Unfortunately, there is no ground investigation information directly beneath the estuary, however the geophysics just to the south of the estuary indicates that the HDD will have 6m of stiff clay and 10m of rock overlying it when drilling beneath the estuary. As a general rule of thumb, 10m cover in rock alone is sufficient to avoid risk of drilling fluid breakout and the risk at the estuary is assessed as low.

Bentonite drilling fluid is composed of approximately 30kg of bentonite clay, a natural occurring clay, per 1m3 of fresh water. Depending on ground conditions, polymer additives may be added. The polymer additives (e.g. polyacrylamide (PHPA) and polyanionic cellulose (PAC)) are organic, usually starch or sugar based. Polymers can be used as a drilling fluid themselves, instead of bentonite, however they are not as effective as bentonite.

The environmental risk from bentonite is that in freshwater environments they are not readily dispersed and, having a higher specific gravity than water, cover the bottom of the watercourse, smothering benthic flora and breeding sites for fauna. In saltwater environments the bentonite drilling fluid is quickly degraded by to ionic exchange between the salts in the seawater and the bentonite clays in the fluid. The bentonite flocculates and is dispersed by currents and wave action with turbidity (discolouration) the only noticeable effect.

Polymer drilling fluids are biodegradable so for most environments they are acceptable. However, they are not recommended where there is a risk of dispersal in artesian water, particularly if the aquifer is used for potable water. When the starches and sugars decay or are broken down by microbes they can affect the water quality.

For the Campile Estuary, if fluid was lost it would be in the order of 1-5m3 which would have a clay content of 30-150kg. The salt water in the estuary would flocculate the bentonite fluid and the clay content would initially be in suspension before settling. It is important to stress that the bentonite clay is inert. It used because of its swelling properties in water, however when it contacts seawater, ionic exchange removes its capacity and it is equivalent in properties to the silt and clay that forms the bed and banks of the Campile Estuary.

Baginbun

<u>Beach</u>
The conceptual design for Baginbun has its minimum depth of cover at the base of the cliffs where the cover is 18m. As a general rule of thumb, 10m cover in rock alone is sufficient to avoid risk of drilling fluid breakout and the risk of breakout on the beach is assessed as very low. For a breakout to occur it would require an open fracture extending from the drill to surface. The risk of this is extremely low – any fracture will be infilled with sediment and even very soft clay would provide sufficient resistance at 18m depth to prevent breakout.

While the design is sufficient to minimise the risk ALARP (as low as reasonably practicable), annular pressure monitoring and good drilling practices will be used as a precaution.

Exit
It must be understood that there will be unavoidable loss of drilling fluid when the HDD exits at the sea floor; this occurs on all landfall HDD's. Containment of the fluid at the exit point is not a practical option in active coastal environments; silt curtains are ineffective and liable to be damaged or lost by wave and current action and engineered solutions such as exit casing and coffer dams introduce much greater environmental risk.

As discussed above, when the loss of bentonite drilling fluid to marine environment results in the bentonite being quickly broken down and dispersed, localised discolouration of the water around the exit point typically lasts for 20-60 minutes before it is dispersed by currents. A strategy that can be used is to drill the majority of the HDD with bentonite drilling fluid and then switch to a biodegradable polymer fluid (starch and sugar based) for the exit.

The volume of losses at the exit point depends on the methodology and the strength of the ground at exit. For Baginbun the HDD contractor will stop the pilot hole 50m before the exit then forward ream the hole to the final diameter by push reaming from land towards the exit. The pilot hole is then continued to the seafloor and drilling fluid in the bore is lost to the sea. The final 50m must then be reamed to final diameter and drilling fluid used during this time will mostly be lost to the sea. Finally, when the duct is inserted into the hole drilling fluid will be displaced from the hole and lost to the sea.

Very approximate volumes are 20 m3 for pilot hole exit, 100 m3 for reaming exit, and 50 m3 for the duct installation. Note that these are fluid volumes; the clay percentage is typically 3% if bentonite fluid is used, the cuttings percentage (rock chippings, generally coarse sand size) is typically 1-5%.

Note that on dozens of previous landfall projects, even on those in very quiet coastal environments, there has been no observable sediment on the beach due to the losses at the exit point, so the beach at Baginbun will not be affected by the exit losses.

4.12 References

Construction Industry Research and Information Association (CIRIA) 2015 *Environmental Good Practice on Site Guide*. 4th Edition.

Department of Transport, Tourism and Sport (2017) *Guidelines for Managing Openings in Public Roads* (Second Edition, April 2017)

Government of Ireland (2013) *Safety, Health and Welfare at Work (Construction) Regulations 2013.*

Government of Ireland (2005) *Safety, Health and Welfare at Work Act 2005.*

Appendix 2: Site synopses.

Appendix 2: Site synopses.

River Barrow and River Nore SAC (Site Code: 002162)

This site consists of the freshwater stretches of the Barrow and Nore River catchments as far upstream as the Slieve Bloom Mountains, and it also includes the tidal elements and estuary as far downstream as Creadun Head in Waterford. The site passes through eight counties – Offaly, Kildare, Laois, Carlow, Kilkenny, Tipperary, Wexford and Waterford. Major towns along the edge of the site include Mountmellick, Portarlington, Monasterevin, Stradbally, Athy, Carlow, Leighlinbridge, Graiguenamanagh, New Ross, Inistioge, Thomastown, Callan, Bennettsbridge, Kilkenny and Durrow. The larger of the many tributaries include the Lerr, Fushoge, Mountain, Aughavaud, Owenass, Boherbaun and Stradbally Rivers of the Barrow, and the Delour, Dinin, Erkina, Owveg, Munster, Arrigle and King's Rivers on the Nore.

Both rivers rise in the Old Red Sandstone of the Slieve Bloom Mountains before passing through a band of Carboniferous shales and sandstones. The Nore, for a large part of its course, traverses limestone plains and then Old Red Sandstone for a short stretch below Thomastown. Before joining the Barrow it runs over intrusive rocks poor in silica. The upper reaches of the Barrow also run through limestone. The middle reaches and many of the eastern tributaries, sourced in the Blackstairs Mountains, run through Leinster Granite. The southern end, like the Nore runs over intrusive rocks poor in silica. Waterford Harbour is a deep valley excavated by glacial floodwaters when the sea level was lower than today. The coast shelves quite rapidly along much of the shore.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

- [1130] Estuaries
- [1140] Tidal Mudflats and Sandflats
- [1170] Reefs [1310] Salicornia Mud
- [1330] Atlantic Salt Meadows
- [1410] Mediterranean Salt Meadows
- [3260] Floating River Vegetation
- [4030] Dry Heath
- [6430] Hydrophilous Tall Herb Communities
- [7220] Petrifying Springs*
- [91A0] Old Oak Woodlands
- [91E0] Alluvial Forests*
- [1016] Desmoulin's Whorl Snail (Vertigo moulinsiana)
- [1029] Freshwater Pearl Mussel (Margaritifera margaritifera)
- [1092] White-clawed Crayfish (Austropotamobius pallipes)
- [1095] Sea Lamprey (Petromyzon marinus)

- [1096] Brook Lamprey (Lampetra planeri)
- [1099] River Lamprey (Lampetra fluviatilis)
- [1103] Twaite Shad (Alosa fallax)
- [1106] Atlantic Salmon (Salmo salar)
- [1355] Otter (Lutra lutra)
- [1421] Killarney Fern (Trichomanes speciosum)
- [1990] Nore Freshwater Pearl Mussel (Margaritifera durrovensis)

Good examples of alluvial forest (a priority habitat on Annex I of the E.U. Habitats Directive) are seen at Rathsnagadan, Murphy's of the River, in Abbeyleix estate and along other shorter stretches of both the tidal and freshwater elements of the site. Typical species seen include Almond Willow (Salix triandra), White Willow (S. alba), Rusty Willow (S. cinerea subsp. oleifolia), Crack Willow (S. fragilis) and Osier (S. viminalis), along with Iris (Iris pseudacorus), Hemlock Water-dropwort (Oenanthe crocata), Wild Angelica (Angelica sylvestris), Thin-spiked Wood-sedge (Carex strigosa), Pendulous Sedge (C. pendula), Meadowsweet (Filipendula ulmaria), Common Valerian (Valeriana officinalis) and the Red Data Book species Nettle-leaved Bellflower (Campanula trachelium).

A good example of petrifying springs with tufa formations occurs at Dysart Wood along the Nore. This is a rare habitat in Ireland and one listed with priority status on Annex I of the E.U. Habitats Directive. These hard water springs are characterised by lime encrustations, often associated with small waterfalls. A rich bryophyte flora is typical of the habitat and two diagnostic species, Palustriella commutata and Eucladium verticillatum, have been recorded.

The best examples of old oak woodlands are seen in the ancient Park Hill woodland in the estate at Abbeyleix; at Kyleadohir, on the Delour, Forest Wood House, Kylecorragh and Brownstown Woods on the Nore; and at Cloghristic Wood, Drummond Wood and Borris Demesne on the Barrow, though other patches occur throughout the site. Abbeyleix Woods is a large tract of mixed deciduous woodland which is one of the only remaining true ancient woodlands in Ireland. Historical records show that Park Hill has been continuously wooded since the 16th century and has the most complete written record of any woodland in the country. It supports a variety of woodland habitats and an exceptional diversity of species including 22 native trees, 44 bryophytes and 92 lichens. It also contains eight indicator species of ancient woodlands. Park Hill is also the site of two rare plants, Nettle-leaved Bellflower and the moss Leucodon sciuroides. The rare Myxomycete fungus, Licea minima has been recorded from woodland at Abbeyleix.

Oak woodland covers parts of the valley side south of Woodstock and is well developed at Brownsford where the Nore takes several sharp bends. The steep valley side is covered by oak (Quercus spp.), Holly (Ilex aquifolium), Hazel (Corylus avellana) and Downy Birch (Betula pubescens), with some Beech (Fagus sylvatica) and Ash (Fraxinus excelsior). All the trees are regenerating through a cover of Bramble (Rubus fruticosus agg.), Foxglove (Digitalis purpurea), Great Wood-rush (Luzula sylvatica) and Broad Buckler-fern (Dryopteris dilatata).

On the steeply sloping banks of the River Nore, about 5 km west of New Ross, in Co. Kilkenny, Kylecorragh Woods form a prominent feature in the landscape. This is an excellent example of relatively undisturbed, relict oak woodland with a very good tree canopy. The wood is quite damp and there is a rich and varied ground flora. At Brownstown, a small, mature oak dominated woodland occurs on a steep slope. There is younger woodland to the north and east of it. Regeneration throughout is evident. The understorey is similar to the woods at Brownsford. The ground flora of this woodland is developed on acidic, brown earth type soil and comprises a thick carpet of Bilberry (Vaccinium myrtillus), Heather (Calluna vulgaris), Hard Fern (Blechnum spicant), Common Cow-wheat (Melampyrum pratense) and Bracken (Pteridium aquilinum).

Borris Demesne contains a very good example of a semi-natural broadleaved woodland in very good condition. There is quite a high degree of natural regeneration of oak and Ash through the woodland. At the northern end of the estate oak species predominate. Drummond Wood, also on the Barrow, consists of three blocks of deciduous woods situated on steep slopes above the river. The deciduous trees are mostly oak species. The woods have a well-established understorey of Holly, and the herb layer is varied, with Bramble abundant. The whitebeam Sorbus devoniensis has also been recorded here.

Eutrophic tall herb vegetation occurs in association with the various areas of alluvial forest and elsewhere where the floodplain of the river is intact. Characteristic species of the habitat include Meadowsweet, Purple Loosestrife (Lythrum salicaria), Marsh Ragwort (Senecio aquaticus), Ground Ivy (Glechoma hederacea) and Hedge Bindweed (Calystegia sepium). Indian Balsam (Impatiens glandulifera), an introduced and invasive species, is abundant in places.

Floating river vegetation is well represented in the Barrow and in the many tributaries of the site. In the Barrow the species found include water-starworts (Callitriche spp.), Canadian Pondweed (Elodea canadensis), Bulbous Rush (Juncus bulbosus), water-milfoils (Myriophyllum spp.), the pondweed Potamogeton x nitens, Broad-leaved Pondweed (P. natans), Fennel Pondweed (P. pectinatus), Perfoliated Pondweed (P. perfoliatus) and crowfoots (Ranunculus spp.). The water quality of the Barrow has improved since the vegetation survey was carried out (EPA, 1996).

Dry heath at the site occurs in pockets along the steep valley sides of the rivers especially in the Barrow Valley and along the Barrow tributaries where they occur in the foothills of the Blackstairs Mountains. The dry heath vegetation along the slopes of the river bank consists of Bracken and Gorse (Ulex europaeus) with patches of acidic grassland vegetation. Additional typical species include Heath Bedstraw (Galium saxatile), Foxglove, Common Sorrel (Rumex acetosa) and Creeping Bent (Agrostis stolonifera). On the steep slopes above New Ross the Red Data Book species Greater Broomrape (Orobanche rapum-genistae) has been recorded. Where rocky outcrops are shown on the maps Bilberry and Great Wood-rush are present. At Ballyhack a small area of dry heath is interspersed with patches of lowland dry grassland. These support a number of clover species, including the legally protected Clustered Clover (Trifolium glomeratum) - a species known from only one other site in Ireland. This grassland community is especially well developed on the west side of the mud-capped walls by the road. On the east of the cliffs a group of rock-dwelling species occur, i.e. English Stonecrop (Sedum anglicum), Sheep's-bit (Jasione montana) and Wild Madder (Rubia peregrina). These rocks also support good lichen and moss assemblages with Ramalina subfarinacea and Hedwigia ciliata.

Dry heath at the site generally grades into wet woodland or wet swamp vegetation lower down the slopes on the river bank. Close to the Blackstairs Mountains, in the foothills associated with the Aughnabrisky, Aughavaud and Mountain Rivers there are small patches of wet heath dominated by Purple Moor-grass (Molinia caerulea) with Heather, Tormentil (Potentilla erecta), Carnation Sedge (Carex panicea) and Bell Heather (Erica cinerea).

Salt meadows occur at the southern section of the site in old meadows where the embankment has been breached, along the tidal stretches of in-flowing rivers below Stokestown House, in a narrow band on the channel side of Common Reed (Phragmites australis) beds and in narrow fragmented strips along the open shoreline. In the larger areas of salt meadow, notably at Carrickcloney, Ballinlaw Ferry and Rochestown on the west bank; Fisherstown, Alderton and Great Island to Dunbrody on the east bank, the Atlantic and Mediterranean sub types are generally intermixed. At the upper edge of the salt meadow in the narrow ecotonal areas bordering the grasslands where there is significant percolation of salt water, the legally protected species Borrer’s Saltmarsh-grass (Puccinellia fasciculata) and Meadow Barley (Hordeum secalinum) are found. The very rare and also legally protected Divided Sedge (Carex divisa) is also found. Sea Rush (Juncus maritimus) is also present. Other plants recorded and associated with salt meadows include Sea Aster (Aster tripolium), Thrift (Armeria maritima), Sea Couch (Elymus pycnanthus), Spear-leaved Orache (Atriplex prostrata), Lesser Sea-spurrey (Spergularia marina), Sea Arrowgrass (Triglochin maritima) and Sea Plantain (Plantago maritima).

Glassworts (Salicornia spp.) and other annuals colonising mud and sand are found in the creeks of the saltmarshes and at the seaward edges of them. The habitat also occurs in small amounts on some stretches of the shore free of stones.

The estuary and the other E.U. Habitats Directive Annex I habitats within it form a large component of the site. Extensive areas of intertidal flats, comprised of substrates ranging from fine, silty mud to coarse sand with pebbles/stones are present. Good quality intertidal sand and mudflats have developed on a linear shelf on the western side of Waterford Harbour, extending for over 6 km from north to south between Passage East and Creadaun Head, and in places are over 1 km wide. The sediments are mostly firm sands, though grade into muddy sands towards the upper shore. They have a typical macro-invertebrate fauna, characterised by polychaetes and bivalves. Common species include Arenicola marina, Nephtys hombergii, Scoloplos armiger, Lanice conchilega and Cerastoderma edule. An extensive area of honey-comb worm biogenic reef occurs adjacent to Duncannon, Co. Wexford on the eastern shore of the estuary. It is formed by the polychaete worm Sabellaria alveolata. This intertidal Sabellaria alveolata reef is formed as a sheet of interlocking tubes over a considerable area of exposed bedrock. This polychaete species constructs tubes, composed of aggregated sand grains, in tightly packed masses with a distinctive honeycomb-like appearance. These can be up to 25cm proud of the substrate and form hummocks, sheets or more massive formations. A range of species are reported from these reefs including: Enteromorpha sp.; Ulva sp.; Fucus vesiculosus; Fucus serratus; Polysiphonia sp.; Chondrus crispus; Palmaria palmate; Coralinus officialis; Nemertea sp.; Actinia equine; Patella vulgate; Littorina littorea; Littorina obtusata and Mytilus edulis.

The western shore of the harbour is generally stony and backed by low cliffs of glacial drift. At Woodstown there is a sandy beach, now much influenced by recreation pressure and erosion. Behind it a lagoonal marsh has been impounded which runs westwards from Gaultiere Lodge along the course of a slow stream. An extensive reedbed occurs here. At the edges is a tall fen dominated by sedges (Carex spp.), Meadowsweet, willowherbs (Epilobium spp.) and rushes (Juncus spp.). Wet woodland also occurs.

The dunes which fringe the strand at Duncannon are dominated by Marram (Ammophila arenaria) towards the sea. Other species present include Wild Clary/Sage (Salvia verbenaca), a rare Red Data Book species. The rocks around Duncannon ford have a rich flora of seaweeds typical of a moderately exposed shore and the cliffs themselves support a number of coastal species on ledges, including Thrift, Rock Samphire (Crithmum maritimum) and Buck's-horn Plantain (Plantago coronopus).

Other habitats which occur throughout the site include wet grassland, marsh, reedswamp, improved grassland, arable land, quarries, coniferous plantations, deciduous woodland, scrub and ponds.

Seventeen Red Data Book plant species have been recorded within the site, most in the recent past. These are Killarney Fern (Trichomanes speciosum), Divided Sedge, Clustered Clover, Basil Thyme (Acinos arvensis), Red Hemp-nettle (Galeopsis angustifolia), Borrer's Saltmarsh-grass, Meadow Barley, Opposite-leaved Pondweed (Groenlandia densa), Meadow Saffron/Autumn Crocus (Colchicum autumnale), Wild Clary/Sage, Nettle-leaved Bellflower, Saw-wort (Serratula tinctoria), Bird Cherry (Prunus padus), Blue Fleabane (Erigeron acer), Fly Orchid (Ophrys insectifera), Ivy Broomrape (Orobanche hederae) and Greater Broomrape. Of these, the first nine are protected under the Flora (Protection) Order, 2015. Divided Sedge was thought to be extinct but has been found in a few locations in the site since 1990. In addition plants which do not have a very wide distribution in the country are found in the site including Thin-spiked Wood-sedge, Field Garlic (Allium oleraceum) and Summer Snowflake. Six rare lichens, indicators of ancient woodland, are found including Lobaria laetevirens and L. pulmonaria. The rare moss Leucodon sciuroides also occurs.

The site is very important for the presence of a number of E.U. Habitats Directive Annex II animal species including Freshwater Pearl Mussel (both Margaritifera margaritifera and M. m. durrovensis), White-clawed Crayfish, Salmon, Twaite Shad, three lamprey species – Sea Lamprey, Brook Lamprey and River Lamprey, the tiny whorl snail Vertigo moulinsiana and Otter. This is the only site in the world for the hard water form of the Freshwater Pearl Mussel, M. m. durrovensis, and one of only a handful of spawning grounds in the country for Twaite

Shad. The freshwater stretches of the River Nore main channel is a designated salmonid river. The Barrow/Nore is mainly a grilse fishery though spring salmon fishing is good in the vicinity of Thomastown and Inistioge on the Nore. The upper stretches of the Barrow and Nore, particularly the Owenass River, are very important for spawning.

The site supports many other important animal species. Those which are listed in the Irish Red Data Book include Daubenton's Bat, Badger, Irish Hare and Common Frog. The rare Red Data Book fish species Smelt (Osmerus eperlanus) occurs in estuarine stretches of the site. In addition to the Freshwater Pearl Mussel, the site also supports two other freshwater mussel species, Anodonta anatina and A. cygnea.

Three rare invertebrates have been recorded in alluvial woodland at Murphy's of the River. These are: Neoascia obliqua (Order Diptera: Syrphidae), Tetanocera freyi (Order Diptera: Sciomyzidae) and Dictya umbrarum (Order Diptera: Sciomyzidae). The rare invertebrate, Mitostoma chrysomelas (Order Arachnida), occurs in the old oak woodland at Abbeyleix and only two other sites in the country. Two flies (Order Diptera) Chrysogaster virescens and Hybomitra muhlfeldi also occur at this woodland.

The site is of ornithological importance for a number of E.U. Birds Directive Annex I species, including Greenland White-fronted Goose, Whooper Swan, Bewick's Swan, Bar-tailed Godwit, Peregrine and Kingfisher. Nationally important numbers of Golden Plover and Bar-tailed Godwit are found during the winter. Wintering flocks of migratory birds are seen in Shanahoe Marsh and the Curragh and Goul Marsh, both in Co. Laois, and also along the Barrow Estuary in Waterford Harbour. There is also an extensive autumnal roosting site in the reedbeds of the Barrow Estuary used by Swallows before they leave the country. The old oak woodland at Abbeyleix has a typical bird fauna including Jay, Long-eared Owl and Raven. The reedbed at Woodstown supports populations of typical waterbirds including Mallard, Snipe, Sedge Warbler and Water Rail.

Land use at the site consists mainly of agricultural activities – mostly intensive in nature and principally grazing and silage production. Slurry is spread over much of the area. Arable crops are also grown. The spreading of slurry and fertiliser poses a threat to the water quality of the salmonid river and to the populations of E.U. Habitats Directive Annex II animal species within the site. Many of the woodlands along the rivers belong to old estates and support many non-native species. Little active woodland management occurs. Fishing is a main tourist attraction along stretches of the main rivers and their tributaries and there are a number of Angler Associations, some with a number of beats. Fishing stands and styles have been erected in places. Both commercial and leisure fishing takes place on the rivers. There is net fishing in the estuary and a mussel bed also. Other recreational activities such as boating, golfing and walking, particularly along the Barrow towpath, are also popular. There is a golf course on the banks of the Nore at Mount Juliet and GAA pitches on the banks at Inistioge and Thomastown. There are active and disused sand and gravel pits throughout the site. Several industrial developments, which discharge into the river, border the site. New Ross is an important shipping port. Shipping to and from Waterford and Belview ports also passes through the estuary.

The main threats to the site and current damaging activities include high inputs of nutrients into the river system from agricultural run-off and several sewage plants, over-grazing within the woodland areas, and invasion by non-native species, for example Cherry Laurel (Prunus laurocerasus) and Rhododendron (Rhododendron ponticum). The water quality of the site remains vulnerable. Good quality water is necessary to maintain the populations of the Annex II animal species listed above. Good quality is dependent on controlling fertilisation of the grasslands, particularly along the Nore. It also requires that sewage be properly treated before discharge. Drainage activities in the catchment can lead to flash floods which can damage the many Annex II species present. Capital and maintenance dredging within the lower reaches of the system pose a threat to migrating fish species such as lamprey and shad. Land reclamation also poses a threat to the salt meadows and the populations of legally protected species therein.

Overall, the site is of considerable conservation significance for the occurrence of good examples of habitats and of populations of plant and animal species that are listed on Annexes I and II of the E.U. Habitats Directive. Furthermore it is of high conservation value for the populations of bird species that use it. The occurrence of several Red Data Book plant species including three rare plants in the salt meadows and the population of the hard water form of the Freshwater Pearl Mussel, which is limited to a 10 km stretch of the Nore, add further interest to this site.

Lower River Suir (Site Code 002137)

This site consists of the freshwater stretches of the River Suir immediately south of Thurles, the tidal stretches as far as the confluence with the Barrow/Nore immediately east of Cheekpoint in Co. Waterford and many tributaries including the Clodiagh in Co. Waterford, the Lingaun, Anner, Nier, Tar, Aherlow, Multeen and Clodiagh in Co. Tipperary. The Suir and its tributaries flows through the counties of Tipperary, Kilkenny and Waterford. Upstream of Waterford City, the swinging meanders of the Suir crisscross the Devonian sandstone rim of hard rocks no less than three times as they leave the limestone-floored downfold below Carrick. In the vicinity of Carrick-on-Suir the river follows the limestone floor of the Carrick Syncline. Upstream of Clonmel the River and its tributaries traverse Upper Palaeozoic Rocks, mainly the Lower Carboniferous Visean and Tournaisian. The freshwater stretches of the Clodiagh River in Co. Waterford traverse Silurian rocks, through narrow bands of Old Red Sandstone and Lower Avonian Shales before reaching the carboniferous limestone close to its confluence with the Suir. The Aherlow River flows through a Carboniferous limestone valley, with outcrops of Old Red Sandstone forming the Galtee Mountains to the south and the Slievenamuck range to the north. Glacial deposits of sands and gravels are common along the valley bottom, flanking the present-day river course.

The site is a candidate SAC selected for the presence of the priority habitats on Annex I of the E.U. Habitats Directive - alluvial wet woodlands and Yew Wood. The site is also selected as a candidate SAC for floating river vegetation, Atlantic salt meadows, Mediterranean salt meadows, old oak woodlands and eutrophic tall herbs, all habitats listed on Annex I of the E.U. Habitats Directive. The site is also selected for the following species listed on Annex II of the same directive - Sea Lamprey, River Lamprey, Brook Lamprey, Freshwater Pearl Mussel, Crayfish, Twaite Shad, Atlantic Salmon and Otter.

Alluvial wet woodland is declining habitat in Europe as a result of drainage and reclamation. The best examples of this type of woodland in the site are found on the islands just below Carrick-on-Suir and at Fiddown Island. Species occurring here include Almond Willow (Salix triandra), White Willow (S. alba), Grey Willow (S. cinerea), Osier (S. viminalis), with Iris (Iris pseudacorus), Hemlock Water-dropwort (Oenanthe crocata), Angelica (Angelica sylvestris), Pendulus Sedge (Carex pendula), Meadowsweet (Filipendula ulmaria) and Valerian (Valeriana officinalis). The terrain is littered with dead trunks and branches and intersected with small channels which carry small streams to the river. The bryophyte and lichen floras appear to be rich and require further investigation. A small plot is currently being coppiced and managed by National Parks and Wildlife. In the drier areas the wet woodland species merge with other tree and shrub species including Ash (Fraxinus excelsior), Hazel (Corylus avellana), Hawthorn (Crataegus monogyna) and Blackthorn (Prunus spinosa). This adds further to the ecological interest of this site.

Eutrophic tall herb vegetation occurs in association with the various areas of alluvial forest and elsewhere where the flood-plain of the river is intact. Characteristic species of the habitat include Meadowsweet (Filipendula ulmaria), Purple Loosestrife (Lythrum salicaria), Marsh Ragwort (Senecio aquaticus), Ground Ivy (Glechoma hederacea) and Hedge Bindweed (Calystegia sepium).

Old oak woodlands are also of importance within the cSAC. The best examples are seen in Portlaw Wood which lies on both sides of the Clodiagh River. On the south-facing side the stand is more open and the Oaks (mainly Quercus robur) are well grown and spreading. Ivy (Hedera helix) and Bramble (Rubus fruticosus) are common on the ground, indicating relatively high light conditions. Oak regeneration is dense, varying in age from 0-40 years and Holly (Ilex aquifolium) is fairly common but mostly quite young. Across the valley, by contrast, the trees are much more closely spaced and though taller are poorly grown on average. There are no clearings; large Oaks extend to the boundary wall. In the darker conditions, Ivy is much rarer and Holly much more frequent, forming a closed canopy in places. Oak regeneration is uncommon since there are as yet few natural clearings. The shallowness of the soil on the north-facing slope probably contributes to the poor tree growth there. The acid nature of the substrate has induced a “mountain” type Oakwood community to develop. There is an extensive species list present throughout including an abundance of mosses, liverworts and lichens. The rare lichen Lobaria pulmonaria, an indicator of ancient woodlands, is found.

Inchinsquillib Wood consists of three small separate sloping blocks of woodland in a valley cut by the young Multeen River and its tributaries through acidic Old Red Sandstone, and Silurian rocks. Two blocks, both with an eastern aspect, located to the north of the road, are predominantly of Sessile oak (Quercus petraea) and Hazel, with Downy Birch (Betula pubescens), Ash and Holly. The ground flora is quite mixed with for example Wood sedge (Carex sylvatica), Bluebell (Hyacinthoides non-scriptus), Primrose (Primula vulgaris), Wood-sorrel (Oxalis acetosella), Pignut (Conopodium majus) and Hard fern (Blechnum spicant). The base poor nature of the underlying rock is, to some extent masked by the overlying drift. The third block, to the south of the road, and with a northern aspect, is a similar although less mature mixture of Sessile Oak, Birch and Holly, the influence of the drift is more marked, with the occurrence of Wood anemone (Anemone nemorosa) amongst the ground flora.

Floating river vegetation is evident in the freshwater stretches of the River Suir and along many of its tributaries. Typical species found include Canadian Pondweed (Elodea canadensis), Milfoil (Myriophyllum spp.), Fennel Pondweed (Potamogeton pectinatus), Curled Pondweed (P. crispus), Perfoliate Pondweed (P. perfoliatus), Pond Water-crowfoot (Ranunculus peltatus), other Crowfoots (Ranunculus spp.) and the moss Fontinalis antipyretica. At a couple of locations along the river, Oppositeleaved Pondweed (Groenlandia densa) occurs. This species is protected under the Flora (Protection) Order, 1999.

The Aherlow River is fast-flowing and mostly follows a natural unmodified river channel. Submerged vegetation includes the aquatic moss Fontinalis antipyretica and Stream Water-crowfoot (Ranunculus pencillatus), while shallow areas support species such as Reed Canary-grass (Phalaris arundinacea), Brooklime (Veronica beccabunga) and Water Mint (Mentha aquatica). The river bank is fringed in places with Alder (Alnus glutinosa) and Willows (Salix spp.).

The Multeen River is fast flowing, mostly gravel-bottomed and appears to follow a natural unmodified river channel. Water Crowfoots occur in abundance and the aquatic moss Fontinalis antipyretica is also common. In sheltered shallows, species such as Water-cress (Rorippa nasturtium-aquaticum) and Water-starworts (Callitriche spp.) occur. The river channel is fringed for most of its length with Alder, Willow and a narrow strip of marshy vegetation.

Salt meadows occur below Waterford City in old meadows where the embankment is absent, or has been breached, and along the tidal stretches of some of the in-flowing rivers below Little Island. There are very narrow, non-continuous bands of this habitat along both banks. More extensive areas are also seen along the south bank at Ballynakill, the east side of Little Island, and in three large salt meadows between Ballynakill and Cheekpoint. The Atlantic and Mediterranean sub types are generally intermixed. The species list is extensive and includes Red Fescue (Festuca rubra), Oraches (Atriplex spp.), Sea Aster (Aster tripolium), Sea Couch Grass (Elymus pycnanthus), frequent Sea Milkwort (Glaux maritima), occasional Wild Celery (Apium graveolens), Parsley Water-dropwort (Oenanthe lachenalii), English Scurvygrass (Cochlearia anglica) and Sea Arrowgrass (Triglochin maritima). These species are more representative of the Atlantic sub-type of the habitat. Common Cord-grass (Spartina anglica), is rather frequent along the main channel edge and up the internal channels. The legally protected (Flora (Protection) Order, 1999) Meadow Barley (Hordeum secalinum) grows at the landward transition of the saltmarsh. Sea Rush (Juncus maritimus), an indicator of the Mediterranean salt meadows, also occurs.

Other habitats at the site include wet and dry grassland, marsh, reed swamp, improved grassland, coniferous plantations, deciduous woodland, scrub, tidal river, stony shore and mudflats. The most dominant habitat adjoining the river is improved grassland, although there are wet fields with species such as Yellow Flag (Iris pseudacorus), Meadow Sweet (Filipendula ulmaria), Rushes (Juncus spp.), Meadow Buttercup (Ranunculus acris) and Cuckoo Flower (Cardamine pratensis).

Cabragh marshes, just below Thurles, lie in a low-lying tributary valley into which the main river floods in winter. Here there is an extensive area of Common Reed (Phragmites australis) with associated marshland and peaty fen. The transition between vegetation types is often well displayed. A number of wetland plants of interest occur, in particular the Narrow-leaved Bulrush (Typha angustifolia), Bottle Sedge (Carex rostrata) and Blunt-flowered Rush (Juncus subnodulosus). The marsh is naturally eutrophic but it has also the nutritional legacy of the former sugar factory which discharged into it through a number of holding lagoons, now removed. Production is high which is seen in the size of such species as Celery-leaved Buttercup (Ranunculus sceleratus) as well as in the reeds themselves.

Throughout the Lower River Suir site are small areas of woodland other than those described above. These tend to be a mixture of native and non-native species, although there are some areas of semi-natural wet woodland with species such as Ash and Willow. Cahir Park Woodlands is a narrow tract of mixed deciduous woodland lying on the flatlying floodplain of the River Suir. This estate woodland was planted over one hundred years ago and it contains a large component of exotic tree species. However, due to original planting and natural regeneration there is now a good mix of native and exotic species. About 5km north west of Cashel, Ardmayle pond is a long, possibly artificial water body running parallel to the River Suir. It is partly shaded by planted Lime (Tilia hybrids), Sycamore (Acer pseudoplatanus) and the native Alder. Growing beneath the trees are shade tolerant species such as Remote sedge (Carex remota).

The site is of particular conservation interest for the presence of a number of Annex II animal species, including Freshwater Pearl Mussel (Margaritifera margaritifera and M. m. durrovensis), Freshwater Crayfish (Austropotamobius pallipes), Salmon (Salmo salar), Twaite Shad (Alosa fallax fallax), three species of Lampreys - Sea Lamprey (Petromyzon marinus), Brook Lamprey (Lampetra planeri) and River Lamprey (Lampetra fluviatilis) and Otter (Lutra lutra). This is one of only three known spawning grounds in the country for Twaite Shad.

The site also supports populations of several other animal species. Those which are listed in the Irish Red Data Book include Daubenton's Bat (Myotis daubentoni), Natterer's Bat (M. nattereri), Pipistrelle (Pipistrellus pipistrellus), Pine Marten (Martes martes), Badger (Meles meles), the Irish Hare (Lepus timidus hibernicus), Smelt (Osmerus eperlanus) and the Frog (Rana temporaria). Breeding stocks of Carp are found in Kilsheelan Lake. This is one of only two lakes in the country which is known to have supported breeding Carp. Carp require unusually high summer water temperatures to breed in Ireland and the site may therefore support interesting invertebrate populations.

Parts of the site have also been identified as of ornithological importance for a number of Annex I (EU Birds Directive) bird species, including Greenland White-fronted Goose (10), Golden Plover (1490), Whooper Swan (7) and Kingfisher. Figures given in brackets are the average maximum counts from 4 count areas within the site for the three winters between 1994 and 1997. Wintering populations of migratory birds use the site. Flocks are seen in Coolfinn Marsh and also along the reedbeds and saltmarsh areas of the Suir.

Coolfinn supports nationally important numbers of Greylag Geese on a regular basis. Numbers between 600 and 700 are recorded. Other species occurring include Mallard (21), Teal (159), Wigeon (26), Tufted Duck (60), Pintail (4), Pochard (2), Little Grebe (2), Black-tailed Godwit (20), Oystercatcher (16), Lapwing (993), Dunlin (101), Curlew (195), Redshank (28), Greenshank (4) and Green Sandpiper (1). Nationally important numbers of Lapwing (2750) were recorded at Faithlegg in the winter of 1996/97. In Cabragh marshes there is abundant food for surface feeding wildfowl which total at 1,000 or so in winter. Widgeon, Teal and Mallard are numerous and the latter has a large breeding population - with up to 400 in summer. In addition, less frequent species like Shoveler and Pintail occur and there are records for both Whooper and Bewick's swans. Kingfisher, a species that is listed on Annex I of the EU Birds Directive, occurs along some of the many tributaries throughout the site.

Landuses adjoining the cSAC consist mainly of agricultural activities including grazing, silage production, fertilising and land reclamation. The grassland is intensively managed and the rivers are therefore vulnerable to pollution from run-off of fertilisers and slurry. Arable crops are also grown. Fishing is a main tourist attraction on stretches of the Suir and some of its tributaries and there are a number of Angler Associations, some with a number of beats. Fishing stands and styles have been erected in places. Both commercial and leisure fishing takes place on the rivers. The Aherlow River is a designated Salmonid Water under the EU Freshwater Fish Directive. Other recreational activities such as boating, golfing and walking are also popular. Several industrial developments discharge to the river.

The Lower River Suir contains excellent examples of a number of Annex I habitats, including the priority habitat Alluvial Forest. The site also supports populations of several Annex II animal species and a number of Red Data Book animal species. The presence of two legally protected plants (Flora (Protection) Order, 1999) and the ornithological importance of the river adds further to the ecological interest of this site.

Hook Head SAC (Site Code: 000764)

The areas of conservation interest at Hook Head comprise marine subtidal reefs to the south and east of the Hook Head Peninsula, and also sea cliffs from Hook Head to Baginbun and Ingard Point. The peninsula forms the eastern side of Waterford Harbour, while to the east it adjoins the estuary mouth of Bannow Bay. Hook Head itself is composed of Carboniferous limestone overlain by Devonian Old Red Sandstone and is palaeontologically of international importance.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

- [1160] Large Shallow Inlets and Bays
- [1170] Reefs
- [1230] Vegetated Sea Cliffs

An exposed to moderately exposed intertidal reef community complex occurs around Hook Head. Subtidally the reefs are aligned in a north-east/south-west orientation and are typically strewn with boulders, cobbles and patches of sand and gravel. They are exposed to prevailing winds and swells from the west and tidal streams tend to be moderate but are strong in some areas. There are also a number of isolated reefs that project from a sand plain. The reefs around Hook Head have excellent examples of tide-swept communities and species richness is high in both the shallow and deep-water communities. A Laminaria-dominated community is recorded from the shallow waters around Hook Head. Deeper waters consist of Echinoderm and sponge-dominated community complex types, characterised by cushion sponges, with branching sponges and the rose 'coral' Pentapora foliacea. In addition, the sponge Stryphnus ponderosa, the sea squirts Sidnyum elegans, Distomus variolosus and Stolonica socialis, and the brittlestar Amphiura securigera are present. These species have a limited distribution in Ireland. The rare red algae Schizymenia dubyi also occurs.

The sublittoral sediments within this area consist of exposed, tide-swept patches of duned gravel and moderately exposed silty sand with only weak tidal streams. The duned gravel is characterised by the burrowing sea cucumber Neopendactyla mixta and the burrowing brittlestar Amphiura securigera, whilst the silty sand is relatively barren. A. securigera has only been recorded from the south-east of Ireland (the Kenmare River) and in Northern Ireland, where it is considered rare. The coarse sediments consist of a community complex distinguished by Pisidia longicornis and mobile and epibenthic species.

The sea cliffs, which extend for a distance of approximately 15 km, are mostly low, usually not more than 10 m, though they extend up to 30 m high near Baginbun Head. Both clay and rock cliffs are represented. The vegetation of the cliffs, as well as the underlying rocky shoreline, is characterised by species such as Thrift (Armeria maritima), Rock Samphire (Crithmum maritimum), Rock Sea-lavender (Limonium binervosum), Sea Plantain (Plantago maritima), Buck's-horn Plantain (Plantago coronopus), Rock Sea-spurrey (Spergularia rupicola) and Sea Mayweed (Matricaria maritima).

The cliffs at this site are of ornithological interest for breeding Chough, Raven) and Peregrine, and there is a small seabird colony, mainly of Guillemots, near Baginbun. The headland is a noted landfall point for migrants.

The waters off Hook Head are rich in marine life and are a popular diver site for SCUBA enthusiasts. Rock pools on the shore support a diverse flora and fauna.

In summary, this site is of conservation importance for its subtidal reef and shallow bay communities, and their diversity of species, as well as for the vegetated sea cliffs. These habitats are listed under the E.U. Habitats Directive. The rocky coastline is also important for a number of breeding birds, two of which are listed on Annex I of the E.U. Birds Directive.

Bannow Bay SAC (Site Code: 000697)

Bannow Bay SAC is a relatively large estuarine site, approximately 14 km long, on the south coast of Co. Wexford. Small rivers and streams to the north and south-west flow into the bay and their sub-estuaries from part of the site. The bay contains large areas of mud and sand, and the underlying geology is mainly of Ordovician slates with the exception of the areas to the east of Bannow Island which are underlain by Cambrian slates.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

- [1130] Estuaries
- [1140] Tidal Mudflats and Sandflats
- [1210] Annual Vegetation of Drift Lines
- [1220] Perennial Vegetation of Stony Banks
- [1310] Salicornia Mud
- [1330] Atlantic Salt Meadows
- [1410] Mediterranean Salt Meadows
- [1420] Halophilous Scrub
- [2110] Embryonic Shifting Dunes
- [2120] Marram Dunes (White Dunes)
- [2130] Fixed Dunes (Grey Dunes)*

The estuary, including the saltmarshes, makes up just over 80% of the site. At low tide up to three-quarters of the substrate is exposed. There are mudflats in the narrow northern part and also in the south-west and south-east. The sediments of the inner estuary associated with the Corock and Owenduff Rivers are generally black anoxic mud, with some fine sand and broken shell. Mats of green algae (Enteromorpha spp.) are present and seaweeds (Fucus spp.) have colonised stony substrates, particularly further south.

Saltmarshes of exceptional species diversity are found above the sand and mudflats, particularly at the south of the site. Communities associated with cord-grass (Spartina sp.) and glassworts (Salicornia spp.) occur in the saltmarsh and on its fringes. A diverse range of glassworts has been recorded, including Salicornia pusilla, S. ramosissima, S. europaea, S. fragilis and S. dolichostachya.

The main areas of saltmarsh are on the islands at Clonmines, at the mouth of the tributary at Clonmines, at the mouth of the tributary at Taulaght, close to Saint Kieran's House, at the north-west of Big Burrow, at the south-east of Bannow Island and at the west of Rabbit Burrow in Fethard Bay. Very small fragmented linear strips of saltmarsh occur in the upper estuary as far north as the confluence of the Corock and Owenduff Rivers and along the other tributaries. The main type of saltmarsh present is Atlantic salt meadow, although the Mediterranean type is also found. Typical species of the former include Common Saltmarsh-grass (Puccinellia maritima), Sea Aster (Aster tripolium), Thrift (Armeria maritima), Sea Plantain (Plantago maritima), Red Fescue (Festuca rubra), Creeping Bent (Agrostis stolonifera), Saltmarsh Rush (Juncus gerardi), Sea Arrowgrass (Triglochin maritima) and Sea Beet (Beta vulgaris subsp. maritima). An abundance of Sea Purslane (Halimione portulacoides) is found in Fethard and in part of the Taulaght saltmarshes. In the larger areas of saltmarsh Sea Rush (Juncus maritimus), a species more typical of Mediterranean salt meadows, is found. Other plants recorded are Lax-flowered Sea-lavender (Limonium humile) and Common Scurvygrass (Cochlearia officinalis).

Good conditions for the community 'annual vegetation of drift lines' exist on the seaward side of dune systems at this site. Typical species which have been recorded include Sea Rocket (Cakile maritima), mayweed (Matricaria sp.), Sea Spurge (Euphorbia paralias), Sea-holly (Eryngium maritimum), orache species (Atriplex spp.), Polygonum spp. and Sea Beet (Beta vulgaris subsp. maritima). Areas of habitat which are likely to be suitable for the development of the community 'perennial vegetation of stony banks' exist at this site, but are small in area.

Also linked with saltmarshes in places are stony beaches and reedbeds. Narrow shingle beaches up to 30 m wide occur in places along the edge of the estuary. The fringing reed communities are mainly confined to the tributaries and are relatively small in extent. They support Sea Club-rush (Scirpus maritimus), Grey Club-rush (S. tabernaemontani), Hemlock Water-dropwort (Oenanthe crocata) and abundant Common Reed (Phragmites australis). Halophilous scrub occurs in four of the larger saltmarsh areas. It is characterised by the presence of the legally protected (Flora (Protection) Order, 1999) and Red Data Book-listed plant Perennial Glasswort (Arthrocnemum perenne), which occurs in only a few sites in the country.

A mosaic of sand dune habitats occurs in three areas at the edge of the estuary. Embryonic shifting dunes and white dunes are characterised by the presence of Lyme-grass (Leymus arenarius), Marram (Ammophila arenaria), Sea Spurge and Seaholly in both Big Burrow and to the south east of Bannow Island.

The priority habitat fixed grey dune is also present. Typical species here include Common Bird's-foot-trefoil (Lotus corniculatus), Kidney Vetch (Anthyllis vulneraria), Wild Thyme (Thymus praecox), stork's-bill species (Erodium spp.), Ribwort Plantain (Plantago lanceolata), Common Restharrow (Ononis repens), Mouse-ear Hawkweed (Hieracium pilosella), Field Wood-rush (Luzula campestris) and Wild Carrot (Daucus carota). Some areas of this dune type contain a carpet of the moss Tortula ruraliformis and lichens (Cladonia sp.). There is some gorse (Ulex sp.) present beside the mossy area at the south-east of the site. Bee Orchid (Ophrys apifera) and Pyramidal Orchid (Anacamptis pyramidalis) have also been recorded. Sharp Rush (Juncus acutus) occurs in a dune slack associated with the grey dunes at Big Burrow. At the west of the system, east of Bannow Island, the dunes are quite high, reaching almost 15m. Nonnative plant species, including Tree Mallow (Lavatera arborea), occur in several parts of the site.

Some freshwater habitats occur at the northern end of the site. These consist mainly of a mosaic of marsh, reedbed and willows (Salix spp.). Species present include Common Reed, with young willows scattered throughout and Hemlock Waterdropwort abundant in the ground layer. In other areas the wetland vegetation consists of a mosaic of Phragmites reedbed, patches of Hard Rush (Juncus inflexus), Meadowsweet (Filipendula ulmaria), Creeping Buttercup (Ranunculus repens), Marsh Bedstraw (Galium palustre), Greater Tussock-sedge (Carex paniculata), Marshmarigold (Caltha palustris) and occasional Bulrush (Typha latifolia), along some old drains. The wetland areas generally merge into a narrow band of dense scrub dominated by Blackthorn (Prunus spinosa) and Hawthorn (Crataegus monogyna), with some Ash (Fraxinus excelsior), willow and gorse.

Most of the estuary has been designated a Special Protection Area (SPA) under the E.U. Birds Directive because of its significant bird interest, particularly during the winter. Parts of this area have also been designated a Wildfowl Sanctuary. Large numbers of wintering wildfowl and waders feed on the mudflats and sandflats, and use the fringing vegetation of reedbed and saltmarsh for roosting and feeding. Populations present include internationally important numbers of Light-bellied Brent Goose (819), and nationally important numbers of Shelduck (475), Pintail (85), Golden Plover (3,144) - a species listed on Annex I of the E.U. Birds Directive, Lapwing (2,000), Knot (508), Dunlin (3,850), Black-tailed Godwit (697), Bar-tailed Godwit (334) and Redshank (377) (all figures mean peaks 1994/95 to 1997/98).

Important breeding populations found within the site include two species listed on Annex I of the E.U. Birds Directive (Little Tern and Kingfisher), a colony of Sand Martins in the cliffs at the west of the site and a heronry with approximately 15 breeding pairs. The rare Reed Warbler may also breed in the area.

Otter and Common Seal occur within the site.

Land use at the site consists mainly of shellfish farming; approximately 20 ha of the intertidal area is under cultivation. Current annual production of oysters is approximately 100 tonnes, concentrated mainly on three farms. There are other farms, but these are in the initial stages of cultivation and current production is negligible. There is evidence of poor farm management in some locations. There are numerous abandoned trestles in the intertidal zone and along the top of the shore. Grading equipment is permanently left on the shore and some areas of saltmarsh are being used as a grading area for oysters. In some areas damage is caused to the shingle vegetation and to the substrate by tractors accessing the aquaculture farms. Any further increase in aquaculture poses a threat.

Other land uses include shooting, bird-watching, conservation management, grazing in some of the dune areas, horse-riding on the beach and Big Burrow sand dunes, picnicing, swimming, sailboarding, jet-skiing, line fishing and bait digging. The removal of sand and beach material also occurs at the site.

The site is of considerable conservation significance for the large number of E.U. Habitats Directive Annex I habitats that it contains, including the priority habitat fixed grey dune. The legally protected and Red Data Book plant species Perennial Glasswort also occurs. The site is also an SPA because of the important numbers of wintering wildfowl it supports, including an internationally important population of Light-bellied Brent Goose.

Bannow Bay SPA (Site Code: 004033)

Bannow Bay is a large, very sheltered, estuarine system with a narrow outlet to the sea, situated on the south coast of Co. Wexford. It is up to 14 km long along its north-east/south-west axis and has an average width of about 2 km. A number of small- to medium-sized rivers flow into the site, the principal being the Owenduff and the Corock which enter at the top end of the estuary. Very extensive intertidal mud and sand flats are exposed at low tide. The sediments have a rich macroinvertebrate fauna, with such species as Peppery Furrow-shell (Scrobicularia plana), Ragworm (Hediste diversicolor) and Lugworm (Arenicola arenaria) occurring frequently. Mats of green algae (Ulva spp.) are present on the intertidal flats and shorelines. Salt marshes are well-developed in the sheltered areas of the site and are characterised by species such as Common Saltmarsh-grass (Puccinellia maritima), Sea Aster (Aster tripolium), Thrift (Armeria maritima), Sea Plantain (Plantago maritima), Red Fescue (Festuca rubra), Saltmarsh Rush (Juncus gerardi) and Sea Rush (Juncus maritimus). Swards of Glasswort (Salicornia spp.) occur on the lower zones of the salt marshes and extend onto the intertidal flats.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Light-bellied Brent Goose, Shelduck, Pintail, Oystercatcher, Golden Plover, Grey Plover, Lapwing, Knot, Dunlin, Blacktailed Godwit, Bar-tailed Godwit, Curlew and Redshank. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.

Bannow Bay supports an excellent diversity of wintering waterfowl and is one of the most important sites in the south-east. Of particular note is an internationally important population of Light-bellied Brent Goose (561) and Black-tailed Godwit (546) - all figures are mean peaks for the 5 winters 1995/96-1999/2000. The site also supports nationally important numbers of a further eleven species: Shelduck (500), Pintail (52), Oystercatcher (711), Golden Plover (1,955), Grey Plover (142), Lapwing (2,950), Knot (508), Dunlin (3,038), Bar-tailed Godwit (471), Curlew (891) and Redshank (377). The populations of Shelduck and Bar-tailed Godwit are of particular note as they comprise 3.4% and 3.0% of the respective all-Ireland totals. Other species which occur include Wigeon (412), Teal (256), Ringed Plover (38) and Turnstone (50). The intertidal sand and mud flats provide excellent feeding for the waterfowl species, while suitable high tide roosts are provided by the salt marshes and other shoreline habitats. Little Egret, a species which has recently colonised Ireland, also occurs at this site.

Bannow Bay SPA is an excellent example of an enclosed estuarine system. It supports internationally important populations of Light-bellied Brent Goose and Black-tailed Godwit as well as nationally important populations of a further eleven species. Two of the species that occur, i.e. Golden Plover and Bar-tailed Godwit, are listed on Annex I of the E.U. Birds Directive. Bannow Bay is a Ramsar Convention site and part of Bannow Bay SPA is a Wildfowl Sanctuary.

Appendix 3: *Chapter 9 Biodiversity* from the Environmental Impact Assessment Report

Contents

9 Biodiversity

9.1 Introduction

This chapter describes the likely effects on biodiversity from the proposed development, both during its construction and operational phases, and ultimately decommissioning. Mitigation measures are also described, where required, that avoid or minimise adverse biodiversity effects.

This report was prepared by Carl Dixon MSc. (Ecological Monitoring) and Ian McDermott MSc. (Ecological Monitoring). Carl is a senior ecologist who has over 20 years' experience in ecological and water quality assessments with particular expertise in freshwater ecology. He also has experience in mammal surveys, invasive species surveys and ecological supervision of large-scale projects.

Ian is an experienced ecologist with particular expertise in surveying for invasive species, as well as mammal and bird surveys. He has carried out ecological surveys for a range of projects including industrial developments, pipelines, quarries and agricultural units.

Refer to **Appendix 1.1** for further details of the authors' qualifications and experience.

9.1.1 Overview of the proposed development

The proposed development (encompassing the onshore elements in Ireland only) will comprise:

Landfall Compound – a temporary landfall compound at Baginbun, where the high voltage direct current (HVDC) cable will be installed underground, below the beach and cliff at Baginbun Beach, by horizontal directional drilling (HDD);

HVDC Cables – two HVDC electricity cables with a nominal capacity of 500 megawatts (MW), installed underground from the landfall at Baginbun to the proposed converter station, including jointing bays and ground level marker posts at intervals along the route;

Converter Station – a converter station situated close to the existing Great Island substation in Wexford;

Tail Station - a 220kV substation located beside the proposed converter station. The Loughtown tail station connects the HVAC 220kV cable into the 220kV grid via the existing Great Island substation.

MV Substation – an ESB MV substation will be located outside the converter station and tail station perimeter fences but within the landholding. This substation will provide the MV and LV connections required for the development;

Converter Station Construction compound - a temporary compound for the construction of the converter station and tail station at Great Island

Contractor Compounds – three temporary cable contractor compounds will be required. There will be one at each end of the route (i.e. the landfall site close to Baginbun Beach and the proposed converter station) and one along the onshore route in the townland of Lewistown, near Dollar Bay;

HDD Compounds – temporary HDD contractor compounds are required. One will be located close to the cable contractor compound at Baginbun Beach and launch and reception compounds will be located at each side of the Campile River Estuary crossing;

High Voltage Alternating Current (HVAC) Cables – one 220 kV HVAC electricity cable circuit consisting of three cables, installed underground connecting the proposed converter station via the tail station to the existing Great Island substation;

Fibre Optic Cables – fibre optic cables for operation and control purposes, laid underground with the HVDC and HVAC cables;

Community Gain Roadside Car Parking near Baginbun Beach – in consultation with Wexford County Council, circa 54 roadside car parking spaces will be constructed; and

Community Gain in Ramsgrange Village – in consultation with Wexford County Council, extension to existing footpaths, four new streetlights and a speed activated sign at Ramsgrange.

9.2 Assessment Methodology

This appraisal is based on a review of desktop data and surveys of the proposed site and surrounding area (refer to **Figure 1.2** *Overview of the Proposed Development*). Ecological surveys were carried out on the 29th March, 20th April, 23rd May, 19th June, 18th of September in 2018, 1st February, 20th May and 16th December in 2019. Winter bird surveys were carried out on 23 November 2015, 15 December 2015, 20 January 2016, 10 February 2016, 3rd March 2016 and 23/3/2016. Winter bird surveys were also carried out on the 11th October 2018, 20th November 2018, 4th December 2018, 15th January 2019, 13th February 2019 and 27th March 2019.

The assessment follows the structure and protocols detailed in the following:

- *'Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports' (EPA, May 2017),*
- *Advice notes on current practice in the preparation of Environmental Impact Statements (EPA, 2003 and revised draft 2015)*
- *Guidelines on the information to be contained in Environmental Impact Statements (EPA 2002).*
- Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (*EU Commission, 2013*).

The appraisal of effects follows the protocols outlined in guidelines for *Assessment of Ecological Impacts of National Road Schemes (National Roads Authority, 2009*) and *CIEEM (2016) Guidelines for Ecological Impact Assessment* *in the UK and Ireland: Terrestrial, Freshwater and Coastal, 2nd edition* and *CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland*

Potential effects on designated Natura 2000 sites (SAC/cSAC/SPA) are specifically addressed in a Natura Impact Statement (NIS) which has been submitted as part of the application for planning consent for the proposed development.

9.2.1 Desktop Review

A desktop study was used to identify features of ecological value occurring within the proposed development and those occurring near it. A desktop review also allows the key ecological issues to be identified early in the appraisal process and facilitates the planning of appropriate surveys. Sources of information utilised for this report include the following:

- National Parks and Wildlife Service (NPWS) - www.npws.ie
- Environmental Protection Agency (EPA) – www.epa.ie
- National Biodiversity Data Centre – www.biodiversityireland.ie
- County Wexford Biodiversity Action Plan 2013-2018;
- Bat Conservation Ireland - http://www.batconservationireland.org
- Birdwatch Ireland - http://www.birdwatchireland.ie/
- British Trust for Ornithology (BTO)-www.BTO.ie
- Best Practice Guidance for Habitat Survey and Mapping (Heritage Council, 2011)
- Guidance on integrating climate changes and biodiversity into environmental impact assessment (EU Commission, 2013)
- Guidelines for Assessment of Ecological Impacts of National Road Schemes (National Roads Authority, 2009). This provides a standardised method for assessing the value of habitats in Ireland.
- EPA Geoportal
- Guidelines for Assessment of Ecological Impacts of National Road Schemes (National Roads Authority, 2009). This provides a standardised method for assessing the value of habitats in Ireland.
- Botanical Society of Britain and Ireland (BSBI) - https://bsbi.org/
- Inland Fisheries of Ireland - http://wfdfish.ie/
- Sea Fisheries Protection Authority (SFPA) and Marine Institute (MI) data - https://www.sfpa.ie/
- EIA Geo Portal (Department of Housing, Planning and Local Government) - https://www.housing.gov.ie/planning/environmental-assessment/environmental-impact-assessment-eia/eia-portal

- Greenlink (2019). Greenlink Marine Environmental Impact Assessment Report. Vol.2 EIAR.

Reference was also made to the following key legislation and documents:

European

- European Communities (Birds and Natural Habitats Regulations; S.I. No. 477 of 2011)
- Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds (codified version of Directive 79/409/EEC as amended) (The Birds Directive);
- Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy (The Water Framework Directive);
- Council Directive 2004/35/EC on environmental liability with regard to the prevention and remedying of environmental damage (The Environmental Liability Directive);
- Directive 2006/44/EC of the European Parliament and of the Council of 6 September 2006 on the quality of fresh waters needing protection or improvement in order to support fish life (The Fish Directive (consolidated)).

Republic of Ireland

- The Wildlife Act 1976 (As Amended).
- European Communities (Conservation of Wild Birds) Regulations 1985 (S.I. 291/1985) as amended by S.I. 31/1995;
- European Communities (Natural Habitats) Regulations, S.I. 94/1997 as amended by S.I. 233/1998 & S.I. 378/2005 (The Habitats Regulations);
- European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477/2011) as amended by S.I. No. 355/2015;
- The Flora (Protection) Order, 2015 (S.I. No. 356/2015);
- The Planning and Development Act, 2000 (as amended);
- Wexford County Development Plan, 2013 - 2019
- National Biodiversity Action Plan 2017-2021.

9.2.2 Surveys Overview

Surveys were carried out at the site in 2015, 2016, 2018 and 2019, which covered the full extent of the proposed development as illustrated in **Figure 1.2.** The following surveys were carried out:

- Habitats were mapped according to the classification scheme outlined in the Heritage Council Publication *A Guide to Habitats in Ireland (Fossitt, 2000)* and following the guidelines contained in *Best Practice Guidance for*

Habitat Survey and Mapping (Heritage Council, 2011). Habitats were cross referenced with Habitats Directive Annex 1 habitats. Alternative sites, site compounds and routes of the proposed development were also surveyed by Dixon Brosnan. Given that the habitats potentially affected by the proposed development are common, specific detailed surveys for particular plant groups were not considered necessary.

- The proposed route, converter station site and landfall site and contractor compounds were surveyed for invasive species.
- All bird species recorded during the habitat survey were recorded. In addition, specialised bird surveys were conducted as follows:
  - Winter Bird usage of potential coastal sites which may be utilised as the landfall for the proposed Greenlink project in County Wexford (2015 and 2016) – this included a survey of the landfall location which was finally selected at Baginbun Beach.
  - Winter Bird Survey to assess bird usage of the proposed landfall site and HDD locations (Campile River Estuary and landfall site at Baginbun Beach) (refer to **Appendix 9.4**)
  - Breeding Bird Survey at two locations in May and June 2018; the proposed converter station location within an agricultural field and Baginbun beach (refer to **Appendix 9.3**)
  - Barn owl (*Tyto alba*) survey of an abandoned building, in proximity to the proposed converter station beside the existing Great Island substation (refer to **Appendix 9.3**)
- A general mammal survey with an emphasis on otters and badgers was carried out in conjunction with the habitat surveys.
- A bat emergence survey was undertaken on the 18th of September 2018 at Dunbrody Bridge using a Batbox Duet bat detector and Echo Meter Touch 2 PRO bat detector. In addition, an onsite day-time preliminary roost assessment of external and internal structures of the bridge was conducted during daylight hours on the 20th of April 2018. A crossing of the Campile River Estuary via Dunbrody Bridge was considered as a potential route option and it was for this reason the bat survey at this location was completed. Although this option does not form part of the preferred cable route, the bat survey results are indicative of bat activity along this section of the estuary.
- An onsite day-time roost assessment/winter hibernation survey of an abandoned building in proximity to the Great Island substation was also undertaken in February 2019 (refer to **Appendices 9.2** and **9.3).**
- An arboricultural survey of the cable route was completed on 24th May and 02nd June 2019 (refer to **Appendix 9.5**).
- The Newtown River will be crossed using mini-HDD technology, with no direct interaction with the watercourse In the unlikely event that mini-HDD technology is not used, an open cut methodology will be implemented. A visual survey in 2018 and 2019 indicated that the Newtown River is a small, highly modified habitat which does not provide high value habitat for fish. A

fish stock survey was not considered necessary and this was discussed and agreed with Inland Fisheries Ireland (Donnachadh Byrne IFI pers. comm. December 2019). Potential minor impacts on freshwater habitats could also occur along the route where the cable route within the road passes over small streams. Small drainage ditches could also be affected. Frac out could lead to minor impacts on aquatic habitats although significant impacts are unlikely.

Site visits and surveys were carried out in accordance with best practice and in the expert opinion of the author, are considered sufficient to assess all potential significant ecological effects associated with the project. The survey scope and timing were considered sufficient to establish the use of habitats.

9.2.3 Consultation

All key stakeholders, including the public, have been consulted with to ensure that their views were addressed in the development process. Organisations consulted are referenced in **Section 1.11** of **Chapter 1- Introduction and Background** and included NPWS, IFI and Birdwatch Ireland, among others. Meeting were held with the NPWS in 2018 and 2019 to identify potential ecological issues. The IFI were consulted by phone in 2019.

Submissions regarding the EIA scoping report are included in **Appendix 1.3.** No submissions were received in relation to the ecological aspects of the proposed development.

Findings of the consultations are integrated into the assessment.

9.3 Baseline Environment

9.3.1 European (Natura 2000) Sites

Special Areas of Conservation (SACs) and candidate SACs are protected under the Habitats Directive 92/43/EEC and the European Communities (Birds and Natural Habitats) Regulations 2011, as amended. Special Protection Areas (SPAs) are protected under the Birds Directive 2009/147/EC and European Communities (Birds and Natural Habitats) Regulations 2011, as amended. Collectively, these sites are referred to as Natura 2000 or European Sites.

In accordance with the European Commission Methodological Guidance (EC2001), a list of Natura 2000 Sites that could be potentially affected by the proposed development has been compiled. Use of a 15km radius is a precautionary measure, as impacts at this distance from the proposed development are highly unlikely in the absence of significant aqueous emissions. All candidate SACs (cSAC) and SPAs sites potentially affected by the proposed development were assessed and are listed in **Table 9.1** and illustrated in **Figure 9.1.**

Table.9.1 Designated sites and location relative to the proposed development

Site	Code	Distance at the closest point (approx.)
Special Area of Conservation (SAC)		
River Barrow & River Nore	002162	0m. The crossing point downstream of Campile under the Campile River Estuary is located within this SAC HDD compounds are outside the SAC boundary. The southern HDD compound is located approximately 18.5m from the SAC boundary and 71m from the estuary channel. The northern HDD compound is located 119m from the SAC boundary and 151m from the estuary channel. The Kilmannock/ Newtown River flows into the SAC approximately 375m downstream of the proposed crossing point. The construction compound at Lewistown is located approximately 340m east of the SAC. The stormwater discharge point from the converter station site, to the Newtown River, is approximately 150 m east and upstream of the SAC.
Hook Head	000764	0m. The offshore cable to the landfall site is located within Hook Head SAC. The HDD compound is located 162m from the SAC boundary and the proposed carpark is approximately 10m west of the SAC boundary.
Bannow Bay	000697	300m north of onshore cable route near Baginbun Beach.
Lower River Suir	002137	1.2km west of the proposed converter station.
Ballyteige Burrow	000696	8.7km east of Baginbun beach in Coolcull townland.
Saltee Islands	000707	9.7km south east of Baginbun Beach landfall site.
Tramore Dunes and Backstrand	000671	11.6km west of the onshore cable route.
Special Protection Area (SPA)		
Bannow Bay SPA	004033	1km north of Baginbun Beach landfall site.
Keeragh Islands	004118	6.2km east of Baginbun Beach landfall site.
Ballyteige Burrow SPA	004020	9.2km east of Baginbun beach in Coolcull townland.
Tramore Back Strand	004027	11.7km west of the onshore cable route.

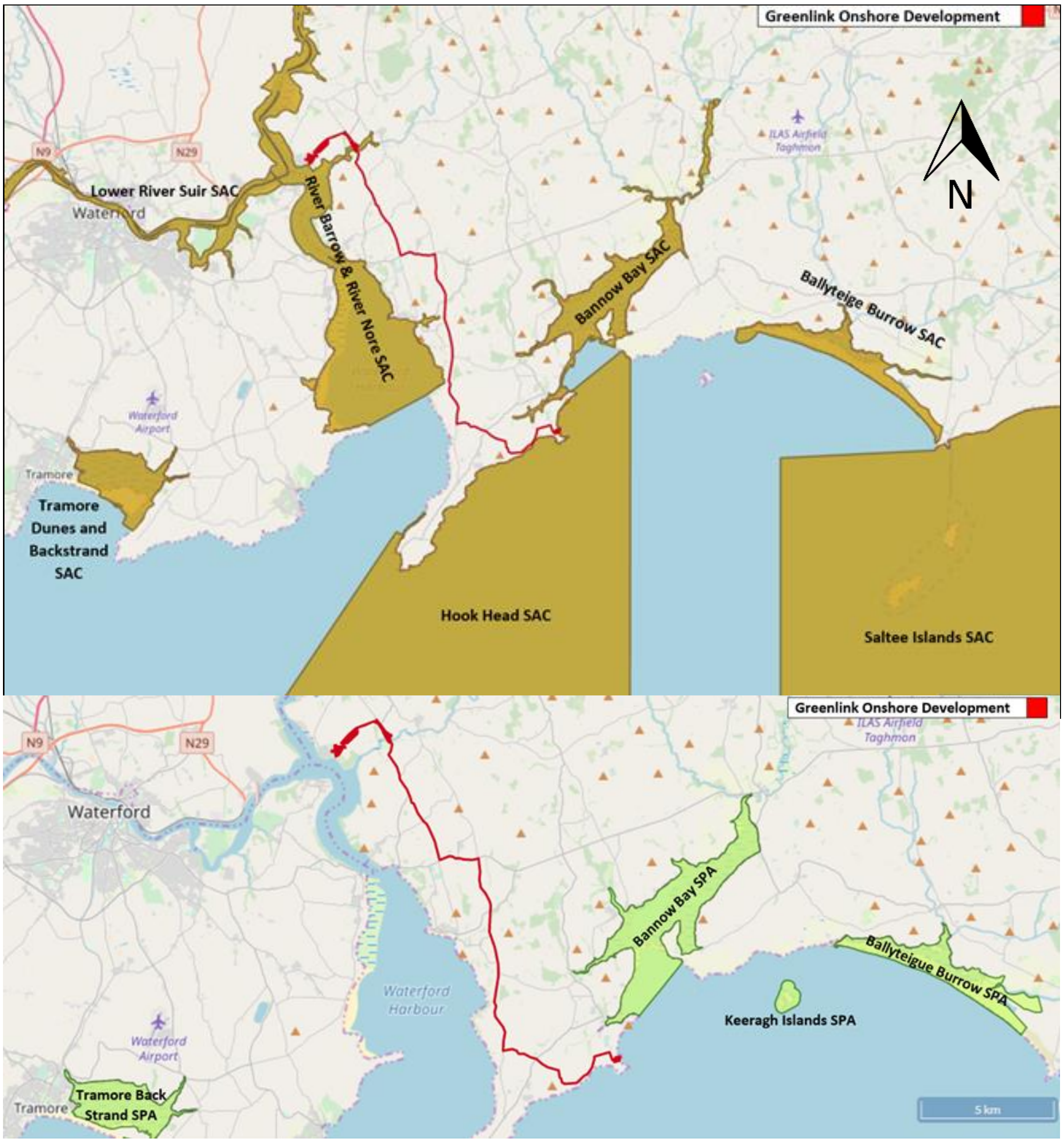


Figure 9.1 Natura 2000 sites within 15km of the proposed development | not to scale

Potential impacts on designated Natura 2000 sites (SAC/cSAC/SPA) are specifically addressed in the NIS which has been submitted as part of this application.

The NIS noted that following a comprehensive evaluation of the potential direct, indirect and cumulative effects on the qualifying interests and conservation objectives for Natura 2000 sites, it has been concluded that the proposed development, either alone or in combination with other plans or projects, will not have an adverse effect on the integrity of Natura 2000 sites. Potential impacts on the ecology of Natura 2000 sites are also assessed in this chapter of the EIAR where relevant.

9.3.2 Nationally Protected Sites

Natural Heritage Areas (NHAs/pNHAs) are national designations under the Wildlife Act 1976, as amended. An NHA is designated for its wildlife value and receives statutory protection. A list of proposed NHAs (pNHAs) was published on a non-statutory basis in 1995, but these have not since been statutorily proposed or designated. Consultation with the NPWS is still required if any development is likely to impact on a pNHA.

The western and southern boundaries of the converter station site are close to the proposed Natural Heritage Area Barrow River Estuary (Site code: 000698). The estuary crossing point downstream of Campile is also located within this pNHA. The southern HDD compound for the Campile River Estuary is located within low value agricultural grassland within the Barrow River Estuary pNHA. The Baginbun Beach landfall site is located approximately 250m north of the Hook Head pNHA (Site code: 000764).

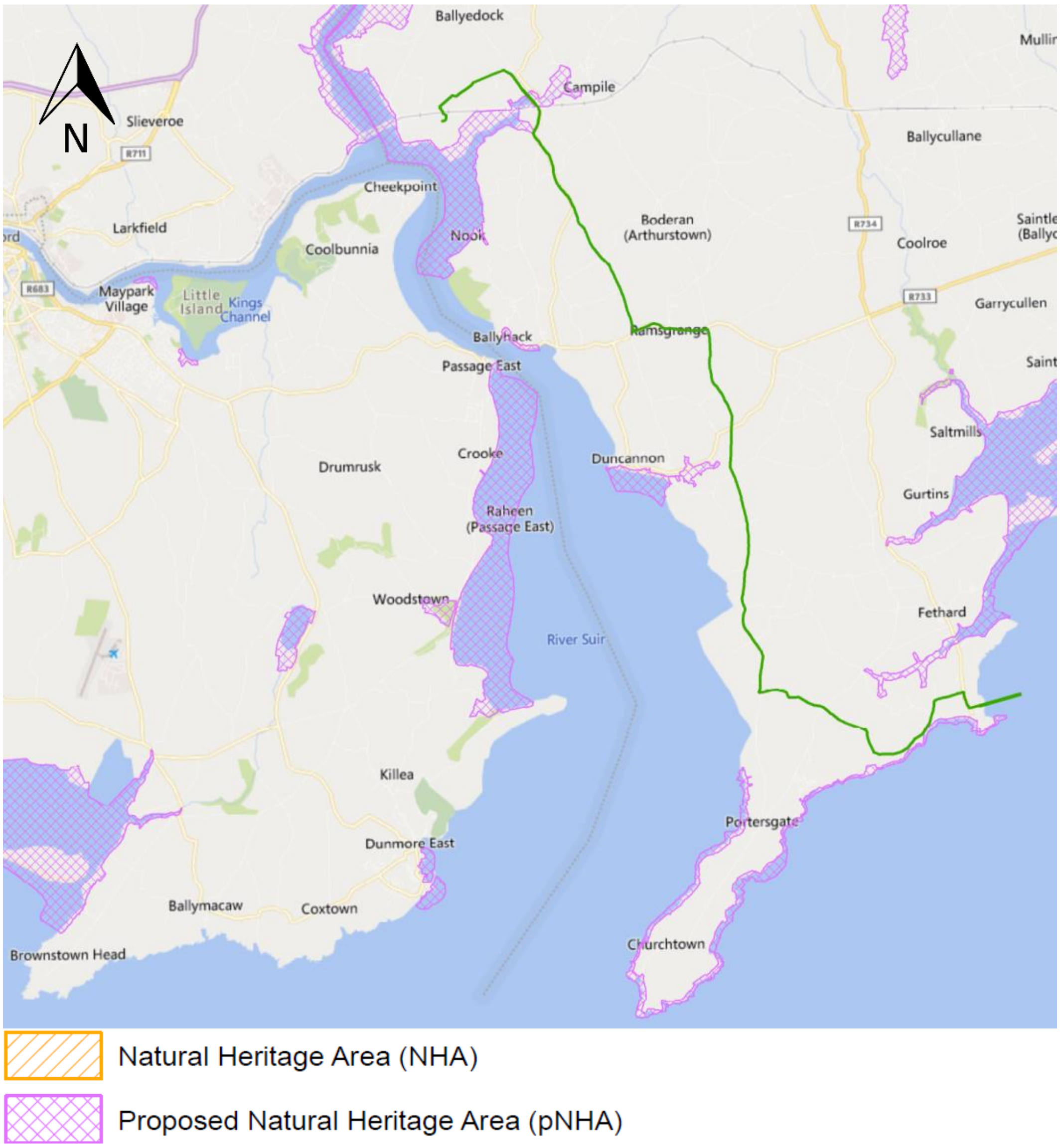


Figure 9.2 NHAs and pNHAs near the proposed development | not to scale

The Duncannon Sandhills pNHA overlaps the River Barrow and River Nore SAC and is located 360m from the proposed development (along the cable route). The Barrow River Estuary pNHA also falls within the River Barrow and River Nore SAC and the Hook Head pNHA falls within the Hook Head SAC. Both NHAs are so designated for a similar range of habitats and species to their respective

SAC sites and thus the impact assessment documented in the NIS is considered relevant. Potential impacts on the ecology of these sites are also assessed in this chapter of the EIAR where relevant.

The NIS concluded the following:

(i) all aspects of the proposed development have been identified which, in the light of the best scientific knowledge in the field, can by themselves or in combination with other plans or projects, affect the European site in the light of its conservation objectives;
(ii) there are complete, precise and definitive findings and conclusions regarding the identified potential effects on any relevant European site;
(iii) on the basis of those findings and conclusions, the competent authorities are able to determine that no scientific doubt remains as to the absence of the identified potential effects; and
(iv) thus, the competent authorities may determine that the proposed development will not adversely affect the integrity of any relevant European site.

9.3.3 Ramsar Sites

The Convention on Wetlands, called the Ramsar Convention, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. A key commitment of Ramsar Contracting Parties is to identify and place suitable wetlands onto the List of Wetlands of International Importance. Bannow Bay is listed as a Ramsar site, which is a non-statutory designation.

9.3.4 Important Bird Areas - Bannow Bay

Important Bird and Biodiversity Areas (IBAs) are sites selected as important for bird conservation because they regularly hold significant populations of one or more globally or nationally threatened, endemic or congregator bird species or highly representative bird assemblages. The European IBA programme aims to identify, monitor and protect key sites for birds all over the continent. It aims to ensure that the conservation value of IBAs in Europe (now numbering more than 5,000 sites or about 40% of all IBAs identified globally to date) is maintained, and where possible enhanced. The programme aims to guide the implementation of national conservation strategies, through the promotion and development of national protected area programmes. Through their designation they aim to form a network of sites ensuring that migratory species find suitable breeding, stop-over and wintering places along their respective flyways.

The function of the IBA Programme is to identify, protect and manage a network of sites that are important for the long-term viability of naturally occurring bird populations, across the geographical range of those bird species for which a site-based approach is appropriate. The proposed landfall site at Baginbun Beach 1.3km south of the Bannow Bay IBA (Site Code: IE096).

The Bannon Bay IBA is an extensive, sheltered sea bay and estuary, situated in County Wexford, 20 km east of Waterford city (refer to **Figure 9.3**).

Figure 9.3 Bannow Bay IBA | not to scale Source: http://datazone.birdlife.org/

At low tide over 75% of the bay is exposed mud and sand with some saltmarsh. The Ownduff and Corock rivers discharge into the head of the bay which is constricted at its mouth by sandbars and a dune system on either side. This wetland supports a wide range of wintering waterfowl. Several additional species occur in numbers of national importance (See **Table 9.2**).

There is intertidal shellfish cultivation within the site, which is a possible threat to habitat quality, while wildfowling causes disturbance to birds.

Habitat quality is reduced by the spread of non-native cordgrass *Spartina*. In 1997, unauthorised mechanical cockle-harvesting caused damage to the intertidal mudflats.

The site qualifies for designation under the following IBA Criteria (2000):

- B1i - The site is known or thought to hold ≥ 1% of a flyway or other distinct population of a water bird species.
- C3 - The site is known to regularly hold at least 1% of a flyway population or of the EU population of a species threatened at the EU level (not listed on Annex 1 of The Birds Directive).
- C6 - The site is one of the five most important in the European region (NUTS region) in question for a species or subspecies considered threatened in the European Union (i.e. listed in Annex I of the EC Birds Directive).

Table 9.2: Bannow Bay IBA trigger species

Species	Current IUCN Red List Category	Season	Year(s) of estimate	Population estimate	IBA Criteria Triggered
Brent Goose (*Branta bernicla*)	Least Concern (LC)	Winter	2002-2006	577-1,045 individuals	B1i, C3
Little Egret *(Egretta garzetta)*	Least Concern (LC)	Winter	2003-2007	12-51 individuals	C6

9.3.5 IFI Fish Survey Data

of fish monitoring for the Water Framework Directive (WFD), between the 30th of September and the 11th of October 2013 by staff from Inland Fisheries Ireland. Although survey work was not carried out within the Campile River Estuary close to the proposed crossing point, the results from surveys on the Barrow-Suir-Nore Estuary Waterbody provides information on what fish species are using the overall estuary. The survey was carried out using beach seines, fyke nets and beam trawls and a total of 22 species were recorded most which would be considered as relatively common marine species such as pollack, cod dab, haddock and scad. Species which are typically present in the estuarine environments included flounder, thick-lipped grey mullet and sand goby were also recorded.

One endangered fish species; twaite shad, listed in Annex II and Annex V of the EU Habitats Directive and also listed as vulnerable in the Irish Red Data book (King et al., 2011) was recorded in this waterbody and European Eel, populations of which are currently in decline were recorded and both these migratory species may migrate up the Campile River.

The Newtown River is a much smaller waterbody, is heavily modified and is of limited ecological value. However, species such as Flounder, Thick-lipped grey Mullet and Sand Goby are likely to occur in the lower tidal reaches. European Eel, Brown Trout and Stickleback could also occur.

9.3.6 Terrestrial and Aquatic Habitats

Ecological surveys were carried out on the 29th March, 20th April, 23rd May, 19th June and 18th September in 2018, 1st February, 20th May and 16th December in 2019. Habitat mapping was carried out in line with the methodology outlined in the Heritage Council Publication, Best Practice Guidance for Habitat Survey and Mapping (Heritage Council, 2011). Refer to **Figures 9.4** *et seq*. The terrestrial and aquatic habitats within or adjacent to the proposed development were classified using the classification scheme outlined in the Heritage council publication *A Guide to Habitats in Ireland* (Fossitt, 2000) and cross referenced with Annex 1 Habitats where required. No rare species were noted during the site surveys. The survey results are representative of the habitats within the application site and include the dominant and characteristic species of flora.

9.3.7 Habitat surveys

The cable route from the converter station and tail station to the landfall site near Baginbun Beach is approximately 23 kilometres long. The entire route will be underground and where possible will follow the existing roads. Works within the road will be at locations which are already subject to persistent intermittent noise. However, there are areas along the route where the underground cables are routed off-road and traverse agricultural lands, principally at the northern end of the route near the converter station site. Where the route diverts off-road the construction activities will impact on more natural habitats and therefore there is potential for greater ecological impacts at these areas. Selection of joint bay locations in these areas will have regard to constraints such as trees, to avoid unnecessary felling.

Habitat descriptions of the route focus on the off-road diversion areas, as set out below. The main elements of the proposed development described in Section 9.1.1, and in more detail in **Chapter 3** *Proposed Development* of this EIAR.

9.3.7.1 Converter Station and Tail Station Site

The converter station and tail station will be constructed close to the existing power station and substation at Great Island. An overview of the proposed development at this location is provided in **Chapter 3** of this EIAR *Proposed Development*. The habitats within the site of the proposed converter station and tail station site and in proximity to same, are shown in **Figure 9.4.** The proposed converter station will impact on improved agricultural grassland (GA1) and gorse scrub (WS1). A cable contractor's compound, main contractor's compound and main contractor's plant and equipment laydown area will be established within the boundary of the Great Island power station. These will be located within areas of recolonising bare ground (ED3) and will impact on a small area of scrub (WS1) dominated by gorse.

Within the Great Island substation site there is a band of immature broadleaved woodland (WS2) which was planted to visually screen the existing Great Island substation. A large agricultural field (GA1), currently used as pasture exists to the east of the immature woodland. Ryegrass (*Lolium perenne*.) dominates the sward with herbaceous species limited in extent. Noted within the agricultural field is a large area of Scrub (WS1) dominated by Gorse (*Ulex europaeus*).

A second, smaller field of improved agricultural grassland (GA1) exists to the south of the proposed converter station site. The two fields are separated by a mixture of scrub and treeline (WL2) / hedgerow (WL1) habitat, composed of Ash (*Fraxinus excelsior*), Hawthorn (*Crataegus monogyna*), Sycamore (*Acer pseudoplatanus*), Blackthorn (*Prunus spinosa*), Gorse (*Ulex europaeus*) and Bramble (*Rubus fruticosus agg)*. The site is bordered to the north by a railway line which is not currently operational and is classified as buildings & artificial surfaces BL3 and the railway line does not support any uncommon habitats or species. Some small pockets of dry meadow and grassy verge GS2; species noted include False Oat Grass (*Arrhenatherum elatius*), Yorkshire Fog (*Holcus lanatus*), Cock's-foot *(Dactylis glomerata)* and Bush Vetch *(Vicia sepium)*.

An abandoned and dilapidated former dwelling (BL3) exists to the southwest of the converter station within an area of mixed broadleaved woodland (WD1) and scrub (WS1). A treeline of semi-mature Sycamore (*Acer pseudoplatanus*) runs north of the building. The dwelling is overgrown with scrub particularly Bramble and immature trees.

An attenuation pond will be constructed within a field of improved agricultural grassland (GA1) to the south of the converter station. The discharge pipeline from the attenuation pond will run parallel to an existing hedgerow (WL1) of hawthorn, blackthorn with some immature ash. The pipeline will cross through the hedge (Wl1) and pass through an existing pathway and a mosaic of scrub (WS1) and dry meadow and grassy verge (GS2) before discharging to the Newtown/ Kilmannock River (CW2).

Bank side vegetation in proximity to the discharge point include a mature oak, dense bramble scrub and a small area of broadleaved woodland with alder (*Alnus glutinosa)*) and willow (Salix sp.) This section of the river may support a brown trout population and flounder and mullet may also occur. No alluvial woodland was recorded.

Kingfisher were also recorded along this river approximately 1km upstream of the discharge location.

The preferred methodology for crossing the Newtown River is by micro-HDD, which will result in no direct effects on the watercourse. In the unlikely event that an open cut methodology is used, the following appraisal applies. Although no signs of otter were recorded at along this watercourse, a visual survey of the Newton River was carried out to assess habitat value for fish as this watercourse will be directly affected by site works and thus there could be an impact prey availability. At the crossing point, which will be crossed via an open cut methodology, the river is tidal with a mud substrate. It is a small stream, part of a network of drains within this area, which has been highly modified and has low potential as fish habitat. Detailed fish stock assessments of tidal habitats are not carried out as standard as they do not provide habitats for sensitive receptors such as salmonid spawning habitat or juvenile lamprey habitat. The distribution of certain estuarine species, such as Grey Mullet and Flounder which could be present, will vary with the tidal cycle which makes assessment problematic. Taking the worst-case scenario, the crossing of the Newtown River will result in a temporary loss of potential habitat and a temporary barrier to fish movement.

The Newtown River is a small highly modified habitat which does not provide high value habitat for fish species and a fish stock assessment was not considered necessary. The substrate consists of shallow mud with some marine shells noted. This is a small sluggish tidal stream with a soft sediment and no benthic invertebrate communities sensitive to siltation will occur. Any disturbance of sediment will have a negligible impact on benthic communities.

Likewise given the limited scale of the potential impact from the discharge of surface water via an attenuation pond and the strongly tidal nature of the receiving environment no significant impact on the Newtown River at the discharge location for surface water during operation will occur. This was discussed and agreed with Inland Fisheries Ireland (Donnachadh Byrne IFI pers. comm. December 2019).

The presence of Kingfisher along the Newtown River indicates that there may be some fish stocks within the overall river. Some species such as Stickleback may occur. Although stocks of European Eel are threatened this species still commonly occurs in small drains and streams. The habitat value for brown trout is low although the presence of occasional individuals cannot be completely discounted. Post construction there will be no residual ecological impact on fisheries habitat. A salvage operation will be carried out during construction and if fish are captured during the crossing works fish will be safely relocated.

The river is bounded by small, vegetated earth banks (BL2) and arable fields. Extensive growth of green algae was noted in sections. Species noted growing along the banks of the river include Great Willow herb (*Epilobium hirsutum*), Horsetail (*Equisetum spp*.), Reed Sweet-grass (*Glyceria maxima*), Meadowsweet (*Filipendula ulmaria*), Creeping Thistle (*Cirsium arvense*), Common Fleabane (*Pulicaria dysenterica*), Hard Rush (*Juncus inflexus*) and Sea Club-rush (*Bolboschoenus maritimus*). A Kingfisher (*Alcedo atthis*) was recorded flying in a southernly direction, along the river. Downstream of the railway the river widens with a more pronounced tidal influence (see **Photograph 9.3 and 9.4**).

Figure 9.4: General overview of habitats at the proposed converter station and tail station site | not to scale [mapping: © Google 2020]

Green: Improved agricultural grassland GA1, Red: Immature broadleaved woodland WS2, Yellow: Scrub WS1, Black: Buildings and artificial surfaces BL3, Pink: Tree line WL2/ Mixed broadleaved woodland WD1/ Scrub WS1, Orange: Recolonising bare ground ED3/ Buildings and artificial surfaces BL3/ Scrub WS1, Purple: Hedgerow WL1/ Scrub/ WS1/ Dry meadows and grassy verge GS2, Blue: Tidal river CW2/ Earth Banks (BL2).

9.3.7.2 Northern Off-road Route Between Great Island and Campile Estuary

The habitats within the off-road sections of the cable route and in proximity to it are indicated below in **Figure 9.5.** This section of the cable route will primarily impact on agricultural lands that are used for pasture (GA1) and arable crops (BC1) – refer to **Photographs 9.1** and **9.2**. Pasture and arable crop fields are highly modified habitats of low ecological value Small strips of transitional habitats, some of which loosely correspond to dry meadows and grassy verge (GS2) habitat, are which are low ecological value, can be found along the edges of the agricultural fields. Farm tracks within these habitats are classified as spoil and bare ground (ED2) and are of low ecological value.


Photographs 9.1 and 9.2: Examples of heavily-grazed, improved agricultural grassland and arable crops

A mosaic of habitats was noted growing along the railway embankment including mixed broadleaved woodland (WD1), with Hawthorn (*Crataegus monogyna*), Blackthorn (*Prunus spinosa*), Willow (Salix spp.), Sycamore (*Acer pseudoplatanus*) and Elder (*Sambucus nigra*). Areas of scrub (WS1), treeline (WL2) and hedgerow (WL1) habitats are also present. Small pockets of low-value, dry meadows and grassy verge (GS2) habitat were also noted. No direct interaction with the railway embankment is proposed, therefore a detailed botanical survey of this area was not carried out.

Fields within the off-road diversion areas have linear habitats along their boundaries. Treeline (WL2) and hedgerow (WL1) habitats dominate, with a range of species noted e.g. Ash (*Fraxinus excelsior*), Hawthorn (*Crataegus monogyna*), Blackthorn (*Prunus spinosa*), Gorse (*Ulex europaeus*), Elm (*Ulmus spp.*), Holly (*Ilex aquifolium*), Common Lime (*Tilia x europaea (T. cordata x platyphyllos*)), Beech (*Fagus sylvatica*), Pine (*Pinus spp.*), Cypress (*Cupressus spp.*), Elder (*Sambucus nigra*) and Oak (*Quercus robur)*. Only one large mature treeline (WL2) was noted. Blocks of mixed broadleaved woodland (WD1) were recorded at various locations, including a section on steep ground adjoining the Campile Estuary. Species noted include Oak (*Quercus robur)*, Beech (*Fagus sylvatica*), Alder (*Alnus glutinosa*), Ash (*Fraxinus excelsior*), Hawthorn (*Crataegus monogyna*), Holly (*Ilex aquifolium*), Birch (*Betula pubescens)*.Poplar (*Populus spp.*) and a small number of conifers. Large, mature trees were recorded within the woodland and along an entrance track to a farmyard (Buildings and artificial surfaces BL1).

Old stone walls (BL1), which were also recorded along the farm tracks, can provide a habitat for plants, mosses and lichens and can provide a habitat for insects, small birds and small mammals. Some common species were noted such as Herb-robert *(Geranium robertianum) and Ivy (Hedera helix)* however no rare or uncommon species were recorded and the loss of habitat will be very minor.

Within the off-road diversion area there are several drainage ditches (FW4). They are particular evident in the wider landscape, close to the converter station site, as much of this land is low lying and was reclaimed. These drainage ditches are artificial in origin and have been excavated to enhance drainage and control the flow of water within the agricultural land. The width and depth vary. The majority of these drainage ditches had at least some standing or running water and support aquatic vegetation including Water-starwort (*Callitriche spp*.), Fools Watercress (*Apium nodiflorum*), Branched Bur-reed (*Sparganium erectum*), Water Dock (*Rumex hydrolapathum*) and Common Reed (*Phragmites australis*). Stickleback (*Gasterosteus aculeatus*) were noted within a section of a drainage ditch to the southwest of the proposed cable route. A number of these drainage ditches have a hydrological connection to the Newtown River (Kilamannock Stream) (Tidal river - CW2).

Photograph 9.3: Newtown River in summer 2018 with sluggish flow noted.

Photograph 9.4: Newtown River crossing point in December 2019. Note greater depth due to heavy rainfall and high tide and die back of vegetation.

Figure 9.5: General overview of habitats - northern off-road area between Great Island and Campile River Estuary | not to scale [background mapping © Google 2020]

Dark green: Improved agricultural grassland GA1, Yellow: Arable crops BC1, Red: Hedgerow WL1/ Tree line WL2, Light green: Mixed broadleaved woodland WD1/ Tree line WL2, White: Stone walls and other stonework BL1/ Spoil and bare ground ED2, Light blue: Tidal river CW2/ Earth bank BL2, Blue dashed line: Drainage ditches FW4, Black: Buildings and artificial surfaces BL1, small pockets of Dry meadows and grassy verge GS2 of insufficient size to be mapped.

9.3.7.3 Campile River Estuary Crossing

It is proposed to use HDD to cross under the Campile River Estuary, at a depth of more than 10m below the riverbed. This methodology will avoid any direct effects on the river. HDD contractor compounds are proposed at either end of the Campile River Estuary crossing. See **Figure 9.6**.

Figure 9.6 Location of HDD crossing at the Campile River Estuary | not to scale [mapping: Bing Maps (c) Microsoft 2020]

The HDD compounds will be set back above mean high water springs (MHWS), within areas of improved agricultural grassland (GA1) used as pasture. The habitats within the proposed development area and in proximity to it are indicated in **Figure 9.7.**

The river channel has been considerably modified over time with the development of embankments (BL2) along the southern bank of the river to the west of Dunbrody Bridge. The river channel embankments were created to allow for the reclamation of intertidal habitats.

Photographs 9.5 and 9.6: The proposed crossing area underneath the Campile River estuary with associated habitats, west of Dunbrody Bridge and north of the railway line

The embankment along the southern bank of the river to the west of Dunbrody Bridge separates the Campile River from an area of improved, heavily grazed agricultural grassland (GA1). The embankment itself, while showing some signs of grazing, is more diverse with Sea Couch (*Elytrigia atherica*), False Oat-grass (*Arrhenatherum elatius*), Nettle (*Urtica dioica*), Bindweed (*Calystegia spp*.) and Bramble (*Rubus spp*.) recorded.

This section of the Campile River Estuary, which is tidal (CW2), with regular fluctuations in salinity and turbidity, and in the rate and direction of water flow, is located within the River Barrow and River Nore SAC. Upper salt marsh (CM2) habitat, which will be unaffected by the proposed development, is present along the Campile River channel (**Photographs 9.5** and **9.6**) in association with areas of mudflat habitat. Floral composition varies. The invasive species Common Cordgrass (*Spartina anglica*) which can cause habitat loss and degradation has become abundant in places. Other species noted include Sea Club-rush (*Bolboschoenus maritimus*), Creeping Bent (*Agrostis stolonifera*), Sea Aster (*Aster tripolium*), Orache (*Atriplex Patula*.) and Sea Plantain (*Plantago maritima*). There is some evidence of grazing by cattle within this habitat.

A band of mixed broadleaved woodland WD1/ Treelines WL2/ Hedgerows WL1, and Scrub WS1 occur to the south of the river. This woodland does not correspond to the Annex I habitat alluvial woodland. Situated to the north of this section of the Campile River Estuary is a band of Mixed broadleaved woodland (WD1/ conifer woodland WD3. Species noted include Ash (*Fraxinus excelsior*), Oak (*Quercus robur*.), Downy Birch (*Betula pubescens),* Scots Pine (*Pinus sylvestris*), Sycamore (*Acer pseudoplatanus*) and Hawthorn (*Crataegus monogyna*). Scattered throughout the habitat are several large mature trees (conifer and broadleaved) which have nesting and bat roost potential. Many of these trees contain natural holes, cracks/splits in major limbs, loose bark, hollows/cavities and dense epicormic growth. Trees, especially native ones, also play host to numerous insect species which are prey items for both bird and bat species. Large mature trees within a woodland habitat are of importance as they can provide essential refuge and breeding sites for many species of mammals and birds, as well as for many invertebrates.

By virtue of size, large mature trees provide more food resources and nesting resources than younger trees. Further detail is provided in the tree survey report which is attached as **Appendix 9.5.** A small area of Recolonising bare ground (ED3)/ Scrub (WS1) was recorded on the northern periphery of the woodland.

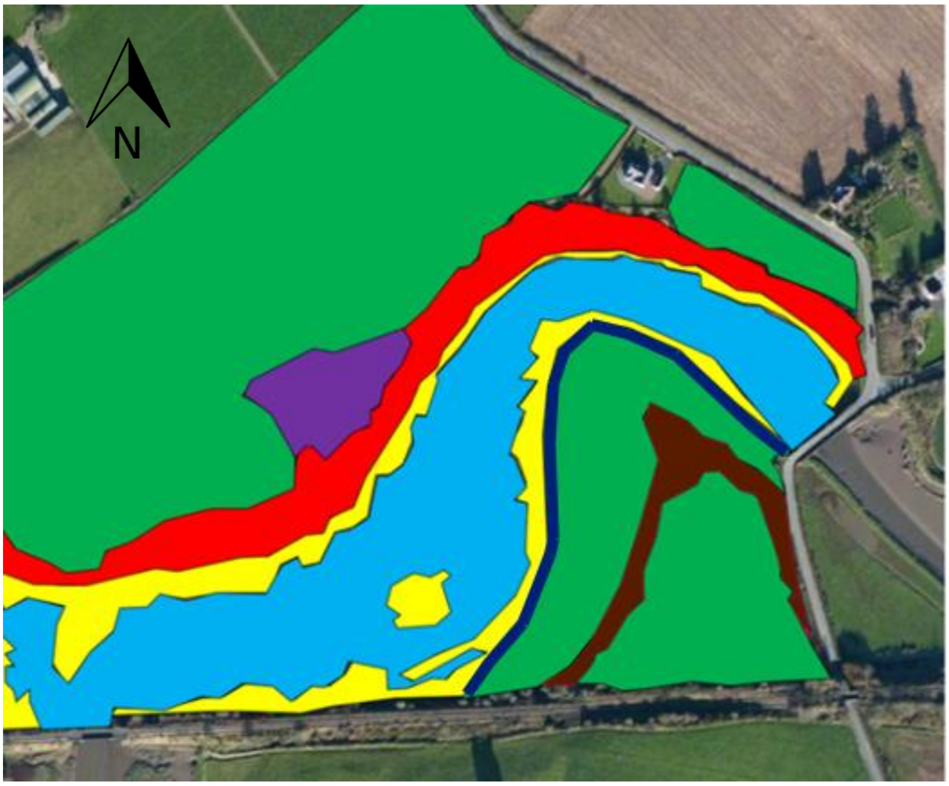


Figure 9.7: General overview of habitats at the Campile River Estuary | not to scale [background mapping © Google 2020]

Light blue: Tidal river CW2, Yellow: Upper salt marsh CM2, Red: Mixed broadleaved/ Conifer Woodland WD2, Purple: Recolonising bare ground ED3/ Scrub WS1, Brown: Mixed broadleaved woodland WD1, Tree lines W2, Hedgerows WL1/ Scrub WS1, Dark green: Improved agricultural grassland GA1, Dark blue: Embankment BL2

9.3.7.4 Baginbun Beach Landfall Site and Roadside Car Parking Area

Baginbun Beach is located to the north of Carnivan Bay on the Baginbun peninsula facing north east and accessed via a 'cul-de-sac' access road, approximately four metres wide and 450 metres in length. Five private properties, improved agricultural grassland (GA1) and arable land (BC1) are accessed from this road. At the end of the access road there is space for approximately three vehicles and a gravel access track leading to the beach. The access track is approximately 3.5m wide with grass verges. The proposed works in this area are described in detail in **Chapter 3** *Proposed Development* and **Chapter 4** *Construction Activities*. The habitats within the proposed development area and in proximity to it are indicated in **Figure 9.8.**

Baginbun beach itself is a sand shore (LS2) which is sheltered by Baginbun Head. Patches of bedrock with fucoids are exposed during low tide, while some small scattered patches of Sea Sandwort (*Honkenya peploides*) occur near the strandline.

Sea cliffs can be broadly divided into two categories: hard (or rocky) cliffs and soft (or sedimentary) cliffs, both of which are covered by the Annex I habitat '*vegetated sea cliffs of the Atlantic and Baltic coasts*'. Hard cliffs are composed of rocks such as limestone, sandstone, granite or quartzite which are hard and relatively resistant to mechanical erosion. Soft cliffs are composed of softer rock, such as shale, or unconsolidated material, such as glacial till. Vegetation of hard sea cliffs in exposed situations exhibits a strong maritime influence and is relatively stable. Soft cliff habitats are more prone to slope failure, which results in the presence of fast-colonising pioneer species.

The offshore cable to the landfall site is located within Hook Head SAC for which Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] are listed as a qualifying interest. Sea cliffs on the Irish coast approximately correspond to the EU Annex I habitat Vegetated sea cliffs of the Atlantic and Baltic coasts (1230). HDD drilling under the cliffs is proposed and no effect on sea cliffs will occur.

The beach is flanked by sea cliffs to the west and south, with the coastal waters of the Celtic Sea to the east and north. The southern cliff faces that extend along Baginbun Head are categorised as hard cliffs (CS1) with exposed rock faces evident. The splash zone is characterised by fucoids and lichens, including Black Tar lichen (*Verrucaria spp.*), Yellow Leafy lichen (*Xanthoria spp.*) and Orange Sea lichen (*Caloplaca spp.*) patches. Higher up, vascular plants become more prevalent within the crevice and ledge community; however exposed rock still dominates. Species noted include Thrift (*Armeria maritima*), Sea Mayweed (*Tripleurospernum maritima*), Sea Beet (*Beta vulgaris ssp. Maritima*), Sea Plantain (*Plantago maritima*) and Common Scurvygrass (*Cochlearia officinalis agg.*). The top of the sea cliff is dominated by low-lying scrub (WS1) habitat composed of Bramble (*Rubus fruticosus agg.*), Bracken (*Pteridium aquilinum*) and spinose plants such as Blackthorn (*Prunus spinosa*) and Gorse (*Ulex europaeus*). Ivy (*Hedera helix*) is also abundant.

To the north along the western periphery of the beach, the cliff transitions to a soft (sedimentary) cliff (CS3) for approximately 150m.

This section of cliff is generally more unstable than the surrounding cliff faces. A large section shows signs of recent slope failure. This area of soft cliff is entirely vegetated and is largely dominated by Bramble and Bracken. Hogweed (*Heracleum sphondylium*) is abundant in places. Other species noted include the non-native amber listed invasive species Montbretia *(Crocosmia* × *crocosmiflora*), Honeysuckle (*Lonicera periclymenum*), patches of stunted Blackthorn and Gorse scrub and Field Horestail (*Equisetum arvense*).

North of the slipway, sea cliff habitat includes grasses e.g. Red fescue (*Festuca rubra*), and patches of Ivy and Bramble scrub. Other species noted include Thrift, Silverweed (*Potentilla anserine*), Sea Mayweed, Sea Plantain, Knapweed (*Centaurea* nigra) and umbellifer species.

Adjoining the beach are heavily vegetated cliffs of moderate height (<15m) with only minor signs of erosion on the northern side of the beach. At the base of the cliffs on the southern side, there is the remains of a large stepped concrete structure (**Photographs 9.7** to **9.10**).

During consultations with Wexford County Council, Greenlink Interconnector Limited agreed to construct car-parking facilities near Baginbun Beach as an element of community gain for the project. A strip of land on the north side of the approach road will be purchased which will allow the road to widened to an overall width of 12m. There will be a 3m wide parking bay on both sides and two 3m wide vehicular lanes. Approximately 54 parking spaces will be provided, with parallel parking along both sides of the road. This will impact on low-value habitats, namely a narrow strip of Improved grassland GA1 and narrow band of bramble scrub WS1 on a raised bank running alongside the road.

Photographs 9.7 to 9.10: Photograph 9.7 shows the Sand shore (LS2) at Baginbun Beach. Photograph 9.8 shows an area of hard cliff (CS1) along Baginbun Head.

Photograph 9.9 shows a soft (sedimentary) sea cliff (CS3) section south of the slipway. Photograph 9.10 shows the section of cliff north of the slipway (CS1/CS3).

Figure 9.8: General overview of terrestrial/ intertidal habitats at Baginbun Beach | not to scale

Red: Rocky sea cliff CS1/ Sedimentary sea cliff CS3, Yellow: Sand shores LS2, Orange: Buildings and artificial surfaces BL3/ Spoil and bare ground ED2, Green: Improved agricultural grassland GA1, Purple: Arable crops BC1.

Figure 9.10 Proposed roadside parking area near Baginbun Beach | not to scale
Yellow=Improved agricultural grassland GA1, Pink= Scrub WS1

9.3.7.5 Minor off-road areas adjacent to roads

There will be impacts on small areas of farmland in proximity to the proposed route where it runs within the existing road network. These small off-line areas facilitate the cable route at difficult locations such as tight corners. Generally, these areas are small and do not support habitats of particular value. A temporary contractor's compound will also be constructed in the townland of Lewistown, near Dollar Bay. As indicated in **Figures 9.9** to **9.12**, the habitats (Improved agricultural grassland GA1 and Arable crop BC1) within these areas are common and of low ecological value.

Species noted within improved agricultural grassland include common grassland species with Perennial Ryegrass (*Lolium Perenne*) dominant. Herbaceous species are generally limited in extent and include common species such as Borad leaved Dock (*Rumex obstusifolius*), Daisy (*Bellis perennis*) and Creeping Thistle (*Cirsium arvense*). Arable land is cultivated on an ongoing basis and herbicide use generally suppresses floral diversity. Common species noted, which are generally early sucessional species, include Groundsel (*Senecio vulgaris*), Prickly Sow Thistle (*Sonchus asper*) and Fumitory (*Fumaria officinalis*).

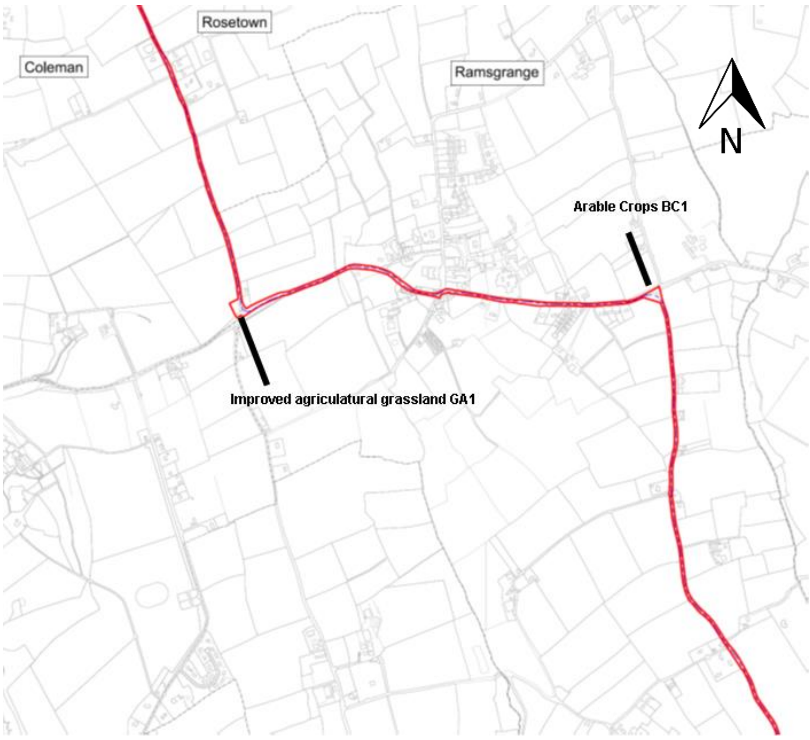


Figure 9.9 Minor off-road diversions near Ramsgrange | not to scale

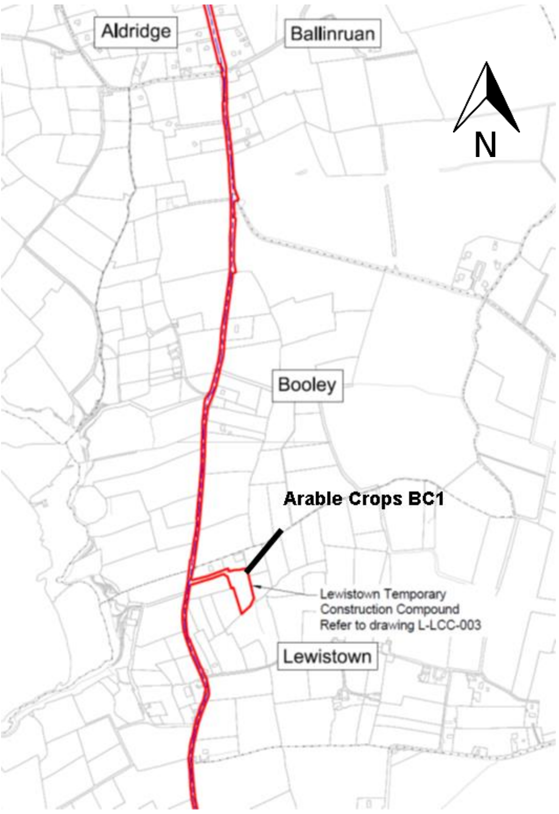


Figure 9.10 Off-road area - contractor's compound at Lewistown | not to scale

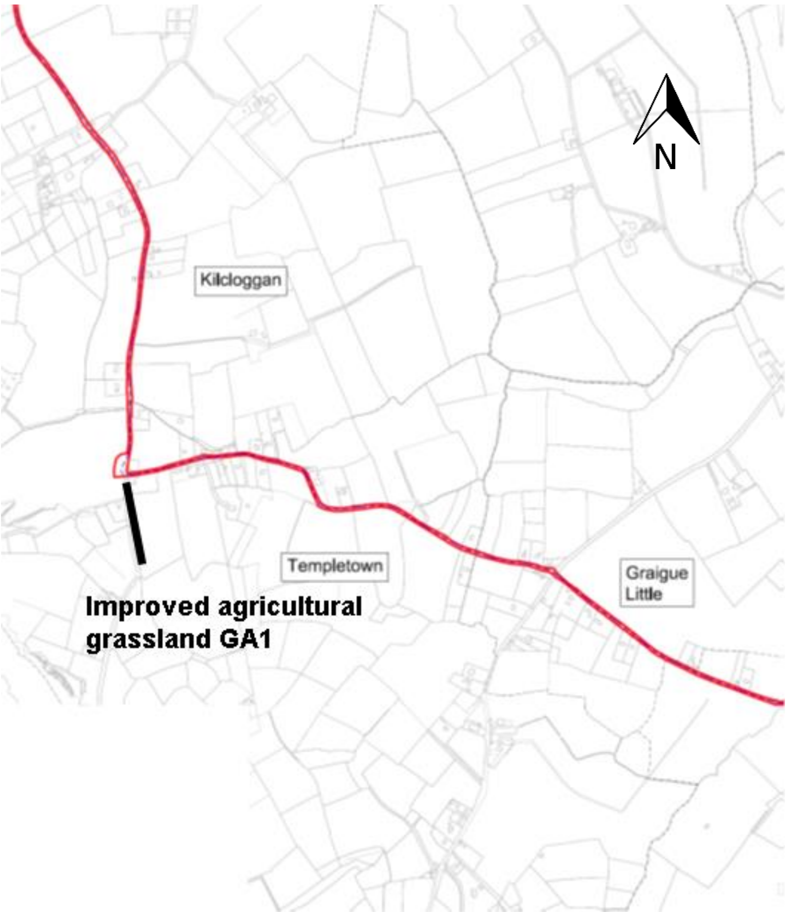


Figure 9.11 Off-road area at Templetown | not to scale

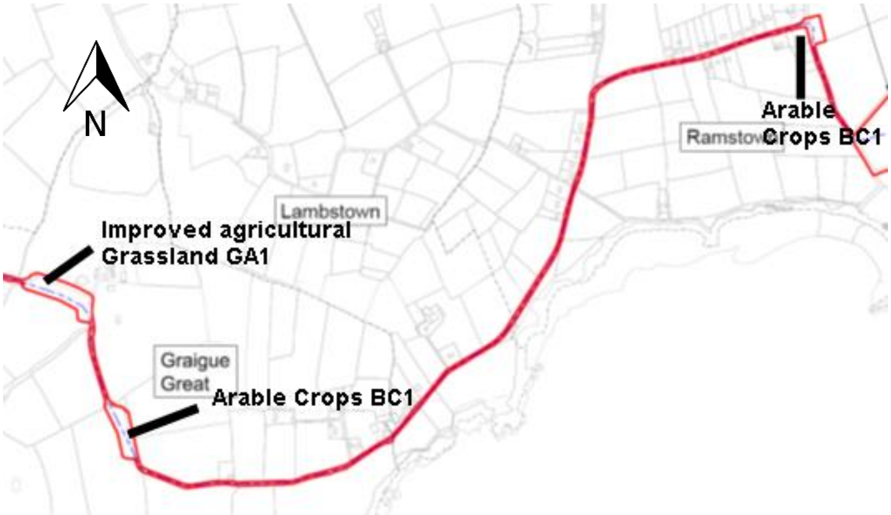


Figure 9.12 Off-road area - Graigue Great and Ramstown | not to scale

9.3.7.6 Cable route within roads, footpaths and verges

The proposed cable route will primarily affect existing public roads (BL3). Most of the proposed route will be laid within the local road networks including the R733, L4050 and the L4045. Refer to **Chapter 3** *Proposed Development* for the location and extent of the cable route along the roadway.

The width and length of each road varies, as do the adjoining habitats (See **Photographs 9.1** and **9.2**). Roads are man-made features with minimal ecological value and the usage of existing roads will ensure that ecological effects are minimised. This is a 'mitigation by avoidance' measure.

The roads are bordered by linear habitats, with hedgerows (WL1), which were planted to provide stock-proof barriers and field boundaries, the dominant linear feature along the local roads. Height, width, structure, composition and ecological value varies throughout (See **Photographs 9.11** and **9.12**). In general, the hedgerows are machine cut and over managed which limits their ecological value. The most common species are Hawthorn (*Crataegus monogyna*), Bramble (*Rubus fruticosus agg.*), Ash (*Fraxinus excelsior*), Ivy (*Hedera helix*), Gorse (*Ulex europaeus*) and Elder (*Sambucus nigra*). Many occur on raised banks of earth that derived from the excavation of adjoining drainage ditches (FW4). The invasive species Winter Heliotrope (*Petasites fragrans*) is very common along road verges.

Although less common there are examples of well-managed, mature, hedgerow habitats, that provide a range of habitats for invertebrates, birds and mammals. Higher numbers of passerine bird species were noted in these hedges. These higher value sections support older hedgerow trees which are of a greater ecological value due to their potential to provide nesting and roosting habitat.

The disturbances of roadside hedgerows, if it were to occur, could potentially cause disruption to hedgerow root systems. However, most of the hedgerows potentially affected are of a moderate value at a local level and any potential effect can be avoided with proper planning and implementation of mitigation measures.

Photographs 9.11 and 9.12: Variation in the linear hedgerow structures and management encountered along the cable route. Photograph 9.12 shows well-managed, mature, hedgerow habitat, that provides ideal habitat for a range invertebrate, bird and mammal species

Several generally small to moderate sized treelines (WL2) were also recorded along the periphery of roads. Generally, these treelines are composed of native deciduous semi-mature trees such as Ash (*Fraxinus excelsior*). However, several spruce treelines were also noted. There are a small number of woodland habitats adjoining roads along the route.

Examples include a broadleaved woodland (WD1) composed of a mosaic of plantation and naturally occurring mature trees at grid reference N52˚13'30.5", W006˚54'07.0". Treelines and woodland edge of which are of local significance are mapped in the tree survey report which is attached as **Appendix 9.5**.

Modern and older stone walls (BL3/BL1) were recorded along sections of the proposed route. These varied in terms of physical structure and composition (type of stone, presence of mortar), age and the degree of maintenance. These habitats are of low value for wildlife and will either be avoided or rebuilt post construction.

The cable will be laid predominantly within existing roads which cross small bridges or culverts are various locations. The following small watercourses are crossed by roads within which the cable will be laid and these watercourses (Saltmills, Ballyhack, Clonsharragh and Curroughmore) ultimately discharge to the estuary within the River Barrow and River Nore SAC. The Graigue Little and Graigue Great watercourses are crossed by the proposed route and ultimately discharge to estuary within the Bannow Bay SAC. These are small streams which are of limited ecological value but could potentially support fish species such as brown trout and eel and will support invertebrate species. They are of insufficient size to be of significant value for otter or other piscivorous species. There will be no discharge of surface water arising from site works into any of these streams. Given the low risk associated with works within the road network, and the dilution provided within the estuarine environment, the impact on aquatic ecology is predicted to be negligible. The impact on European sites and proposed Natural Heritage Areas is also predicted to be negligible.

A mature stand of Japanese knotweed was recorded approximately 35m east of the Templars Inn carpark, within a hedgerow habitat located along the road verge. Details on the distribution of invasive species is provided in **Section 9.3.9.7**.

9.3.8 Habitats - Ecological Value

The ecological value of habitats has been defined using the classification scheme outlined in the *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (National Roads Authority, 2009) which is included in **Appendix 9.1.** It should be noted that the value of a habitat is site specific and will be partially related to the amount of that habitat in the surrounding landscape. Habitats that are considered to be good examples of Annex I and Priority habitats are classed as being of International or National Importance. Semi-natural habitats with high biodiversity in a county context and that are vulnerable, are considered to be of County Importance. Habitats that are semi-natural, or locally important for wildlife, are considered to be of Local Importance (higher value) and sites containing small areas of semi-natural habitat or maintain connectivity between habitats are considered to be of Local Importance (lower value). The habitats to be potentially affected by the proposed development and their ecological value are described below in **Table 9.3.**

Table 9.3. Habitats potentially affected by the proposed development and their relative value

Converter Station and Tail Station Site and Adjacent Lands		
Habitat	**Comments**	**Ecological value (NRA guidelines)**
Buildings and artificial surfaces (BL3)	Derelict building. This is a man-made habitat, with low species diversity of minimal ecological value.	Local importance (Lower value).
Recolonising bare ground ED3/ Buildings and artificial surfaces BL3/ Scrub WS1	This is a modified habitat with limited value for local wildlife.	Local importance (Lower value).
Improved agricultural grassland (GA1)	This is a highly modified habitat with limited value for local wildlife.	Local importance (Lower value).
Immature woodland (WS2)	This habitat is of a low ecological value at local level and is largely fragmented from similar habitats in the surrounding landscape.	Local importance (Lower value).
Scrub (WS1)	Scrub can be of value to wildlife by providing nesting sites for birds, cover for small mammals and foraging habitat for birds and invertebrates. Birds use scrub to nest or shelter in, birds feed on invertebrates found in scrub and feed on berries from hawthorn, blackthorn, elder, spindle and bramble; they also act as seed dispersers for these shrub species. The berries are particularly important as a source of winter food to both migratory species and resident species.	Local importance (Higher value).
Hedgerow (WL1)/Scrub (WS1)/ Dry meadow and grassy verge (GS2)	Native hedgerows provide habitats for local wildlife such as birds, insects, mammals and commuting routes and nesting habitat. They can also act as linking corridors between habitat patches. Dry meadow and grassy verge (GS2) corresponds to the Habitats Directive Annex I habitat: 'lowland	Local importance (Low to Higher value).

	hay meadows *(Alopecurus pratensis, Sanguisorba officinalis)* (6510)'. However, the dry meadow and grassy verge habitat within the site is very sporadic and small in size. It does not represent a valuable example of this Annex 1 habitat type.	
Mixed broadleaved woodland (WD1)/ Scrub (WS1)/ Tree line (WL2)	Of value to wildlife particularly in an intensively farmed landscape.	Local importance (Higher value).
Tidal River CW2/ Earth bank (BL2)	Small heavily modified watercourse.	Local importance (Higher value).
Northern Off-road Area between Great Island and the Campile Estuary		
Habitat	**Comments**	**Ecological value (NRA guidelines)**
Improved agricultural grassland (GA1)	This is a highly modified habitat with limited value for local wildlife.	Local importance (Lower value).
Arable crop (BC1)	This is a highly modified habitat with limited value for local wildlife.	Local importance (Lower value).
Hedgerow (WL1)/ Tree line (WL2)	Hedgerows, particularly if native, provide important habitats for local wildlife such as birds, insects, mammals and commuting routes and nesting habitat. They also act as linking corridors between habitat patches. Generally, the hedgerows to be impacted are of poor quality. This habitat will be largely unaffected by the proposed works.	Local importance (Higher value).
Dry meadow and grassy verge (GS2) (of insufficient size to be mapped)	Dry meadow and grassy verge (GS2) corresponds to the Habitats Directive Annex I habitat: 'lowland hay meadows *(Alopecurus pratensis, Sanguisorba officinalis)* (6510)'. However, the dry meadow and grassy verge habitat within the site is very sporadic and limited in extent. It does not represent a valuable	Local importance (Lower value).

	example of this Annex 1 habitat type.	
Buildings and artificial surfaces (BL3)	Existing farms and buildings. This is a man-made habitat, with low species diversity of minimal ecological value.	Local importance (Lower value).
Mixed broadleaved woodland (WD1) / Treeline (WL2)	Woodland can provide important habitats for local wildlife such as birds, insects, mammals including bats. This habitat also provides ecological corridors between features of higher ecological value. Large mature trees within a woodland habitat are of particular importance as they can provide essential refuge and breeding sites for many species of mammals and birds, as well as for many invertebrates. By virtue of size, large mature trees provide more food resources and nesting resources than younger trees, in addition, to more protection for flora and fauna from inclement weather.	Local importance (Higher value).
Stone walls and other stonework (BL1)/ Spoil and other bare ground (ED2)	Farm tracks are of minimal ecological value. The stone walls vary in terms of physical structure and composition (type of stone, presence of mortar), age and the degree of maintenance. Older and more neglected structures are generally the most important for wildlife.	Local importance (Lower value)
Drainage ditch (FW4)	Man-made habitat associated with hedgerow/treeline habitats. It is a highly modified habitat which provides arterial drainage.	Local importance (Lower value)
Tidal river (CW2)/ Earth banks (BL2)	The Newtown River acts as a natural wildlife corridor. Otter (Habitats Directive Annex II species) and Kingfisher (Birds Directive Annex I species) were recorded along the	Local importance (Higher value).

	Newtown River. The river flows to the River Barrow & River Nore SAC approximately 375m downstream of the proposed crossing point. Tidal rivers correspond approximately to the annexed habitat, 'estuaries (1130)''. However, this is a relatively small stream which has been heavily modified.	
Campile River Estuary Crossing		
Habitat	**Comments**	**Ecological value (NRA guidelines)**
Tidal rivers (CW2)	The Campile River Estuary is located within the River Barrow and River Nore SAC and therefore is of international importance.	International importance.
Upper salt marsh (CM2)	This habitat is located within the River Barrow and River Nore SAC and therefore is of international importance. The habitat has links to the Annex I habitat 'Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) (1330)'	International importance.
Mixed broadleaved woodland (WD2)/conifer woodland (WD3)	Woodland can provide important habitats for local wildlife such as birds, insects, mammals including bats. This habitat also provides ecological corridors. Large mature trees within a woodland habitat are of particular importance as they can provide essential refuge and breeding sites for many species of mammals and birds, as well as for many invertebrates. By virtue of size, large mature trees provide more food resources and nesting resources than younger trees, in addition, to more protection for flora and	The River Barrow and River Nore SAC (where this habitat is located) is classified as being of international value. However, the habitat itself is relatively common and is not listed as a qualifying habitat for the SAC. Therefore, it is classified as being of Local importance (Higher value).

	fauna from inclement weather. Badger (*Meles meles*), was recorded within this woodland habitat.	
Mixed broadleaved Woodland (WD1)/ Tree lines (WL2)/ Hedgerows (WL1)/ Scrub (WS1)	This can provide important habitats for local wildlife such as birds, insects, and mammals including bats. This habitat also provides ecological corridors.	The River Barrow and River Nore SAC (where this habitat is located) is classified as being of international value. However, the habitat itself is relatively common and is not listed as a qualifying habitat for the SAC. Therefore, it is considered to be of Local importance (Higher value).
Improved agricultural grassland (GA1)	This is a highly modified habitat with limited value for local wildlife.	The River Barrow and River Nore SAC (where this habitat is located) is classified as being of international value. However, the habitat itself is not listed as a qualifying habitat for the SAC. Therefore, it is considered to be of Local importance (Lower value).
Recolonising bare ground (ED3)/ Scrub (WS1)	A relatively small area of modified habitat.	Although the area in which this species occurred is classified as being of national value (within the Barrow River Estuary boundary), the habitat itself is considered to be of Local importance (Lower value).
Embankment (BL2)	Dominated by grassland with some estuarine species.	The River Barrow and River Nore SAC (where this habitat is located) is classified as being of international value. However, the habitat is not listed as a qualifying habitat for the SAC. Therefore, it is considered to be of Local importance (Lower value).
Baginbun Beach Landfall Site and Car Parking		
Habitat	**Comments**	**Ecological value (NRA guidelines)**
Rocky sea cliffs (CS1) / Sedimentary sea cliffs (CS3)	This habitat occurs within the Hook Head SAC and corresponds to the EU Annex I habitat 'Vegetated sea cliffs of the Atlantic and Baltic coasts (1230)'.	International importance.

Sand shores (LS2)	This habitat occurs within the Hook Head SAC	International importance.
Buildings and artificial surfaces (BL3) / Spoil and bare ground (ED2)	This is a highly modified habitat, with low species diversity and is of minimal ecological value.	Local importance (Lower value).
Improved agricultural grassland (GA1)	This is a highly modified habitat with limited value for local wildlife.	Local importance (Lower value).
Arable crop (BC1)	This is a highly modified habitat with limited value for local wildlife.	Local importance (Lower value).
Scrub (WS1)	Low-value habitat dominated by bramble.	Local importance (Lower value).
Minor off-road areas adjacent to Roads		
Habitat	Comments	Ecological value (NRA guidelines)
Arable crop (BC1)	This is a highly modified habitat with limited value for local wildlife.	Local importance (Lower value).
Improved agricultural grassland (GA1)	This is a highly modified habitat with limited value for local wildlife.	Local importance (Lower value).
Cable route within roads, footpaths and verges		
Habitat	Comments	Ecological value (NRA guidelines)
Buildings and artificial surfaces (BL3)/ Stone walls and other stonework (BL1)	This is a highly modified habitat, with low species diversity and minimal ecological value.	Local importance (Lower value).
Hedgerows (WL1)/ Tree lines (WL2)	Can provide habitats for local wildlife such as birds, insects, and mammals including bats. This habitat also provides ecological corridors.	Local importance (Higher value).

9.3.9 Flora

The proposed development lies within Ordnance Survey National Grid 10km squares S61, S71, S70 and S80 as detailed below:

- Grid square S61 - proposed converter station site and the western section of cable route

- Grid square S71 - Eastern section of the off-road cable route (as described in **Chapter 3**), the Campile River Estuary crossing and the northern section of the cable route within artificial surfaces i.e. in roads, footpaths and verges.
- Grid square S70 - Southern section of the cable route within artificial surfaces i.e. in roads, footpaths, Lewistown Compound and verges.
- Grid square S80 - Baginbun Beach landfall site.

The NPWS rare plant database notes the presence of the following protected plant species within grid squares S61, S71, S70 and S80 **(Table 9.4)** These species were not recorded within the study area during site surveys. Refer to **Figure 9.13**. Site surveys were conducted during the optimum time period to record these species if present.

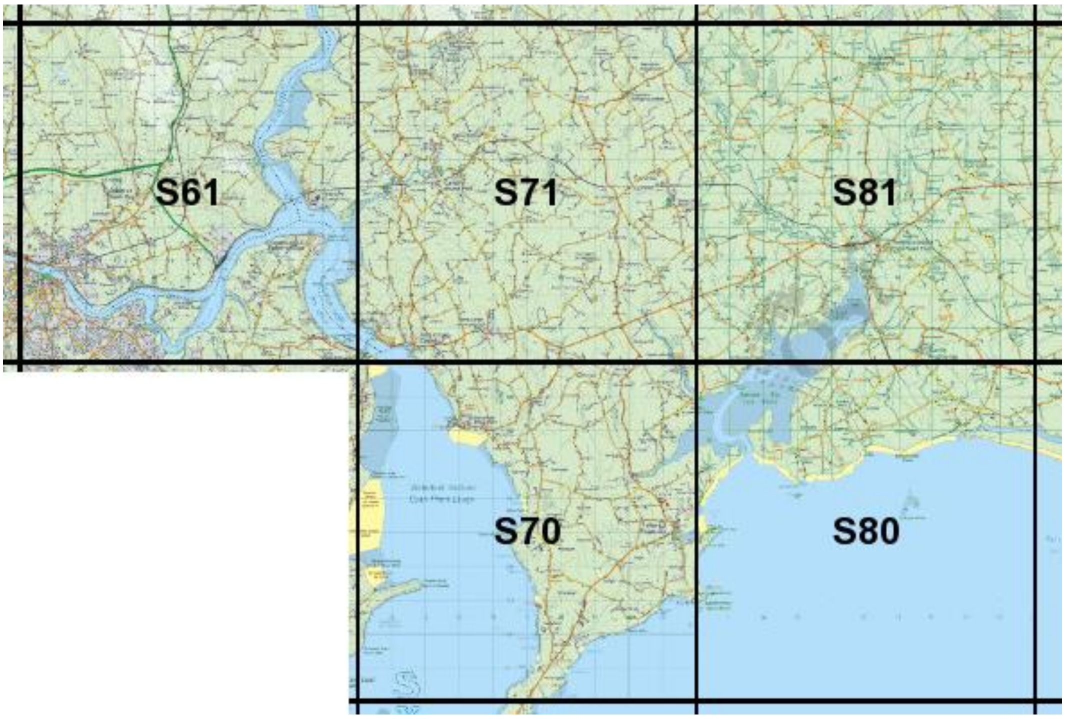


Figure 9.13 10km Grid Zones | source © OSi 2020 | not to scale

Table 9.4: Protected species listed by the NPWS as occurring within grid squares S61, S71, S70 and S80

Grid Square	Flowering plant Species	Latin Name
S61, S71	Tufted Salt-marsh Grass	*Puccinellia fasciculata*
S61	Opposite-leaved Pondweed	*Groenlandia densa*
S61, S71	Meadow Barley	*Hordeum secalinum*
S61, S71, S80	Betony	*Stachys officinalis*
S71, S70	Clustered Clover	*Trifolium glomeratum*
S71	Basil Thyme	*Acinos arvensis*
S70	Penny Royal	*Mentha pulegium*
S70	Lesser Centaury	*Centaurium pulchellum*

S80	Wild Asparagus	*Asparagus officinalis ssp. prostratus*
S80	Cottonweed	*Otanthus maritimus*

The National Biodiversity Data Centre (NBDC) online database provides data on the distribution of mammals, birds, and invertebrates within the 10km grid squares. Some 796 flowering plants are listed by the NBDC as present in grid squares S61, 745 flowering plants are listed as present in the grid square S71, 686 flowering plants are listed as present in the grid square S70 and 564 flowering plants are listed as present in the grid square S80. **Table 9.5** lists threatened species and designations. Given that the habitat types within the proposed development area are common, no rare species would be expected to occur and no rare species were recorded during the site surveys.

Table 9.5: NBDC flowering and endangered flowering plants

Grid Square	Flowering plant Species	Latin Name	Designations
S61, S71	Borrer's Saltmarsh-grass	*Puccinellia fasciculata*	Flora (Protection) Order, 2015. Threatened Species: Vulnerable
S61, S71	Chives	*Allium schoenoprasum*	Flora (Protection) Order, 2015. Threatened Species: Vulnerable
S61, S71	Divided Sedge	*Carex divisa*	Flora (Protection) Order, 2015. Threatened Species: Regionally Extinct
S61, S71	Meadow Barley	*Hordeum secalinum*	Flora (Protection) Order, 2015. Threatened Species: Endangered
S61, S71, S70, S80	Sharp-leaved Fluellen	*Kickxia elatine*	Threatened Species: Endangered
S61	Weasel's-snout/ Lesser Snapdragon	*Misopates orontium*	Flora (Protection) Order, 2015. Threatened Species: Endangered
S71	Betony	*Stachys officinalis*	Flora (Protection) Order, 2015. Threatened Species: Endangered
S71, S70	Clustered Clover	*Trifolium glomeratum*	Flora (Protection) Order, 2015. Threatened Species: Endangered
S71	Little-robin	*Geranium purpureum*	Threatened Species: Endangered
S71	Nettle-leaved Bellflower	*Campanula trachelium*	Threatened Species: Endangered
S70	Corky-fruited Water-dropwort	*Oenanthe pimpinelloides*	Threatened Species: Vulnerable
S70, S80	Henbane	*Hyoscyamus niger*	Threatened Species: Vulnerable
S70	Lesser Centaury	*Centaurium pulchellum*	Flora (Protection) Order, 2015. Threatened Species: Endangered
S70	Pennyroyal	*Mentha pulegium*	Flora (Protection) Order, 2015. Threatened Species: Endangered
S70, S80	Perennial Glasswort	*Sarcocornia perennis*	Flora (Protection) Order, 2015. Threatened Species: Endangered

S70	Wild Clary	*Salvia verbenaca*	Threatened Species: Vulnerable
S80	Corncockle	*Agrostemma githago*	Threatened Species: Regionally Extinct
S80	Cornflower	*Centaurea cyanus*	Threatened Species: Regionally Extinct
S80	Green-winged Orchid	*Orchis morio*	Threatened Species: Endangered
S80	Wild Asparagus	*Asparagus officinalis ssp. prostratus*	Flora (Protection) Order, 2015. Threatened Species: Vulnerable

9.3.10 Fauna

9.3.10.1Otter (Lutra lutra)

Otters, along with their breeding and resting places are protected under the provisions of the Wildlife Act 1976-2018, as amended. Otters have additional protection because of their inclusion in Annex II and Annex IV of the Habitats Direct which is transposed into Irish law in the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I 477 of 2011), as amended. Otters are also listed as requiring strict protection in Appendix II of the Berne Convention on the Conservation of European Wildlife and Natural Habitats and are included in the Convention on International Trade of Endangered species (CITES). Otters are listed as a conservation objective for the River Barrow and River Nore SAC.

Although rare in parts of Europe, they are widely distributed in the Irish countryside in both marine and freshwater habitats. Otters are solitary and nocturnal and as such are rarely seen. Thus, surveys for otters rely on detecting signs of their presence. These include spraints (faeces), anal gland secretions, paths, slides, footprints and remains of prey items.

Spraints are of value as they are used as territorial markers and are often found on prominent locations such as grass tussocks, stream junctions and under bridges. In addition, they are relatively straightforward to identify.

Otters occasionally dig out their own burrows but generally they make use of existing cavities as resting places or for breeding sites. Suitable locations include eroded riverbanks, under trees along rivers, under fallen trees, within rock piles or in dry drainage pipes or culverts etc. If ground conditions are suitable, the holt may consist of a complex tunnel and chamber system. Otters often lie out above ground especially within reed beds where depressions in the vegetation called “couches” are formed. (NRA, 2005b). Generally, holts or resting areas can be located by detecting signs such as spraints or tracks.

In contrast natal holts which are used by breeding females can be extremely difficult to locate. They are often located a considerable distance from any aquatic habitats and otters may also use habitats adjoining small streams with minimal or no fish populations. In addition, natal holts are usually carefully hidden and without obvious sprainting sites. Otters do not have a well-defined breeding season.

Otters are largely nocturnal, particularly in areas subject to high levels of disturbance as evidenced by the presence of otters in the centre of Cork and Limerick City. Thus, otters can adapt to increased noise and activity levels; however, breeding holts are generally located in areas where disturbance is lower. A review of existing records within the 10km radius grid squares (S61, S71, S70, S80) showed that otter or signs of otter have been recorded on numerous occasions. Otter activity was recorded near sections of the cable route i.e. at Baginbun Beach, at Cheekpoint and at Barrow Bridge close to the existing Great Island Power Station.

Dixon.Brosnan Environmental Consultants carried out otter surveys at the Campile River Estuary crossing and at Baginbun Beach in 2018 and 2019 within 150m of proposed site works. There is no optimum time period during which to carry out otter surveys.

Higher search effort was focused in areas that typically have a higher probability of otter activity (i.e. mature riparian treelines, bridge abutments, embankments, areas bounded by scrub, open grassy promontories, mud and sand habitat).

Surveys by DixonBrosnan recorded otter spraints at three locations in proximity to the Campile River Estuary. (**Figure 9.14**). A live otter was recorded during a bat survey at Dunbrody Bridge. Fresh otter tracks were noted along Baginbun Beach in March 2019 (**Photograph 9.13**). No holts or couches were recorded in proximity to the proposed site works.

Figure 9.14: Locations of otter spraint (blue shade) near and along the Campile River Estuary | not to scale

Photograph 9.13: Otter tracks recorded on Baginbun Beach

9.3.10.2Bats

In Ireland, nine species of bat are currently known to be resident. These are classified into two Families: the Rhinolophidae (Horseshoe bats) and the Vespertilionidae (Common bats). The lesser horseshoe bat *Rhinolophus hipposideros* is the only representative of the former Family in Ireland. All the other Irish bat species are of the latter Family and these include three pipistrelle species:

- Common *Pipistrellus*,
- Soprano *P. pygmaeus* and
- Nathusius' *P. nathusii*,

four *Myotids*:

- Natterer's *Myotis nattereri*,
- Daubenton's *M. daubentonii*,
- whiskered *M. mystacinus*,
- Brandt's *M. brandtii*,

the brown long-eared *Plecotus auritus* and Leisler's *Nyctalus leisleri* bats.

Whiskered and Natterer's bats are listed as 'Threatened in Ireland', while the other species are listed as 'Internationally Important' in the Irish Red Data Book 2: Vertebrates (Whilde, 1993). The population status of both Whiskered and Natterer's bats was considered '*indeterminate*' because of the small numbers known of each, a few hundred and approximately a thousand respectively.

Ireland is considered to be an international stronghold for Leisler's bat, whose global status is described as being at 'low risk, near threatened' (LR; nt) by the IUCN (Hutson, *et al.*, 2001).

Near threatened status is applied to those taxa that are close to being listed as vulnerable (facing a high risk of extinction in the wild in the medium-term future on the basis of a range of criteria defined by the IUCN). The Irish population of the Lesser Horseshoe Bat is estimated at 14,000 individuals and is considered of International Importance because it has declined dramatically and become extinct in many other parts of Europe. Data collected shows that the species increased significantly between from the early 1990s to present.

A review of existing bat records within a 10km radius of the study site (sourced from Bat Conservation Ireland's National Bat Records Database) showed that the Irish bat species listed in **Table 9.6**, have been recorded locally. Other species which have not been included within this database may also occur.

Table 9.6: Presence of Irish bat species recorded along or in proximity to the proposed Greenlink development (NBDC records).

Common name	Scientific name	Presence
Lesser Noctule	*Nyctalus leisleri*	S61, S71
Pipistrelle	*Pipistrellus sensu lato*	S61, S70
Soprano Pipistrelle	*Pipistrellus pygmaeus*	S61, S71
Daubenton's Bat	*Myotis daubentonii*	S61, S71
Natterer's Bat	*Myotis nattereri*	S71
Brown Long-eared Bat	*Plecotus auritus*	S61, S70
Whiskered Bat	*Myotis mystacinus*	S71

While the remaining Irish bat species; Nathusius', Pipistrelle, Brandt's and Lesser Horseshoe Bat have not been recorded in the local area to date, Brown long-eared, Soprano and Common Pipistrelle and Whiskered bat may potentially occur as these species are widespread in the Irish countryside. Natterer's bat and Brandt's bat are rarer Irish species and are less likely to occur. Lesser Horse Bat does not occur in the eastern part of the country.

All bat species are protected under the Wildlife Acts (1976 to 2000, as amended) which make it an offence to wilfully interfere with or destroy the breeding or resting place of all species; however, the Acts permit limited exemptions for certain kinds of development. All species of bats in Ireland are listed in Schedule 5 of the 1976 Act and are therefore subject to the provisions of Section 23 which make it an offence to:

- Intentionally kill, injure or take a bat
- Possess or control any live or dead specimen or anything derived from a bat
- Wilfully interfere with any structure or place used for breeding or resting by a bat
- Wilfully interfere with a bat while it is occupying a structure or place which it uses for that purpose.

All bats are listed on Annex IV of the EU Habitats Directive. The domestic legislation that implements this Directive gives strict protection to individual bats and their breeding and resting places. It should also be noted that any works interfering with bats and especially their roosts, including for instance, the installation of lighting in the vicinity of the latter, may only be carried out under a licence to derogate from Regulation 23 of the Habitats Regulations 1997, (which transposed the EU Habitats Directive into Irish law) issued by NPWS.

Furthermore, on 21st September 2011, the Irish Government published the European Communities (Birds and Natural Habitats) Regulations 2011 which include the protection of the Irish bat fauna and further outline derogation licensing requirements. **Table 9.7** summarises the protection given to bats by national and international legislation and conventions.

Table 9.7. Legislative protection for bats in Ireland

Legislation/Convention	Relevance to Irish bats
Wildflife Acts (1976 to 2018) as amended	It is an offence to wilfully interfere with or destroy the breeding or resting place of bats, (with some exemptions for certain kinds of construction development). Provides for the creation of NHAs.
EC Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (Directive 92/43/EEC), commonly known as the 'Habitats Directive	Lists all the vesper bats in Annex IV as in need of strict protection and also encourages Member States to conserve landscape features such as river corridors, field boundaries, ponds and woodlands. It also requests that Member States establish a system to monitor the incidental capture and killing of the animals listed in Annex IV. The lesser horseshoe bat is further listed in Annex II of the EU Habitats Directive The level of protection offered to lesser horseshoe bats effectively means that areas important for this species are designated as Special Areas of Conservation.
The Convention on the Conservation of European Wildlife and Natural Habitats, commonly known as the 'Berne Convention'.	It obliges states to protect and conserve animals and their habitats, especially those listed as endangered or vulnerable. It also obliges parties to promote national policies for the conservation of wild fauna and natural habitats.
The Convention on the Conservation of Migratory Species of Wild Animals, commonly known as the 'Bonn Convention'.	This led to the European Bats Agreement (EUROBATS), which lists a wide range of objectives, including promoting research programmes relating to the conservation and management of bats, promoting bat conservation and public awareness of bats, and identifying and protecting important feeding areas of bats from damage and disturbance.

Dixon.Brosnan conducted a bat survey at Dunbrody Bridge (refer to **Figure 9.8** for bridge location). It is noted that this survey was an initial survey which was carried out when a crossing at this bridge was under consideration. The survey method generally follows that outlined in Collins (2016) and under these guidelines this bridge was considered to have moderate potential as a potential bat roosting site. It is noted that only an initial survey was carried out, as no further surveys were considered necessary at this location when an alternative crossing methodology for the Campile Estuary was selected.

The focus of the survey was primarily to determine if bats were roosting in the bridge which as under consideration as part of the proposed cable route. The survey was conducted using standard heterodyne bat monitors (Batbox III and Batbox Duet) and an Echo Meter Touch 2 PRO bat detector on the 18th of September 2018. More detail on the methodology and the results of the survey are provided in **Appendix 9.2.** The proposed route will not affect the bridge.

Four species were identified during the emergence survey:

1. Soprano pipistrelle (*Pipistrellus pygmaeus*)
2. Brown Long-eared Bat (*Plecotus auratus)*
3. Daubenton's Bat (*Myotis daubentoni*)
4. Leisler's bat (*Nyctalus leisleri*).

No bats were recorded emerging from Dunbrody Bridge and only low numbers of Soprano pipistrelle, Brown long-eared and Leisler's bat were recorded. These findings suggest that the area in proximity to the bridge has low importance for bats, restricted to a site-specific level of importance only.

A bat survey at an abandoned building was carried out on the 1st of February 2019 (See **Appendix 9.2** and refer to **Figure 9.2).** The former dwelling is located in close proximity to the existing Great Island substation and proposed converter station.

The focus of the survey was primarily to determine if bats were roosting in the building. Therefore, an onsite day-time roost assessment/winter hibernation survey of external and internal structures was undertaken. No signs of bats were recorded within the building. Internally the building has some potential to provide an occasional roosting site for bats but the likelihood of a maternal and hibernation roost being present is low. It is considered unlikely that this building, which will not be directly affected by the proposed development, constitutes a critical resource for bats within the wider landscape.

Impacts on boundary habitats may have adverse effects on the local bat populations utilising the site, as these linear features are valuable in linking roost sites to foraging areas and facilitate the dispersal of bats into the wider landscape. A gap in a treeline of greater than 10m may force some species of bats to seek an alternative commuting route.

Bats also often use features such as hedgerows, treelines, woodland edges and waterways as commuting pathways between roosts and foraging areas. Sheltering vegetation, such as treelines and woodland, not only acts as cover from potential predators and the weather, but also provides structure for acoustic orientation and navigation. Sheltered areas also allow insects to gather and therefore support bat forging. Large mature trees are scattered throughout the proposed cable route. These are primarily found within off-road diversion areas. Several large mature trees were recorded within the mixed broadleaved/conifer woodland (WD2) at the Campile River Estuary and within a treeline to the north of the woodland. (**Figure 9.3**).

A tree forms an essential part of an often-complex ecosystem that provides a variety of habitats for a range of different wildlife species, including bats. Exactly which features are most important will depend on the woodland type and the species of bats present.

Although woodlands are used in some way by all Irish bat species, some bat species rely exclusively on trees for roost sites, whilst others use them for part of the year. All Irish bat species are known to forage in woodland and along woodland edges. Any tree can be used as a bat roost, as long as it provides shelter, e.g. in the form of splits, cracks, holes and cavities in the trunk and branches, loose bark and ivy cover. Roosts can be at any height in the tree, although upper trunk and branches are probably more common. Trees such as oak, beech and ash are particularly suitable for bats.

All bat species are nocturnal, resting in dark conditions in the day and emerging at night to feed. Many species of bats are known to sample the light levels before emerging from their roost; only emerging for their night's hunting when the light intensity outside reaches a critical level after sunset (Swift 1980). When bats emerge from roosts early in the evening, they tend not to echolocate but rely on eyesight to fly from the roost to adjoining treelines or hedgerows. Where there is too much luminance near exit points, a bats vision can be reduced resulting in disorientation. Light near a roost access point will delay bats from emerging and shorten the amount of time available to them for foraging. Any delays of emergence can reduce feeding periods and affect the overall survival rate of bats. Bright light may reduce social flight activity and cause bats to move away from the light area to an alternative dark area. Illuminating a bat roost can cause disturbance (Downs et al 2003) and this may result in the bats deserting the roost or even becoming entombed within it (Packman et al 2015). In addition to causing disturbance to bats at the roost, artificial lighting can also affect the feeding behaviour of bats. (Bat Conservation Trust, 2018). In most bat species, there is an evening period of activity followed by another at dawn. These two flights correlate with the peak flight times of nocturnal insect prey. Insects are attracted to light particularly if it is a single light source in a dark area. The effects of artificial lighting on drinking resources for bats has been recorded to be stronger than on foraging (Bat Conservation Trust, 2018). Artificial lighting can also increase the chances of predation. It is believed that Myotis species shun bright light as a predator avoidance strategy. Many avian predators will hunt bats which may be one reason why bats avoid flying in the day. Lighting can be particularly harmful to bat populations along river corridors, woodland edges, along hedgerows and treelines and at lake edges.

Overall, it is concluded that no structures which have the potential to be of value as bat roosts will be affected by the proposed development. The woodland area at the Campile River Estuary has the potential to provide roosting habitat for bats but will not be directly affected. Although indirect lighting due to nigh time associated with the HDD works could occur however this woodland area is located 130m from the HDD compound and lights will be faced away from this woodland area. The Campile River Estuary has the potential to provide high value feeding habitat but likewise will not be directly affected. Therefore, potential effects on bats largely relate to limited effects on linear habitats within off road diversion areas and potential effects on individual mature trees.

9.3.10.2Badger

Badger (*Meles meles*) and their setts are protected under the provisions of the Wildlife Act 1976, as amended, and it is an offence to intentionally, knowingly or unknowingly kill or injure a protected species, or to willfully interfere with or destroy the breeding site or resting place of a protected wild animal.

Badger setts are formed by a complex group of interlinked tunnels, and therefore works in proximity to setts can potentially cause damage to this protected species.

The size of the home range of a badger will vary depending on the local habitat, food availability, landscape features and local badger density. A home range may be as small as 30 hectares in a good rural habitat, but as large as 300 hectares in a poor habitat. On average a territory may be around 50 hectares.

Field signs are characteristic and sometimes quite obvious and include tufts of hair caught on barbed wire fences, conspicuous badger paths, footprints, small excavated pits or latrines in which droppings are deposited, scratch marks on trees, and snuffle holes, which are small scrapes where badgers have searched for insects and plant tubers.

Badger surveys were carried out at all of the off-road diversion areas in conjunction with habitat surveys on the 29th March, 20th April, 23rd May, 19th June, and 18th September in 2018, and 1st February, 24th May and 16th December in 2019. The badger surveys were carried adhering to best practice guidance (TII, 2006b; 2008c) and involved a systematic search of all fence lines, woodland and scrub habitats for physical evidence of Badger, e.g. setts, latrines, badger paths.

Several different sett types are recognised and are categorised in **Table 9.8.** Whilst these four sett categories look clear cut, classification can be difficult in the field. Many badger social groups do not have an annex sett, whilst in poor badger habitat, large areas may be searched without finding a main sett.

Table 9.8 Sett Types

Sett type	Definition
Main	Several holes with obvious, large spoil heaps and obvious paths between the sett entrances
Annexe	Generally, less than 150m from the main sett and consisting of several holes. May be used periodically.
Subsidiary	Usually at least 50m from main sett with no obvious paths. May be used intermittently
Outlier	Little spoil and no obvious paths. Intermittent use only

A main badger sett was recorded within the woodland habitat approximately 220m southwest of the northern HDD Campile River Estuary compound **(Figure 9.15** and **Photographs 9.14** to **9.17).** The sett has 10 entrance holes, with large fresh spoil heaps in association with four of the holes. Obvious tracks link each sett entrance hole. Fresh bedding and foraging signs were noted within a small patch of bracken and bramble scrub habitat in immediate proximity to the sett entrances. Numerous badger tracks were recorded in the surrounding landscape. An active annexe sett was recorded approximately 50m west of the main sett along the northern periphery of the woodland habitat. A disused outlier sett was noted along the trackway within the woodland habitat, within 100m of the HDD site. No direct effect on these setts will occur. No other signs of badger were recorded within the proposed works area; however, a young badger was recorded as roadkill on the R733, approximately three kilometres northeast of the most northerly section of the cable route.

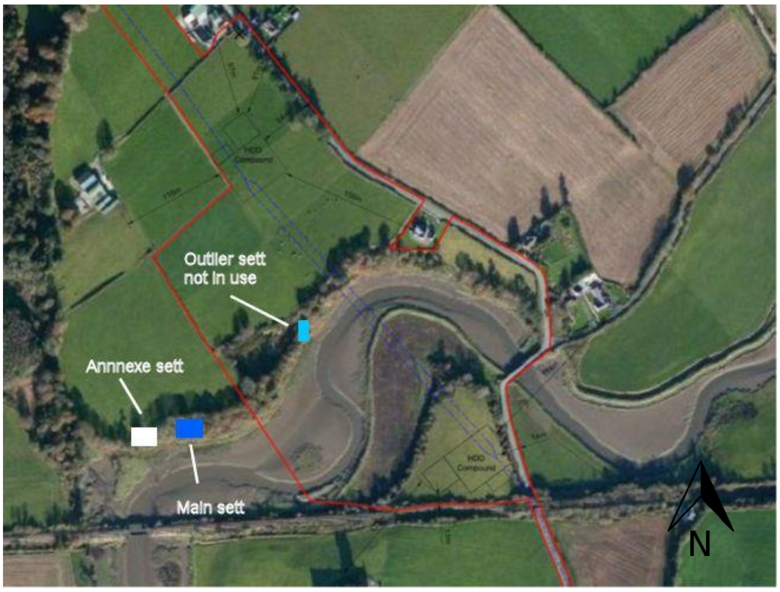


Figure 9.15: Sett Locations | not to scale

Photographs 9.14 to 9.17: Badger signs e.g. Sett entrances holes, pathways and drag marks.

9.3.10.3 Other terrestrial mammals

Seventeen other species of terrestrial mammal have been recorded by the NBDC within the study area, seven of which - Sika Deer, Pygmy Shrew, Hedgehog, Irish Hare, Irish Stoat, Pine Marten and Red Squirrel - are protected under the Irish Wildlife Act 1976 and 2000. Signs of fox were common within the proposed cable route and likewise rabbits are common.

Sika Deer (*Cervus nippon*)

Sika Deer prefer forest with dense understorey, thickets, natural woodlands and commercial plantations, but will also forage in open grassy areas with dense cover nearby. Sika Deer are highly opportunistic feeders, foraging on grasses to a range of shrubs and tree species. They have very large daily range, moving up to 2.5 km per day and are classified as intermediate grazer-browsers due to their highly opportunistic feeding patterns.

Signs of deer were noted approximately 350m southeast of the proposed converter station site, within an arable field. Tracks and an area of flattened vegetation, which may be used as a daytime resting area, were recorded.

Hedgehog (*Erinaceus europaeus*)

Hedgehog can be found throughout Ireland, with male hedgehogs having an annual range of around 56 hectares. Several factors are thought to influence the distribution of hedgehogs in a habitat, with nest sites, food availability and the presence of predators believed to be major contributory factors. Generally, hedgehogs prefer edge habitat and pasture but in recent years have begun to colonize urban areas. Due to the habitats recorded within the study area, hedgehog is likely to occur.

Irish hare *(Lepus timidus hibernicus)*

Irish Hare is one of three lagomorphs found on the Island of Ireland and the only native lagomorph. It is listed on Appendix III of the Berne Convention, Annex V(a) of the EC Habitats Directive (92/43/EEC). Irish hare are adaptable and live in a wide variety of habitats. The species typically reaches its highest densities on farmland, particularly where there is a mix of grassland and arable fields along with hedgerows and other cover. Irish Hares usually shelter in dense vegetation such as rushes, heather, tall grass and occasionally in hedgerows.

Three individuals, showing possible breeding behaviour, were recorded within the agricultural grassland field within the footprint of the proposed converter station just east of the existing Great Island substation.

Red Squirrel *(Sciurus vulgaris)*

Red Squirrel is listed on Appendix III of the Berne Convention and can be found throughout Ireland. They are found in all types of habitat but typically are in higher densities in mature mixed broadleaved forests. They can also survive in monoculture coniferous woodland. Red squirrels feed mainly on tree seeds, although they can utilise fungi, fruit and buds as they become available in the woodland.

Sightings of live animals have been recorded in the wider landscape (NBDC).

While the majority of the habitats within the proposed cable route are considered sub-optimal for this species, a number of bands of woodland do occur which have higher potential. While no signs of Red Squirrel were recorded, the species could potentially occur.

Pygmy Shrew (*Sorex minutus*)

Pygmy Shrew is common throughout mainland Ireland and prefers habitats such as hedgerows and grasslands and stone walls. While no signs of pygmy shrew were observed this species is likely to occur within the proposed development.

Irish Stoat (*Mustela erminea hibernica*)

Irish stoats occur in most habitats with sufficient cover, including urban areas. Even though no evidence of Irish stout were noted it is likely that stoat will occur in the area given the presence of prey species.

Pine Marten (*Martes martes*)

Pine Marten are habitat specialists, requiring forest or scrub habitat to exist in an area. They are adept at climbing trees as they have powerful non-retractable claws. The species is primarily active at night and individuals live in territories that can vary in size from 50 hectares to 400 hectares. Males typically have bigger territories than females and there can be partial overlap between adjacent territories.

Pine Marten has been recorded near the onshore cable route as roadkill (NBDC). Although this species could potentially occur with the study area no evidence of pine martin was recorded.

9.3.10.4 Reptiles (terrestrial) and Amphibians

According to records held by the NBDC, Common Frog (*Rana temporaria)* and Smooth Newt (*Lissotriton vulgaris*) are the only amphibians recorded along the proposed cable route. The species was not recorded during the site visit but there is the possibility of them occurring within the study area.

The Smooth Newt (*Lissotriton vulgaris),* is the only member of the Urodela (the tailed amphibians) found in Ireland. While commonly encountered near water bodies, adult newts are actually terrestrial, only returning to water bodies to breed. They tend to prefer habitats that offer protection from desiccation, such as long grass, woodland and scrubland. Newts will over-winter in refugia such as woodpiles and rotting logs, which offer them some protection from the elements. A single adult Smooth Newt was recorded near the existing Great Island substation in 2018 (NBDC). However, the species was not recorded during site surveys.

The Common Lizard (*Zootoca vivipara*) is Ireland's only native terrestrial reptile. Ideal habitats for the species are south-facing, damp tussocky grassland, scrub covered hillsides, dunes or banks, and woodland tracks, and it also resides in peat bogs, dry grasslands and heathlands. Due to the habitats recorded within the study area it is likely that Common lizard occurs.

9.3.10.5Birds

The National Biodiversity Centre online data base lists 129 species of bird recorded within grid square S61, 102 species within S71, 133 species within S70 and 141 species within grid square S80. Of these species, a number are listed under Annex I of the Birds Directive and are Red Listed Birds of Conservation Concern in Ireland (**Table 9.9**).

Table 9.9: Bird species listed under Annex I of the Birds Directive and/or classified as Red Listed Birds of Conservation Concern in Ireland recorded within the proposed development footprint (NBDC records).

Grid Square	Species	Birds Directive Annex	BOCCI
		I	Red List
S61, S71, S70	Barn Owl		X
S61, S71, S70, S80	Bar-tailed Godwit	X	
S61, S71, S70, S80	Black-headed Gull		X
S61, S70, S80	Common Goldeneye		X
S61, S71, S70	Kingfisher	X	
S61, S70	Pochard		X
S61, S71, S70, S80	Redshank		X
S80	Common Tern	X	
S61, S71, S70, S80	Corn Crake	X	X
S61, S70, S80	Dunlin	X	X
S61, S71, S70, S80	Eurasian Curlew		X
S61, S71, S70, S80	Eurasian Wigeon		X
S61, S80	Eurasian Woodcock		X
S61, S71, S70, S80	European Golden Plover	X	X
S70, S80	Great Northern Diver	X	
S61, S71, S70	Grey Partridge		X
S61, S71, S70, S80	Grey Wagtail		X
S61, S71, S70, S80	Hen Harrier	X	
S61, S71, S70, S80	Herring Gull		X
S61, S71, S70, S80	Little Egret	X	
S80	Little Tern	X	
S70	Little Gull	X	
S80	Long-tailed Duck		X
S61, S71, S70, S80	Meadow pipit		X
S71, S80	Mediterranean Gull	X	
S61, S71, S70, S80	Merlin	X	
S61, S71, S70, S80	Northern Lapwing		X
S70, S80	Northern Pintail		X
S61, S70, S80	Northern Shoveler		X
S61, S70, S80	Peregrine Falcon	X	

Grid Square	Species	Birds Directive Annex	BOCCI
		I	Red List
S70, S80	Red-billed Chough	X	
S70, S80	Red-throated Diver	X	
S70, S80	Sandwich Tern	X	
S61, S80	Short-eared Owl	X	
S61, S71	Tufted Duck		X
S61, S80	Whooper Swan	X	
S61, S71, S70, S80	Yellowhammer		X

Surveys for general bird usage were carried out in conjunction with habitat surveys within the entire development footprint on the 29th March, 20th April, 23rd May, 19th June, and 18th of September in 2018, and 1st February, 24th May and 16th December in 2019.

All birds utilizing habitats within the proposed development footprint and in proximity to it were recorded (See **Figure 9.16**) Specific breeding bird and Barn Owl and winter bird surveys were also carried out and these are discussed separately below.

Birds species listed in Annex I of the Birds Directive are considered a conservation priority. Certain bird species are listed by BirdWatch Ireland as Birds of Conservation Concern in Ireland (BOCCI). These are bird species suffering declines in population size. BirdWatch Ireland and the Royal Society for the Protection of Birds have identified and classified these species by the rate of decline into Red and Amber lists. Red List bird species are of high conservation concern and the Amber List species are of medium conservation. Green listed species are regularly occurring bird species whose conservation status is currently considered favourable. Birds species listed in Annex I of the Birds Directive (2009/147/EC) are considered a conservation priority. Species recorded within the proposed development footprint which were recorded during habitat surveys are shown in **Table 9.10**.

Table 9.10: Bird Species recorded during site surveys

Species		Birds Directive Annex			BOCCI	
		I	II	III	Red List	Amber List
Phalacrocorax carbo	Cormorant					X
Numenius arquata	Curlew		X		X	
Limosa limosa	Black-tailed Godwit					X
Tringatotanus	Redshank				X	
Tringa nebularia	Greenshank					
Anas penelope	Wigeon		X	X	X	
Anas crecca	Teal		X	X		X
Anas platyrhynchos	Mallard		X	X		

Species		Birds Directive Annex			BOCCI	
		I	II	III	Red List	Amber List
Sturnusvulgaris	Starling					X
Saxicolatorquata	Stonechat					X
Corvus corax	Raven					
Erithacus rubecula	Robin					X
Alcedo atthis	Kingfisher	X				X
Larus ridibundus	Black-headed Gull				X	
Streptopelia decaocto	Collared Dove					
Larus marinus	Great black-backed Gull					X
Accipiter nisus	Sparrowhawk					X
Larus argentatus	Herring Gull				X	
Vanellus vanellus	Lapwing		X		X	
Haematopus ostralegus	Oystercatcher					X
Pyrrhocorax pyrrhocorax	Chough	X				X
Anthus pratensis	Meadow Pipit				X	
Carduelis chloris	Greenfinch					X
Passer domesticus	House Sparrow					X
Turdus merula	Blackbird					
Regulusregulus	Goldcrest					X
Phasianus colchicus	Pheasant					
Prunella modularis	Dunnock					
Carduelis carduelis	Goldfinch					
Troglodytes troglodytes	Wren					
Ardea cinerea	Grey Heron					
Pyrrhula pyrrhula	Bullfinch					
Corvus frugilegus	Rook					
Corvus monedula	Jackdaw					
Pica pica	Magpie					
Columba palumbus	Woodpigeon		X	X		
Fringilla coelebs	Chaffinch					
Corvus cornix	Hooded Crow					
Parus caeruleus	Blue Tit					
Hirundo rustica	Barn Swallow					X

Species		Birds Directive Annex			BOCCI	
		I	II	III	Red List	Amber List
Riparia riparia	Sand Martin					X
Motacilla cinerea	Grey Wagtail				X	
Motacilla alba yarrellii	Pied Wagtail					
Buteo buteo	Buzzard					
Aegithalus caudatus	Long-tailed Tit					
Parus major	Great Tit					
Turdus philomelos	Song Thrush					
Parus ater	Coal Tit					
Anthus petrosus	Rock Pipit					
Columba livia	Rock Dove		X			
Branta bernicla hrota	Light-bellied Brent Goose		X			X
Columba livia f. domestica	Feral Pigeon					
Symbol	**Description**					
I	*Annex 1: species and sub-species are particularly threatened. Member States must designate Special Protection Areas (SPAs) for their survival and all migratory bird species.*					
II	*Annex 2: bird species can be hunted. However, the hunting periods are limited, and hunting is forbidden when birds are at their most vulnerable: during their return migration to nesting areas, reproduction and the raising of their chicks.*					
III	*Annex 3: overall, activities that directly threaten birds, such as their deliberate killing, capture or trade, or the destruction of their nests, are banned. With certain restrictions, Member States can allow some of these activities for species listed here.*					

At a meeting in 2018 the NPWS noted the following:

- A number of Peregrine Falcon roosts in the wider area along the route
- A Peregrine Falcon box within the Great Island power station site is used by a juvenile
- Whooper Swan using fields close to an unfinished housing estate in Ballinruan
- Golden Plover use fields to the north of the route at Fisherstown
- Shanacloon Wetland, to the west of the cable route, is used by wintering wildfowl
- There are records of at least one Hen Harrier frequenting the Campile Estuary area

Given the limited potential for disturbance for works along roads and the distance involved, no impact on peregrine falcon roosts, whooper swans, golden plover or Shanacloon Wetland will occur. Given the existing levels of noise and disturbance at the Great Island Power Station no impact on the juvenile Peregrine Falcon using the nest box will occur. Hen Harrier were not recorded by DixonBrosnan surveys and the use of HDD methodology will prevent any impacts from occurring.

Overall, the proposed cable route is of local value for terrestrial bird species that are relatively common in the Irish countryside. There are no terrestrial features or habitats of particular value, which would differentiate the habitats along the cable routes and the off-road diversion areas from large areas of similar habitat in the surrounding countryside.

The presence of a watercourse i.e. Newtown River and Campile River, does provide additional habitat for more specialised species such as Kingfisher (*Alcedo atthis*). Kingfisher is listed on Annex I of the EU Birds Directive and Appendix II of the Bern Convention. The species is Amber-listed in Ireland and BirdLife International has evaluated the European population as depleted, due to a moderate historical decline.

Kingfishers prefer still or gently flowing water with plenty of small fish, and with reeds, rushes or shrubs on the banks for perches. Streams, small rivers, canals and ditches are favoured to open waterbodies, but it also uses lakes, ponds and flooded gravel pits. Egg-laying occurs from March to July. Suitable banks for nesting are required in breeding season, but nest-sites can be over 250 m from foraging waters and can occur infrequently in walls, rotten tree stumps, concrete tunnels in canal banks, or in the burrow of Sand Martin (*Riparia riparia*). Suitable Kingfisher nesting banks are generally tall vertical banks with soft material into which they can dig their burrows.

The size of a kingfisher territory depends on the amount of food available, and on the bird population in the area. Territories tend to cover at least one kilometre of river, but may extend over 3-5 km. Any nearby waterbody that provides good fishing will be included in the territory. Kingfishers may be found along streams of all kinds, lakes and ponds and tend to be more coastal in winter, where they may be seen in estuaries, rocky seashores and harbours.

Breeding Kingfisher has been recorded in the wider area (NBDC). A kingfisher was recorded at the Newtown River approximately 150m upstream of the proposed open cut crossing point. No potential kingfisher nesting habitat was recorded within 150m of the crossing point or of the proposed discharge point from the converter station attenuation pond.

Choughs are a corvid species primarily associated with coastal areas. They are amber listed species under Birdwatch Ireland's Bird of Conservation Concern in Ireland (BWI BoCCI), afforded statutory protections under the Irish Wildlife Acts and the EU Birds Directive (Annex I). This species was recorded in flight approximately 150m from the proposed HDD site at Baginbun Beach. No feeding habitats of particularly high value for this species was recorded within the development footprint and no potential breeding habitat will be affected.

Breeding Bird survey

The NPWS noted at a meeting in 2018 that a Black Guillemot breeding area is located at Baginbun Headland (both sides of the Martello Tower) approximately 400m from the landfall site at Baginbun Bay. Given the distance involved no impact on this species will occur.

Specific breeding bird surveys were carried out by Dixon.Brosnan on the 23rd May 2018 and 19th June 2018. The survey methodology utilised a scaled down version of the British Trust for Ornithology's (BTO) Common Bird Census (CBC) Technique (Bibby et al., 2000 & Gilbert et al., 1998), with aspects of species-specific survey methodologies employed where required (Gilbert et al., 1998).

All bird species encountered during the survey were mapped and coded using standard BTO ‘Species Codes’ and ‘Categories of Breeding Evidence’ e.g. singing male, agitated behaviour, carrying food, recently fledged downy young. No attempts were made to locate nests as bird behaviour is generally sufficient to determine probable or confirmed breeding.

The habitats within the development footprint are dominated by habitats which are not of significant value for uncommon bird species. Works at the Lewistown compound, along the cable route and at the HDD site (Campile River Estuary crossing and Baginbun Beach) will be short in duration and whilst there may be short-term disturbance/ displacement during the works period the impact on birds is predicted to be imperceptible. However more detailed breeding bird surveys were considered necessary where works will be longer in duration and habitat removal will be permanent. Thus, a breeding bird survey was carried out at the proposed converter station. Due to presence of sea cliffs at the landfall site at Baginbun Beach, a breeding bird survey was also considered necessary here.

Kingfisher were recorded along the Newtown/Kilmmanock River however no suitable breeding habitat was recorded during site surveys. Kingfisher were also recorded during winter bird counts at the Campile River Estuary, but no suitable breeding habitat was recorded. Therefore, no specific breeding surveys for this species was considered necessary.

To summarise the breeding bird survey was undertaken at two locations as indicated in **Figure 9.16**:

(1) proposed converter station location within agricultural fields and

(2) Baginbun beach - on the beach front and adjoining roadside.

Figure 9.16: Breeding bird survey (Converter site and Baginbun Beach) routes outlined in red | not to scale

A total of 25 species were recorded within the proposed converter station site while 28 species were recorded from the Baginbun Beach survey site. Of these species a total of 15 species i.e. Wren, Magpie, Dunnock, Blackbird, Robin, Great tit, Blue tit, Goldfinch, Herring Gull, Greater Black-backed Gull, Rook, Hooded Crow, Woodpigeon, Starling and Barn Swallow were recorded from both sites.

A full list of bird species recorded during the 2018 surveys is provided in **Table 9.12** (refer to **Table 9.11** for the relevant BTO breeding bird survey codes). More detail on the methodology and the results of the survey are provided in **Appendix 9.3.**

Table 9.11 British Trust for Ornithology breeding bird survey codes

Breeding status	Confirmed breeder (Br)	Probable breeder (Pr)	Possible breeder (Po)	Non-breeder (N)
Observed behaviours	Distraction-display or injury feigning (DD)	Pair in suitable nesting habitat (P)	Observed in suitable nesting habitat (H)	Flying Over (F)
	Used nest or eggshells found from current season (UN)	Permanent Territory (T)	Singing Male (S)	Migrant (M)
	Recently fledged young or downy young (FL)	Courtship and Display (D)		Summering non-breeder (U)
	Adults entering or leaving nest-site indicating occupied nest (ON)	Visiting probable nest site (N)		
	Adult carrying faecal sac or food for young (FF)	Agitated Behaviour (A)		
	Nest containing eggs (NE)	Brood patch of incubating bird (I)		
	Nest with young seen or heard (NY)	Nest Building or excavating nest-hole (B)		

Table 9.12 Breeding bird survey results

Proposed Converter Station and Tail Station Site				
Bird species	Breeding status	Estimated No. of Pairs	No. Birds recorded per visit	
			23/05/2018	19/06/2018
Wren	Br - FF	3 - 4	8	7
Magpie	Pr - P	1	1	2
Dunnock	Po - S	1 - 2	3	1

Blackbird	Po - S	2	4	2
Whitethroat	Br - FF	2	1	2
Robin	Br - FL	1 - 2	4	3
Great tit	Po - S	1	1	1
Blue tit	Po - H	1	2	1
Raven	N - F	0	1	0
Goldfinch	N - F	0	6	7
Chaffinch	Pr - P	1 - 2	4	4
Bullfinch	Po - H	1	1	2
Linnet	Po - H	1	0	2
Herring Gull	N-F	0	3	5
Greater Black-backed Gull	N-F	0	0	2
Rook	N-F	0	17	36
Hooded Crow	N-F	0	2	5
Woodpigeon	Po - H	1	2	1
Feral pigeon	N-F	0	0	7
Little egret	N-F	0	1	1
Starling	N-F	0	0	1
Barn Swallow	N-F	0	4	5
Chiffchaff	Po - S	0 - 1	0	1
Willow warbler	Po - S	0 - 1	0	1
Pheasant	Po - H	1	3	1
Baginbun Beach / Proposed Landfall Site/ Car Parking Area				
Bird species	**Breeding status**	**Estimated No. of Pairs**	**No. Birds recorded per visit**	
			23/05/2018	**19/06/2018**
Wren	Po - S	1 - 3	3	1
Magpie	N - F	0	1	0
Dunnock	Br - FL	1 - 2	3	0
Blackbird	Pr - P	2 - 3	6	3
Robin	Br - FL	2	2	2
Great tit	Po - H	0 - 1	1	1
Meadow pipit	Po - S	1 - 2	2	1
Rock pipit	Br - FL	2	4	1
Chough	N - F	0	1	0
Pied wagtail	Br - FL	1	2	3
House sparrow*	Br - ON	1 - 10	31	53
Blue tit	Po - S	0 - 1	0	1

Goldfinch	Po - S	0 - 2	7	3
Greenfinch	N - F	0	1	0
Reed bunting	Po - S	0 - 1	0	1
Herring Gull	N - F	0	13	4
Greater Black-backed Gull	N - F	0	1	3
Lesser Black-backed Gull	N - F	0	2	0
Cormorant	N - F	0	2	1
Rook	N - F	0	6	2
Hooded Crow	N - F	0	2	1
Jackdaw	N - F	0	2	3
Woodpigeon	N - F	0	21	15
Sparrow hawk	N - F	0	1	0
Sand martin	Pr - N	0 - 2	0	4
Stonechat	Br - FL	1	0	2
Starling*	Br - ON	1 - 2	8	0
Barn Swallow	N - F	0	5	0
Notes	** House sparrows and Starling largely concentrated around area to northwest of Baginbun Beach. Private dwelling with large number of bird feeders within garden. Both species seen entering gap below tiles.*			

At the proposed converter station site, it was estimated that three species are definitely breeding, a further two are probably breeding, 10 are possibly breeding, while the remaining 10 species are non-breeding. At Baginbun Beach, it was estimated that seven species are definitely breeding, a further two are probably breeding, six are possibly breeding, while the remaining 13 species are non-breeding.

Species recorded as breeding or potentially breeding during the survey period included resident species such as Wren, Robin, Rock pipit, Stonechat and House sparrow, and breeding migrants, including Sand Martin, Chiffchaff, Willow Warbler and Whitethroat

The two Annex I species recorded, namely Chough and Little Egret, both were recorded as non-breeders.

Although Chough were not recorded breeding within the study area, they are likely to be breeding within the wider landscape as there are suitable cliff faces within the wider landscape. Choughs commonly build their nests on ledges in crevices and caves of coastal cliffs. No high value feeding or nesting habitat for Little Egret was recorded within the proposed development area.

Overall, the study area provides widespread breeding and foraging habitat and supports a diverse bird population. Most of the species recorded during the surveys are generally considered to be common and widespread. The most important habitats within the study area that provide resources for local populations of breeding species are less intensively managed and include scrub, hedgerows, treelines, woodland and coastal cliffs and crevices with ledge vegetation mosaics.

No significant populations of breeding birds were recorded within the survey area and most of the species recorded are common and widespread within the county although a few species were noted to be Red and Amber listed. The nature conservation value of the breeding bird assemblage onsite is of local value.

None of the species recorded during breeding bird surveys are listed as qualifying interests for the Bannow Bay SPA or as a trigger species for the Bannow Bay IBA.

Barn Owl survey

The NPWS noted at a meeting in 2018 that there are records of Barn Owl using the abandoned building to the south of the converter station site.

Dixon.Brosnan carried out a Barn owl (*Tyto alba*) survey at an abandoned and derelict old building in close proximity to the existing Great Island substation and proposed converter station site location. The survey was carried out on the 1st of February 2019 **(See Appendix 9.3).**

The focus of the survey was to determine if barn owl use the building. Therefore, an onsite daytime building visual inspection of external and internal structures was undertaken.

The survey followed the guidelines set out in '*Barn Owl Surveying Standards for National Road Projects*' (Transport Infrastructure Ireland (TII) Publications, 2017) and '*Barn Owl Tyto alba Survey Methodology and Techniques for use in Ecological Assessment: Developing Best Practice in Survey and Reporting*' (Shawyer, 2011).

Although barn owl nest verification surveys are best undertaken during the breeding season, they can also be conducted successfully by experienced barn owl ecologists after the owls have vacated their nest site, during the late autumn and winter months.

Barn owl activity was not recorded at the abandoned and derelict old building and the site was deemed to be unoccupied during the survey period and probably during the previous breeding season.

There was no evidence (i.e. pellets, white-wash and moulted feathers) of barn owl observed during the daytime inspection in and around the building. Although the building provides potential nesting opportunities no evidence of barn owl presence was recorded.

Winter bird surveys

Winter bird surveys were carried out in 2015/2016, and again in 2018/2019 at Baginbun Beach and the Campile River Estuary. The same vantage points were used during both survey periods. More detail on the methodology and the results of the survey are provided in **Appendix 9.4.**

Winter bird surveys 2015 to 2016

Winter bird counts were carried out by Dixon.Brosnan in 2015/2016 season in order to assess winter bird usage of potential landfall sites at Booley Bay, Boyces Bay and Baginbun Bay. An additional site (Sandeel Bay) was added in December 2015. Subsequently, Baginbun Bay was selected as the landfall site and thus only the data from this location is assessed below (See **Figure 9.17**)

The initial winter bird surveys were undertaken on six dates between November 2015 and March 2016. The survey methodology was based on that used by the British Trust for Ornithology (BTO), Wetland Bird Survey (WeBS) and also that for the Irish Wetland Bird Survey (I-WeBS), as outlined in Gilbert et al. (1998).

The winter bird survey was undertaken using Nicon ProStaff-7 10X42 binoculars and a Safari 20-60 X 80 spotting scope. Ninety-minute counts were undertaken at either high tide, mid tide or low tide. Tides and weather conditions for each day were recorded.

Many of these birds were recorded overflying the channel as the surveys cover a radius of approximately 300m from each vantage point. Trawlers fishing for sprat offshore attracted large numbers of sea birds and seals. Thus, during the periods when trawlers were present numbers were elevated above the expected normal level. A total of 48 bird species were recorded during the site surveys. Two species listed as qualifying interests for the Bannon Bay SPA i.e. Oystercatcher and Redshank, were recorded at Baginbun Beach. Both were recorded in low numbers.

None of the waterbirds recorded by vantage point counts at Baginbun Bay were recorded in high numbers and numbers were low in-comparison to the figures which would be considered nationally significant (i.e. 1% or more of the all-Ireland population of an Annex I species or 1% or more of the bio-geographical population of a migratory species). More detail on the methodology and the results of the survey are provided in **Appendix 9.4.**

Figure 9.17: Vantage point locations for the winter bird counts | not to scale

Winter bird surveys 2018 to 2019

A winter bird survey was also carried out Dixon.Brosnan on six separate occasions; from October 2018 to March 2019 (refer to **Appendix 9.4**). The survey methodology was based on that used by the British Trust for Ornithology (BTO), Wetland Bird Survey (WeBS) and also that for the Irish Wetland Bird Survey (I-WeBS), as outlined in Gilbert et al. (1998) and the low tide waterbird surveys (Lewis, L. J. et. al. 2014). The winter bird survey was undertaken using 8.5×45 binoculars and a Swarovski ATX30-70x95 spotting scope. Ninety-minute counts were undertaken at each survey location at either high tide, mid tide and low tide. The scope of the survey was informed by the previous winter bird surveys, and also the selection of the preferred landfall site at Baginbun Beach.

The survey was focused on the following areas and the data gathered was used as a factor in determining the preferred cable route during the design process:

- The coastal waters and beach at Baginbun Beach which is the landfall location;
- A proposed cable crossing of the Campile River Estuary south of the railway line;
- A proposed cable crossing of the Campile River Estuary north of the railway line (This has been spilt into two vantage point locations due to sightlines):
    - North of the railway line
    - West of Dunbrody Bridge.

The survey locations were based on information gathered during the original site walkover and the location of the proposed works. Boundaries of the count areas were selected primarily to delineate patches of relatively homogenous habitat within the study area to compare bird usage of these habitats and spatial areas; but were also selected to be easily perceived by the observer. This was done by use of sightlines to prominent landmarks such as permanent marker buoys, coastal features and features on the horizon. Survey vantage point locations for the winter bird counts are shown in **Appendix 9.4.**

Where possible the survey covered a radius of approximately 300m from the landfall site at Baginbun and the HDD site at the Campile River Estuary. A radius of 300m was used based on information by Borgmann (2011) stating that establishing set-back distances of 250 m from waterfowl, diving ducks, wading birds, and shorebirds may lessen the impacts to the most sensitive species. In addition, in most instances a visual stimulus will create a disturbance effect before any associated noise starts to have an effect e.g. a flight response might be expected by many species if approached to within c. 100-150m across a mudflat (Cutts et. Al, 2013).

A total 26 species were recorded from the site visits during the winter bird survey as detailed below in **Table 9.13**. Seven species were recorded within all three survey sites i.e. Black-headed Gull, Little Egret, Curlew, Black-tailed Godwit, Greenshank, Redshank and Teal.

Table 9.13: Species recorded during the winter bird surveys, along with their conservation status

		Birds Directive Annex			BOCCI		European Birds of Conservation Concern - Ireland		
Species		I	II	III	Red List	Amber List	SPEC 1	SPEC 2	SPEC 3
Larus ridibundus	Black-headed Gull				X				
Limosa limosa	Black-tailed Godwit					X	X		
Larus canus	Common Gull					X			
Phalacrocorax carbo	Cormorant					X			
Numenius arquata	Curlew		X		X		X		
Calidris alpina	Dunlin	X			X				X
Larus marinus	Great black-backed Gull					X			
Gavia immer	Great Northern Diver	X				X			
Tringa ochropus	Green Sandpiper								
Tringa nebularia	Greenshank								
Ardea cinerea	Grey Heron								
Uria aalge	Guillemot					X			
Larus argentatus	Herring Gull				X			X	
Alcedo atthis	Kingfisher	X				X			X
Larus fuscus	Lesser black-backed Gull					X			
Egrettagarzetta	Little Egret	X							
Tachybaptus ruficollis	Little Grebe					X			
Falco columbarius	Merlin	X				X			
Haematopus ostralegus	Oystercatcher					X	X		

		Birds Directive Annex			BOCCI		European Birds of Conservation Concern - Ireland		
Species		I	II	III	Red List	Amber List	SPEC 1	SPEC 2	SPEC 3
Alca torda	Razorbill					X	X		
Tringatotanus	Redshank				X			X	
Gavia stellata	Red-throated Diver	X				X			X
Phalocrocorax aristotelis	Shag					X		X	
Gallinago	Snipe		X	X		X			X
Anas crecca	Teal		X	X		X			
Arenaria interpres	Turnstone								
Anas penelope	Wigeon		X	X	X				

Only one Special Protection Area (Bannow Bay SPA, Site Code 004033) is deemed relevant to the proposed development. A total of five species listed as qualifying interests for the Bannow Bay SPA were recorded utilising the survey sites, namely, Dunlin, Curlew, Black-tailed Godwit, Oystercatcher and Redshank. Two species listed as qualifying interests were recorded at Baginbun Beach i.e. Redshank and Oystercatcher while four species were recorded in proximity to the Campile River Estuary crossing i.e. Redshank, Curlew, Dunlin and Black-tailed Godwit. None of these species were recorded in high abundance which would be considered important at a national level.

The peak numbers recorded by Dixon.Brosnan during the 2018/2019 winter bird survey represent a fraction of the mean peak number of these species within the SPA during the baseline period (1995/96 – 1999/00). The survey area for the SPA, which was used during the baseline period and the survey area used by Dixon.Brosnan for winter bird surveys do not coincide as the surveys carried out by Dixon.Brosnan focused on smaller, specific areas of particular relevance to this project whereas baseline surveys assess the overall value of the SPA for wintering bird species from different count locations. Although a direct comparison is not possible, the baseline data provides a benchmark for the birds recorded during Dixon.Brosnan surveys.

The peak number for each species represented as a percentage of the mean peak for each species during the baseline period was calculated as follows:

- Dunlin - <1%
- Curlew – 2.5%
- Black-tailed Godwit – 5.9%
- Oystercatcher - <1%
- Redshank – 6.9%

Overall, six Annex I bird species were recorded i.e. Little Egret, Dunlin, Kingfisher, Merlin, Red-throated Diver and Great Northern Diver. Six Red Listed species were recorded, namely Black-headed Gull, Herring Gull, Redshank, Wigeon, Dunlin and Curlew. Merlin was recorded roosting at Baginbun Head on a single occasion.

The mudflat habitat along the Campile River estuary is of local value for waders e.g. Curlew, Black-tailed Godwit, Greenshank and Redshank all of which were recorded during the winter bird survey. A high tide roost of Redshank was recorded south of the railway, along the riverbank.

The NPWS noted at a meeting in 2018 that Razorbill, Shag, Fulmar and Guillemot occur in the vicinity of the landfall at Baginbun Beach. Three of these species namely Razorbill, Shag and Guillemot were recorded however numbers were relatively low.

Overall, none of the waterbirds recorded by vantage point counts were recorded in high numbers and numbers were low in-comparison to the figures which would be considered nationally significant (i.e. 1% or more of the all-Ireland population of an Annex I species or 1% or more of the bio-geographical population of a migratory species). The results were also consistent with the previous 2015/ 2016 surveys.

9.3.10.6 Invasive Species

Non-native plants are defined as those plants which have been introduced outside of their native range by humans and their activities, either purposefully or accidentally. Invasive non-native species are so-called as they typically display one or more of the following characteristics or features: (1) prolific reproduction through seed dispersal and/or re-growth from plant fragments; (2) rapid growth patterns; and, (3) resistance to standard weed control methods.

Where a non-native species displays invasive qualities and is not managed it can potentially: (1) out compete native vegetation, affecting plant community structure and habitat for wildlife; (2) cause damage to infrastructure including road carriageways, footpaths, walls and foundations; and, (3) have an adverse effect on landscape quality. The NBDC lists several high impact invasive species which have been recorded within grid squares S61, S71, S70, S80 (**Table 9.14**).

Table 9.14: NBDC list of high impact invasive species.

Grid Square	Common Name	Latin Name
S61	Chinese Mitten Crab	*Eriocheir sinensis*
S61, S71	Canadian Waterweed	Elodea canadensis
S61, S71, S70, S80	Cherry Laurel	*Prunus laurocerasus*
S61, S71, S70, S80	Common Cord-grass	Spartina anglica
S71, S70	Giant-rhubarb	Gunnera tinctoria
S61		*Fallopia japonica x sachalinensis = F. x bohemica*
S61	Giant Knotweed	Fallopia sachalinensis
S61, S70	Indian Balsam	Impatiens glandulifera
S61, S71, S70, S80	Japanese Knotweed	*Fallopia japonica*
S61	New Zealand Pigmyweed	Crassula helmsi
S61, S71, S70, S80	Rhododendron	Rhododendron ponticum
S61, S71, S70, S80	Brown Rat	*Rattus norvegicus*
S61, S71, S70, S80	American Mink	*Mustela vison*
S61, S71, S70	Eastern Grey Squirrel	Sciurus carolinensis
S71	Feral Ferret	Mustela furo
S61, S71	House Mouse	Mus musculus
S61	Sika Deer	*Cervus nippon*

The non-native and invasive species Japanese Knotweed (*Fallopia japonica*) was recorded in proximity to the proposed works area. Rhododendron (*Rhododendron ponticum*) were recorded in proximity to and within the proposed works area.

Regulations 49 and 50 of the European Communities (Birds and Natural Habitats) Regulations 2011 make it an offence to plant, disperse, allow dispersal or cause the spread of certain species e.g. Japanese knotweed, Himalayan balsam and Rhododendron, keep the plant in possession for purpose of sale, breeding, reproduction, propagation, distribution, introduction or release, keep anything from which the plant can be reproduced or propagated from the species, without a granted licence and keep any vector material for the purposes of breeding, distribution, introduction or release. Regulation 49 deals with the '*Prohibition on introduction and dispersal*' while Regulation 50 deals with the '*Prohibition on dealing with and keeping certain species*'. Regulation 50 has yet to be brought into Irish law. Regulation 74 is a transitional provision in relation to Regulation 49 and 50.

The Wildlife (Amendment) Act 2000 states that anyone who plants or otherwise causes to grow in a wild state in any place in the State any species of (exotic) flora, or the flowers, roots, seeds or spores of (exotic) flora shall be guilty of an offence.

There is a statutory obligation under S.I. 477 of 2011 of the European Communities (Birds and Natural Habitats) Regulations 2011 to address invasive species in Ireland. Rhododendron, Three Cornered Leek and Japanese Knotweed are listed under the *3rd Schedule: Part 1 – Plants; Non-native species subject to restrictions under Regulations 49 & 50.*

The non-native and invasive species Japanese Knotweed (*Fallopia japonica*), Rhododendron (*Rhododendron ponticum*) and Three-Cornered Leek (*Allium triquetrum*) were recorded within or in proximity to the proposed works area. All three species are listed on both the "Most Unwanted: Established Threat" and on the "High Risk: Recorded Species" list compiled by Invasive Species Ireland a joint initiative by the Northern Ireland Environment Agency and NPWS. All invasive species listed are also included in the NRA Guidelines on the Management of Noxious Weeds and Non-native Species on National Roads (NRA, 2010) as these species have been shown to have an adverse impact on landscape quality, native biodiversity or infrastructure; and are likely to be encountered during road schemes. The location of Japanese knotweed, Three Cornered Leek and Rhododendron within or in proximity to the proposed development area is shown in **Figures 19** to **21**. The Amber listed species Winter Heliotrope was recorded within the works area and is ubiquitous along roadside verges in this area and was too prevalent to effectively map.

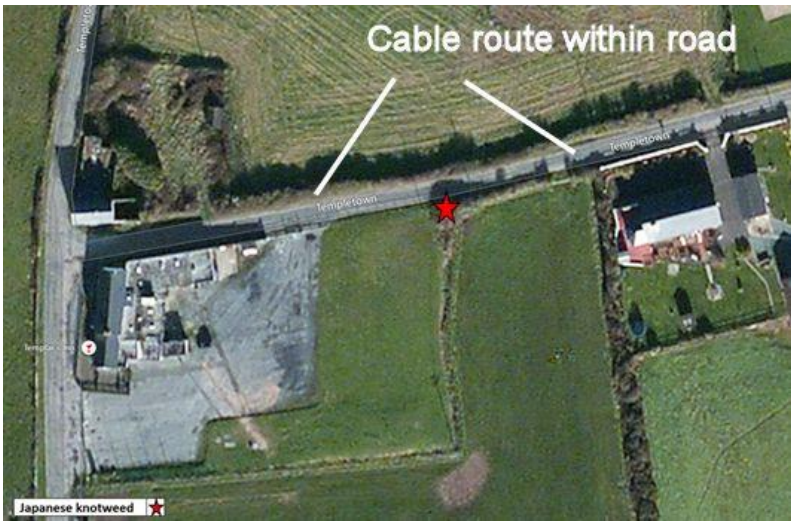


Figure 19. Location of the high-risk invasive species Japanese knotweed. A mature stand of Japanese knotweed was recorded approximately 35m east of the Templars Inn carpark, within a hedgerow habitat along the road verge (grid reference N52˚10'49.0", W006˚53'37.1"). The cable trench will be constructed in the road to the north of this hedgerow

Figure 20: Location of Rhododendron| not to scale. Rhododendron was recorded growing within the understory of woodland and tree line/ hedgerow habitats at various locations within and in proximity to proposed works, at the Campile River Estuary Crossing.

Figure 21: Location of Three-cornered Leek | not to scale This species was recorded approximately 86m from the proposed car parking area, which is the closest point of the proposed development at Baginbun Beach

Japanese Knotweed (*Fallopia japonica*)

Japanese knotweed is a highly invasive, non-native species which was originally introduced as an ornamental plant but has since spread along transport routes and rivers to become a serious problem. From an ecological viewpoint it out-competes native species by forming dense stands which suppresses growth of other species. It grows extremely vigorously and can penetrate through small faults in tarmac and concrete and thus can damage footpaths, roads and flood defence structures. As it can survive in poor quality soils, including spoil, it often thrives in brownfield sites and in urban areas. The key features of the plant are summarised below:

- Produces fleshy red tinged asparagus like shoots when it first breaks through the ground in an established stand;
- Has large, heart or spade-shaped green leaves which are approximately the size of your hand;
- Has leaves arranged in a zig-zag pattern along the stem;
- Grows up to 3 metres in height;
- Yellow / cream flowers in late summer (Typically the start forming from late July onwards);
- Hollow bamboo like stems which have distinctive ring like nodules at regular intervals along it;
- Brown stem remain in winter once it has died back;
- Extensive rhizome system (roots) (7m radius x 3m depth approximately);
- Orange centred rhizome; and
- Spread entirely via the movement of plant and rhizome fragments.

The plant has woody underground rhizomes which can extend seven metres laterally from a parent plant. The leaves and stems die back during winter, but growth is extremely rapid during spring. The plants spread mainly through fragments of rhizomes - as little as 0.7g of material or the size of a small fingernail is sufficient, and through cut stems. Stem material cannot regenerate once it has dried, but rhizome material may be viable for up to 20 years in the soil. Thus, control of this species is very difficult. The key characteristics of this species are shown in **Figure 9.21.**

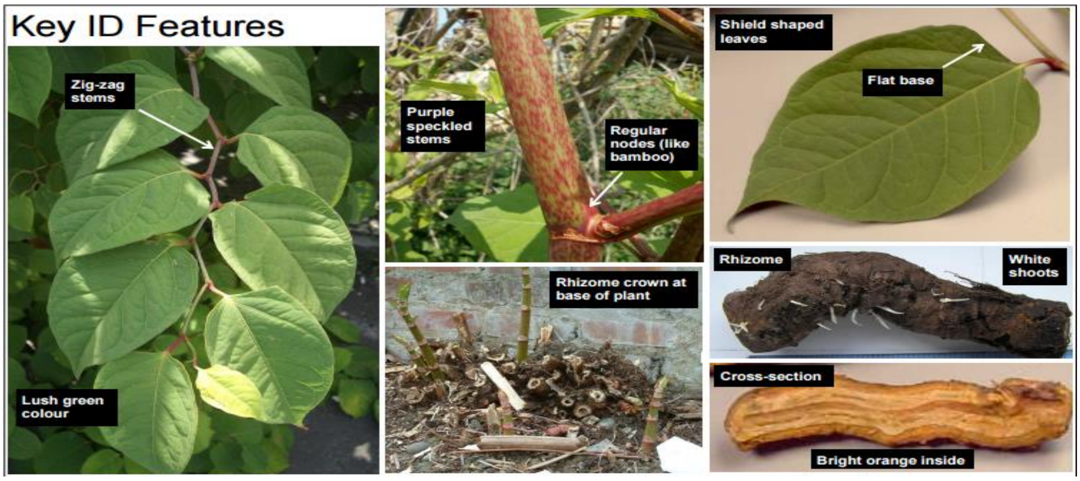


Figure 9.21 Key features of Japanese knotweed

Rhododendron *(Rhododendron ponticum)*

Rhododendron is listed on both the “Most Unwanted: Established Threat” and on the “High Risk: Recorded Species” list compiled by Invasive Species Ireland a joint initiative by the Northern Ireland Environment Agency and NPWS.

Under the right ecological condition, Rhododendron can become a highly invasive and once it has invaded an area, few native plants survive. Rhododendron can regenerate via seeds, suckers or rootlets. It forms extensive dense thickets which cast a very deep shade, leading in woodland to loss of ground flora, epiphytic bryophytes and lichens, modifying the fauna and preventing regeneration of trees. In addition to the effect of shade, it may produce biochemicals which can affect other plants, inhibiting the germination or seedling establishment of other species. There is also evidence for the prevention of mycorrhizal development in the roots of seedlings of competing plant species. *R. ponticum* is identified as a serious threat to upland oakwood. It is also identified as a threat for several lower plants and fungi including *Acrobolbus wilsonii, Arthothelium macounii, Lejeunea mandonii*. The characteristics of this species are illustrated in **Figure 9.22**.

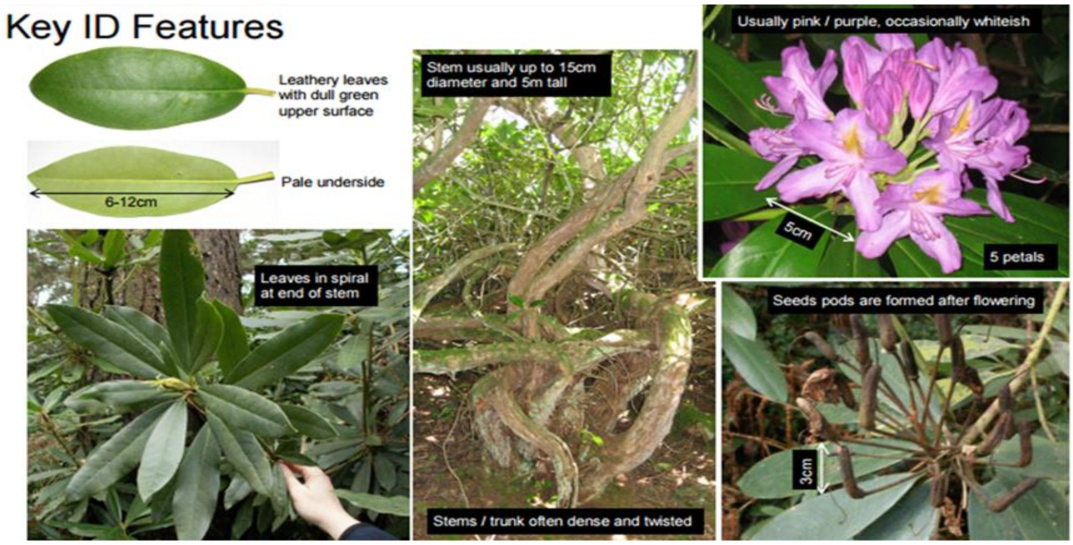


Figure 9.22: Key features of Rhododendron

Three-cornered leek (*Allium triquetrum)*

Three-cornered leek (*Allium triquetrum*), a species also listed under Regulations 49 and 50 of the European Communities (Birds and Natural Habitats) Regulations 2011, was also recorded near the works area. Three-cornered leek is known to have serious impacts on the natural habitats that it invades and is very aggressive, having the potential to rapidly occupy large tracts of land. Plants form dense and persistent stands that totally dominate the ground-flora when conditions are suitable (*moist and shaded*). These stands crowd out and displace the indigenous grasses and groundcover and can also seriously impede the regeneration of the over-storey vegetation. This species was recorded approximately 86m from the proposed car parking area, which is the closest point of the proposed development at Baginbun Beach. Therefore, other than avoidance and standard biosecurity measures as outlined below, a management programme is not required in relation to this species. An invasive species survey will be carried out prior to the commencement of works to ascertain if the distribution of this species has changed, the supervising ecologist will update this ISMP as required based on up to date data.

Figure 6: Three-Cornered Leek

Winter Heliotrope (*Petasites fragrans*)

Short hairy herbaceous perennial, up to 30cm with heart shaped leaves 20-50cm wide persisting in winter. White to lilac flowers, smelling strongly of almonds or Reproduces vegetatively as only male plants found in Britain and Ireland. It occurs on unvegetated or sparsely vegetated habitats including constructed, industrial or other artificial habitats. It is also found in hedgerows, roadsides, stream banks, waste ground and the edges of woodland. Forms dense stands excluding native vegetation. Following best practice guidance, the Amber Listed species Winter Heliotrope (*Petasites fragrans*), can be readily managed through standard eradication/control methods post construction. On the basis of their invasive qualities, the ecological value and types of habitats recorded during the walkover survey and their Amber Listing by Invasive Species Ireland, this species will not have a significant effect on habitats outside the works area.

Figure 7 Winter Heliotrope

9.3.10.7 Other terrestrial and freshwater species listed by NBDC as present within grid squares S61, S71, S70, S80.

Table 9.15 below lists other species listed by NBDC as being present within grid squares S61, S71, S70, S80, that are considered under threat and/or provided with legal protection. None of these species were recorded during site surveys.

Table 9.15: Other species listed by NBDC as present within grid squares S61, S71, S70, S80

Species Group	Named species
Alga	None protected
Annelid	None protected
Bony fish (Actinopterygii)	European Eel - Threatened Species: OSPAR Convention & Threatened Species: Critically Endangered
Centipede	None protected
Conifer	None protected.
Crustacean	None protected.
Fern	None protected.
Fungus	None protected.

Species Group	Named species
Harvestman (Opiliones)	None protected.
Hornwort	None protected.
Horsetail	None protected.
Beetle (Coleoptera)	None protected.
Butterflies	Marsh Fritillary listed as a Protected Species: EU Habitats Directive Annex II & Threatened Species: Vulnerable. Small Blue & Wall listed as Endangered. Dark Green Fritillary is listed as Vulnerable. Dingy Skipper, Gatekeeper, Grayling & Small Heath listed as Near Threatened.
Caddis fly (Trichoptera)	None protected.
Dragonfly (Odonata)	None protected
Flea (Siphonaptera)	None protected.
Earwig (Dermaptera)	None protected.
Hymenopteran	*Colletes (Colletes) similis*, *Megachile (Megachile) centuncularis*, *Andrena (Andrena) fucata*, *Andrena (Leucandrena) barbilabris*, *Nomada panzer*, Moss Carder-bee & Large Red-Tailed Bumble Bee are threatened species: near threatened. *Bombus (Bombus) magnus* is listed as a threatened species: data deficient. *Andrena (Melandrena) nigroaenea*, *Hylaeus (Spatulariella) hyalinatus*, *Andrena (Micrandrena) semilaevis*, Northern Colletes & Neat Mining Bee are threatened species: vulnerable. Great Yellow Bumble Bee is a threatened species: endangered.
Moths	None protected.
Stonefly (Plecoptera)	1 species recorded. Not protected.
Hemiptera	None protected.
True fly (Diptera)	None protected.
Lichen	None protected.
Liverwort	None protected.
Millipede	None protected.
Mollusc	Moss Chrysalis Snail & Swollen Spire Snail are threatened species: endangered. Silky Snail & Common Whorl Snail are threatened species: near threatened. Ear Pond Snail, Hollowed Glass Snail, Marsh Whorl Snail, Heath Snail, Lake Orb Mussel, Moss Bladder Snail, Smooth Glass Snail & English Chrysalis Snail are threatened species: vulnerable.
Moss	Slender Pocket-moss, Blunt-fruited Pottia & Bark Signal-moss are listed as a threatened species: vulnerable. Hair-pointed Grimmia is listed as a threatened species: data deficient. Hasselquist's Hyssop, Rib-leaf Moss & Megapolitan Feather-moss are listed as a threatened species: near threatened
Slime Mould	None protected

9.4 Potential Effects

This section documents the potential effects of the proposed development on biodiversity including the following:

- Terrestrial and Aquatic Habitats
- Impacts on fish
- Invasive Species
- Fauna Generally
- Otter
- Bats
- Badger
- Other Mammals
- Birds
- Other Fauna
- Water Quality and Aquatic Ecology
- Climate Change and Biodiversity.

Potential effects include:

- Indirect effects due to increased noise, vibration and disturbance including lighting during the construction phase of the development;
- Indirect effects on the terrestrial biodiversity due to the spreading of invasive species during site works;
- Indirect effects on the adjoining Baginbun Beach and Campile River Estuary, effects could arise from increased noise, lighting and disturbance associated with the HDD works;
- Indirect effects on the riverine, estuarine and marine environment could arise during construction from increased run-off of suspended solids or from inadvertent spillages of hydrocarbons during construction works;
- Direct effects due to a net, permanent loss of an area of semi-natural terrestrial habitat
- Indirect effects due to increased traffic and noise associated with the site, vibration at HDD sites and piling at the converter station site could potentially increase levels of disturbance which could result in the disturbance/displacement of birds and mammals such as otter. The precast piles will only penetrate as far as the weathered top of the bedrock, not into the intact rock. The installation of the precast piles does not have the potential to impact the bedrock aquifer.

Potential effects on designated Natura 2000 sites (SAC/cSAC/SPA) are specifically addressed in a NIS which forms part of the planning application documentation for the proposed development. The NIS concluded that on the basis of objective scientific information, the proposed development will not, either alone or in combination with other plans or projects, adversely affect any of the constitutive interests of the River Barrow & River Nore SAC, Hook Head SAC, Lower River Suir SAC and the Bannow Bay SPA, in light of these site's conservation objectives. Impacts on designated sites including Natura 2000 sites are also addressed within this chapter of the EIAR.

When describing changes/activities and effects on ecosystem structure and function, important elements to consider include positive/negative, extent, magnitude, duration, frequency and timing and reversibility (IEEM, 2018).

Section 3.7 of the Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports', (EPA, August 2017) provides standard definitions which have been used to classify the effects in respect of ecology (See **Appendix 1.5**).

9.4.1 Do nothing scenario

In the absence of development, it is expected that the small areas which are currently managed intensively for agriculture (arable and pasture) would remain under the same management regime. The general pattern of succession from scrub with patches of grassland to woodland would be expected to continue on areas that are not currently grazed. However, on-going monitoring and management of the invasive species recorded during site surveys is required to avoid further spread.

9.4.2 Construction Phase

9.4.2.1 Terrestrial and Aquatic Habitats

The potential effects on terrestrial habitats are generally restricted to direct removal of habitats and possible effects from the spread of invasive species. Based on the criteria outlined by EPA, 2017, as described above, the predicted effects in the absence of mitigation are detailed in **Table 9.16.**

Table 9.16 Potential impacts in the absence of mitigation

Converter Station and Tail Station Site and adjacent lands		
Habitat	**Ecological value (NRA guidelines)**	**Potential impacts in the absence of mitigation**
Buildings and artificial surfaces (BL3)	Local importance (Lower value).	These habitats are highly modified and any impact on ecology will be minimal. Neutral, imperceptible, temporary impact.
Recolonising bare ground (ED3)/ Buildings and artificial surfaces (BL3)/Scrub (WS1)	Local importance (Lower value).	Loss of a small area of this habitat will have a limited localised impact on local ecology.

		Negative, slight, long-term impact.
Improved agricultural grassland (GA1)	Local importance (Lower value).	Habitat which is highly managed and has low biodiversity. Any impact on ecology will be low. Negative, slight, long-term impact.
Immature woodland (WS2)	Local importance (Lower value).	Planted woodland of limited ecological at present but ecological value will increase as the woodland matures. Neutral, imperceptible long-term impact.
Scrub (WS1)	Local importance (Higher value).	Loss of scrub which provides feeding and nesting resources will have a limited localised impact on ecology. Negative, slight, long-term impact.
Mixed broadleaved woodland (WD1)/ Scrub (WS1) Treeline (WL2)	Local importance (Higher value).	Mosaic of habitats of local ecological value which provide feeding and nesting resources. Very minor loss of habitat. Negative, not significant, temporary impact.
Hedgerow (WL1)/Scrub (WS1)/ Dry meadow and grassy verge (GS2)	Local importance (Low to Higher value).	Mosaic of habitats of local ecological value which provide feeding and nesting resources. Very minor loss of habitat. Negative, not significant, temporary impact.
Tidal River CW2	Local importance (Higher value).	Use of HDD methodology will prevent significant impacts. Discharge of surface water during operation will be ongoing. Negative, slight, long-term impact.
Off-road areas between Great Island and the Campile Estuary		
Habitat	**Ecological value (NRA guidelines)**	**Potential impact in the absence of mitigation**
Improved agricultural grassland (GA1)	Local importance (Lower value).	Habitat which is highly managed and has low biodiversity.

		Negative, slight, temporary impact.
Arable crop (BC1)	Local importance (Lower value).	Habitat which is highly managed and has low biodiversity. Any impact on ecology will be low. Negative, slight, temporary impact.
Hedgerow (WL1)/Treeline (WL2)	Local importance (Higher value).	Loss of hedgerow/treeline which provides feeding and nesting resources will have a limited localised impact on local ecology. Neutral, not significant, temporary impact.
Dry meadow and grassy verge (GS2) (of insufficient size to be mapped)	Local importance (Lower value).	Small areas may be affected where it occurs along road boundaries. Negative, not significant, temporary impact.
Buildings and artificial surfaces (BL3)	Local importance (Lower value).	Low value habitat. Neutral, imperceptible, temporary impact.
(Mixed) broadleaved woodland (WD1)/(Mixed) Conifer Woodland (WD3)	Local importance (Higher value).	No impact on this habitat will occur. Neutral, imperceptible, temporary impact.
Stone walls and other stonework (BL1)/ Spoil and bare ground (ED2)	Local importance (Lower value)	Minor impact on low value habitat. Neutral, imperceptible, temporary impact.
Drainage ditch (FW4)	Local importance (Lower value)	Habitat not affected. Neutral, imperceptible, temporary impact.
Tidal river (CW2)/ Earth banks (BL2)	Local importance (Higher value).	Neutral, imperceptible, temporary impact.
Minor off road areas in proximity to roads		
Habitat	**Ecological value (NRA guidelines)**	Potential impact in the absence of mitigation
Arable crop (BC1)	Local importance (Lower value).	Habitat which is highly managed and has low biodiversity. Negative, slight, temporary impact.
Improved agricultural grassland (GA1)	Local importance (Lower value).	Habitat which is highly managed and has low biodiversity. Negative, slight, temporary impact.
Campile River Estuary Crossing		

Habitat	Ecological value (NRA guidelines)	Potential impact in the absence of mitigation
Tidal rivers (CW2)	International importance.	Will be unaffected due to use of HDD technology. Neutral, imperceptible temporary impact.
Upper salt marsh (CM2)	International importance.	Will be unaffected due to use of HDD technology. Neutral, imperceptible, temporary impact.
Mixed broadleaved woodland (WD2)/ Conifer woodland (WD3)	Although classified as being of international value where this habitat occurs within the River Barrow and River Nore SAC boundary it is considered of Local importance (Higher value).	Will be unaffected due to use of HDD technology. Neutral, imperceptible, temporary impact.
Mixed broadleaved woodland (WD1)/ Treelines (WL2)/ Hedgerows (WL1)/ Scrub (WS1)	Although classified as being of international value, where this habitat occurs within the River Barrow and River Nore SAC boundary it is considered of Local importance (Higher value).	Will be unaffected due to use of HDD technology. Neutral, imperceptible, temporary impact.
Improved agricultural grassland (GA1)	Although classified as being of international value where this habitat occurs within the River Barrow and River Nore SAC boundary it is considered of Local importance (Lower value).	Low value habitat. Negative, slight, temporary impact.
Recolonising bare ground (ED3)/Scrub (WS1)	Although classified as being of national value, where this habitat occurs within the Barrow River Estuary boundary it is considered of Local importance (Lower value).	Will be unaffected due to use of HDD technology. Neutral, imperceptible, temporary impact.
Embankment (BL2)	Although classified as being of international value where this habitat occurs within the River Barrow and River Nore SAC boundary it is considered of Local importance (Higher value).	Will be unaffected due to use of HDD technology. Neutral, imperceptible, temporary impact.
Baginbun Beach Landfall Site and Car Parking Area		

Habitat	Ecological value (NRA guidelines)	Potential impact in the absence of mitigation
Rocky sea cliffs (CS1) / Sedimentary sea cliffs (CS3)	International importance.	Will be unaffected due to use of HDD technology. Neutral, imperceptible, temporary impact.
Sand shores LS2	International importance.	Will be unaffected due to use of HDD technology. Neutral, imperceptible, temporary impact.
Buildings and artificial surfaces (BL3) / Spoil and bare ground (ED2)	Although classified as being of International importance where this habitat occurs within the Hook Head SAC boundary it is considered of lower value, local importance.	Low value habitat. Neutral, imperceptible, temporary impact.
Improved agricultural grassland (GA1)	Local importance (Lower value).	Habitat which is highly managed and has low biodiversity. Neutral, imperceptible, temporary impact.
Arable crop (BC1)	Local importance (Lower value).	Habitat which is highly managed and has low biodiversity. Negative, slight, temporary impact.
Scrub (WS1)	Local importance (Lower value).	Loss of scrub which provides feeding and nesting resources will have a limited localised impact on ecology Negative, slight, permanent impact.
Cable route within artificial surfaces i.e. in roads, footpaths and verges		
Habitat	**Ecological value (NRA guidelines)**	Potential impact in the absence of mitigation
Buildings and artificial surfaces BL3)/Stone walls and other stonework (BL1)	Local importance (Lower value).	Low value habitat. Negative, slight, permanent impact.
Hedgerows (WL1)/ Treelines (WL2)	Local importance (Higher value).	As detailed in the tree survey report which is attached as **Appendix 9.5** significant stands of trees along the route have been identified. Road surfaces will naturally curtail root development. The route will avoid stands or

		mature trees where possible and no significant loss of trees or hedgerow is predicted to occur. Negative, slight, permanent impact.

9.4.2.2 Invasive species

There is potential during the construction phase for invasive species to be spread to Natura 2000 sites, thus impacting negatively on qualifying habitats. The risk from the spread of invasive species to Natura 2000 sites is minimal due to the limited potential for the spread of invasive species over large distances. An Invasive Species Management Plan (ISMP) which provides additional details is included as **Appendix 9.6.**

Three Cornered Leek occurs outside the works area and will be avoided. Based on surveys to date Japanese Knotweed occurs outside the works area and avoidance is the preferred methodology. Where this is not possible excavation and removal to a licenced facility under licence will be carried as detailed in the Invasive Species Management plan based on up to date survey data.

Rhododendron occurs within the red line boundary, however avoidance will be largely possible through control measures. Where avoidance is not possible, the ISMP provides methodologies for its successful eradication within the works area and biosecurity protocols.

The Amber Listed species Winter Heliotrope was recorded within the works area and is ubiquitous along roadside verges in this area. It does not create a significant risk to Natura 2000 sites or other habitats outside Natura 2000 sites and be treated by standard herbicide treatment post construction.

The invasive species management plan will be updated by the supervising ecologist, based on up to date data.

No impediment to the removal of these species within proposed development area if required as part of the invasive species management plan, has been identified. No risk to local ecology has been identified from the spread of invasive species.

The ISMP (which is included as **Appendix 9.6**) provides detailed methodologies for the effective avoidance of invasive species and treatment of same if required. Overall no impact on adjoining habitat or the qualifying interests and conservation objectives for European sites from the spread of invasive species will occur.

9.4.2.3 Potential Effects on Fauna

There will be effects on habitats located within the proposed works areas and there is the potential for adverse effects on fauna. Increased lighting, noise, vibration and disturbance will occur during construction which can result in disturbance and/or displacement of fauna.

9.4.2.4 Otter

Surveys by Dixon.Brosnan in 2018 and 2019 recorded the presence of otter along the Campile River Estuary and at Baginbun Beach, however no holts or couches were recorded.

During construction works there will be increased noise and activity associated with the site works. The HDD sites at Campile River Estuary and Baginbun Beach are set back a minimum of 100metres from aquatic habitats which will be of primary value for otters.

Baginbun Beach is extensively used by the general public, and that usage is highest in proximity to the car park that is located immediately adjacent to the development site. These circumstances, particularly where dogs are also present, may reduce usage of the area by otter. The Campile River Estuary in proximity to Dunbrody Bridge and Dunbrody Abbey is already subject to some level of disturbance from traffic and human activity and otters readily habituate in these circumstances.

Based on the absence of otter breeding sites, the distance of the HDD sites from high value otter habitat, and the short-term nature of construction works there remains the potential for short-term slight negative effects.

9.4.2.5 Bats

A bat survey was carried out at Dunbrody Bridge, over the Campile River Estuary in September 2018. While no bats were recorded emerging from the bridge, the survey did detect limited usage of the surrounding area by Brown Long-eared Bat, Daubenton’s Bat, Leisler’s Bat and Soprano Pipistrelle. The recorded activity was largely confined to the external boundaries of the survey area namely woodland and tree line habitats. Daubenton’s bat was recorded foraging along the Campile River Estuary.

A crossing of the Campile River Estuary via Dunbrody Bridge was considered as an option and it was for this reason the bat survey at this location was completed. Although this option was not utilised, the bat survey results are indicative of bat activity along this section of the estuary.

No potential roosting sites were identified within the proposed development area during the survey at Dunbrody Bridge. An additional day-time roost assessment/winter hibernation survey of an abandoned building in proximity to the proposed converter station site found no signs of bats.

Whilst the loss of immature woodland, scrub and small areas of grassland around the proposed converter station site and small areas of grassland, hedgerow, treeline and scrub habitat along the proposed cable route will reduce the net feeding area available for bats, the effect will be temporary to long term and slight in the context of the amount of similar habitat in the surrounding landscape.

Lighting during night-time works at the HDD compounds will be focused away from woodland and treeline habitats and will be temporary. External lighting will be installed at the proposed converter station. However, to avoid creating any unnecessary glare external lighting at the converter station will be turned off during hours of darkness. The exception would be for emergency outdoor works.

Overall the effect is predicted to be long term and slight and the effect will be localised and will not significantly affect overall bat populations as there will be no significant loss of critical resources for bats.

9.4.2.6 Badger

A main badger sett was recorded within the woodland habitat approximately 220m southwest of the northern Campile River Estuary HDD crossing site. An active annexe sett was recorded approximately 50m east of the main sett along the northern periphery of the woodland habitat. Although grassland habitat suitable for foraging was recorded within the development footprint no specific signs of badger foraging were recorded.

Badgers could potentially be affected via loss of habitat, increased noise and disturbance and via direct impacts on setts. In this instance there will be no direct effect on setts. The setts, which were located within woodland habitat at the Campile River Estuary, are not located in proximity to the proposed development area and due to the distances involved no effect on badger using these setts, including badgers that could potentially be breeding, will occur.

Although there is considerable regional variation the mean density of badger social groups in Ireland was estimated at 1 group per 2 km^2 (0.495 per km^2). There will be a net loss of potential feeding habitat within sections of the proposed development. Badgers show a strong preference for pasture used for cattle. Under the NRA guidelines (NRA, 2006c) where loss of habitat is likely to be greater than 25%, the effect may be considered as significant on the affected social group. In this instance there will only be temporary impacts on a very small area of potential badger feeding habitat and the effect will not be significant.

It is concluded therefore that the impact on habitats within the proposed onshore route will not have significant effects on badgers although changes in feeding patterns may occur during construction. Overall the effect is predicted to be temporary and slight.

9.4.2.7 Other Mammals

Signs of Irish Hare were recorded within the proposed converter station site and other mammal species which are protected under the Irish Wildlife Act 1976, as amended, such as Sika Deer, Pine Martin, Hedgehog, and Red Squirrel could potentially occur within the proposed development area. However, most of the works will take place within roads and road verges or will impact on common habitats.

Effects on these species due to loss of habitat and increased noise and disturbance and lighting are predicted to be long-term and slight at the converter station and temporary and slight within the proposed cable route and at compounds and other offline areas.

9.4.2.8 Birds

9.4.2.9 Birds associated with terrestrial habitats

The terrestrial bird species recorded during bird surveys are typical of the types of habitat noted on site and are generally common. No rare or uncommon species or species of high conservation value were recorded. No significant effect on peregrine falcon utilising the Great Island Power Station will occur. The use of HDD methodology will prevent any significant effects on hen harrier which is known to occur that Campile River Estuary.

There will be a net loss of semi-natural habitats within the proposed development area (e.g. arable land, scrub and grassland) and the loss of scrub at the site of the proposed converter station in particular will have a localised effect on nesting and feeding resources for common bird species. However, scrub habitat is often an ephemeral habitat within the wider agricultural/ industrial landscape and the scrub within the proposed converter site is not diverse or of particularly high value. Small areas of this type of scrub are commonly lost or recreated within the wider landscape. Only very small areas of grassland will be lost and the habitat quality of improved agricultural grassland to be affected by the cable route and compounds will quickly regenerate. Overall, the loss of habitat for breeding birds within the development site is considered a long term, slight effect.

Some disturbance/displacement of terrestrial and breeding birds may occur during construction due to increased noise and disturbance during construction. However, this will be short in duration. The effect is therefore predicted to be temporary and slight. Disturbance levels will be relatively low during operation, this is considered a long-term, slight impact.

9.4.2.10 Birds associated with shoreline/ estuarine habitats

Bird surveys were carried out to determine the degree to which the shoreline/estuarine habitats and waters in proximity to the proposed development site are utilised by birds and in particular important populations of overwintering waders and waterfowl. A total of 26 bird species were recorded during the winter bird surveys carried out in 2018/2019. Birds species listed in Annex I of the Birds Directive are considered a conservation priority and five such species were recorded. (Little Egret, Dunlin, Kingfisher, Red-throated Diver and Great Northern Diver). Six Red Listed species were recorded, namely Black-headed Gull, Herring Gull, Redshank, Wigeon, Dunlin and Curlew.

Several bird species were recorded feeding and/or roosting along the shoreline at Baginbun Beach and estuarine habitats at the Campile River Estuary. Although no habitats within the Bannow Bay SPA will be directly affected, there could potentially be indirect effects on bird species listed as qualifying interests for this SPA where they occur outside the SPA boundary. A total of five species listed as qualifying interests for the Bannow Bay SPA were recorded utilising the survey sites, namely, Dunlin, Curlew, Black-tailed Godwit, Oystercatcher and Redshank. None of these species were recorded in high abundance or at levels that would be considered important at a national level.

Overall, none of the waterbirds recorded by vantage point counts were recorded in high numbers and numbers were low in-comparison to the figures which would be considered nationally significant (i.e. 1% or more of the all-Ireland population of an Annex I species or 1% or more of the bio-geographical population of a migratory species).

Effects on birds near the proposed development areas could potentially arise during construction when levels of noise and activity will increase. The Bannow Bay SPA is located 1.3km north of Baginbun Beach landfall site. Given the distance involved disturbance from light, noise and vibration during the construction phase will not impact on foraging birds within the SPA during the winter period. However potentially impacts on these species feeding outside of the SPA boundary and in particular at Baginbun Beach which is the closest point of the proposed works to the SPA, could potentially occur.

Works with the potential to generate the greatest noise and vibration impacts (blasting and rock breaking) will take place at the converter station site which is located 11.5km km from the Bannow Bay SPA.

The potential effects and impacts of disturbance have been widely recognised in wildlife conservation legislation, as has the need to develop conservation measures for birds whilst taking human activities into account. Article 4.4 of the Bird's Directive (79/409/EEC) requires member states to "*take appropriate steps to avoid… any disturbances affecting the birds, in so far as these would be significant having regard to the objectives of this Article*". This specifically relates to conservation measures concerning Annex I species.

Optimal foraging theory is a useful basis from which to understand likely effects of disturbance on feeding. Many studies have shown that birds concentrate where feeding is best.

If birds are forced temporarily or permanently to leave these places, then there is an increased risk that their foraging ability will suffer. However, the severity of this type of situation and the way is which birds respond; vary in a very complex way. The multiplicity of variables underlying the observed interactions between birds and people makes it difficult to assess the cause and implications of a particular instance of disturbance. The magnitude of disturbance to birds may arise from synergistic effects of more than one activity.

Burger (1981), in a study of a coastal bay, found that birds were present 42% of the time when people were present, but birds were present 72% of the time when people were absent. Human activities such as jogging or grass mowing, which involved rapid movement or close proximity to roosting birds, usually caused them to flush (fly away). Slow-walking birdwatchers and clammers did not usually cause birds to flush. Gulls and terns were least affected and usually returned to where they had been; ducks usually flushed and flew to the centre of the pond; and herons, egrets and shorebirds were most disturbed and flushed to distant marshes.

The magnitude and predictability of impacts as a result of disturbance ranges between species, seasons, weather, source and duration of disturbance, degree of previous exposure of the individuals to disturbance and the occurrence of additional disturbances. Most disturbances to wetland birds result in an interruption to normal activity and the displacement of birds over variable distances, often into sub-optimal habitats. This can be critical during severe winters and can lead to a reduction in the carrying capacities of important wintering wetland sites. However, in general studies show that most bird species have the ability to habituate to regular and continual sources of noise and visual disturbance.

Migratory birds generally have to cope with narrow physiological and energetic balances and are often bound to fixed time-schedules (e.g. Piersma, 1994). Hence, they heavily depend on the resources they find at their stop-over sites en route between breeding- and wintering areas, and any serious disturbance or other human impact may easily disturb the precarious balance the birds are subject to. Eventually winter survival and breeding success, and thus population levels, might be affected as well (e.g. Madsen & Fox, 1995).

The proposed development site is located predominately within an agricultural landscape and along roadways. During the construction stage, there will be short-term increases in noise, vibration, lighting and disturbance. Blasting and rock breaking which have the potential to cause the highest levels of disturbance will only be carried out at the proposed converter station which is located approximately 11.5 m from the Bannow Bay SPA.

In general studies show that most bird species have the ability to habituate to regular and continual sources of noise and visual disturbances. While there may be some temporary displacement of bird species, there will not be a significant negative effect on their overall survival rate due to the close proximity of identical habitat, roosting and foraging resources e.g. high value mudflats with high densities of macro-invertebrates in relation to the Campile River Estuary.

Also, peripheral habitats including woodland, treelines and hedgerows provide a visual screen between the site works and birds utilising the nearby Bannow Bay SPA.

Works in close proximity to the Campile River Estuary, which provides habitat for wintering birds, will take place outside the peak season for wintering birds which runs from October to March inclusive. This will minimise the disturbance to any wintering/migratory bird species utilising the sites during this period.

Due to the distance involved no effect on the Black Guillemot breeding area at Baginbun Headland will occur. The impact on kingfisher utilizing the Newtown River will be long term and imperceptible.

The construction phase of the proposed development, in particular the HDD works, will increase noise and disturbance in proximity to aquatic habitats of potential value to wintering birds, however given the value of adjoining habitats for birds, visual screening of the HDD sites, the availability of alternative habitat and the short-term nature of the works, the impact on wintering birds will be temporary and imperceptible.

Overall, given the scale and temporary nature of the works, the distances involved, existing disturbance factors and avoidance of works in key areas during the bird wintering period, there will be no significant effect on bird populations utilising estuarine and marine habitats.

9.4.2.11Effects on other fauna

No signs of amphibians or reptiles were recorded. The proposed development area is only likely to support common invertebrate species. Given that the habitats which will be affected are relatively common in the surrounding landscape and the limited scale and short-term nature of the proposed development any effect on these species will be temporary and slight negative.

9.4.2.12 Water quality and aquatic ecology

There are no substantial freshwater habitats which will be affected by construction works. The Campile River Estuary which will be crossed via HDD is estuarine at the crossing point. A HDD methodology will also be employed at Baginbun Beach and thus there is the potential to impact on the marine environment. It is intended that the Newtown River will be crossed using trenchless techniques (mini-HDD), which will result in no direct interaction with the water quality and aquatic ecology. The use of an open cut methodology has also been assessed as a precautionary measure, although it is considered highly improbable that it will be required.

HDD drilling has the potential to release drilling fluids into the surface environment through frac-outs, whereby drilling fluids are released through fractured bedrock into the surrounding rock and sand and travels toward the surface. However, as drilling fluids consist of a betonite clay-water mixture they are not classified as toxic of hazardous substances.

Given that bentonite is chemically inert, the dilution provided in the receiving waterbody and given that tidal habitats are generally robust and adapted to naturally fluctuating levels of silt, the impact on estuarine habitats and macroinvertebrate populations would be temporary and negligible. Likewise, the impact on fish such as Grey Mullet, European eel, Sea Trout, Salmon and Lamprey species which could potentially be moving through estuarine waters would be temporary and slight.

In the unlikely event that the Newtown River is crossed via an open cut methodology, there is the potential for the generation of increased silt levels and there is the potential for minor spills of hydrocarbons from construction machinery. The impact of increased silt and minor spills of hydrocarbons would not have a significant impact in the context of the limited potential for significant accidental discharges, the naturally occurring fluctuations in suspended solids in the estuarine environment and the high level of dilution provided in the estuarine environment. Although use of the Newtown River by fish is expected to be limited, it has the potential to support species such as Flounder and Thick Lipped Grey Mullet. There will be temporary displacement of these species from the works area and free movement of fish will be prevented during the crossing period if open cut is deployed; however this is a temporary impact. Overall it is concluded that the crossing of the Newtown River will have a temporary, slight effect on water quality and aquatic ecology.

Most of the effects from the cable route will be within terrestrial habitats within roads or road verges and common agricultural habitats such as arable fields and intensively farmed grassland.

Minor impacts on water quality could occur due to minor localised run off of surface water during construction, use of concrete and minor contamination of surface water and ground water due to minor leaks of hydrocarbons from machinery. Ponded rainwater in excavations may need to be removed. No direct discharge of water from excavations to stream or rivers is proposed. Ponded surface water will be pumped to vegetated areas to allow solids to be removed via overland flow. If required a settlement tank will be utilised with surface water discharging via a silt sock and/or overland flow.

Surface water run-off from site compounds will either discharge to existing surface water management system at greenfield rates or will be allowed to run-off to vegetated areas. The temporary foul drainage at the construction compounds will comprise self-contained sanitary facilities, with wastewater stored and tankered off-site to appropriately licenced disposal facilities. Appropriate silt control measures such as silt fences will be employed where necessary. All water from wheel wash stations will be collected, fully contained and dispatched for treatment and disposal off-site. Based on the above, the potential negative effects on surface water and groundwater from the proposed works within roads, road verges or off-road diversion areas will be slight to not significant.

The HDD compounds have been located above the flood plain, which is an embedded mitigation which minimises the risk of flood events contributing to uncontrolled run-off of polluted water.

Precast piling will be installed at the converter station site. The precast piles will only penetrate as far as the weathered top of the bedrock, not into the intact rock. The installation of the precast piles does not have the potential to impact the bedrock aquifer.

The effect on water quality and aquatic ecology during construction is predicted to be short term and not significant to slight.

9.4.2.13Climate change and biodiversity

The EU Commission guidance document on integrating climate change and biodiversity into environmental impact assessment (EU Commission, 2013) aims to improve the way in which climate change and biodiversity are integrated into Environmental Impact Assessment. Key principles specified by the document when considering impacts include the following:

- Consider climate change at the outset;
- Analyse the evolving environmental baseline trends;
- Take an integrated approach;
- Seek to avoid biodiversity and climate change effects from the start;
- For biodiversity, EIA should focus on ensuring 'no net-loss';
- Assess alternatives that make a difference in terms of climate change and biodiversity;
- Use ecosystem-based approaches and green infrastructure as part of the project design and/or mitigation measures; and

- Assess climate change and biodiversity synergies and cumulative effects which can be significant.

The potential effects from the proposed development on climate have been specifically addressed by **Chapter 7** *Air Quality and Climate* of this EIAR. No significant interactions between the effects on biodiversity resulting from this development and climate change have been identified.

In relation to biodiversity, it is important to adopt an "*ecosystem approach which considers all of the different ecological elements and how they interact with each other*". The entire proposed development includes a mixture of semi-natural habitats with native hedgerow/ treeline and woodland habitats, which form connective elements within the local landscape. Dense hedgerows for example can connect different ecological elements within a landscape which allows mammals, birds and invertebrates a means of moving through the landscape under cover. In addition, these boundary habitats provide nesting and feeding habitat for birds and other fauna and is of value as feeding habitat for bats. The retention of these habitats is therefore considered important in maintaining ecological value within the site.

The project has been designed to minimise impacts on biodiversity by ensuring that most of the construction activity will be located in areas of low ecological value, such as existing roads. Minimisation of effects on linear habitats will help to maintain connectivity and the use of HDD techniques will prevent effects on important estuarine and shoreline habitats. Planting of trees at the converter site will create additional habitat. Overall therefore the effect will be imperceptible.

9.4.3 Operational Phase

Chemical contaminants such as hydrocarbons could potentially impact on water quality and thus could impact on fish species, aquatic ecology and aquatic qualifying species for the River Barrow and River Nore SAC which migrate through or occur within the estuary (Sea lamprey (*Petromyzon marinus)*, River Lamprey (*Lampetra fluviatilis)*, Twaite Shad (*Alosa fallax)* and Salmon (*Salmo salar*)*)* and on common fish species within the Newtown River. Impacts on fish populations could in turn impact on populations of otter.

Surface water run-off from yard areas and the building roofs of the converter station site, will discharge through proposed filter drains and surface water sewers, through a bypass interceptor, to a proposed attenuation pond, to be constructed to the south-eastern part of the site. Discharges from the attenuation pond will be controlled to greenfield rates. Water from the attenuation pond will be discharged to the Newtown River in the southern part of the site. The Newtown River is tidal at this location. The impact on water quality in the Newtown River is predicted to be long-term and imperceptible.

Foul wastewater will be collected from the welfare facilities in the converter station and tail station. It will be contained in the units and removed from site periodically, by a licensed service provider, to a local sewage treatment plant, which has adequate capacity.

Transformers will be sited within a reinforced concrete bund (which will have 100% capacity) which will be linked to an underground oil dump tank.

Transformer bunds will be designed as waterproof structures in accordance with BS EN 1992-3 and the crack width will be limited to 0.2mm with appropriate water bars. The bunds will be tested in accordance with standard bund testing requirements. Rainwater or other surface water shall permeate through a flame trap. Once permeated through the stone fire trap, the water will be collected in a common dump tank. It will then be pumped out of the dump tank via a bund water control pump to a manhole, before flowing by gravity to an oil separator prior to final discharge into the surface water drainage system. The oily water system will incorporate penstocks to close off the system.

The oil separator shall be a Class 1 full retention unit in accordance with BS EN 858-1, incorporating a coalescer automatic closure device and high oil level alarm. The separator shall be fully capable of isolating all upstream oil flow in the event that the high-level oil alarm is activated. The interceptor will be sized to suit the storm intensity flow rates from the transformer bunds and any other designated oil containment area.

A range of mitigation measures will be implemented as part of the operation of the proposed converter station site. In general, the estuarine habitats listed as qualifying interests for the River Barrow and River Nore SAC (Mudflats and sandflats not covered by seawater at low tide, Salicornia and other annuals colonizing mud and sand, Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) and Mediterranean salt meadows (*Juncetalia maritimi*)) are robust. Given the comprehensive mitigation measures to be implemented as part of the proposed development, the dilution provided in the estuarine environment and the qualifying habitats in question, any impacts on water quality will not affect qualifying habitat interests for the River Barrow and River Nore SAC.

Sea lamprey (*Petromyzon marinus)*, River Lamprey (*Lampetra fluviatilis)*, Twaite Shad (*Alosa fallax)* and Salmon (*Salmo salar*) will occur in the lower estuary but these migratory species will only move through the estuary and thus will only be present for a limited time period. Given the comprehensive mitigation measures to be implemented as part of the proposed development, the dilution provided in the estuarine environment and the qualifying habitats in question, any impacts on water quality will not significantly impact on qualifying species for the River Barrow and River Nore SAC and the impact on these species will be not significant.

9.4.3.1 Invasive Species

During the operational phase, no effects due to the spread of invasive species will occur. The effect will be imperceptible.

9.4.3.2 Bats

Artificial lighting from the proposed converter station site could have a potential negative and long-term effect on bat behavior. A bat survey did not record bats within the derelict house to the south of the proposed converter station. External lighting will be turned off during hours of darkness, the potential effects are limited to periods when repairs are being conducted and therefore are long-term and imperceptible. A comprehensive landscaping scheme will be implemented at the converter station site incorporating significant earthworks, berming, planting of approximately 15,000 native mixed-woodland trees, and zones of grassland meadow. This scheme will provide breeding and nesting habitat for birds and mammals including bats, and in the long-term improve the habitat value of the existing site. The effect will be long term and slight.

9.4.3.3 Operational effects from noise and visual disturbance

There will be no ongoing noise and disturbance associated with the cable route apart from occasional maintenance works. There will be long-term increase in noise and activity at the converter station during operation. The converter station will be near the existing Great Island Power Station and therefore existing levels of noise and activity will already be relatively high. It is also noted that noise mitigation measures are integrated into the design. Given the distance from the Bannow Bay SPA, the existing levels of noise and activity in this general area, the ability of winter birds to habitualise to increased levels of light, noise and activity no effect on winter birds listed as qualifying interests for the Bannow Bay SPA will occur.

During the operational phase the levels of activity will stabilise and birds and mammals in the surrounding landscape will habitualise to increased activity. Two personnel will be stationed at the converter station at all times and levels of activity will be low.

The effects on birds and mammals in habitats adjoining the proposed development is therefore predicted to be long term and not significant during operation.

9.4.4 Decommissioning

As mentioned in **Chapter 3** *Proposed Development*, once the interconnector ceases operation the proposed development will be decommissioned. Equipment and all above ground civil works at the converter site will be removed and the site returned to its previous state. Underground cables will remain in-situ as there would be more of an environmental impact in their removal. Above ground structures such as the link boxes and fibre optic joints will be removed, and their locations reinstated.

As the site of the converter station and tail station is generally of low biodiversity interest, the impact of decommissioning will be temporary and not significant following the implementation of standard mitigation measures.

9.5 Mitigation and Monitoring Measures

The mitigation measures have been drawn up in line with current best practice and include an avoidance of sensitive habitats at the design stage and mitigation measures will function effectively in preventing significant ecological impacts. The following mitigation measures will be implemented.

A Construction and Environmental Management Plan (CEMP) has been prepared for the proposed development and is included as **Appendix 4.1**. This CEMP provides details of all proposed mitigation measures. All measures outlined in the CEMP will be implemented in full, at a minimum.

The principal mitigation measures are detailed below:

Construction best practice measures (of relevance in respect of any potential ecological impacts) will be implemented throughout the proposed development, including the preparation and implementation of detailed method statements. The works will incorporate the relevant elements of the guidelines outlined below:

- NRA (2010) Guidelines for the Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads. National Roads Authority, Dublin.
- IFI (2016) Guidelines on protection of fisheries during construction Works in and adjacent to waters (IFI, 2016)
- H. Masters-Williams et al (2001) Control of water pollution from construction sites. Guidance for consultants and contractors (C532). CIRIA.
- E. Murnane, A. Heap and A. Swain. (2006) Control of water pollution from linear construction projects. Technical guidance (C648). CIRIA.

All personnel involved with the proposed development will receive an on-site induction relating to operations and the environmentally sensitive nature of European sites and to re-emphasise the precautions that are required as well as the precautionary measures to be implemented. Site managers, foremen and workforce, including all subcontractors, will be suitably trained in pollution risks and preventative measures.

All staff and subcontractors have the responsibility to:

- Work to agreed plans, methods and procedures to eliminate and minimise environmental impacts,
- Understand the importance of avoiding pollution on-site, including noise and dust, and how to respond in the event of an incident to avoid or limit environmental impact;
- Respond in the event of an incident to avoid or limit environmental impact;
- Report all incidents immediately to the site manager;
- Monitor the workplace for potential environmental risks and alert the site manager if any are observed; and
- Co-operate as required, with site inspections.

9.5.1 Construction Phase Mitigation Measures -Water Quality

As part of the assessment of the required construction mitigation, best practice construction measures which will be implemented for the proposed development were considered. A summary of the measures relevant to hydrology are provided as follows and are in accordance with Construction Industry Research and Information Association (CIRIA) guidance – Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors (Masters-Williams et al, 2001). Further detail is provided in the

CEMP which is attached as Appendix 5 and in Chapter 13 of the EIAR (Water and Hydrology) which is attached as Appendix 7.

To minimise the potential for elevated silt levels in surface water run-off, the working area used during construction will be clearly outlined prior to the commencement of works and will be kept to the minimum area necessary to effectively complete the works. Vegetation will be retained where possible.

A set of standardised emergency response procedures will govern the management of emergency incidents. These are provided in the CEMP (which is a live document which will be updated/added to as construction progresses), together with the Emergency Incident Response Plan.

A detailed spillage procedure will be put in place and all will be trained with respect to the relevant procedures to be undertaken in the event of the release of any sediment, hydrocarbons into a watercourse. Spill kits will be maintained on site and relevant staff will be trained in their effective usage. All site personnel will be trained and aware of the appropriate action in the event of an emergency, such as the spillage of potentially polluting substances. In the event of spillage of any polluting substance and/or pollution of a watercourse, Wexford County Council, Inland Fisheries Ireland and the NPWS shall be notified. Further measures include:

- A monitoring regime/programme for water quality will be put in place;
- All works undertaken will be fully consolidated to prevent run-off of silt;
- Silt fences/swales shall be provided at all locations where surface water run-off may enter/leave the working areas, and adjacent to the haul roads;
- There will be no tracking of machinery within watercourses;
- Dewatering, where required, will incorporate the use of filter media; there will be no direct discharges into the small watercourses (Saltmills, Ballyhack, Clonsharragh and Curroughmore, Graigue Little and Graigue Great) which will be crossed by the cable within existing roads or road verges.
- Self-contained wheel wash facilities will be provided to protect watercourses from the carriage of silt on vehicles with the waste liquid contained on site, and dispatched off-site for disposal at an appropriately permitted facility;
- The length of trench excavation at any particular section of the cable route will be limited to ensure that the trench will not act as a conduit for stormwater run-off.
- Access/haul roads shall be set back from watercourses by at least 10m where possible.
- Refuelling of vehicles will take place at designated locations at a distance of 10m or greater from the nearest watercourse;
- Any fuel stored on site will be stored in double skinned, appropriately sized bunded containers and will be located in a designated work compound;

- No vehicles will be left unattended when refuelling;
- A spill kit including an oil containment boom and absorbent pads will be on site at all time;
- All vehicles will be regularly maintained, washed and checked for fuel and oil leaks;
- Concreting works will be carried out in dry conditions where possible and concrete works will be strictly controlled and monitored.
- No concrete washout will be allowed to discharge to watercourses. Wash out of concrete trucks will not be permitted on site;
- There will be no direct pumping of contaminated water from the works to a watercourse at any time;

The following construction management measures will be implemented at all construction compounds, onshore cable routes and the converter station site;

Contractor Compounds

- Any containers of potential polluting materials such as fuels and oils will be stored in a bunded area (110% capacity) and protected from flood damage and inundation;
- All bunded storage areas will be a minimum distance of 10m away from any watercourse;
- A designated bunded refuelling area on an impermeable surface will be provided at all construction compounds, again at a minimum distance of 10m away from any watercourse.

Converter Station Site

- Secure oil and chemical storage in over-ground bunded areas (110% capacity), limited to the minimum volume required to serve immediate needs with specified delivery and refuelling areas;
- Emergency spill kits retained onsite at sensitive locations;
- Cessation of work and development of measures to contain and/or remove pollutant should an incident be identified;
- Temporary measures will be provided to ensure only clean water is discharged from site i.e. de-silting and temporary oil interceptor. These will be subject to daily inspection to ensure they remain adequate and effective;
- Interceptor/dump/attenuation tanks will be secured at designated points, strapped down to the concrete slab. Backfill will be carefully controlled, ensuring this is balanced and even around all sides of the tank, while the tank is gradually filled internally with water, to avoid distortion or damage from external backfill pressures. The interceptor washdown slab will be constructed. Interceptors will be commissioned by a specialist contractor;
- Silt traps will be employed and maintained in appropriate locations;

- Temporary interception bunds and drainage ditches will be constructed up slope of excavations to minimise surface runoff ingress and in advance of excavation activities;
- Excavation and earthworks will be suspended during and immediately following periods of heavy rainfall in order to minimise sediment generation and soil damage;
- Below ground drainage will be installed prior to erection to completion of building superstructure/roof drainage. Final connection will be made when down pipes are installed to ensure accurate positioning;
- The treated water will discharge directly into the surface water drainage system as it is suitable for direct discharge into the local watercourses, having passed through the oil separator.

Surface Water Drainage from the Converter Station

Oily water is classified as rainwater runoff and/or surface wash down which may potentially contain small amounts of low hydrocarbon concentrates in oil containment areas. This is to be treated directly by oil separator facilities on site.

It is proposed to include a Class 1 full retention oil separator unit for the oily water system. Oil storage volume will be provided by the separator and the separator shall be fully capable of isolating all upstream oil flow in the event that the high-level oil alarm is activated. Oil resistant nitrile rubber seals will be employed throughout the oily water drainage systems. The oil separator will be vented in accordance with the manufacturer's recommendations, with vents located clear of all site operating areas, a minimum of 2000mm above ground level. Vent pipes will be supported by means of a concrete post and protected from vehicular traffic by means of spaced concrete bollards, if required.

The treated water will discharge directly into the surface water drainage system as it is suitable for direct discharge into the local watercourses, having passed through the oil separator described above.

Onshore Cable Route

- Any groundwater or rainwater that collects in a trench will be pumped into locations agreed with the landowners and local authorities. Typically, this will be onto adjacent land, not directly into waterways, and through a filter medium, to avoid the build-up of silt, as some granular material will, inevitably, be pumped out with the water. A similar arrangement will apply at joint bays, where a sump will be cast into the concrete base for a pump.
- There will be no direct discharges into the small watercourses (Saltmills, Ballyhack, Clonsharragh and Curroughmore, Graigue Little and Graigue Great) which will be crossed within existing roads or road verges.
- The flowrates will have to match that of the water into the trench, as it must be kept generally free of water. A single pump with a 75mm hose will usually be adequate to deal with rainwater running into a trench.
- For the HDDs, any groundwater or rainwater that collects in a HDD drilling pit shall be pumped away as described above. Any bentonite (or similar HDD

drilling head lubrication material) shall be handled and removed by the drilling contractor. Typically for a land-based HDD the volume of bentonite would be approximately 5 cubic metres per shift, and for the landfall HDD the volume of bentonite would be approximately 15 cubic metres per shift. Further information on bentonite is discussed in **Section 4.11.2.1** of **Chapter 4** *Construction Strategy.*

Watercourse crossing - Newtown River

- The preferred method to cross the Newtown River is a HDD using a mini-rig. The non-preferred alternative is an open-cut methodology. For the open-cut method the watercourse will be temporarily dammed to allow for cable installation. At the stream crossing, the cable trenching detail will not differ, however, a one metre separation between the protective measures and the bed of the watercourse will be maintained to account for any future erosion. If the open-cut methodology is required the Newtown River watercourse will be temporarily dammed immediately upstream and downstream of the cable installation. Over-pumping will be employed to ensure continuous flow in the watercourse.
- The watercourse is of sufficient size to support fish species. A fish salvage operation will therefore be conducted prior to damming under the provisions of a Section 14 licence. Standard biosecurity protocols will be implemented, and fish will be translocated to similar habitat upstream of the works area.
- Appropriate silt control measures such as silt fences will be employed where required. Once reinstatement of the cable trench is complete, the temporary dams will be removed and over pumping ceased. No haul road is proposed at the watercourse crossing; plant will utilise existing accesses used by landowners to avoid further works within the watercourse.

Foul Drainage

The temporary foul drainage at the construction compounds will cater for welfare facilities including a canteen, toilets, showers and hand wash basin only, and will comprise self-contained sanitary facilities, with wastewater stored and tankered off-site to appropriately licensed disposal facilities.

Flooding

The following best practice construction measures relevant to the hydrological regime and flooding will be implemented for the duration of the construction phase. Further detail is provided in the CEMP which is attached as **Appendix 4.1** and in Chapter 13 of the EIAR (Water and Hydrology).

- All construction compounds will be in areas that are at low risk of flooding (outside 1:100-year flood zone);
- Material storage locations will be set back from watercourses and surrounded with silt fencing and covered. There will be no material storage in floodplains or areas at risk of pluvial flooding. Material excavated from trenches along the roads will be loaded onto trucks and removed from the site;

- Weather warnings will be monitored during construction to ensure that there is no risk to construction workers installing the cable. A risk assessment will be carried out in the case of a weather warning to determine what works can proceed, and what works need to be postponed;
- No material will be stored in flood plains or in areas which would impede flood flow paths;
- Temporary works (including haul roads) will be designed so as not to affect the connectivity between the relevant channel and the floodplain to maintain adequate flood storage during the construction phase;
- Where the proposed works encounter an existing drainage line, arrangements will be made to reinstate the existing drainage system. This will mitigate the risk of excess run-off from the proposed works. All road and drainage system modifications are to be designed following relevant best practice guidelines; and
- Road run-off will be channelled during excavation works for the cable, to avoid potential ponding on roads or flooding of adjacent lands during construction.

9.5.2 Construction works - Noise

Best practice noise and vibration control measures will be employed by the contractor. This includes guidance on several aspects of construction site environmental measures, including, but not limited to the following:

Specific noise abatement measures will be taken to comply with the recommendations of BS 5228-1 and 2:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites: Noise and vibration* (BSI, 2014) and the *European Communities (Noise Emission by Equipment for Use Outdoors) Regulations, 2001* (EC, 2001). The following specific measures will be implemented during the construction phase to ensure noise and vibration effects are minimised;

- Site representatives shall be appointed to be responsible for matters relating to noise and vibration;
- Equipment will be switched off when not required;
- Internal haul routes will be well maintained;
- Rubber linings shall be used in chutes and dumpers etc. to reduce impact noise;
- Drop heights of materials will be minimised;
- Plant and vehicles will be started sequentially rather than all together;
- Construction plant and activities to be employed on site will be reviewed to ensure that they are the quietest available for the required purpose;
- Generators will be located away from sensitive receivers and will be enclosed;

- Where required, improved sound reduction methods e.g. enclosures shall be used;
- Site equipment will be located away from noise sensitive areas, as much as is feasible;
- Regular and effective maintenance by trained personnel will be carried out to reduce noise and/or vibration from plant and machinery;
- Acoustic barriers with a density of at least 7kg per square metre will be provided around construction works to minimise the effects of noise and vibration generating activities
- Typically, site activities shall be limited to 7am – 7pm, Monday to Friday; and 7am – 2pm, Saturday. It may also be necessary in exceptional circumstances to undertake some other types of activities outside of normal construction core working hours. Any such working hours outside the normal construction core working hours will be agreed with Wexford County Council. The planning of such works will have regard to nearby sensitive receptors;
- A Community Liaison Plan will be prepared to provide for effective community liaison to help ensure the smooth running of construction activities and to address any issues that may arise.
- Construction work within 400 metres of the Gas Networks Ireland transmission pipeline will be carried out in accordance with the Code of Practice for Working in the Vicinity of the Gas Transmission Network (included as Appendix 4.2 to this EIAR). This may include the assessment of potential peak particle velocity effects associated with rock removal activities.
- For the locations where significant temporary noise effects are predicted during cable route excavation, Greenlink Interconnector Ltd and the appointed contractor will develop and implement specific measures to mitigate impacts, potentially including temporary acoustic screening and discretionary pre-condition surveys.
- The use of vibratory roller compactors will be in ‘static’ mode only, for compaction activities within 50m of properties.
- To minimise the impulsive noise and vibration associated with the driving of pre-cast piles, the following measures will be taken as required, to meet the established noise and vibration thresholds: acoustic screen for hammer head and top of pile and the use of a resilient pad (dolly) between the pile and the hammer head.

9.5.3 Lighting during construction

Potential impacts during construction and operation, from lighting, will be mitigated by the following measures:

- Floodlights will be cowled and angled downwards to minimise spillage;

- Lighting will be provided with the minimum luminosity sufficient for safety and security purposes;
- Lighting will be positioned and directed as not to unnecessarily impact on designated sites or woodland habitats.

9.5.4 Construction Works – Invasive Species

- A survey for invasive species will be carried out prior to the commencement of works. This is to confirm the extent of infestations as identified by invasive species surveys to date, and to determine whether any new infestations have established in the intervening period. A step by step procedure for the management of invasive species is set out in the ISMP which is included as Appendix 9.6. This includes undertaking up to date surveys prior to commencement of construction and based on the results, proposed methodologies, in accordance with codes of practice and guidelines, for the elimination of these species. No significant effects on Natura 2000 sites will occur. However as invasive species are present within the overall study area and given their invasive nature, repeat surveys will be carried out and mitigation implemented.
- Prior notification will be given to all contractors that parts of the site are infested with Japanese knotweed, Rhododendron and Three-Cornered Leek and Winter Heliotrope and that they must adhere to this protocol to avoid the spread of the plant within and more importantly, outside of the works area. This includes any site investigation works in advance of commencement of excavation works.
- The location of the invasive species will be clearly delineated with hazard tape in a manner visible to machine operators prior to the commencement of works. Appropriate signage will be put in place to deter any entrance by people or machinery into the areas within which the invasive species are growing.
- The invasive species management plan (which is a live document), will ensure that risks are minimised. This includes any site investigation works which may proceed the commencement of site works. The management plan will include all provisions for site hygiene and appropriate disposal of contaminated soil and subsoil.
- If contaminated material is to be removed off site it will require a licence from the National Parks and Wildlife Service in advance of any removal, in accordance with the European Communities (Birds and Natural Habitats) Regulations 2011 (SI 477).

9.5.5 Protection of habitats

- The Wildlife Amendment Act 2000 (S.46.1) provides that it is an offence to cut, grub, burn or destroy any vegetation on uncultivated land or such growing in any hedge or ditch from the 01st of March to the 31st of August. Exemptions include the clearance of vegetation in the course of road or other construction works or in the development or preparation of sites on which any building or other structure is intended to be provided. Where possible, vegetation will be removed outside of the breeding season and in particular, removal during the peak-breeding season (April-June inclusive) will be avoided. This will also minimise the potential disturbance of breeding birds outside of the proposed development site boundary.

- To prevent incidental damage by machinery or by the deposition of spoil during site works, any habitats earmarked for retention in close proximity to the proposed works will be identified and will be securely fenced or sign posted early in the construction phase. These will be clearly visible to machine operators. Hedgerow, tree and scrub vegetation that are to be retained which are located in close proximity to working areas will be clearly marked and fenced off to avoid accidental damage during excavations and site preparation.
- Habitats that are damaged and disturbed will be left to regenerate naturally or will be rehabilitated and landscaped once construction is complete. Disturbed areas will be seeded or planted using appropriate native grass or species native to the areas where necessary. Within the large field that accommodates the converter station site, a comprehensive landscaping scheme will be implemented, incorporating significant earthworks, berming, planting of approximately 15,000 native mixed-woodland trees, and zones of grassland meadow.
- There will be a defined working area which will be fenced off with designated haul routes to prevent inadvertent damage to adjoining habitats.
- To prevent incidental damage by machinery or by the deposition of spoil during site works, any habitats earmarked for retention nearby will be securely fenced or sign posted early in the construction phase. These will be clearly visible to machine operators.
- Habitats that are damaged and disturbed will be left to regenerate naturally or will be rehabilitated and landscaped once construction is complete. Disturbed areas will be seeded or planted using appropriate native grass or species native to the areas where necessary.
- Mature trees, particularly over mature trees with the potential to provide bat roosts will be avoided. Any hedgerows or treeline habitat disturbed during construction will be replanted using a suitable mix of native species.
- Tree root systems can be damaged during site clearance and groundworks. No materials will be stored within the root protection area of mature trees. Materials, especially soil and stones, can prevent air and water circulating to the roots. Retention of the existing networks of woodland/ tree lines/ hedgerows will provide natural screening and help to maintain biodiversity. Where tree root systems cannot be avoided the trees will be assessed by an arboriculturalist to determine if crown reduction is required. If a small number of trees are removed they will be replanted.

9.5.6 Otter Mitigation Measures

- No signs of otter or otter holts were noted within 150m of cable route, HDD launch pits or proposed converter station, although otter was recorded utilising habitats along the Campile River Estuary and at Baginbun Beach. Otters could occur along the Newtown/Kilmannock River. A detailed pre-construction survey will confirm the absence of otter holts within 150m of the proposed development area.

- If otter holts are recorded at that time, the supervising ecologist will determine the appropriate means of minimising effects i.e. avoidance, moving works, timing of works etc. If required the ecologist will obtain a derogation licence from the NPWS, to facilitate licenced exclusion from the breeding or resting site in accordance with a plan approved by the NPWS.

- Any holts found to be present will be subject to monitoring and mitigation as set out in the NRA *Guidelines for the Treatment of Otter prior to the Construction of National Road Schemes (2006b)*. If found to be inactive, exclusion of holts may be carried out during any season. No wheeled or tracked vehicles (of any kind) will be used within 20m of active, but non-breeding, otter holts. Light work, such as digging by hand or scrub clearance will also not take place within 15m of such holts, except under licence. The prohibited working area associated with otter holts will be fenced and appropriate signage erected. Where breeding females and cubs are present no evacuation procedures of any kind will be undertaken until after the otters have left the holt, as determined by a specialist ecologist. Breeding may take place at any season, so activity at a holt must be adjudged on a case by case basis. The exclusion process, if required, involves the installation of one-way gates on the entrances to the holt and a monitoring period of 21 days to ensure the otters have left the holt prior to removal.

9.5.7 Crossing of the Newtown/ Kilmannock River Mitigation Measures

The key design mitigation measure for this watercourse crossing is the use of mini-HDD as the preferred construction methodology. Vegetation will not be significantly adversely affected as the majority of the access route to this location is on road, while off-road access is limited.

In the unlikely event that mini-HDD technology is not used, the following mitigation measures will be implemented:

- Works will comply with The IFI's Guidelines on protection of fisheries during construction works in and adjacent to waters (IFI, 2016) and IFI will be consulted with regard to any proposed over pumping at the Newtown River crossing.
- Construction activities at the Newtown River will be undertaken during daylight hours only This will ensure that there is potential for undisturbed fish passage at night. The works will be temporary and will not create a significant long-term barrier to fish movement.
- Works will take place outside the most sensitive time for these species: during the summer periods from July – September inclusive. Due to dryer conditions in the summer period this will also minimise the risk of ground damage, minimises the potential for silt generation and thus minimises the risk of inadvertent ecological impacts.

- The least preferred option will be open cut methodology, therefore requiring dams to be put in place. The height of the dams and method of construction will take into account the potential impacts from high tide events downstream. Works during high spring tides will be avoided.
- Over-pumping of the stream will take into account that pumping may be required from downstream to upstream during high tides.
- Turbidity monitoring will be carried out to ensure that sediment levels are not significantly elevated above baseline levels.
- A fish salvage operation will be carried out by the supervising ecologist and fish, if present, will be relocated to suitable habitats in proximity to the proposed works. This will be carried out following receipt of a section 14 licence from Inland Fisheries Ireland and in consultation with Inland Fisheries Ireland.
- Sediment from the stream bed will be stockpiled outside of the flood plain and used to re-create the stream bed.
- Dams will be removed gradually, with silt curtains in place and under ecological supervision to minimise the potential for silt generation.
- Bankside impacts will be minimised, and any disturbed areas will be reseeded as soon as practicably possible after completion of works.

9.5.8 Badger Mitigation Measures

As a precautionary measure, the site will be surveyed for badgers immediately prior to the commencement of site works, to confirm the absence of badgers within the zone of influence of the development. If badgers are discovered at that time, the mitigation measures outlined in the NRA publication, *Guidelines for the Treatment of Badgers Prior to the Construction of a National Road Scheme* (NRA, 2006c), are to be followed. If necessary, the following measures will be employed for all construction works where badger issues arise:

- Badger sett tunnel systems can extend up to c. 20m from sett entrances. Therefore, no heavy machinery will be used within 30m of badger setts (unless carried out under licence); lighter machinery (generally wheeled vehicles) will not be used within 20m of a sett entrance; light work, such as digging by hand or scrub clearance will not take place within 10m of sett entrances. Based on the results of badger surveys to date the HDD works at the Campile River Estuary will not take place within these buffer zones.

- During the breeding season (December to June inclusive), none of the above works will be undertaken within 50m of active setts or pile driving within 150m of active setts. Based on the results of badger surveys to date the HDD works at the Campile River Estuary will not take place within these buffer zones.

- Where badger setts are likely to be affected, they will be clearly marked and buffer zones for vehicles clearly marked by fencing and signage;

- Works close to badger setts or removal of badgers from a site will only be carried out under the supervision of a qualified ecologist under license from the NPWS;

- Where affected setts do not require destruction, construction works may commence once recommended mitigation measures to address the badger issues as identified by the supervising ecologist and agreed with NPWS, have been complied with. Such mitigation may include hoarding or visual screens.

- In the unlikely event that destruction of a badger sett is required this can only be carried out under licence from the NPWS. In these circumstances, which are highly unlikely to arise, badgers must have an alternative sett within their territory that can be utilised or an alternative artificial sett will be provided.

9.5.9 Bat Mitigation Measures

The first aim of the developer will be to entirely avoid or minimise the potential effect of the proposed development on bats and their breeding and resting places. During the site works, general mitigation measures for bats will follow the National Road Authority's '*Guidelines for the Treatment of Bats during the Construction of National Road Schemes' NRA (2005)* and *'Bat Mitigation Guidelines for Ireland: Irish Wildlife Manuals, No. 25'* (Kelleher, C. & Marnell, F. (2006)). These documents outline the requirements that will be met in the pre-construction (site clearance) stage to minimise negative effects on roosting bats, or prevent avoidable effects resulting from significant alterations to the immediate landscape.

The contractor will take all reasonable steps to ensure works do not harm individuals by altering working methods or timing to avoid bats, if necessary. No bat roosts were recorded within the proposed development areas. The following mitigation measures will be implemented:

- Any required felling of mature trees, as identified by the supervising ecologist, will be undertaken in autumn (September-November) or spring (April-May) to avoid the destruction of maternity roosts and hibernating sites. Young bats are unable to escape injury because they cannot fly. Equally, hibernating bats may not arouse sufficiently to avoid fatal injuries;
- Felled trees will not be mulched immediately. Such trees should be left lying several hours and preferably overnight before any further sawing or mulching. This would allow any bats within the tree to emerge and avoid accidental death. A bat ecologist will be on-hand during felling operations to inspect felled trees for bats. If bats are seen or heard in a tree that has been felled, work should cease and the local NPWS Conservation Ranger should be contacted for advice;
- Bat roosting sites can change depending on a variety of factors and therefore the presence of bats should never be ruled out completely;
- Retain mature to semi-mature trees in external boundaries where possible and resist 'tidying up' dead wood and spilt limbs on tree specimens;
- Any inadvertent damage to treelines outside the proposed development area but adjacent to it and thus at risk, will be clearly marked by the supervising ecologist.
- During construction lighting will typically be provided by tower mounted 1000W metal halide floodlights that will be cowled and angled downwards to minimise spillage. The primary area of concern is the potential impact on

woodland habitat at the HDD site at the Campile River Estuary HDD site. There will be no directional lighting focused towards this woodland and as noted above by cowling and focusing lights downwards light spillage will be minimised

- Felling of trees with no potential for roosting bats (features such as tree holes, crevices, loose bark, spilt limbs and dead wood are absent) does not require a bat specialist to be present;

If bats are recorded by the bat ecologist within any vegetation or structure on site i.e. trees, or walls to be removed or impacted on, no works will proceed without a relevant derogation licence from the NPWS.

Upon completion external lighting will be installed at the converter station. To avoid creating any unnecessary glare external lighting will be turned off during hours of darkness with the exception being for emergency outdoor works.

9.5.10 Bird Mitigation Measures

Works in close proximity to the Campile River Estuary will take place outside the peak season for wintering birds which runs from October to March inclusive. This will prevent any disturbance to wintering species utilising the sites during this period.

The Wildlife Act 1976, as amended, provides that it is an offence to cut, grub, burn or destroy any vegetation on uncultivated land, or any such growing in any hedge or ditch from the 1st of March to the 31st of August. Exemptions include the clearance of vegetation in the course of road or other construction works or in the development or preparation of sites on which any building or other structure is intended to be provided. Nonetheless, it is recommended that vegetation be removed outside of the breeding season.

Retention of the native tree lines, hedgerows and woodland along the site boundaries will reduce the loss of breeding and nesting habitat for birds. NRA guidelines on the protection of trees and hedges prior to and during construction should be followed (NRA, 2006b).

Prior to the commencement of construction works a full survey for evidence of Barn owl occupation will be carried out by a suitably qualified person to ensure no offence is committed under the Wildlife Act. If evidence of Barn owl is found within the building, no construction work shall take place within 30 metres of any part of the site containing material evidence unless survey-based evidence has been provided to the Local Planning Authority that no birds are nesting at the site to which the consent applies. If a nesting site were to be removed it would be necessary to create as a minimum the same amount of suitable Barn owl foraging habitat to that which is being lost to ensure no net loss in biodiversity. This can be on or off-site. A habitat management plan should specify a topping regime of not more than once a year and not before 15th July. Annual topping on a rotational basis can help ensure there is always some optimum foraging habitat available for the barn owls.

9.5.11 Biodiversity and Landscaping

A comprehensive landscaping scheme is proposed for the converter station and tail station site, leading to long-term local improvements in habitat and species diversity in the area. The planting will be in 7-8m wide woodland shelter belts around the perimeter of the site and an area of woodland to the north east corner of the site. In total there will be approximately 20,000m^2 of woodland planting and in the order of 16,500 trees. The planting mix will also include a selection of larger 2.5-5m advanced tree sizes to the planting area mix (c. 10% of overall mix) and will include Oak (4.0-4.5m tall) and Pine planting (2.5-3m tall). The trees to be planted (Pedunculate oak, Scots Pine, Willow, Hazel, Birch, Hawthorn, Blackthorn, Wild Cherry, Bird Cherry, Rowan, Holly and Crab Apple) are native and in line with the “no net loss principle” will provide high quality habitat replacement for the common habitats which will we will be affected by the proposed development.

9.5.12 Operational Phase

There will be two personnel stationed at the converter station at all times operating the interconnector, with only infrequent visits by personnel to the tail station, foul wastewater generated will be minimal. Foul wastewater will be collected from the welfare facilities in the converter station and tail station. It will be contained in the units and removed from site periodically, by a licensed service provider, to a local sewage treatment plant, which has adequate capacity.

Surface water on site will be collected in a new surface water drainage system. Surface water from the proposed access road will connect to the existing Great Island sub-station road drainage.

Surface water run-off from yard areas and the building roofs of the converter station and tail station, will discharge through proposed filter drains and surface water sewers, through a bypass interceptor, to a proposed attenuation pond, to be constructed to the south-eastern part of the site. The attenuation pond will provide c. 800 m3 of storage and will discharge at greenfield rates.

Transformers will be sited within a reinforced concrete bund which will be linked to an underground oil dump tank.

Transformer bunds will be designed as waterproof structures in accordance with BS EN 1992-3. The bunds will be tested in accordance with standard bund testing requirements.

The height of all oil retaining area walls will be a minimum of 450mm above the finished substation ground level or the support plinth(s) of the associated contacting equipment, whichever is greater, to provide a physical barrier preventing possible vehicular contact with transformers.

Rainwater or other surface water within this bund shall permeate through a flame trap. Once permeated through the stone fire trap, the water will be collected in a common dump tank. It will then be pumped out of the dump tank via a bund water control pump to a manhole, before flowing by gravity to a hydrocarbon interceptor prior to final discharge into the surface water drainage system.

The oily water system will incorporate penstocks to close off the system.

The hydrocarbon interceptor system will include a Class 1 full retention unit in accordance with BS EN 858-1, incorporating a coalescer automatic closure device and high oil level alarm. The separator shall be fully capable of isolating all upstream oil flow in the event that the high-level oil alarm is activated. The interceptor will be sized to suit the storm intensity flow rates from the transformer bunds and any other designated oil containment area.

The lighting system will provide adequate illumination within the converter station to allow personnel to move without risk to health and safety. Security lighting will be installed against the building and GRP lighting poles of at least 6m height will be installed for illuminating the external area between buildings, transformer and reactor area and within the perimeter walls.

Under normal operating conditions, external lighting would be switched off during the hours of darkness, to avoid any unnecessary impacts on fauna including otter. The exception would be for emergency repairs to outdoor equipment, where high-level illumination would be switched on.

The key operational mitigations are the enclosure of key noise-emitting equipment. This includes acoustic enclosures for transformers, and the placing of particular items of plant at the converter station within buildings, thereby already limiting noise breakout to the atmosphere. **Chapter 8** of the EIAR *Noise and Vibration* notes that no significant residual noise and vibration effects are predicted during the operational phase.

9.5.13 Decommissioning

The mitigation measures, described for the construction phase, updated to reflect best practice at the time, will be implemented for the decommissioning phase.

9.6 Cumulative and Transboundary Effects

The proposed development forms part of the Greenlink project, which also includes offshore elements, and works in the United Kingdom.

The only potential for cumulative or interactive effects with the wider project to occur is at the landfall site near Baginbun Beach, as described in **Chapter 18** *Cumulative, Transboundary and Interactive Effects* and the potential effects at this location have been fully documented in this chapter. Considering the nature and location of the proposed development as described in **Chapter 3** and **Chapter 4** no transboundary effects are predicted.

Two permitted developments have been identified, which will be located in the general vicinity of the proposed development site and which have the potential to result in cumulative effects arising from their construction and/or operation. These were the only proposed developments in the area which were of sufficient scale to have the potential to have a significant cumulative impact with the proposed development. These projects are assessed below in Table 9.17.

Table 9.17 Potential Cumulative Effects

Plans and Key Policies/Issues/Objectives		
Greenlink Project - Marine Impacts	Marine habitats which are specifically addressed within the Greenlink Marine Natura Impact Statement	Impacts relating to the qualifying marine habitats for the Hook Head SAC ('Reef' and 'Large shallow inlets and bays') are specifically addressed in the Greenlink Marine Natura Impact Statement. This report concluded that "*there will be no adverse effects on the conservation objectives of the Qualifying Interest*" in relation to reef habitats and that there will be "*No Adverse Significant Effect to Qualifying Interest*" in relation to large shallow inlets and bays. In the absence of any significant adverse effect in relation to the terrestrial and marine components of the project no significant adverse effect on qualifying interests and conservation objectives for Natura 2000 sites has been identified.
River Basin Management Plan 2018-2021	The project should comply with the environmental objectives of the Irish RBMP which are to be achieved generally by 2021. • Ensure full compliance with relevant EU legislation • Prevent deterioration • Meeting the objectives for designated protected areas • Protect high status waters • Implement targeted actions and pilot schemes in focus sub-catchments aimed at:	The implementation and compliance with key environmental policies, issues and objectives of this management plan will result in positive cumulative effects to European sites. The implementation of this plan will have a positive impact for the biodiversity. It will not contribute to cumulative impacts with the proposed development.

Plans and Key Policies/Issues/Objectives		
	targeting water bodies close to meeting their objective and addressing more complex issues which will build knowledge for the third cycle.	
Inland Fisheries Ireland Corporate Plan 2016 -2020 **The Inland Fisheries Act 2010.**	To ensure that Ireland's fish populations are managed and protected to ensure their conservation status remains favourable. That they provide a basis for a sustainable world class recreational angling product, and that pristine aquatic habitats are also enjoyed for other recreational uses. To develop and improve fish habitats and ensure that the conditions required for fish populations to thrive are sustained and protected. To grow the number of anglers and ensure the needs of IFI's other key stakeholders are being met in a sustainable conservation focused manner. EU (Quality of Salmonid Waters) Regulations 1988. All works during development and operation of the project must aim to conserve fish and other species of fauna and flora habitat; biodiversity of inland fisheries and ecosystems and protect spawning salmon and trout.	The implementation and compliance with key environmental issues and objectives of this corporate plan will result in positive on-combination effects to European sites. The implementation of this corporate plan will have a positive impact for biodiversity of inland fisheries and ecosystems. It will not contribute to cumulative impacts with the proposed works.
Irish Water Capital Investment Plan 2014-2016	Proposals to upgrade and secure water services and water treatment services countrywide.	Likely net positive impact due to water conservation and more effective treatment of water.
Water Services Strategic Plan (WSSP, 2015)	Irish Water has prepared a Water Services Strategic Plan (WSSP, 2015), under Section 33 of the Water Service No. 2 Act of 2013	The WSSP forms the highest tier of asset management plans (Tier 1) which Irish Water prepare,

Plans and Key Policies/Issues/Objectives		
	to address the delivery of strategic objectives which will contribute towards improved water quality and biodiversity requirements through reducing: • Habitat loss and disturbance from new / upgraded infrastructure; • Species disturbance; • Changes to water quality or quantity; and • Nutrient enrichment /eutrophication.	and it sets the overarching framework for subsequent detailed implementation plans (Tier 2) and water services projects (Tier 3). The WSSP sets out the challenges we face as a country in relation to the provision of water services and identifies strategic national priorities. It includes Irish Water's short, medium and long-term objectives and identifies strategies to achieve these objectives. As such, the plan provides the context for subsequent detailed implementation plans (Tier 2) which will document the approach to be used for key water service areas such as water resource management, wastewater compliance and sludge management. The WSSP also sets out the strategic objectives against which the Irish Water Capital Investment Programme is developed. The current version of the CAP outlines the proposals for capital expenditure in terms of upgrades and new builds within the Irish Water owned assets. The overarching strategy was subject to AA and highlighted the need for additional plan/project environmental assessments to be carried out at the tier 2 and tier 3 level. Therefore, no likely significant cumulative effects are envisaged.

Plans and Key Policies/Issues/Objectives		
Wexford County Development Plan 2013-2019	Strategic Environmental Objectives within the development plan include: B1 - Conserve and enhance the diversity of habitats and species within the county and support the sustainable management of these areas. B2 - Ensure compliance with the Habitats Directive with regard to protection of Natura 2000 sites and habitats 197 and species listed under Annexes I and II of the Directive and prevent the loss of ecological networks and steppingstones or parts thereof which provide important connectivity for species. B3 - To ensure compliance with Article 10 of the Habitats Directive with regard to the protection of wildlife corridors and contiguous areas of habitat which are important on a County level for wild fauna and flora and essential for the migration, dispersal and genetic exchange of wild species. B4 - Protect aquatic and terrestrial habitats from the spread of invasive species.	The implementation of the Wexford County Development Plan 2013-2019 will have a positive impact on biodiversity. It will not contribute to cumulative impacts with the proposed development.
WWTP discharges	Fethard-on-Sea and Environs WWTP, Duncannon WWTP, Campile WWTP, New Ross WWTP, Graiguenamanagh Tinnahinch WWTP, Borris Waste Water Works, Goresbridge WWTP, Muinebheag and Leighlinbridge WWTP, Carlow WWTP, Athy WWTP, Stradbally Agglomeration WWTP, Monasterevin Town, WWTP, Portarlington WWTP, Thomastown WWTP, Bennettsbridge WWTP, Kilkenny	Discharges from municipal WWTPs are required to meet water quality standards. Irish Water Capital Investment Plan 2014-2016 and 2017 – 2021 proposes to upgrade water treatment services countrywide. Discharges from municipal WWTPs are required to meet water quality standards Given that no significant effect on water quality is

Plans and Key Policies/Issues/Objectives		
	City and Environs WWTP, Castlecomer WWTP, Clogh – Moneenroe WWTP, Durrow WWTP, Waterford city WWTP, Portlaw WWTP, Carrick-on-Suir WWTP, Fiddown WWTP, Kilsheelan WWTP, Clonmel WWTP etc.	predicted from this proposed project no significant cumulative effects on water quality will occur.
Great Island Power Station		Discharges from and noise levels relating to the Great Island Power Station are governed by strict limits to ensure compliance with quality standards. No long-term cumulative impact will occur
Great Island - Kilkenny 110kV Line Uprate Project	Permission was sought for the development at the existing Great Island to Kilkenny 110 kV overhead line which is approximately 49 kilometres long. Approximately 2.6km of the existing circuit is located within the functional area of Wexford County Council with approximately 46.4lm located within County Kilkenny. The development will consist of the uprate of the Great Island Kilkenny 110 kV overhead line which will primarily include: re-stringing the conductor with a higher capacity conductor, replacement of a large proportion of existing structures, breaking out and reconstruction of the concrete foundation and shear blocks of metal masts, painting of mast structures, replacement of insulators, crossarms, stays and/or fittings on existing structures; and the fitting/replacement of bird flight diverters. No additional structures are proposed along the existing circuit. Any	Given the nature and location of this project, no significant cumulative effects will occur The uprate project has sufficient physical separation from the site of the proposed development to reduce the potential for cumulative noise and vibration effects and surface water effects to a negligible level. If the construction of the energy storage system is concurrent with the bulk excavation works on the site of the converter there is potential for cumulative effects, as the sites are located adjacent to each other. Should this situation arise, construction activities will be planned and phased, in consultation with the construction management

Plans and Key Policies/Issues/Objectives		
	replacement structures will be reconstructed at or immediately adjacent to the existing structures they will replace and will be of a generally similar height and appearance. Associated temporary site development works to gain access to the existing structures include clearance of vegetation, disassembly and reassembly of stone walls and gate posts and removal and reinstatement of existing fencing. The proposed development includes all other temporary associated and ancillary site development works required for the uprate of the existing circuit, including the installation of silt traps, silt fences, stone roads, bog mats and clean span bridges. No additional structures, no alteration to the nature, extent, alignment, character or voltage of the existing electricity infrastructure is proposed.	team for the energy storage system project. Given the location of these projects (in areas of relatively low habitat and species value), together with the implementation of best practice standard construction environmental measures, the CEMP for the proposed development and the Construction Traffic Management Plan, as detailed, no significant cumulative effects on biodiversity will result.
Great Island Energy Storage System	Permission for the development of a grid system services facility within a total site area of up to 1.15 hectares, to include 1 no. TSO compound including 1 no. single storey TSO electrical substation building and 1 no. single storey customer substation, electrical inverter/transformer station modules, containerised battery storage modules on concrete support structures, heating, ventilation and air conditioning units (HVAC units). Access tracks and upgraded site entrance, associated electrical cabling and ducting, security gates, perimeter security fencing, CCTV security monitoring system, landscaping works and all	This project is located adjacent to the site of the proposed converter and tail station and surrounded on three sides by the red-line boundary of the proposed development. It is possible that the construction of these projects with the proposed development could overlap. However, given the location of these projects (in areas of relatively low habitat and species value), together with the implementation of best practice standard construction environmental measures, the CEMP for the proposed

Plans and Key Policies/Issues/Objectives		
	associated ancillary infrastructure on land.	development and the Construction Traffic Management Plan, as detailed, no significant cumulative effects on biodiversity will result.

9.7 Residual Effects

9.7.1 Residual Effects - Habitats

The proposed development will have effects on habitats that are primarily of limited local ecological value and there will be no perceptible effect on habitats listed as qualifying interests the River Barrow and Nore SAC (Estuaries, Mudflats and sandflats not covered by seawater at low tide, *Salicornia* and other annuals colonising mud and sand, Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) and Mediterranean salt meadows (*Juncetalia maritimi*)) or Hook Head SAC (Vegetated sea cliffs of the Atlantic and Baltic coasts).

There will be a net loss of common terrestrial habitats, and high value habitats have been avoided at the design stage. No significant effect due to habitat fragmentation or significant effects on commuting routes for fauna will occur. No rare or uncommon plant species were recorded. Landscaping and tree planting at the proposed converter site will provide additional habitat which will be greater value from an ecological viewpoint over time. There will be a loss of semi-natural vegetation, including scrub and hedgerow/treelines within the offline work area. This is considered a long-term localised, imperceptible impact.

Trees on roadsides along the route were surveyed and will be avoided where possible. The root development of trees is likely to have been curtailed by the existing road surface. Where the route cannot avoid mature tree roots an arboriculturist will specify appropriate crown reduction to maintain the stability of the trees.   No significant loss of trees will occur and any trees removed will be replaced. Additional habitat will be created by the planting of native trees.

Break out of HDD drilling fluid could potentially impact on vegetated sea cliffs at Baginbun Beach, however no significant effects on vegetation will occur due to the non-toxic nature of the drilling fluids and the low risk of frac out occurring. The levels of dust generated by construction works will be low and the impact on vegetation outside the works area, including vegetated sea cliffs as Baginbun Beach will be temporary and imperceptible.

9.7.2 Residual effects -Designated sites

The southern HDD compound for the Campile River Estuary is located within low value agricultural grassland within the Barrow River Estuary pNHA. The temporary loss of grassland habitat will have an imperceptible effect on this pNHA. The Campile River Estuary will be crossed via HDD methodology which will also be utilised at the Baginbun landfall site. This effectively prevents any direct effects on designated sites. Noise, lighting, vibration during construction will not have a significant effect, as it will be temporary in nature, will be subject to detailed mitigation and due to the distance from the boundary of Natura 2000, the effects will be insignificant. As detailed below no significant effects on water quality, migratory fish, otter or birds or significant effects from the spread of invasive species will occur. No significant effects will arise during operation and decommissioning. It is concluded therefore that there will be no significant effect on Natura 2000 sites.

9.7.3 Residual effects - Invasive species

Japanese Knotweed and Three-Cornered Leek were recorded within the study area and these stands will be avoided. Where avoidance is not possible, they will be eradicated within the works area and biosecurity measures will be implemented to prevent any spread offsite. Rhododendron may also be avoidable and if this not feasible it will also be eradicated from the works area. Winter Heliotrope is ubiquitous in road verges and will be eradicated from the works area via a standard herbicide treatment programme. Mitigation measures in relation to invasive species are included in the ISMP which will be modified to include up to date monitoring data. No effect from the spread of invasive species will occur.

9.7.4 Residual effects - aquatic ecology

Impacts on water quality could potentially arise from elevated silt and hydrocarbon levels in surface water run-off and hydrocarbon contamination of surface and ground water. The HDD and Converter Station sites are located in proximity to tidal waterbodies which support species and habitats that are adapted to extreme fluctuations in silt levels and which provide considerable dilution in relation to possible hydrocarbon contamination. The use of HDD methodology at sensitive locations will effectively prevent any such effects from occurring. Based on an assessment of potential risks, a range of detailed mitigation measures have been specified in line with appropriate guidelines for each element of the project, to prevent any significant effect on water quality from occurring. These include measures in relation to hydrocarbon usage and storage, methodologies for silt control, measures in relation to the discharge of surface water arising within the works area and measures in relation to stockpiling excavated material. Based on the above no significant effect on water quality will occur. Therefore, there will be no significant effect on aquatic habitats and no knock-on effect on otter which is listed as a qualifying interest for the River Barrow and River Nore SAC which includes the Campile River Estuary or on common fish species on which otter feed.

The Newtown River, which is tidal at the crossing point is of low fisheries value and may be crossed via an open cut method. A fish salvage operation will be carried out by the supervising ecologist to ensure that fish mortality is prevented. The instream works will create a barrier to fish movement; however this is a temporary impact and this small, heavily modified and culverted watercourse does not provide suitable habitat for Annex II species which are listed as qualifying interests for the River Barrow and River Nore SAC (River Lamprey, Sea Lamprey, Salmon and Twaite Shad). No significant effect on migratory fish will occur.

There will be no discharges of surface water to small watercourses along the route and silt control measures will be utilised in relation to any other discharge. The impact on water quality from construction in relation to potential effects on small drains and watercourses will be temporary and imperceptible.

The potential effect from frac out will not be significant due to the high level of dilution provided in the estuarine and marine environment and the fluctuations in silt levels that naturally arise in these environments. Any impact from frac out during HDD will be temporary and imperceptible.

Kingfisher (listed on Annex 1 of the Birds Directive) was recorded along the Newtown River upstream of the works area. No evidence of otter (listed on Annex 2 of the Habitats Directive which is a qualifying interest for the River Barrow and River Nore SAC) were recorded within 150m of the Newtown River crossing and discharge outlet which will used during operation.

In the absence of significant effect on water quality and fish populations no significant effect on otter or kingfisher will occur. The overall impact on water quality and fish is considered a temporary, imperceptible impact.

During operation surface water will be discharged to an attenuation pond before discharging to a tidal section of the Newtown River. The use of a hydrocarbon interceptor will prevent any potential effects from hydrocarbons. The is considered a long-term, and imperceptible impact.

9.7.5 Residual effects - Vibration, lighting, noise and disturbance

Levels of vibration, lighting, noise and disturbance will increase during construction and a range of mitigation measures have been specified to minimise such impacts. The construction of the converter station will include rock breaking and blasting and short-term works at HDD sites will take place 24/7. This is likely to lead to short-term disturbance and displacement of common bird and mammal species during the construction period. The habitats in proximity to the converter station consist of common agricultural and industrial habitats which are not of significant value for fauna. The buffer zone between the HDD sites and the Campile River Estuary provides a sufficient buffer to prevent significant effects on badgers utilising woodland on the northern bank of the Campile River Estuary, and on bird species within and adjacent to the estuary. Any residual effect will be temporary and imperceptible. No significant effects on bats. Any residual effect will be temporary and imperceptible.

Otter were not recorded at the Newtown River and although they could potentially occur this small water courses is not a critical resource for this species. The buffer zone between the HDD sites and the Campile River Estuary and the HDD site and Baginbun Beach are sufficient to prevent any significant effect from occurring with respect to bird populations utilising the estuary or marine environment for foraging. By confining works at the Campile River Estuary to the April to September period no effects on winter bird species utilising estuarine mudflats will be prevented.

9.7.6 Residual effects - Cumulative

Other plans relevant to the proposed development and potential cumulative impacts were assessed and where necessary mitigation measures specified. This included an assessment of the marine elements of this project. No significant cumulative effects will occur.

9.7.7 Residual effects - Operation

In relation to the converter station where operation effects could potentially occur, sufficient mitigation in relation to noise has been built in the project design and the level of human activity will be low. Lighting will be turned off at night. Levels of ongoing noise, lighting and disturbance associated with the operation of the converter will not be significant and fauna would be expected to habituate to the prevailing conditions in a relatively short time period.

Otter were not recorded at the Newtown River to the south of the converter station and this river is not a critical resource for this species.

Mitigation measures which have been specified in relation to water quality effects including appropriate storage of chemicals, the use of a hydrocarbon interceptor and discharge via an attenuation pond ensuring that there will be no significant effect on water quality during operation.

9.7.8 Residual effects - Decommissioning

When it becomes appropriate to decommission the interconnector, each item of equipment in the converter station and tail station will be removed with appropriate management, based on the waste regulations and environmental guidelines at the time of decommissioning. All above ground structures within the proposed converter station and tail station footprint will be removed and the site will be returned to its previous state. Underground cables will remain in-situ as there would be more of an environmental impact in their removal. Ecology and invasive species surveys will be carried out prior to decommissioning and appropriate mitigation will be provided based on up to date data and in line with up to date guidelines. The original habitats will be restored and levels of noise, lighting and disturbance will return to levels pre-construction. Therefore, no significant effect from decommissioning or the decommissioning process will occur.

9.7.9 Impact Assessment Summary

Table 9.18 summarises the potential biodiversity impacts, mitigation and monitoring measures and residual impacts that will arise following implementation of the mitigation measures.

Table 9.18 Summary of Impacts, Mitigation Measures and Residual Impacts

Receptor	Potential Effects	Mitigation	Monitoring	Residual Effects
Converter Station and Tail Station Site and Adjacent Lands				
Buildings and artificial surfaces (BL3)	**Neutral, imperceptible, temporary impact.**	None proposed	None proposed	**No significant effects**
Recolonising bare ground ED3/ Buildings and artificial surfaces (BL3)/Scrub WS1	**Negative, slight, long-term impact.**	Refer to CEMP and detailed breakdown in Section 9.5	Refer to CEMP and detailed breakdown in Section 9.5	**No significant effects**
Improved agricultural grassland (GA1)	**Negative, slight, long-term impact.**	Refer to CEMP and detailed breakdown in Section 9.5	Refer to CEMP and detailed breakdown in Section 9.5	**No significant effects**
Immature woodland (WS2)	**Neutral, imperceptible, long-term impact.**	None proposed	None proposed	**No significant effects**
Scrub (WS1)	**Negative, slight, long-term impact.**	Refer to CEMP and detailed breakdown in Section 9.5	Refer to CEMP and detailed breakdown in Section 9.5	**No significant effects**
Treelines (WL2) /(Mixed) Broadleaved Woodland (WD1)/ Scrub	**Neutral, not significant, temporary impact.**	Refer to CEMP and detailed breakdown in Section 9.5	Refer to CEMP and detailed breakdown in Section 9.5	**No significant effects**

Receptor	Potential Effects	Mitigation	Monitoring	Residual Effects
Hedgerow (WL1)/Scrub (WS1)/ Dry meadow and grassy verge (GS2)	**Negative, not significant, temporary impact.**	Refer to CEMP and detailed breakdown in Section 9.5	Refer to CEMP and detailed breakdown in Section 9.5	**No significant effects**
Tidal River CW2	**Negative, slight, long-term impact.**	Refer to CEMP and detailed breakdown in Section 9.5	Refer to CEMP and detailed breakdown in Section 9.5	**No significant effects**
Off-road area between Great Island and the Campile River Estuary				
Improved agricultural grassland (GA1)	**Negative, slight, temporary impact.**	Refer to CEMP and detailed breakdown in Section 9.5	Refer to CEMP and detailed breakdown in Section 9.5	**No significant effects**
Arable crop (BC1)	**Negative, slight, temporary impact.**	Refer to CEMP and detailed breakdown in Section 9.5	Refer to CEMP and detailed breakdown in Section 9.5	**No significant effects**
Hedgerow (WL1)	**Neutral, not significant, temporary impact.**	None proposed	None proposed	**No significant effects**
Dry meadow and grassy verge (GS2) (of insufficient size to be mapped)	**Neutral, not significant, temporary impact.**	Refer to CEMP and detailed breakdown in Section 9.5	Refer to CEMP and detailed breakdown in Section 9.5	**No significant effects**

Receptor	Potential Effects	Mitigation	Monitoring	Residual Effects
Buildings and artificial surfaces (BL3)	**Neutral, imperceptible, temporary impact.**	None proposed	None proposed	**No significant effects**
(Mixed) broadleaved woodland (WD1)/ Treeline (WL2)	**Neutral, imperceptible, temporary impact.**	None proposed	None proposed	**No significant effects**
Stone walls and other stonework (BL1)/ Spoil and bare ground (ED2)	**Neutral, imperceptible, temporary impact.**	None proposed	None proposed	**No significant effects**
Drainage ditch (FW4)	**Neutral, imperceptible, temporary impact.**	None proposed	None proposed	**No significant effects**
Tidal river (CW2)	**Neutral, imperceptible, temporary impact.**	Refer to CEMP and detailed breakdown in Section 9.5	Refer to CEMP and detailed breakdown in Section 9.5	**No significant effects**
Minor off-road areas adjacent to roads				
Arable crop (BC1)	**Negative, slight, temporary impact.**	Refer to CEMP and detailed breakdown in Section 9.5	Refer to CEMP and detailed breakdown in Section 9.5	**No significant effects**

Receptor	Potential Effects	Mitigation	Monitoring	Residual Effects
Improved agricultural grassland (GA1)	**Negative, slight, temporary impact.**	Refer to CEMP and detailed breakdown in Section 9.5	Refer to CEMP and detailed breakdown in Section 9.5	**No significant effects**
Campile River Estuary Crossing				
Tidal rivers (CW2)	**Neutral, imperceptible, temporary impact.**	Refer to CEMP and detailed breakdown in Section 9.5	Refer to CEMP and detailed breakdown in Section 9.5	**No significant effects**
Upper salt marsh (CM2)	**Neutral, imperceptible, temporary impact.**	Refer to CEMP and detailed breakdown in Section 9.5	Refer to CEMP and detailed breakdown in Section 9.5	**No significant effects**
Mixed broadleaved/ conifer woodland (WD2)	**Neutral, imperceptible, temporary impact.**	Refer to CEMP and detailed breakdown in Section 9.5	Refer to CEMP and detailed breakdown in Section 9.5	**No significant effects**
Mixed broadleaved woodland (WD1)/Tree lines (WL2)/Hedgerows (WL1)/Scrub (WS1)	**Neutral, imperceptible, temporary impact**	Refer to CEMP and detailed breakdown in Section 9.5	Refer to CEMP and detailed breakdown in Section 9.5	**No significant effects**
Improved agricultural grassland (GA1)	**Negative, slight, temporary impact.**	Refer to CEMP and detailed breakdown in Section 9.5	Refer to CEMP and detailed breakdown in Section 9.5	**No significant effects**

Receptor	Potential Effects	Mitigation	Monitoring	Residual Effects
Recolonising Bare Ground (ED3)/Scrub (WS1)	**Neutral, imperceptible, temporary impact.**	None proposed	None proposed	**No significant effects**
Embankment (BL2)	**Neutral, imperceptible, temporary impact.**	Refer to CEMP and detailed breakdown in Section 9.5	Refer to CEMP and detailed breakdown in Section 9.5	**No significant effects**
Baginbun Beach Landfall Site and Road-side Car Parking Area				
Rocky sea cliffs (CS1) / Sedimentary sea cliffs (CS3)	**Neutral, imperceptible, temporary impact.**	Refer to CEMP and detailed breakdown in Section 9.5	Refer to CEMP and detailed breakdown in Section 9.5	**No significant effects**
Buildings and artificial surfaces (BL3) / Spoil and bare ground (ED2)	**Neutral, imperceptible, temporary impact.**	None proposed	None proposed	**No significant effects**
Sand shores (LS2)	**Neutral, imperceptible, temporary impact.**	Refer to CEMP and detailed breakdown in Section 9.5	Refer to CEMP and detailed breakdown in Section 9.5	**No significant effects**
Improved agricultural grassland (GA1)	**Neutral, imperceptible, temporary impact.**	Refer to CEMP and detailed breakdown in Section 9.5	Refer to CEMP and detailed breakdown in Section 9.5	**No significant effects**

Receptor	Potential Effects	Mitigation	Monitoring	Residual Effects
Arable crop (BC1)	**Negative, slight, temporary impact.**	Refer to CEMP and detailed breakdown in Section 9.5	Refer to CEMP and detailed breakdown in Section 9.5	**No significant effects**
Scrub WS1	**Negative, slight, permanent impact.**	Refer to CEMP and detailed breakdown in Section 9.5	Refer to CEMP and detailed breakdown in Section 9.5	**No significant effects**
Otter				
Habitat	**Negative, slight, short-term impact.**	Refer to CEMP and detailed breakdown in Section 9.5	Refer to CEMP and detailed breakdown in Section 9.5	**No significant effects**
Bats				
Roosting sites, foraging sites, hibernation sites	**Negative, slight to negligible, long-term impact.**	Refer to CEMP and detailed breakdown in Section 9.5	Refer to CEMP and detailed breakdown in Section 9.5	**No significant effects**
Badger				
Habitat and setts	**Negative, slight, long-term impact.**	Refer to CEMP and detailed breakdown in Section 9.5	Refer to CEMP and detailed breakdown in Section 9.5	**No significant effects**

Receptor	Potential Effects	Mitigation	Monitoring	Residual Effects
Other Mammals				
Habitats, noise and disturbance	**Negative, slight, long-term impact**	Refer to CEMP and detailed breakdown in Section 9.5	Refer to CEMP and detailed breakdown in Section 9.5	**No significant effects**
Birds				
Habitat	**Negative, slight, permanent impact.**	Refer to CEMP and detailed breakdown in Section 9.5	Refer to CEMP and detailed breakdown in Section 9.5	**No significant effects**
Shoreline / Estuarine Habitats	**Negative, slight, short-term impact.**	Refer to CEMP and detailed breakdown in Section 9.5	Refer to CEMP and detailed breakdown in Section 9.5	**No significant effects**
Other Fauna				
Amphibians, reptiles, invertebrates	**Negative, slight, temporary impact.**	Refer to CEMP and detailed breakdown in Section 9.5	Refer to CEMP and detailed breakdown in Section 9.5	**No significant effects**
Water Quality and Aquatic Ecology				
Marine and aquatic habitats	**Negative, not significant, short-term impact.**	Refer to CEMP and detailed breakdown in Section 9.5	Refer to CEMP and detailed breakdown in Section 9.5	**No significant effects**

9.8 Conclusions

All potential ecological constraints were identified and incorporated into the project design and appropriate mitigation specified. Overall, it has been concluded that the project will not have a significant effect on ecological receptors and no significant effect on ecology has been identified.

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Appendix 4: *Winter Bird Survey*

DixonBrosnan

environmental consultants

Project	**Winter Bird Survey to assess bird usage of a proposed landfall site and HDD locations for the Greenlink electricity interconnector project, Co. Wexford.**			
Client	**Arup**			
Project ref	**Report no**	**Client ref**		
1938.3	1938.3	-		

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Date	**Rev**	**Status**	**Prepared by**	
19/12/19	0	0 issue to client	Carl Dixon MSc.	
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v180907

Contents

1. Introduction

Greenlink Interconnector Limited (GIL) is proposing to develop Greenlink (an electricity interconnector), linking the existing electricity grids in Ireland and Great Britain. Greenlink will consist of two converter stations, one close to the existing substation at Great Island in County Wexford (Ireland), and one close to the existing substation at Pembroke in Pembrokeshire (Wales). The converter stations will be connected by underground cables (onshore) and subsea cables (offshore). Dixon.Brosnan was commissioned by Arup to carry out an appraisal of the potential effects of the proposed development, on birds utilising the development site and the coastal areas adjacent to it.

The land cables will be connected with the marine cables in a transition jointing bay (TJB) buried in the ground above the high-water mark. In all areas the cables will be buried below surface. TJBs are typically 25m long x 5m wide and 3m deep below ground level.

Horizontal directional drilling (HDD) is the preferred method of installation at the landfall site at Baginbun Beach. HDD is a technique whereby a hole is drilled from shore under any sea defences, cliffs, dune systems or sensitive features e.g. certain river crossings, to a point a suitable distance offshore or onshore, in the case of the Campile River Estuary crossing. The hole is usually drilled at a distance of several hundred metres from the sensitive feature. A pipe is then inserted into the drilled hole. The pipe is used as a duct into which the cables are installed.

The information in this report was used to help determine the potential effects on bird populations and also informed the conclusions of the ecological appraisal of the proposed development.

Special attention was paid to two locations within the study area (**see Figure 1**), which are likely to be of particular relevance to the proposed development. These are as follows:

- The proposed landfall site at Baginbun Beach;
- The Campile River Estuary in close proximity to Dunbrody Abbey. Due to the size of the site and the sightlines available this section of the survey was divided into three distinct survey areas;
    - South of the Disused Railway Line
    - North of the Disused Railway Line
    - West of Dunbrody Bridge.

Results from these locations are discussed in the context of the study area as a whole and in the context of available i-webs data, previous winter bird surveys and in relation to nearby Special Protection Areas (SPAs).

2. Desktop Review

A desktop review was carried out to identify designated SPAs in the surrounding landscape and any previous records of water birds (waders and wildfowl) from the study area and surrounding region. From the information identified in the desktop review and a site inspection, it was concluded that winter bird counts would be required to accurately assess any potential ecological impacts on birds which might accrue from the proposed development.

2.1. Designated sites

Ireland is required under the terms of the EU Birds Directive (2009/147/EC) to designate Special Protection Areas (SPAs) for the protection of endangered species of wild birds. Sites that meet any of the following criteria may be selected as SPAs:

- A site regularly supporting 20,000 waterbirds or 10,000 pairs of seabirds;
- A site regularly supporting 1% or more of the all-Ireland population of an Annex I species;
- A site regularly supporting 1% or more of the biogeographical population of a migratory species;
- A site that is one of the 'n' most suitable sites in Ireland for an Annex I species or a migratory species (where 'n' is a variable which is related to the proportion of the total biogeographic population of a species held by Ireland).

In Ireland a programme to identify and designate these SPA sites has been in place since 1985. It is our typical mild and wet winters that make the wetlands of Ireland such an important resource for over three-quarters of a million of these waterbirds each year. Over 50 species of waterbird migrate here either on passage to more southerly resorts or to spend the entire winter here. They seek out the relatively undisturbed wetland areas for ice-free feeding conditions and for safe roosting opportunities. In some cases, significant proportions of the biogeographic populations of waterbird overwinter here (e.g. Light-bellied Brent Goose, Black-tailed Godwit, Whooper Swan, Greenland White-fronted Goose and Ringed Plover).

Ireland's SPA Network encompasses over 570,000 hectares of marine and terrestrial habitats. The marine areas include some of the productive intertidal zones of our bays and estuaries that provide vital food resources for several wintering wader species including Dunlin, Knot and Bar-tailed Godwit. Marine waters adjacent to the breeding seabird colonies and other important areas for sea ducks, divers and grebes are also included in the network.

The majority of the breeding seabirds and wintering waterbirds are considered to be regularly occurring migratory birds; over 60% of 25 Annex I listed species that now occur in Ireland on a regular basis belong to the breeding seabird and wintering waterbird groups. This has in part led to the situation that the majority (> 80%) of Ireland's SPAs are designated for these two bird groups (NPWS, Special Protection Areas (SPA)).

The survey areas do not lie within any SPAs for Birds and the closest such site: Bannow Bay SPA (Site Code: IE004033), is located at a distance of 1.3km north of Baginbun Beach and approximately 10km southeast of the Campile River Estuary survey sites. **Table 1** below lists the qualifying interests for the Bannow Bay SPA.

The Bannow Bay SPA covers an area of 1,363 hectares in size with 92% of that being composed of marine area. Bannow Bay is a large, very sheltered, estuarine system with a narrow outlet to the sea. Very extensive intertidal mud and sand flats are exposed at low tide, with an average width of about 2 km. A number of small to medium sized rivers flow into the site, the principal being the Owenduff and the Corock which enter at the top end of the estuary. The sediments have a rich macroinvertebrate fauna, with such species as *Scrobicularia plana*, *Hediste diversicolor* and *Arenicola marina* being frequent. Salt marshes are well developed in the sheltered areas of the site. The main land use within the site is shellfish farming. The site is surrounded by agricultural land.

Table 1: Qualifying interests for the Bannow Bay SPA

Species code	Species	Scientific name	Conservation objective
A046	Light-bellied Brent Goose	*Branta bernicla hrota*	Maintain
A048	Shelduck	*Tadorna tadorna*	Maintain
A054	Pintail	*Anas acuta*	Maintain
A130	Oystercatcher	*Haematopus ostralegus*	Maintain
A140	Golden Plover	*Pluvialis apricaria*	Maintain
A141	Grey Plover	*Pluvialis squatarola*	Maintain
A142	Lapwing	*Vanellus vanellus*	Maintain
A143	Knot	*Calidris canutus*	Maintain
A149	Dunlin	*Calidris alpina*	Maintain
A156	Black-tailed Godwit	*Limosa limosa*	Maintain
A157	Bar-tailed Godwit	*Limosa lapponica*	Maintain
A160	Curlew	*Numenius arquata*	Maintain
A162	Redshank	*Tringa totanus*	Maintain
A999	Wetland and Waterbirds		Maintain

Restore = Restore favourable conservation condition, Maintain = Restore favourable conservation condition

The selection of species listed as Special Conservation Interests for the Bannow Bay SPA was based on the following:

1. During winter the site regularly supports 1% or more of the biogeographical population of Light-bellied Brent Geese (*Branta bernicla hrota*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 561 individuals.

2. During winter the site regularly supports 1% or more of the all-Ireland population of Dunlin (*Calidris alpina*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 3,038 individuals.

3. During winter the site regularly supports 1% or more of the biogeographical population of Black-tailed Godwit (*Limosa limosa*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 546 individuals.

4. During winter the site regularly supports 1% or more of the biogeographical population of Bar-tailed Godwit (*Limosa lapponica*). The mean peak number of this Annex I species within the SPA during the baseline period (1995/96 – 1999/00) was 471 individuals.

Additional Special Conservation Interests for Bannow Bay SPA are as follows:

5. During winter the site regularly supports 1% or more of the all-Ireland population of Shelduck (*Tadorna tadorna*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 500 individuals.

6. During winter the site regularly supports 1% or more of the all-Ireland population of Pintail (*Anas acuta*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 52 individuals.

7. During winter the site regularly supports 1% or more of the all-Ireland population of Oystercatcher (*Haematopus ostralegus*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 711 individuals.

8. During winter the site regularly supports 1% or more of the all-Ireland population of Golden Plover (*Pluvialis apricaria*). The mean peak number of this Annex I species within the SPA during the baseline period (1995/96 – 1999/00) was 1,955 individuals.

9. During winter the site regularly supports 1% or more of the all-Ireland population of Grey Plover (*Pluvialis squatarola*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 142 individuals.

10. During winter the site regularly supports 1% or more of the all-Ireland population of Lapwing (*Vanellus vanellus*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 2,950 individuals.

11. During winter the site regularly supports 1% or more of the all-Ireland population of Knot (*Calidris canutus*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 508 individuals.

12. During winter the site regularly supports 1% or more of the all-Ireland population of Curlew (Numenius arquata). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 891 individuals.

13. During winter the site regularly supports 1% or more of the all-Ireland population of Redshank (Tringa totanus). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 377 individuals.

14. The wetland habitats contained within Bannow Bay SPA are identified of conservation importance for non-breeding (wintering) migratory waterbirds. Therefore, the wetland habitats are considered to be an additional Special Conservation Interest.

To acknowledge the importance of Ireland's wetlands to wintering waterbirds, “Wetland and Waterbirds” may be included as a Special Conservation Interest for some SPAs that have been designated for wintering waterbirds and that contain a wetland site of significant importance to one or more of the species of Special Conservation Interest. Thus, a further objective is to maintain or restore the favourable conservation condition of the wetland habitat within the Bannow Bay SPA as a resource for the regularly occurring migratory waterbirds that utilise it.

2.2 NPWS Winter bird survey – Bannon Bay SPA

During 2009/2010 a waterbird survey programme was conducted by the NPWS within Cork Harbour. This waterbird survey programme was designed to investigate how waterbirds are distributed across coastal wetland sites during the low tide period. The surveys ran alongside and are complementary to the Irish Wetland Bird Survey (I-WeBS) which is a nationwide survey undertaken primarily on a rising tide or at high tide. This survey consisted of four low tide counts (October, November and December 2009 and February 2010) and one high tide count (January 2010), where waterbirds were counted within a series of 8 count subsites within the SPA. The behaviour of waterbirds during counts was attributed to one of two categories (foraging or roosting/other) while the position of the birds was recorded as per one of four broad habitat types (intertidal, subtidal, supratidal and terrestrial). In addition to the main survey programme described above, an additional high tide roost survey was completed on 25/02/2010.

A total of 42 waterbird species were recorded during the 2009/10 survey programme at Bannow Bay SPA. All SCI species were recorded within all counts undertaken with the exception of Pintail, which was not recorded in any count.

Low tide counts are useful in assessing the use of the estuary by foraging waterbirds. For example, certain species are recorded sporadically during high-tide counts yet can occur in high numbers during low-tide counts. Certain species may move onto fields for example to forage and roost during period of high-tide and thus are not recorded during site surveys.

2.3 Wading Birds & Wildfowl

Bannow Bay supports an excellent diversity of wintering waterfowl and is one of the most important sites in the south-east. Of particular note is an internationally important population Light-bellied Brent Goose. It also supports nationally important numbers of a further 12 species, which includes 3.4% of the national total for Shelduck, 3.0% of the total for Black-tailed Godwit, 2.6% of the total for Bar-tailed Godwit and 2.6% of the total for Pintail. The intertidal sand and mud flats provide excellent feeding for waterfowl species, while suitable roosts are provided by the salt marshes and other shoreline habitats. Habitats are generally of good quality. Part of site is a Wildfowl Sanctuary. The site has been well monitored since the 1970s.

2.4 Ramsar Site

The Convention on Wetlands, called the Ramsar Convention, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. A key commitment of Ramsar Contracting Parties is to identify and place suitable wetlands onto the List of Wetlands of International Importance. Bannow Bay is listed as a Ramsar site, which is a non-statutory designation.

2.5 Important Bird Areas – Bannow Bay

Important Bird and Biodiversity Areas (IBAs) are sites selected as important for bird conservation because they regularly hold significant populations of one or more globally or regionally threatened, endemic or congregator bird species or highly representative bird assemblages. The European IBA programme aims to identify, monitor and protect key sites for birds all over the continent. It aims to ensure that the conservation value of IBAs in Europe (now numbering more than 5,000 sites or about 40% of all IBAs identified globally to date) is maintained, and where possible enhanced. The programme aims to guide the implementation of national conservation strategies, through the promotion and development of national protected-area programs. Through their designation they aim to form a network of sites ensuring that migratory species find suitable breeding, stop-over and wintering places along their respective flyways.

The function of the Important Bird Area (IBA) Programme is to identify, protect and manage a network of sites that are important for the long-term viability of naturally occurring bird populations, across the geographical range of those bird species for which a site-based approach is appropriate. The proposed landfall site at Baginbun Beach lies in proximity to the Bannow Bay IBA (Site Code: IE096).

The Bannon Bay IBA is an extensive, sheltered sea bay and estuary, situated in County Wexford, 20 km east of Waterford city. At low tide over 75% of the bay is exposed mud and sand with some saltmarsh. The Ownduff and Corock rivers discharge into the head of the bay which is constricted at its mouth by sandbars and a dune system on either side. This wetland supports a wide range of wintering waterfowl. Several additional species occur in numbers of national importance.

There is intertidal shellfish cultivation within the site, which is a possible threat to habitat quality, while wildfowling causes disturbance to birds. Habitat quality is reduced by the spread of non-native cord-grass *Spartina*. In 1997 unauthorized mechanical cockle-harvesting caused damage to the intertidal mudflats.

The site qualifies for designation under the following IBA Criteria (2000):

- B1i - The site is known or thought to hold ≥ 1% of a flyway or other distinct population of a waterbird species
- C3 - The site is known to regularly hold at least 1% of a flyway population or of the EU population of a species threatened at the EU level (not listed on Annex 1 of The Birds Directive).
- C6 - The site is one of the five most important in the European region (NUTS region) in question for a species or subspecies considered threatened in the European Union (i.e. listed in Annex I of the EC Birds Directive).

Table 2: Provides a summary of the Bannon Bay IBA trigger species.

Species	Current IUCN Red List Category	Season	Year(s) of estimate	Population estimate	IBA Criteria Triggered
Brent Goose (*Branta bernicla*)	Least Concern (LC)	Winter	2002-2006	577-1,045 individuals	B1i, C3
Little Egret *(Egretta garzetta)*	Least Concern (LC)	Winter	2003-2007	12-51 individuals	C6

2.6 Review of the Irish Wetland Bird Survey (I-WeBS) & waterbird survey programme

Most species which occur in Ireland migrate from the north and northwest (principally Canada, Greenland and Iceland) or from the northeast (northern continental Europe, including Scandinavia, Russia and Siberia), moving south to winter predominantly in west and northwest Europe and west Africa (Wetlands International, 2006, Wernham *et al*., 2002). Estuaries and other wetlands of north-west Europe support vast numbers of these migratory wading birds and wildfowl each winter. These wetland habitats along with the mild climate, provide ample feeding throughout the winter period, particularly when many other parts of northwest Europe are frozen over. It is the high densities of benthic macroinvertebrates and easy access which are the main attraction of these wetland sites. Disturbance free roosting and resting areas are additional important ecological requirements. It is a combination of these factors which make Ireland particularly attractive for wintering waterbirds.

The Irish Wetland Bird Survey (I-WeBS) is the scheme that monitors wintering waterbirds in Ireland. The survey runs from September to March each winter. Wetlands of all types and sizes are monitored, including estuaries, coastlines, bays, rivers, turloughs, lakes, streams and flooded fields. I-WeBS is traditionally a high-tide survey and at large, complex estuarine sites with extensive intertidal areas that require some time to cover, counts are typically made within three hours either side of the high tide. A review of the Irish Wetland Bird Survey (I-WeBS) data shows that the landfall site at Baginbun Beach is not monitored as part of the Irish Wetland Bird Survey.

In relation to the study sites around the Campile River Estuary crossing, it is noted that the 'South of the Disused Railway Line' vantage point site falls within a larger subsite of the I-

Webs program namely, Subsite Barrow Bridge – Passage East (Code: 0M496). The 'North of the Disused Railway Line' and 'West of Dunbrody Bridge' vantage points are not monitored as part of I-Webs programme. The vantage point 'South of the Disused Railway Line' covers approximately 1% of the total area of subsite 0M496.

A review of the Irish Wetland Bird Survey (I-WeBS) data for the period 2013-2014 season (only data available) for the subsite 0M496 is detailed in **Table 3** below. It is noted that the table only presents data from a single month i.e. February 2014.

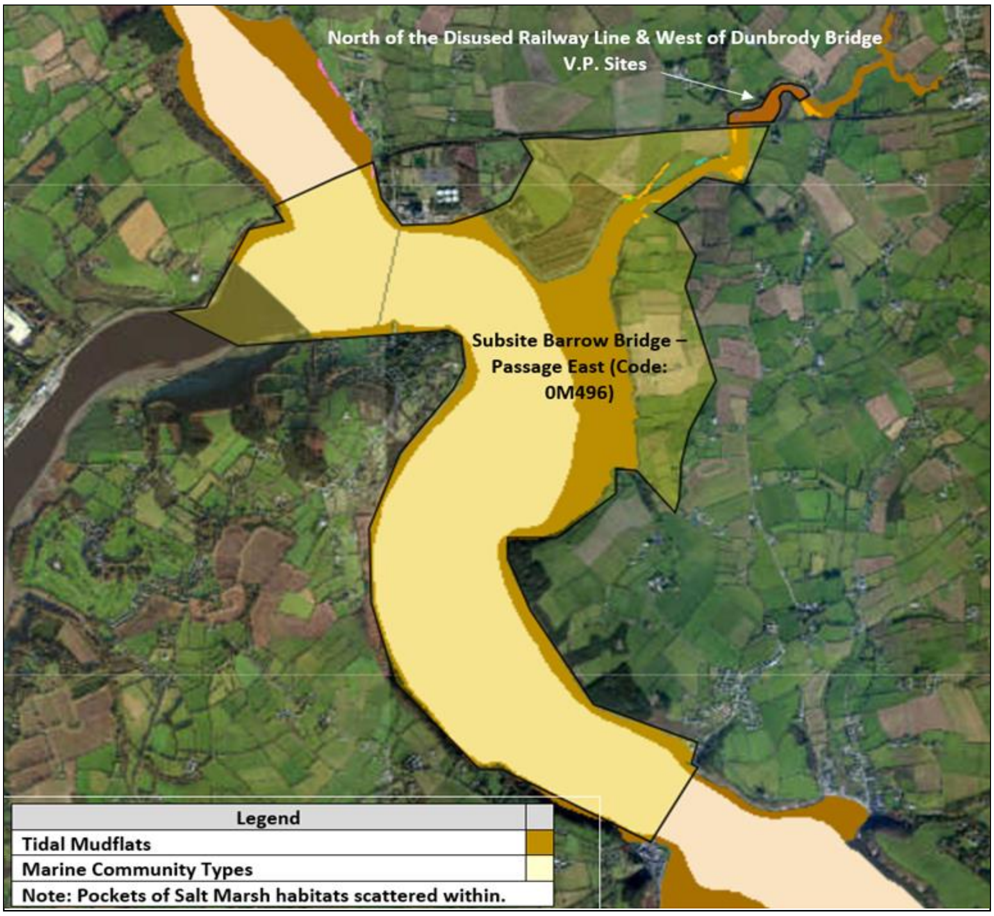

Figure 1: General overview of habitats recorded within Subsite 0M496 and North of the Disused Railway Line and West of Dunbrody Bridge vantage point sites. **Source: NPWS Site Specific Conservation Objectives (SSCO) mapping system.**

Table 3. Irish Wetland Bird Survey (I-WeBS) data for the period 2013-2014 season (only data available is for February 2014) for the subsite 0M496

Species	Annual peak of each species	Species	Annual peak of each species
Wigeon	38	Curlew	25
Teal	45	Redshank	4
Mallard	71	Black-headed Gull	40
Cormorant	9	Lesser Black-backed Gull	20
Little Egret	3	Herring Gull	10
Grey Heron	7	Great Black-backed Gull	29

Of the species recorded Little Egret is listed on Annex I of the Birds Directive. Wigeon, Curlew, Redshank, Black-headed Gull and Herring Gull are classified as Red Listed species (high conservation concern) by BirdWatch Ireland and the Royal Society for the Protection of Birds (Colhoun. K. et al 2013).

However, it is noted that none of the species recorded during the 2013-2014 survey period were recorded in high numbers and numbers were low in-comparison to the figures which would be considered nationally significant (i.e. 1% or more of the all-Ireland population of an Annex I species or 1% or more of the bio-geographical population of a migratory species).

3. Previous winter bird counts 2015 - DixonBrosnan Environmental Consultants

3.1 Winter Bird surveys (2015/2016) of potential landfall sites for the proposed Greenlink project in Co. Wexford

Winter bird counts were carried out in 2015/2016 season to assess winter bird usage of coastal sites which were proposed as landfalls for the proposed Greenlink project. Three sites were initially chosen (Booley Bay, Boyces Bay and Baginbun Bay) with an additional site (Sandeel Bay) added in December 2015. Results relating to the Baginbun Bay are shown below in **Tables 4** and **5**.

The winter bird surveys were undertaken on the following dates: 23th November 2015, 15th December 2015, 20th January 2016, 10th February 2016, 3rd March 2016 and 23rd March, 2016. The survey methodology was based on that used by the British Trust for Ornithology (BTO), Wetland Bird Survey (WeBS) and also that for the Irish Wetland Bird Survey (I-WeBS), as outlined in Gilbert et al. (1998).

The winter bird survey was undertaken using Nicon ProStaff-7 10X42 binoculars and a Safari 20-60 X 80 spotting scope. Ninety-minute counts were undertaken at either high tide, mid tide or low tide. Tides and weather conditions for each day were recorded.

It is noted that many of these birds were recorded overflying the channel and that the survey covered a radius of approximately 300m from each vantage point. Trawlers fishing for sprat offshore attracted large numbers of sea birds and seals. Thus, during the periods when trawlers were present numbers were elevated above the expected normal level. A total of 48 bird species were recorded during the site surveys. Two species listed as qualifying interests for the Bannon Bay SPA i.e. Oystercatcher and Redshank, were recorded at Baginbun Beach. Both were recorded in low numbers.

None of the waterbirds recorded by vantage point counts in proximity to Baginbun Bay were recorded in high numbers and numbers were low in-comparison to the figures which would be considered nationally significant (i.e. 1% or more of the all-Ireland population of an Annex I species or 1% or more of the bio-geographical population of a migratory species).

Table 4 - Bird survey results (2015/2016)	1% National	1% International	Baginbun Beach					
Species			23/11/2015	15/12/2015	20/01/2016	10/02/2016	03/03/2016	23/03/2016
Black-headed Gull		20000	3			12		
Common Gull		16400	5					
Herring Gull		10200	2	4	2	1	6	3
Great Black-backed Gull		4200		7			1	
Lesser Black-backed Gull		5500	2					
Kittiwake				103				
Little Gull		1230	1					
Gannet					3			
Cormorant	120	1200	1	1				1
Shag		2000		19	1	3	3	2
Black Guillemot			1					
Oystercatcher	690	8200	1					
Redshank	300	3900		8				
Mallard	290	20000						1
Great Crested Grebe	40	3500				1		
Great Northern Diver	20	50			1	4	1	

Table 5: Species recorded within Baginbun Beach survey area, along with relevant conservation status		**Birds Directive Annex**			**BOCCI**		**European Birds of Conservation Concern - Ireland**		
Species		**I**	**II**	**III**	**Red List**	**Amber List**	**SPEC 1**	**SPEC 2**	**SPEC 3**
Larus ridibundus	Black-headed Gull				X				
Larus canus	Common Gull					X			
Larus argentatus	Herring Gull				X			X	
Larus marinus	Great black-backed Gull					X			
Larus fuscus	Lesser black-backed Gull					X			
Rissa tridactyla	Kittiwake					X			X
Larus minutus	Little Gull	X				X			X
Morus bassana	Gannet					X			
Phalacrocorax carbo	Cormorant					X			
Phalocrocorax aristotelis	Shag					X		X	
Cepphus grylle	Black Guillemot					X		X	
Haematopus ostralegus	Oystercatcher					X	X		
Tringatotanus	Redshank				X			X	
Anas platyrhynchos	Mallard		X	X					
Podiceps cristatus	Great Crested Grebe					X			
Gavia immer	Great Northern Diver	X				X			

Symbol	**Description**
I	**Annex 1**: species and sub-species are particularly threatened. Member States must designate Special Protection Areas (SPAs) for their survival and all migratory bird species.
II	**Annex 2**: bird species can be hunted. However, the hunting periods are limited and hunting is forbidden when birds are at their most vulnerable: during their return migration to nesting areas, reproduction and the raising of their chicks.
III	**Annex 3**: overall, activities that directly threaten birds, such as their deliberate killing, capture or trade, or the destruction of their nests, are banned. With certain restrictions, Member States can allow some of these activities for species listed here.

4. Winter bird survey 2018/2019 - methodology

A winter bird survey was undertaken by DixonBrosnan at each vantage point location on six separate occasions; October 2018 to March 2019. The survey methodology was based on that used by the British Trust for Ornithology (BTO), Wetland Bird Survey (WeBS) and also that for the Irish Wetland Bird Survey (I-WeBS), as outlined in Gilbert et al. (1998) and the low tide waterbird surveys (Lewis, L. J. et. al. 2014). The winter bird survey was undertaken using 8.5×45 binoculars and a Swarovski ATX30-70x95 spotting scope. Ninety-minute counts were undertaken at each survey location at either high tide, mid tide and low tide.

The vantage point locations for the winter bird counts are shown in **Figure 2**. The survey locations were based on information gathered during the original site walkover and the location of the proposed works. Boundaries of the count areas were selected primarily to delineate patches of relatively homogenous habitat within the study area in order to compare bird usage of these habitats and spatial areas; but were also selected to be easily perceived by the observer. This was done by use of sight-lines to prominent landmarks such as permanent marker buoys, coastal features and features on the horizon.

Where possible the survey covered a radius of approximately 300m from the proposed works area. A radius of 300m was used based information gathered by Borgmann (2011) stating that establishing set-back distances of 250 m from waterfowl, diving ducks, wading birds, and shorebirds may lessen the impacts to the most sensitive species. In addition, in most instances a visual stimulus will create a disturbance effect before any associated noise starts to have an effect e.g. a flight response might be expected by many species if approached to within c. 100-150m across a mudflat (Cutts et. Al, 2013).

All waterbirds present within the count areas other than passerines, doves and pigeons were identified to species and their behaviour was also noted. Waterbirds are defined as ‘‘birds that are ecologically dependent on wetlands’’ (Ramsar Convention, 1971) which are a diverse group that includes divers, grebes, swans, geese and ducks, gulls, terns and wading birds. Birds flying over the count area but not utilising the resources within it, were not included in the counts, however notes were made on any substantial movements of birds that were observed. Birds re-locating within a site were not counted twice, however there may be some overlap been the survey sites i.e. ‘South of the Disused Railway’, ‘North of the Disused Railway Line’ and ‘West of Dunbrody Bridge’, due to their close proximity.

Figure 2: vantage point location for the winter bird counts.

5. Results

Vantage point count locations were utilised for the winter bird survey as shown in **Figure 2**. Conditions experienced during the survey along with survey notes are recorded in **Table 6.** It is important to note that waterbird counts represent a 'snapshot' of bird numbers during a count session, so in general and taking into account all potential sources of error, resulting data are regarded to be underestimates of population size.

Table 6. Survey conditions and notes

Baginbun Beach	
Date: 11/10/2018	**Tides & Weather** Tide for general area: High – 07.36 (4.23m) & Low – 13.56 (0.46m). General Conditions: Overcast with light breezes of 4 - 7mph. Rain light and scattered. Temperatures of 11 Degrees Celsius. State of water – calm (rippled). Visibility good
Notes: • Vantage point on cliff top by car park. • Survey conducted at 12.00, tide state – low. • Shags loafing on headland to southeast i.e. Baginbun Point. Foraging trips within coastal waters within study site. • Herring Gull foraging within exposed rock pools at low tide along foreshore. • Great black-backed Gull loafing/roosting on exposed bedrock on top of headland i.e. Baginbun Point.	

• Oystercatcher foraging within exposed fucoids along foreshore. • Flyby - Oystercatcher (10), Curlew (1), Cormorant (2), Great black-backed Gull (6), Herring Gull (2), Shag (1). • Human, on-foot – shoreline with dog approximately 1 hour 5 minutes into survey for a period of 10 minutes. Disturbance – High response of Oystercatcher - flew away to areas outside of survey site and did not return during the count session. • 13.20pm single Grey seal (*Halichoerus grypus*) moving through site.	
Date: 20/11/2018	**Tides & Weather** Tide for general area: High – 15.25 (3.70m) & Low – 09.18 (1.15m). General Conditions: Partly cloudy with fresh to strong breezes of 19 - 31mph. No rain. Temperatures of 7 Degrees Celsius. State of water – moderate (waves present). Visibility good.
Notes: • Vantage point on cliff top by car park. • Survey conducted at 13.00, tide state – high. • Human, on-foot – shoreline at commencement of survey with additional dog walker arriving 5 minutes into survey and 2 further people arriving 10 minutes into survey. Remained on site for approximately 30 minutes. • Shags loafing on headland to southeast i.e. Baginbun Point with foraging trips within coastal waters within study site. • Gulls loafing – on water top and/or headland i.e. Baginbun Point • Red-throated Diver foraging. • Auks – loafing on water top to far east of survey site. • Fishing trawler working approximately 50m east of survey site. • Large numbers of Auks and gulls flying in a northernly direction outside study site. • Flyby – Cormorant (4) in a north south direction. • Tide rising throughout survey period.	
Date: 04/12/2018	**Tides & Weather** Tide for general area: High – 15.22 (3.75m) & Low – 09.20 (0.94m). General Conditions: Overcast with light breezes of 1 - 3mph. Dry conditions. Temperatures of 2 Degrees Celsius. State of water – calm (rippled). Visibility good.
Notes: • Vantage point on cliff top by car park. • Survey conducted at 10.40, tide state – low. • Great Northern Diver foraging and loafing within water. • Shags loafing on headland to southeast i.e. Baginbun Point with foraging trips within coastal waters within study site. • Herring Gulls and Great Black-backed Gulls loafing/roosting on headland to southeast i.e. Baginbun Point. • Merlin (*Falco columbarius*) an Annex I species loafing on headland i.e. Baginbun Point. • Oystercatcher loafing on exposed rock along southern boundary of survey site. • Large vessel arrived 10minutes into survey and remained for most of survey period – weak response of birds present i.e. waterbirds move slightly away from the source of the disturbance. • Grey heron – loafing • Flyby – Herring Gull (5), Great Black-backed Gull (6), Shag (3), Oystercatcher (1), Grey Heron (2), Great Northern Diver (1). Mostly along a north south axis. • Moderate numbers of Great Northern Diver foraging outside survey site.	

Date: 15/01/2019	**Tides & Weather** Tide for general area: High – 11.42 (3.41m) & Low – 05.38 (1.56m). General Conditions: Mostly cloudy with light breezes of 4 - 7mph. Dry conditions. Temperatures of 7 Degrees Celsius. State of water – calm (rippled). Visibility ok.
Notes: • Vantage point on cliff top by car park. • Survey conducted at 10.25, tide state – high. • Shags and Cormorant loafing on headland to southeast i.e. Baginbun Point with foraging trips within coastal waters within study site. • Great Black-backed Gulls loafing/roosting on headland to southeast i.e. Baginbun Point. • Great Northern Diver foraging and loafing within water. • Razorbill – foraging • Flyby – Light-bellied Brent Goose (15), Herring Gull (2), Great Black-backed Gull (3). Mostly along a north south axis. • Human (x2), on-foot – shoreline with dog 10minutes before survey end. Weak response of birds present i.e. waterbirds move slightly away from the source of the disturbance. • 2 Harbour Porpoise (*Phocoena phocoena*) foraging within site for a brief period.	
Date: 13/02/2019	**Tides & Weather** Tide for general area: High – 10.57 (3.40m) & Low – 17.16 (1.54m). General Conditions: Overcast with moderate to fresh breezes of 19 - 31mph. Dry conditions. Temperatures of 9 Degrees Celsius. State of water – moderate (waves present). Visibility good.
Notes: • Vantage point on cliff top by car park. • Survey conducted at 10.45, tide state – high. • Herring Gulls loafing/roosting on headland to southeast i.e. Baginbun Point. • Red-throated Diver – foraging • Common Gull – loafing on water • Human, on-foot – shoreline with dog - (x2) – High response of Cormorant - flew away to areas outside of survey site and did not return during the count session • Flyby –Light-bellied Brent Goose (5), Black-headed Gull (17), Gannet (2), Common Gull (8), Herring Gull (12), Great Black-backed Gull (1). Mostly along a north south axis.	
Date: 27/03/2019	**Tides & Weather** Tide for general area: High – 09.43 (3.35m) & Low – 16.10 (1.10m). General Conditions: Cloudless with calm wind conditions. Dry. Temperatures of 11 Degrees Celsius. State of water – calm (glassy). Visibility good.
Notes: • Vantage point on cliff top by car park. • Survey conducted at 09.00, tide state – high. • Shag loafing on headland to southeast i.e. Baginbun Point with foraging trips within coastal waters within study site. • Herring Gulls and Great Back-backed Gulls loafing/roosting on headland to southeast i.e. Baginbun Point. • Great Northern Diver foraging and loafing within water. • Lesser black-backed Gull – loafing on water • Cormorant – foraging	

- Human, on-foot – shoreline for approximately 1 hour into survey period, including dog walker for approximately 15 minutes. Weak response, of waterbirds i.e. move slightly away from the source of the disturbance.
- Single Grey seal (*Halichoerus grypus*) moving through site.
- Fresh Otter (*Lutra lutra*) tracks on beach.
- Flyby –Curlew (2), Lesser black-backed Gull (2), Cormorant (2), Herring Gull (4), Great Black-backed Gull (2). Mostly along a north south axis, some gulls along east west axis.
- Moderate numbers of Gannet, Gulls and Divers to east of study site.

South of the Disused Railway Line

Date: 11/10/2018	**Tides & Weather** Tide for general area: High – 07.36 (4.23m) & Low – 13.56 (0.46m). General Conditions: Mostly cloudy with light breezes of 4 - 7mph. No rain. Temperatures of 12 - 13 Degrees Celsius. State of water – calm (rippled). Visibility good

Notes:

- Vantage point on flood embankment.
- Survey conducted at 14.00, tide state – low.
- Large number of birds flushed from site on arrival i.e. high disturbance response by wildfowl and curlew.
- Black-tailed Godwit (17) noted foraging within a section of agricultural grassland to southwest of vantage point.
- Numerous birds of prey noted passing through site and/or circling overhead i.e. Buzzard, Sparrow hawk and Kestrel.
- Redshank and Greenshank predominately foraging along exposed mudflat habitat.
- Constant movement of Redshank and Greenshank around site.
- Black-tailed Godwit – foraging and loafing within exposed mudflat habitat.
- Gulls and ducks – loafing prior to disturbance.
- Grey heron – foraging
- Curlew – loafing – prior to disturbance.

Date: 20/11/2018	**Tides & Weather** Tide for general area: High – 15.46 (4.03m) & Low – 09.46 (1.05m). General Conditions: Cloudy with light to gentle breezes of 4 - 12mph. Light and scattered rain. Temperatures of 7 Degrees Celsius. State of water – calm (rippled). Visibility good.

Notes:

- Vantage point on flood embankment.
- Survey conducted at 10.50, tide state – low.
- Redshank and Greenshank predominately foraging along exposed mudflat habitat.
- Teal – loafing
- Red-throated Diver – foraging
- Flock of Black-tailed Godwit (15) and Curlew (9) noted foraging within a section of agricultural grassland to northeast of vantage point i.e. around the grounds of Dunbrody Abbey.
- Snipe and Curlew - loafing
- Little Grebe – foraging
- Turnstone & redshank (6) flushed from site by flyby Peregrine Falcon (*Falco peregrinus*) – Annex I species.
- Constant movement of Redshank and Greenshank around site.

• Flyby –Curlew (2), Black-headed Gull (36), Common Gull (1), Oystercatcher (1) Little Egret (1). • Tide slowly rising throughout survey.	
Date: 04/12/2018	**Tides & Weather** Tide for general area: High – 15.43 (4.10m) & Low – 09.48 (0.84m). General Conditions: Overcast with light breezes of 1 - 3mph. Dry conditions for most of survey period with scattered moderate showers for last half hour. Temperatures of 2 Degrees Celsius. State of water – moderate (waves present). Visibility good to ok.
Notes: • Vantage point on flood embankment. • Survey conducted at 12.30, tide state – mid-high (rising). • Teal – loafing and foraging • Snipe predominately foraging along mudflat habitat • Redshank and Greenshank predominately foraging along exposed mudflat habitat. • Constant movement of Redshank and Greenshank around site. • Dunlin foraging along mudflat habitat – arrived from a westerly direction to forage on small patch of remaining exposed mudflat habitat. • Flyby –Curlew (4), Black-headed Gull (45), Lesser Black-backed Gull (1), Oystercatcher (1) Lapwing (89), Teal (8). • Tide rising throughout survey.	
Date: 15/01/2019	**Tides & Weather** Tide for general area: High – 12.01 (3.68m) & Low – 18.38 (1.49m). General Conditions: Nearly overcast with light breezes of 4 - 7mph. Dry conditions. Temperatures of 7 Degrees Celsius. State of water – calm (rippled). Visibility good.
Notes: • Vantage point on flood embankment. • Survey conducted at 12.25, tide state – high. • Teal – foraging – single teal roosting • Redshank and Greenshank predominately foraging along exposed mudflat habitat. • Constant movement of Redshank and Greenshank around site. • Black-tailed Godwit – foraging and loafing within exposed mudflat habitat • Black-headed Gulls – loafing • High tide roost of redshank (12) noted along exposed rock to southwest of vantage point. Birds dispersed within site as tide receded. • Flyby –Curlew (2), Black-headed Gull (31), Herring Gull (3). • Tide receding during survey.	
Date: 13/02/2019	**Tides & Weather** Tide for general area: High – 11.16 (3.67m) & Low – 17.44 (1.44m). General Conditions: Overcast with gentle breezes of 8 - 12mph. light scattered rain. Temperatures of 10 Degrees Celsius. State of water – calm (rippled). Visibility ok to good.
Notes: • Vantage point on flood embankment. • Survey conducted at 12.40, tide state – high. • Some small areas of exposed mudflat along river margins at beginning of survey. As survey precedes tide slowly falls resulting in greater areas of mudflat exposure.	

<table>
<tr><td colspan="2">

Curlew – predominately loafing
High tide roost of redshank (15) noted along exposed rock to southwest of vantage point. Birds dispersed within site as tide receded.
Teal – foraging and loafing
Grey heron and Black-tailed Godwit loafing.
Redshank and Greenshank predominately foraging along exposed mudflat habitat.
Constant movement of Redshank and Greenshank around site.
Human, on-foot – railway line – high disturbance response of majority of Black-tailed Godwit i.e. fly away to areas outside of site and do not return during the count session.
Flyby –Curlew (5), Black-headed Gull (20), Cormorant (2), Wigeon (7), Mallard (3).

</td></tr>
<tr><td>Date: 27/03/2019</td><td>Tides & Weather
Tide for general area: High – 10.02 (3.64m) & Low – 16.38 (1.00m).

General Conditions: Lightly cloudy with calm wind conditions. Dry. Temperatures of 12 - 13 Degrees Celsius. State of water – calm (rippled). Visibility good.</td></tr>
<tr><td colspan="2">Notes:

Vantage point on flood embankment.
Survey conducted at 11.00, tide state – high.
Some small areas of exposed mudflat along river margins at beginning of survey. As survey precedes tide slowly falls resulting in greater areas of mudflat exposure.
Little Egret and Snipe – foraging and loafing
Redshank and Greenshank predominately foraging along exposed mudflat habitat.
Constant movement of Redshank and Greenshank around site.
Grey heron and teal – foraging
Flyby –Lesser Black-backed Gull (3), Cormorant (1).

</td></tr>
<tr><th colspan="2">North of the Disused Railway Line</th></tr>
<tr><td>Date: 15/10/2018</td><td>Tides & Weather
Tide for general area: High – 10.25 (3.72m) & Low – 16.53 (1.21m).

General Conditions: Partly cloudy with calm wind conditions. Dry. Temperatures of 11 - 13 Degrees Celsius. State of water – calm (glassy). Visibility good.</td></tr>
<tr><td colspan="2">Notes:

Vantage point behind flood embankment near southwest corner of agricultural field.
Survey conducted at 12.05, tide state – mid to low.
All waders foraging. Constant movement around site.
Tide receding throughout.
Human, on-foot – railway line – high disturbance response of some birds. i.e. fly away to areas outside of site and do not return during the count session.
Black-headed Gulls loafing.
Flyby – Black-headed Gulls (13)

</td></tr>
<tr><td>Date: 19/11/2018</td><td>Tides & Weather
Tide for general area: High – 15.01 (3.81m) & Low – 08.58 (1.24m).

General Conditions: Cloudy with light breeze of 4 - 7mph. Dry. Temperatures of 8 Degrees Celsius. State of water – calm (rippled). Visibility good.</td></tr>
<tr><td colspan="2">Notes:

Vantage point behind flood embankment near southwest corner of agricultural field.
Survey conducted at 11.00, tide state – low.

</td></tr>
</table>

- Redshank and Greenshank predominately foraging along exposed mudflat habitat.
- Constant movement of Redshank and Greenshank around site.
- Approximately 40 Black-headed Gulls noted foraging within agricultural grassland around Dunbrody Abbey, to south of survey site.
- Teal – foraging
- Black-tailed Godwit – foraging.
- Tide rising throughout survey period.
- Flyby – Black-headed Gulls (33), Curlew (1), Greenshank (1)

Date: 10/12/2018	**Tides & Weather** Tide for general area: High – 07.24 (4.22m) & Low – 13.43 (1.00m). General Conditions: Nearly overcast with light breezes of 1 - 3mph. Dry conditions. Temperatures of 5 Degrees Celsius. State of water – calm (rippled). Visibility good.

Notes:

- Vantage point behind flood embankment near southwest corner of agricultural field.
- Survey conducted at 10.15, tide state – low.
- Redshank and Greenshank predominately foraging along exposed mudflat habitat.
- Constant movement of Redshank and Greenshank around site.
- Teal, Little Egret and Curlew – foraging
- Snipe – loafing and foraging
- Cormorant – foraging
- Flyby – Black-headed Gulls (3)

Date: 10/01/2019	**Tides & Weather** Tide for general area: High – 08.16 (4.13m) & Low – 14.30 (1.11m). General Conditions: Overcast with light breezes of 1 - 3mph. Light scattered rain. Temperatures of 9 Degrees Celsius. State of water – calm (rippled). Visibility ok.

Notes:

- Vantage point behind flood embankment near southwest corner of agricultural field.
- Survey conducted at 08.00, tide state – high
- Curlew, Redshank and Snipe – loafing. Some sporadic foraging by redshank.
- Teal and Wigeon loafing on water.
- Tide receding during survey.
- Kingfisher (*Alcedo atthis*) – Annex I species foraging within site
- Flyby – Black-headed Gulls (63), Curlew (1), Common Gull (1)

Date: 14/02/2019	**Tides & Weather** Tide for general area: High – 12.22 (3.54m) & Low – 06.26 (1.44m). General Conditions: Overcast with light breezes of 1 - 3mph. Dry. Temperatures of 10 Degrees Celsius. State of water – calm (rippled). Visibility good.

Notes:

- Vantage point behind flood embankment near southwest corner of agricultural field.
- Survey conducted at 11.00, tide state – mid to high
- Redshank and Greenshank predominately foraging along exposed mudflat habitat.
- Constant movement of Redshank and Greenshank around site.
- Teal and Curlew – foraging
- Kingfisher (*Alcedo atthis*) – Annex I species foraging within site

<table>
<tr><td colspan="2">

Tide slowly rising throughout survey period. Moderate areas of mudflat exposed at beginning of survey. As tide rises and area of mudflat habitat reduces, some birds leave the survey site.
Flyby – Black-headed Gulls (23), Herring Gull (3)
Pair of Buzzard constantly present.

</td></tr>
<tr><td>Date: 28/03/2019</td><td>Tides & Weather
Tide for general area: High – 10.51 (3.34m) & Low – 17.33 (1.25m).

General Conditions: Scattered cloud to nearly overcast at times. Light breezes of 1 - 3mph. Dry. Temperatures of 10 Degrees Celsius. State of water – calm (rippled). Visibility good.</td></tr>
<tr><td colspan="2">Notes:

Vantage point behind flood embankment near southwest corner of agricultural field.
Survey conducted at 09.00, tide state – low
Redshank and Greenshank predominately foraging along exposed mudflat habitat.
Constant movement of birds around site.
Teal, Black-tailed Godwit and Grey heron – foraging
Kingfisher (Alcedo atthis) – Annex I species foraging within site
Tide slowly rising throughout survey period. However, large area of exposed mudflat still available at end of survey period.
Flyby – Shelduck (2)
Pair of Buzzard constantly present.

</td></tr>
<tr><td colspan="2">West of Dunbrody Bridge</td></tr>
<tr><td>Date: 15/10/2018</td><td>Tides & Weather
Tide for general area: High – 10.25 (3.72m) & Low – 16.53 (1.21m).

General Conditions: Partly cloudy with calm wind conditions. Dry. Temperatures of 14 Degrees Celsius. State of water – calm (glassy). Visibility good.</td></tr>
<tr><td colspan="2">Notes:

Vantage point from area of amenity grassland by Dunbrody Bridge.
Survey conducted at 13.45, tide state – low.
All waders foraging. Constant movement around site. Some sporadic loafing behaviour.
Black-headed Gull – loafing and foraging
Little Egret – loafing and foraging.
Kingfisher (Alcedo atthis) – Annex I species, brief foraging spell within site
Flyby – Little Egret (2)

</td></tr>
<tr><td>Date: 19/11/2018</td><td>Tides & Weather
Tide for general area: High – 15.01 (3.81m) & Low – 08.58 (1.24m).

General Conditions: Mostly cloudy with gentle to fresh breezes of 8 - 24mph. Dry. Temperatures of 7 Degrees Celsius. State of water – calm (rippled). Visibility good.</td></tr>
<tr><td colspan="2">Notes:

Vantage point from area of amenity grassland by Dunbrody Bridge.
Survey conducted at 12.45, tide state – low.
Tide rising throughout survey. Approximately 50 minutes into survey, mudflat habitat submerged.

</td></tr>
</table>

<table>
<tr><td colspan="2">• Redshank and Greenshank foraging within exposed mudflat habitat at beginning of survey.
• Flyby – Redshank (4), Dunlin (4), Black-tailed Godwit (1), Black-headed Gull (4).
• Pair of Buzzard constantly present.</td></tr>
<tr><td>Date: 10/12/2018</td><td>Tides & Weather
Tide for general area: High – 07.24 (4.22m) & Low – 13.43 (1.00m).

General Conditions: Nearly overcast with light breezes of 1 - 3mph. light scattered showers. Temperatures of 5 Degrees Celsius. State of water – calm (rippled). Visibility good.</td></tr>
<tr><td colspan="2">Notes:
• Vantage point from area of amenity grassland by Dunbrody Bridge.
• Survey conducted at 11.55, tide state – low.
• Redshank and Greenshank predominately foraging along exposed mudflat habitat.
• Constant movement of Redshank and Greenshank around site.
• Teal – loafing and foraging
• Little Egret – foraging
• Flyby – Black-headed Gulls (8), Herring Gull (1)</td></tr>
<tr><td>Date: 10/01/2019</td><td>Tides & Weather
Tide for general area: High – 08.16 (4.13m) & Low – 14.30 (1.11m).

General Conditions: Overcast with light breezes of 1 - 3mph. Dry. Temperatures of 9 Degrees Celsius. State of water – calm (rippled). Visibility good.</td></tr>
<tr><td colspan="2">Notes:
• Vantage point from area of amenity grassland by Dunbrody Bridge.
• Survey conducted at 09.40, tide state – high.
• Tide very slowly receding throughout resulting in small areas of exposed mudflat habitat along river margins.
• Ducks – foraging
• Redshank and Greenshank predominately foraging along exposed mudflat habitat.
• Constant movement of birds around site.
• Curlew – foraging
• Flyby – Redshank (1), Curlew (4), Black-headed Gull (1).</td></tr>
<tr><td>Date: 14/02/2019</td><td>Tides & Weather
Tide for general area: High – 12.22 (3.54m) & Low – 06.26 (1.44m).

General Conditions: Overcast with light breezes of 1 - 3mph. Dry. Temperatures of 10 Degrees Celsius. State of water – calm (rippled). Visibility good.</td></tr>
<tr><td colspan="2">Notes:
• Vantage point from area of amenity grassland by Dunbrody Bridge.
• Survey conducted at 12.40, tide state – high.
• Approximately 5 -10% of mudflat habitat exposed at beginning of survey. Tide very slowly receding throughout.
• Redshank and Greenshank predominately foraging along exposed mudflat habitat.
• Constant movement of birds around site.
• Teal – foraging
• Flyby – Redshank (2), Kingfisher (1)
• Pair of Buzzard constantly present.</td></tr>
<tr><td>Date: 28/03/2019</td><td>Tides & Weather</td></tr>
</table>

	Tide for general area: High – 10.51 (3.34m) & Low – 17.33 (1.25m). General Conditions: Lightly cloudy with light breezes of 1-3mph. Dry. Temperatures of 11 Degrees Celsius. State of water – calm (rippled). Visibility good.

Notes:

- Vantage point from area of amenity grassland by Dunbrody Bridge.
- Survey conducted at 10.40, tide state – low.
- Teal – foraging and loafing
- Redshank and Greenshank predominately foraging along exposed mudflat habitat.
- Green Sandpiper - foraging
- Constant movement of birds around site.
- Tide slowly rising throughout survey
- Pair of Buzzard constantly present.

Species recorded during the surveys, along with peak abundance are summarised in **Table 7** below.

Table 7 – Peak numbers of winter birds recorded at each vantage point.	1% National	1% International	Baginbun Beach	South of Railway	North of Railway	West of Dunbrody Bridge
Species			**Peak No's High/Low Tide**	**Peak No's High/Low Tide**	**Peak No's High/Low Tide**	**Peak No's High/Low Tide**
Black-headed Gull		20000		83 (LT)	16 (LT)	2 (LT)
Common Gull		16400	1 (HT)	2 (LT)		
Herring Gull		10200	7 (LT)			
Great Black-backed Gull		4200	15 (HT)			
Lesser Black-backed Gull		5500	1 (HT)			
Grey Heron	25	2700	1 (LT)	1 (LT & HT)	1 (LT)	1 (LT)
Little Egret	20	1300		2 (LT)	2 (LT)	1 (LT)
Cormorant	120	1200	4 (HT)		1 (LT)	
Shag		2000	15 (LT)			
Common Guillemot			4 (HT)			
Razor Bill			3 (HT)			
Curlew	350	8400		17 (LT)	22 (HT)	2 (LT)
Oystercatcher	690	8200	2 (LT)			
Black-tailed Godwit	190	610		32 (LT)	3 (LT)	2 (LT)
Greenshank	20	2300		3 (LT)	3 (LT)	3 (HT)
Redshank	300	3900		26 (HT)	14 (HT)	3 (LT & HT)
Snipe		20000		9 (LT)	4 (HT)	
Green Sandpiper		15500				1 (LT)
Turnstone	95	1400		3 (LT)		
Dunlin	570	13300		5 (LT)		
Wigeon	630	15000		15 (LT)	14 (HT)	
Teal	340	5000		15 (LT)	18 (HT)	23 (HT)
Kingfisher					1 (HT)	1 (LT)
Little Grebe	20	4000		1 (LT)		
Great Northern Diver	20	50	10 (LT)			
Red-throated Diver	20	3000	2 (HT)	1 (LT)		
Notes	HT - denotes high tide. LT - denotes low tide.					

6. Discussion of results

Twenty-six species in total were recorded during the site survey (11 species – Baginbun Beach, 15 species – South of the Disused Railway Line, 12 species – North of the Disused Railway Line, 10 species – West of Dunbrody Bridge). Certain bird species are listed by BirdWatch Ireland as Birds of Conservation Concern in Ireland (BOCCI). These are bird species suffering declines in population size. Birds species listed in Annex I of the Birds Directive (2009/147/EC) are considered a conservation priority. Species recorded during the surveys are shown in **Table 8** along with their conservation status.

6.1 Bird Species of Conservation Concern

In addition to species listed in the EU Birds Directive (see **Section 2.1**), species of conservation concern in the Irish and European context are also classified under Birds of Conservation Concern Ireland (BoCCI) and Species of European Conservation Concern (SPEC). Both of these assessment processes are used to identify priority species in order that conservation action can be taken to improve species status.

Birds of Conservation Concern Ireland (BoCCI) 2014– 2019 (Colhoun. K. et al 2013)

BirdWatch Ireland and the Royal Society for the Protection of Birds (RSPB) have listed priority bird species suffering decline in the Irish/European and global context. The Birds of Conservation Concern in Ireland (BoCCI) list classifies birds as Red (high conservation concern) or Amber (medium conservation concern) based on their conservation status and hence conservation priority. All other regularly occurring species are classified as Green List and are not considered threatened. Listed species must meet one or more of the following criteria:

Red List: Their breeding population or range has declined dramatically in recent years, or their breeding population has undergone a significant decline since 1800, or they are of global conservation concern. Red listed species automatically qualify for Amber status.

Amber List: Their population or range has declined moderately in recent years, or they are rare or sporadically breeding species, or their breeding or wintering population is internationally important and/or localised, or they have an unfavourable conservation status in Europe.

Green List: Do not meet Red or Amber-listing criteria.

European Conservation Status (SPEC)

Species of European Conservation Concern are assessed by BirdLife International and recognised by the SPEC process:

SPEC 1: European species of global conservation concern, i.e. classified as Critically Endangered, Endangered, Vulnerable or Near Threatened at global level (BirdLife International 2016a). SPEC 1 species are automatically BoCCI Red-listed and both SPEC 2 and 3 species are Amber-listed except for those that do not breed in Ireland.

SPEC 2: Species whose global population is concentrated in Europe, and which is classified as Regionally Extinct, Critically Endangered, Endangered, Vulnerable, Near Threatened, Declining, Depleted or Rare at European level.

SPEC 3: Species whose global population is not concentrated in Europe, but which is classified as Regionally Extinct, Critically Endangered, Endangered, Vulnerable, Near Threatened, Declining, Depleted or Rare at European level.

Table 8: Species recorded along with their conservation status		**Birds Directive Annex**			**BOCCI**		**European Birds of Conservation Concern - Ireland**		
Species		**I**	**II**	**III**	**Red List**	**Amber List**	**SPEC 1**	**SPEC 2**	**SPEC 3**
Larus ridibundus	Black-headed Gull				X				
Larus canus	Common Gull					X			
Larus argentatus	Herring Gull				X			X	
Larus marinus	Great black-backed Gull					X			
Larus fuscus	Lesser black-backed Gull					X			
Egrettagarzetta	Little Egret	X							
Ardea cinerea	Grey Heron								
Numenius arquata	Curlew		X		X		X		
Phalacrocorax carbo	Cormorant					X			
Phalocrocorax aristotelis	Shag					X		X	
Alca torda	Razorbill					X	X		
Uria aalge	Guillemot					X			
Tringa ochropus	Green Sandpiper								
Gallinago gallinago	Snipe		X	X		X			X
Limosa limosa	Black-tailed Godwit					X	X		
Haematopus ostralegus	Oystercatcher					X	X		
Tringatotanus	Redshank				X			X	
Tringa nebularia	Greenshank								
Calidris alpina	Dunlin	X			X				X
Arenaria interpres	Turnstone								
Alcedo atthis	Kingfisher	X				X			X
Anas penelope	Wigeon		X	X	X				
Anas crecca	Teal		X	X		X			
Tachybaptus ruficollis	Little Grebe					X			
Gavia stellata	Red-throated Diver	X				X			X
Gavia immer	Great Northern Diver	X				X			

6.2 Results in relation to designated sites

Only one Special Protection Area (Bannow Bay SPA, Site Code 004033) is deemed relevant to the proposed works. The qualifying interests for Bannow Bay SPA are shown in **Table 1** together with the conservation objectives for each species. A total of five species listed as qualifying interests for the Bannow Bay SPA were recorded utilising the survey sites, namely, Dunlin, Curlew, Black-tailed Godwit, Oystercatcher and Redshank. None of these species were recorded in high abundance i.e. considered important at a national level.

The peak numbers recorded by DixonBrosnan during the 2018/2019 winter bird survey (**Table 7**) represent a fraction of the mean peak number of these species within the SPA during the baseline period (1995/96 – 1999/00) (**See Section 2.1 Designated Sites**). The peak number of each species represented as a percentage in comparison to the mean peak of each species during the baseline period is as follows;

- Dunlin - <1%
- Curlew – 2.5%
- Black-tailed Godwit – 5.9%
- Oystercatcher - <1%
- Redshank – 6.9%

6.3 Results in the context of winter bird counts carried out in 2015/2016 season within Baginbun and I-Webs.

6.3.1 Baginbun Beach

As detailed in **Table 4** and **Table 7** above; 16 species were recorded during the 2015/2016 survey season. Twelve species recorded during the 2018/2019 season. Both survey periods recorded similar species within the Baginbun survey area. Of these species, Common Gull, Lesser Black-backed Gull and Shag were noted to be down in peak abundance numbers during the 2018/2019 survey period, compared to the 2015/2016 survey period.

Eight species (Kittiwake, Little Gull, Black Guillemot, Mallard, Great Crested Grebe, Black-headed Gull, Redshank and Gannet) were recorded either foraging or loafing/roosting within the survey area at Baginbun during the 2015/2016 period but were not recorded during the 2018/2019 survey period (**Table 4** and **Table 7**).

Four species (Grey Heron, Common Guillemot, Razorbill and Red-throated Diver) were recorded during the 2018/2019 period that were not recorded during the 2015/2016 survey season (**Table 4** and **Table 7**).

Three waterbird species listed as Annex I species under the EU Birds Directive i.e. Great Northern Diver, Red-throated Diver and Little Gull were recorded at 'Baginbun Beach'. Great Northern Diver was recorded during both survey seasons. There was an increase of 6 individuals in the peak abundance numbers, between the 2015/2016 and 2018/2019 survey period (**Table 4** and **Table 7**). A single Little Gull was recorded on one occasion during the 2015/2016 season. Red-throated Diver was recorded during 2 survey dates during the 2018/2019 survey season at Baginbun, with a peak number of 2 individuals.

Overall, none of the species recorded within 'Baginbun Beach' survey area during both the 2015/2016 and 2018/2019 survey periods were recorded in numbers which would be considered nationally significant.

Of the species recorded, two are listed as qualifying interests for the Bannon Bay SPA i.e. Oystercatcher and Redshank. Both species were recorded within 'Baginbun Beach' during the 2015/2016 season. Oystercatcher was the only species of the two recorded during the 2018/2019 survey period. Both were recorded at low numbers.

Bannon Bay SPA is of high value for birds and the mudflat habitat supports high numbers of wintering birds. Based on the results of the bird counts it is concluded that the habitats at 'Baginbun Beach' i.e. in proximity to the proposed works area, are of a low value for birds listed as qualifying interests for the SPA.

6.2.2 South of Railway, North of Railway and West of Dunbrody Bridge

As detailed in **Table 7** above;

- 15 species were recorded 'South of the Disused Railway Line',
- 12 species were recorded 'North of the Disused Railway Line',
- 10 species were recorded 'West of Dunbrody Bridge'.

Seven species were recorded within all 3 survey sites i.e. Black-headed Gull, Little Egret, Curlew, Black-tailed Godwit, Greenshank, Redshank and Teal.

As seen in **Table 7** the majority of species were recorded in proximity to the railway line i.e. 'South of the Disused Railway Line' and 'North of the Disused Railway Line'. This is presumably due to the greater area of mudflat habitat available at these locations. Both the 'North of the Disused Railway Line' and 'South of the Disused Railway Line' survey sites are approximately 4 times the area of the survey site 'West of Dunbrody Bridge'.

Four Annex I species were recorded during the site surveys i.e. Little Egret, Kingfisher, Dunlin and Red-throated Diver.

- Little Egret, Dunlin and Red-throated Diver were recorded 'South of the Disused Railway Line'.
- 'Kingfisher and Little Egret were recorded North of the Disused Railway Line' and 'West of Dunbrody Bridge'

Five red listed species were recorded within the total survey area i.e. Black-headed Gull, Curlew, Redshank, Dunlin and Wigeon. A high tide roost of redshank was recorded on two occasions along the southern river bank (**Table 6**), south of the railway. Numbers ranged from 12 to 15 individuals.

7. Summary

A total 26 species were recorded from the site visits during the winter bird survey.

Five Annex I bird species were recorded i.e. Little Egret, Dunlin, Kingfisher, Red-throated Diver and Great Northern Diver. Six Red Listed species were recorded, namely Black-headed Gull, Herring Gull, Redshank, Wigeon, Dunlin and Curlew. Merlin was also recorded roosting at Baginbun Head on a single occasion.

Overall, a total of five species listed as qualifying interests for the Bannow Bay SPA were recorded either foraging or loafing/roosting within the survey sites, namely, Redshank, Curlew, Dunlin, Black-tailed Godwit and Oystercatcher. Two species listed as qualifying interests were recorded at Baginbun Beach i.e. Redshank and Oystercatcher while four species were recorded in proximity to the Campile River crossing i.e. Redshank, Curlew, Dunlin and Black-tailed Godwit.

The mudflat habitat noted along the Campile estuary is of local value for waders e.g. Curlew, Black-tailed Godwit, Greenshank and Redshank all of which were recorded during the winter bird survey.

A high tide roost of redshank was recorded south of the railway, along the river bank.

8. Discussion

The habitats in close proximity to the proposed HDD site at Campile River Estuary and landfall site have the potential to support an array of waterbird species including those listed as qualifying interests for the Bannow Bay SPA. Although some waterbird species will be faithful to specific habitats within the SPA, many will at times also use habitats situated in proximate areas or in areas ecologically connected e.g. via coastal waters, to the SPA. These areas may be used as alternative high tide roosts, as a foraging resource or, be simply flown over, either on migration or as commuting corridors between feeding and roosting areas. (NPWS 2012).

Different habitats will vary in their sensitivity periods based around function e.g. mudflats are most important during the winter for wintering waterbirds. It must also be taken into account that numerous factors are at play when it comes to numbers and distribution of species within the survey sites e.g. prey abundance, habitat quality and disturbance factors. As wading bird distribution is highly correlated with the densities of their prey (Yates et.al. 1993) it is likely that their distribution is linked to the densities of prey items.

Both Curlew and Black-tailed Godwit were noted foraging outside the survey area, within agricultural grassland around the Campile River Estuary (**Table 6**). When tidal flats are covered at high water, intertidally-foraging waterbirds are excluded and many will move to nearby fields to feed. Terrestrial foraging is also important when environmental factors (e.g. low temperature) reduce the profitability of intertidal foraging (e.g. Zwarts & Wanink, 1996). Black-tailed Godwit and Curlew can be considered generalists, making use of a range of habitats, for example foraging across both intertidal mudflats and grassland habitats. For Black-tailed Godwit in southern Ireland for example, the feeding resources provided by grasslands have been shown to be important for the maintenance of the wintering population (Alves et al., 2013). Therefore, any disturbance events caused by the proposed project along the Campile River Estuary, will have a minimal impact on the foraging capabilities of these species due to their ability to utilise a wide array of habitats within the wider landscape that occur outside the zone of influence of the works.

The topic of alternative habitat use is also applicable to benthic-foraging divers e.g. Great Northern Diver, whose foraging distribution is highly influenced by water depth and tidal conditions. Many of these species however (e.g. Great Northern Diver and Red-throated Diver) exhibit a widespread coastal distribution during winter utilising shallow nearshore waters to a greater degree at certain times (e.g. storms, driving onshore winds). Due to the large area of coastal waters available to these species at Baginbun Beach, any potential disturbance caused by HDD works will be minimal in relation to the alternative habitat available to these species.

No works will be carried out in the vicinity of the Campile Estuary between 01 October and 31 March inclusive to eliminate the potential for impacts on migratory winter waterbirds.

A new study by BirdWatch Ireland has found that the number of waterbirds wintering in Ireland has declined by 15% over the past five years and 40% since the mid-1990's. Wading bird species, including Knot, Dunlin, Golden Plover and Redshank, have been the worst hit, suffering a combined loss of over 100,000 individuals (19%) over the past five years (Burke, et al. 2018). Oystercatcher, Dunlin, Redshank and Turnstone, four species recorded during the winter bird survey have seen a drop in numbers by more than 20%. The only species recorded to show increases were Black-tailed Godwit and Greenshank (Burke, et al. 2018). Thus, an assessment of potential disturbance of wintering birds is a high priority.

Disturbances to waterbirds can result in an interruption to normal activity and the displacement of birds over variable distances, often into sub-optimal habitats. This can be critical during severe winters and can lead to a reduction in the carrying capacities of important wintering wetland sites. However, in general, studies show that most bird species have the ability to habituate to regular and continual sources of noise and visual disturbances providing there is no large 'startling' component. It is noted that the area around the proposed works at Baginbun Beach and at the Campile River, is already subject to some background disturbance by traffic, pedestrians, village residents and tourists. HDD works in the vicinity of the Campile Estuary will be avoided during the winter season between 01 October and 31 March. Whilst there may be some temporary displacement of bird species outside of the bird wintering period, the works will not have a significant negative effect on their overall survival rate due to the close proximity of identical habitat, roosting and foraging resources e.g. high value mudflats with high densities of macro-invertebrates in relation to the Campile River Estuary (**Figure 1**).

9. Conclusions

A total of 26 bird species were recorded during the winter bird surveys. Some species that are considered of high conservation value (Annex I of the Birds Directive, qualifying species for the Bannon Bay SPA and Red List species) were recorded.

Ireland is required under the terms of the EU Birds Directive (2009/147/EC) to designate certain areas as Special Protection Areas (SPAs) for the protection of endangered species of wild birds based on several criteria (**Section 2.1** above). Bannow Bay SPA is of high value for birds and mudflat habitat supports high numbers of wintering birds. Based on the desktop review of data and the results of the bird counts it is concluded that the habitats in proximity to the proposed works areas i.e. Baginbun Beach and Campile River crossing, are of low to moderate importance for wintering bird populations. Given the level of background disturbance which already exists in these areas and the ability of birds to habitualise to such disturbance, the impact on birds and in particular birds listed as qualifying interests for the Bannow Bay SPA, is predicted to be minor.

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Appendix 5: CEMP

Greenlink Interconnector Limited

Greenlink Ireland | Onshore

Construction Environmental Management Plan

Issue | 3 September 2020

Job number 246369-00

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Appendices

Appendix 4.1 CEMP

1 Introduction

1.1 Overview

This Construction Environmental Management Plan (CEMP) has been prepared by Arup to support Greenlink Interconnector Limited's (GIL) application for consent to develop an interconnector to link the existing electricity grids in Ireland and Great Britain.

Greenlink Interconnector Limited will have a construction management team which will supervise all aspects of the construction phase of the proposed development.

Greenlink Interconnector Limited's construction management team will ensure the contractor (and any subcontractors) will comply with all of the performance requirements set out in the tender documentation including the conditions attached to statutory consent s which may be granted by An Bord Pleanála, Department of Housing Planning and Local Government, EPA and other relevant statutory consent authorities.

Greenlink Interconnector Limited's construction management team will ensure compliance with the mitigation measures set out in the EIAR.

This CEMP sets out the duties and responsibilities which will be imposed on the contractor in the construction contract. Greenlink Interconnector Limited's construction management team will be responsible for ensuring that the contractor complies with all requirements of this CEMP.

1.2 Proposed Development

The proposed development (encompassing the onshore elements in Ireland only) comprises the following elements:

- **Landfall Compound** – a temporary landfall compound near Baginbun Beach, on the Hook Head peninsula in County Wexford, where the high voltage direct current (HVDC) cable will be installed under the beach and cliff at Baginbun Beach by horizontal directional drilling (HDD);
- **HVDC Cables** – two HVDC electricity cables with a nominal capacity of 500 megawatts (MW), installed underground from the landfall near Baginbun Beach to the converter station, including jointing bays at intervals along the route;
- **Converter Station** – a converter station with a permanent access road situated close to the existing Great Island substation in Wexford;
- **Tail Station-** a 220kV substation located beside the proposed converter station. The tail station connects the HVAC 220kV cable into the 220kV grid via the existing Great Island substation;

- **MV Substation -** an ESB substation
- **Contractor Compounds** – three temporary cable contractor compounds will be required (i) at the landfall site close to Baginbun Beach (ii) at the proposed converter station and (iii) one along the onshore route in the townland of Lewistown near Dollar Bay;
- **HDD Compounds** – temporary HDD contractor compounds are required. One will be located close to the cable contractor compound at Baginbun Beach and launch and reception compounds will be located at each side of the Campile River Estuary crossing;
- **High Voltage Alternating Current (HVAC) Cables** – three 220kV HVAC electricity cables installed underground connecting the proposed converter station via the tail station to the existing Great Island substation; and
- **Fibre Optic Cables** – fibre optic cables for control and communication purposes, laid underground with the HVDC and HVAC cables;
- **Community Gain Roadside Car Parking near Baginbun Beach** – in consultation with Wexford County Council, circa 54 roadside car parking spaces will be constructed; and
- **Community Gain in Ramsgrange Village** – in consultation with Wexford County Council, extension to existing footpaths, four new streetlights and a speed activated sign at Ramsgrange.

1.3 Purpose

The purpose of this CEMP is to provide a framework that outlines how Greenlink Interconnector Limited will manage and where practicable minimise negative environmental effects during the construction of the proposed development. Construction is considered to include all site preparation, enabling works, demolition, materials delivery, materials and waste removal, construction activities and associated engineering works.

This CEMP identifies the minimum requirements with regard to the appropriate mitigation, monitoring, inspection and reporting mechanisms that need to be implemented throughout construction. Compliance with this CEMP does not absolve GIL from compliance with all legislation and bylaws relating to their construction activities.

This CEMP has been produced as part of the application for consent to ensure compliance with legislative requirements and the Environmental Impact Assessment Report (EIAR) and Natura Impact Statement (NIS) that has been prepared for the proposed development.

1.4 Approach

This CEMP provides a framework to:

- Describe the programme for environmental management during construction;

- Implement those monitoring and mitigation measures identified in the EIAR and NIS;
- Outline the principles and minimum standards required during the development of the CEMP (and associated Method Statements) and throughout construction;
- Identify the relevant roles and responsibilities for developing, implementing, maintaining and monitoring environmental management; and
- Outline the procedures for communicating and reporting on environmental aspects of the proposed development throughout construction.

It is intended that this CEMP would be expanded and updated prior to the commencement of any construction activities on site. The CEMP is a dynamic document and will remain up to date for the duration of the construction period. The CEMP may need to be altered during the lifecycle of the construction period to take account of monitoring results, legislative changes, outcomes of third-party consultations etc.

Following appointment, the contractor will be required to develop more specific Method Statements that is cognisant of the proposed construction activities, equipment and plant usage and environmental monitoring plan for the proposed development. This CEMP should not be considered a detailed Construction Method Statement as it would be the responsibility of the contractor, appointed to undertake the individual works, in association with Greenlink Interconnector Limited, to implement appropriate procedures and progress this documentation prior to commencement of construction.

This CEMP outlines the range of potential types of construction methods, plant and equipment which may be used by any contractor appointed to enable their effects to be assessed for the purposes of the planning authority's environmental impact assessment and appropriate assessment prior to determining whether to grant planning permission.

1.5 Structure

This CEMP is structured as follows:

- **Section 1** introduces the proposed development and outlines the purpose of the CEMP;
- **Section 2** describes in detail the proposed development;
- **Section 3** sets outs the framework and mechanisms through which environmental requirements would be managed;
- **Section 4** outlines the procedures to be employed during construction to manage environmental aspects;
- **Sections 5** and **6** describe in detail the measures to be implemented to minimise likely significant negative effects, as far as practicable, during the construction of the proposed development.

1.6 Updates to Construction Environmental Management Plan

As previously mentioned, the detailed CEMP(s) are considered 'live' documents that will be reviewed and revised regularly as construction progresses. The process for update, review, and approval of the CEMP(s) must be documented in the detailed CEMP(s) to ensure that all revisions can be easily understood, applied and updated.

The contractor is required to update the CEMP that to ensure that it:

- Is in accordance with the mitigation measures specified in the EIAR and NIS and this CEMP;
- Is in accordance with any conditions that may be prescribed as part of the consent(s) for the proposed development;
- Aligns with those design and construction details described in the EIAR and NIS and ensures there is no material change in terms of significant effects on the environment; and
- Where practicable the contractor should seek to identify opportunities for further reducing significant negative environmental effects and to implement best practice in as far as reasonably practicable, i.e. take every reasonable effort to reduce and prevent negative effects, while enhancing benefits.
- Will have regard to the guidance contained in the handbook published by Construction Industry Research and Information Association (CIRIA)[1].

Further, the following plans, and any others considered relevant, will be incorporated into the CEMP:

- Heritage Strategy;
- Construction Compound Management Plan;
- Noise and Vibration Management Plan;
- Dust Management Plan; and
- Emergency Incident Response Plan.

It is expected that amendments to the CEMP may be necessary to reflect inter alia changes in the project scope, contract scheduling, contractor appointments, environmental management policies, practices or regulations, and developments on the site. These reviews and updates are necessary to ensure that environmental performance is subject to continual improvement and that best practice is implemented throughout construction.

In addition, the following preliminary environmental control plans are attached to this CEMP as Appendices:

- Frac-out Contingency Plan

[1] CIRIA (2015) Environmental Good Practice on Site Guide, 4th Edition

- Pollution Prevention and Emergency Response Plan
- Procedure for Dealing with Silty Water
- Environmental Preparedness Plan.

2 The Proposed Development

2.1 Overview

Greenlink Interconnector Limited is proposing to develop Greenlink, linking the electricity grids in Ireland and Great Britain. Greenlink will consist of two converter stations, one close to the existing substation at Great Island in County Wexford (Ireland), and one close to the existing substation at Pembroke in Pembrokeshire (Wales). The converter stations will be connected by underground cables (onshore) and subsea cables (offshore).

In 2013, the European Union adopted Regulation (EU) No 347/2013 (EC, 2013) guidelines for trans-European energy infrastructure. These regulations established a process to identify Projects of Common Interest (PCI) and appoint a competent authority to coordinate and issue consents and decisions regarding major energy infrastructure projects. Greenlink was deemed a PCI and An Bord Pleanála was deemed the competent authority in Ireland.

Greenlink will be of key strategic importance providing significant additional interconnection between Ireland, Great Britain (GB) and onwards to mainland Europe. It will provide additional transmission network capacity, reinforcing the existing electricity grids in Ireland (EirGrid) and GB (National Grid), whilst contributing to each country’s strategic interconnection objectives.

Greenlink will deliver increased security of supply, facilitate fuel diversity and greater competition, and will ultimately provide significant benefits to consumers in Ireland and GB. It is recognised that there are significant benefits to be accrued both in Ireland and GB from the provision of additional interconnection of the two national electricity grids.

2.2 HVAC Grid Connection and Tail Station

The Irish HVAC grid connection will be made from the Great Island 220KV substation in County Wexford, Ireland, to the proposed Great Island converter station. These sites are adjacent to each other and the connection will be made by a very short underground cable. The connection will be subject to agreement with landowners.

The HVAC cables will connect to a new small substation adjacent to the proposed converter station. This substation is referred to as a ‘tail station’ and will be fully enclosed. The site footprint of the substation will be 34.75m x 31.7m.

2.3 Converter Station

The converter station footprint site will be 1.85 hectares. The footprint will accommodate a nominal 500MW station for the conversion between HVAC and HVDC electrical currents. Within that footprint, two alternative converter station configurations are currently being considered by Greenlink Interconnector Limited.

Although the final configuration of the converter station has not yet been determined, the 'worst-case' environmental effects of the converter station alternatives have been taken into consideration during the preparation of this CEMP.

Within the large field that accommodates the converter station site, a comprehensive landscaping scheme will be implemented, incorporating significant earthworks, berming, planting of approximately 15,000 native mixed-woodland trees and zones of grassland meadow.

2.4 HVDC Onshore Cables

The cable route between the converter station and the landfall site is approximately 23km long. The entire route will be underground, generally approximately 1m below ground level and where possible follow the existing roads. However, for engineering reasons there are areas along the route where it is necessary to divert the underground cables off road and traverse agricultural lands.

For approximately the first 2.7 kilometres at Great Island / Campile, the cables will be laid under agricultural lands. This section of the route also includes a trenchless crossing of the Campile River Estuary, downstream of Dunbrody Bridge. The cables will be a minimum of 10 metres below the riverbed at this location. In agricultural land, a 30m working strip of land will be fenced-off for construction.

Most of the route between Dunbrody Bridge and the landfall location at Baginbun Beach is under existing roads. Installation of ducts on roads require approximately 100-300m of road to be fenced off (depending on road conditions), the road excavated, the ducts installed, and the trench backfilled with duct surround material.

2.5 Landfall Site

Following technical and environmental analysis Baginbun Beach was selected as the preferred landfall site. The cable route at Baginbun Beach will be formed by horizontal direction drill (HDD).

2.6 Stream and River Crossings

Northeast of the proposed converter station the cable corridor crosses a watercourse, Kilmannock Stream/ Newtown River. The preferred method of crossing this watercourse is by mini-horizontal directional drill (mini-HDD).

In the unlikely event that mini-HDD is not used, the cable trenching at this stream crossing will not differ from the standard approach however, the trench will be deeper to provide a one metre separation between the cable protective measures and the bed of the watercourse will be maintained to account for any future erosion. The watercourse will be temporarily dammed immediately upstream and downstream of the cable installation. Over-pumping will be employed to ensure continuous flow in the watercourse and will be completed within a day. Pollution prevention measures, as outlined later in this CEMP, will be installed to avoid any downstream siltation impacts.

Once reinstatement of the cable trench is complete, the temporary dams will be removed, and over-pumping ceased.

It is proposed to use HDD to cross under the Campile River Estuary, at a depth of more than 10m below the riverbed. This methodology will avoid any direct effects on the river.

2.7 Construction Compounds

2.7.1 Cable Contractor Compound

Three temporary cable contractors' compounds/lay down areas will be required. There will be one at each end of the route (i.e. the Great Island converter station site and at the landfall site close to Baginbun Beach), and one will be located in the townland of Lewistown near Dollar bay, along the onshore route.

2.7.2 HDD Contractor Compound

There will be a temporary compound for the HDD contractor close to the cable contractor compound near Baginbun Beach. Two similar temporary HDD compounds will be established at Campile, one at either end of the Campile River Estuary crossing.

2.7.3 Construction Compound

The temporary contractor's construction compound will be established at the converter station site at Great Island. It will provide facilities and lay down areas for the construction of the converter station and tail station.

3 Environmental Management Framework

3.1 Overview

The contract(s) awarded for the proposed development will include a requirement for the contractor to comply with relevant documentation including the EIAR, planning (and other statutory consent) conditions received and this CEMP.

As part of the environmental management framework contractors will need to comply with all relevant environmental legislation and take account of published standards, accepted industry practice, national guidelines and codes of practice appropriate to the proposed development. Due regard should be given to the guidance and advice given by ISO14001 standard[2] and Construction Industry Research and Information Association (CIRIA) guidance[3,4,5].

The appointed contractor will be required to develop and implement an Environmental Management System (EMS) that follows the principles of ISO14001. Further, the appointed contractor's EMS should include an environmental policy, operational, monitoring and auditing procedures to ensure compliance with all environmental requirements and to monitor compliance with environmental legislation and the environmental management provisions outlined in the relevant documentation.

3.2 Responsibilities

3.2.1 Employer

Greenlink Interconnector Limited will be the employer responsible for ensuring that competent parties are appointed to undertake construction and that sufficient resources are made available to facilitate the appropriate management of risks to the environment.

3.2.2 Employers Representative

Greenlink Interconnector Limited and/or the Employers Representative (ER) appointed by Greenlink Interconnector Limited will be responsible for monitoring compliance with the CEMP. The ER may be required to appoint temporary or permanent specialists with appropriate skills and experience as required to implement on site procedures and monitor construction on behalf of the employer, i.e. competent experts in biodiversity and architecture, archaeology and heritage, noise, vibration, dust, waste, land, soils, contamination and/or water.

[2] ISO (2015) ISO 14001:2015 Environmental management systems -- Requirements with guidance for use
[3] CIRIA (2015) Environmental Good Practice on Site C692 (fourth edition) (C762)
[4] CIRIA (2015) Coastal and marine environmental site guide (second edition) (C744)
[5] CIRIA (2002) Brownfield development sites: ground-related risks for buildings (X263)

3.2.3 The Contractor

The contractor(s) appointed will be responsible for the organisation, direction and execution of environmental related activities during the detailed design and construction of the proposed development. The contractor is required to undertake all activities in accordance with the relevant environmental requirements including the consent documentation and other regulatory and contractual requirements.

3.2.4 Site Manager

A Site Manager will be appointed by the contractor to oversee the day-to-day management of working areas within the site and ensure that effective, safe, planned construction activities are delivered on an ongoing basis to the highest standards. The Site Manager will be a suitably qualified, competent and experienced professional that will oversee site logistics, communicate regularly with construction staff, accommodate project-specific inductions for staff on site and ensure that all work is compliant with the relevant design standards and health and safety legislation.

3.2.5 Environmental Manager

An Environmental Manager will be appointed by the contractor to ensure that the CEMP is effectively implemented. The Environmental Manager will be a suitably qualified, competent and experienced professional that would perform the necessary tasks, review environmental procedures and consult with the members of the construction team and stakeholders as requited. The Environmental Manager would be responsible for:

- Preparing, maintaining and implementing the CEMP;
- Establishing, implementing, and maintaining the EMS in line with ISO 14001;
- Conducting regular environmental inspections and audits as specified in the contract and checking adherence to the CEMP;
- Ensuring that construction occurs in accordance with the relevant environmental requirements and that such compliance is adequately recorded and documented;
- Completing a site inspection and compiling an environmental compliance as agreed and specified in the CEMP;
- Attending site and stakeholder meetings as required;
- Keeping up-to-date with relevant environmental best practice and legislative changes;
- Liaising with the relevant staff to prepare Method Statements and relevant plans for all activities where there is a risk of environmental damage;
- Having a detailed level of knowledge on all aspects of environmental information associated with the proposed development;
- Ensuring all personnel have undertaken adequate environmental inductions, awareness briefings and training (including subcontractors);

- Dealing with environmental complaints; and
- Managing and responding to environmental incidents and ensuring that all incidents are recorded and reported in an appropriate manner.

3.2.6 Liaison Manager

A liaison manager will be appointed and will be responsible for managing such tasks as the following:

- Briefing neighbours on progress and issues as necessary;
- Liaison with Wexford County Council and emergency services as appropriate;
- Liaison with local Gardaí, particularly in relation to traffic movements and permits where necessary; and

Contact details for the liaison manager will be posted on all construction site notice boards, on the project website, and on any other information or correspondence, which may be distributed from time to time.

3.2.7 Environmental Specialists engaged by the Contractor

To fulfil its obligations under the CEMP and to support its Environmental Manager, the contractor will be responsible for engaging suitably qualified and experienced professionals including where necessary the following (i.e. depending on the scope of the contract) competent experts:

- Project archaeologist;
- Project ecologist;
- Noise and vibration specialist;
- Air quality and dust specialist;
- Land, soils and contamination specialist(s); and
- Water specialist.

3.3 Communication Procedures

3.3.1 Community and Stakeholder Engagement

The contractor will take all reasonable steps to engage with stakeholders in the local community, focusing on those who may be affected by the construction works including residents, businesses, community resources and specific vulnerable groups.

Communication with the local community, Wexford County Council and other relevant stakeholders shall be undertaken at an appropriate level and frequency throughout construction.

Greenlink Interconnector Limited will establish a Communications Management Plan that will specify obligations in relation to community and stakeholder engagement that the contractor must adhere to. Where communications are related to environmental issues the Environmental Manager will be informed and engaged with, as appropriate.

3.3.1.1 Community Liaison

Greenlink Interconnector Limited recognises the importance of effective community liaison in order to reduce nuisance to residents, to ensure public safety and welfare and to help ensure the smooth running of construction activities. Important issues in ensuring good relations are:

- Providing information for the public during the construction phase, (particularly nearby sensitive receptors);
- Providing the correct points of contact and being responsive; and
- Ensuring good housekeeping in all aspects of the operations.

A ‘good neighbour’ policy will be implemented, as far as possible. Key aspects of this policy include:

- Early implementation of the policy i.e. from the commencement of construction;
- Reduction of nuisance factors;
- Maintaining access to neighbouring premises;
- Clear and concise information; and
- Undertaking timely liaison with stakeholders.

The Contractor will be required to prepare a Community Liaison Plan, which will include details of how the local community, road users and affected residents will be notified in advance of the scheduling of major works, any temporary traffic diversions and the progress of the construction works.

This plan will typically include details of the following:

- Contractor’s community relations policy;
- Personnel nominated to manage public relations;
- A methodology for processing observations, queries and complaints from the general public, relevant authorities, the media and emergency services; and
- The strategy for project- wide liaison with all relevant parties.

3.3.2 Regular Consultation and Public Communications

The Communications Management Plan will also specify obligations in relation to regular consultation and public communications activities required during the construction of the proposed development. The contractor will facilitate regular consultation in accordance with the specifications and cooperate with this plan. Where communications are related to environmental issues the Environmental Manager would be informed and engaged with, as appropriate.

Details of the available communication channels/points of contact for members of the public to contact the project team during construction will be established in advance of the commencement of construction and displayed around working areas.

3.3.3 Advance Notice of Works

The contractor will ensure that local residents, businesses, occupiers, general users of the area and stakeholders are informed in advance of construction activities that may affect them. Relevant obligations and procedures in relation to advance notice of works will be identified in the detailed CEMP(s) and in the Communications Management Plan.

All notifications will detail the nature, estimated duration and working hours. All notifications will include a project-specific contact number to which any enquires can be directed. The contractor will be responsible for preparing and issuing the notifications subject to the relevant approval and consents.

Greenlink Interconnector Limited and the contractor in consultation with Wexford County Council and statutory stakeholders will decide whether to arrange any further targeted consultation with the public or relevant stakeholders in advance of specific construction activities on a local basis.

3.3.4 Emergency Contacts

An emergency contact list will be established and made available to all construction staff employed. The contact list shall be displayed prominently on site as well as at suitable locations where construction activity is being carried out around working areas. The contact list will include key environmental representatives that may need to be contacted in the event of an incident.

3.3.5 Enquiries and Complaints

The contractor will establish a process for handling all enquires including complaints. All enquires will be recorded and a log will be maintained to include details of the response and action taken. This will be available upon request for inspection to Wexford County Council. All enquiries, whether a query or a complaint, will be dealt with in a timely manner.

The Environmental Manager will be immediately informed of any environmental-related issues that have been raised. Where appropriate, the Environmental Manager would be responsible for informing Wexford County Council, relevant stakeholders and statutory bodies.

Any works that are carried out in response to an enquiry/complaint within/adjacent the shared boundary with SSE, will be carried out in consultation with SSE.

4 Environmental Management Procedures

4.1 Training, Awareness and Competence

The contractor (and their subcontractors) will be selected with due consideration of relevant qualifications and experience. The contractor will be required to employ construction staff with appropriate skills, qualifications and experience appropriate to the needs of the works to be carried out during construction.

A site induction will be provided to all construction staff before they commence work on site. Where appropriate, the contractor will identify specific training needs for the construction workforce and will ensure that appropriate training requirements are fulfilled.

The contractor will establish an Environmental Training and Awareness Programme and ensure that all personnel receive adequate training prior to the commencement of construction activities. A baseline level of environmental awareness will be established through the site induction programme. Key environmental considerations and objectives will be incorporated into this induction. Specifically, site inductions will cover the following as a minimum:

- Introduction to the Environmental Manager;
- Description of the CEMP(s) and consequences of non-compliance;
- The requirements of due diligence and duty of care;
- Overview of conditions of consents, permits and licences;
- Requirements associated with community engagement and stakeholder consultation;
- Identification of environmental constraints and notable features within the site; and
- Procedures associated with incident notification and reporting including procedures for dealing with damage to the environment.

Nobody will work on site without first receiving environmental induction. Signed records of environmental training will be established, maintained and made available to the Employers Representative.

Site briefings and talks would be carried out on a regular basis to ensure that construction staff have an adequate level of knowledge on environmental topics and community relations and can effectively follow environmental control procedures throughout construction.

4.2 Meetings

Greenlink Interconnector Limited and/or the Employer’s Representative will arrange regular meetings to discuss environmental matters and ensure effective coordination to be attended by:

- Greenlink Interconnector Limited;

- The Employer's Representative;
- Contractor (including Site Manager);
- Environmental Manager; and
- Environmental Specialists – engaged by either Greenlink Interconnector Limited and/or the contractor.

The Environmental Manager will be responsible for arranging and holding monthly meetings and site walk overs with the Employer's Representative. The Environmental Manager would develop and distribute minutes of the monthly meetings and distribute them accordingly.

4.3 Monitoring, Inspections and Audits

For the duration of the contract(s), the environmental performance of the contractor will be monitored through site inspections and audits. The programme for monitoring, inspections and audits shall be specified in the contract and it is likely to be a combination of internal inspections and independent external audits that may be either random or routine.

Records of all inspections carried out should be recorded on standard forms and all actions should be closed out in a reasonable time. The detailed CEMP(s) would include further details of inspection procedures.

4.3.1 Monitoring

Mitigation and monitoring will be carried out in accordance with the requirements of the EIAR and NIS so that construction activities are undertaken in a manner that does not give rise to significant negative effects. Suitable monitoring programmes will need to be developed, implemented, documented, and assessed (with potential follow up) in accordance with the specification outlined in the detailed CEMP(s).

The results of all environmental monitoring activities would be reviewed by the Environmental Manager on an ongoing basis to enable trends or exceedance of criteria to be identified and corrective actions to be implemented as necessary. The contractor will be required to inform the Employer's Representative of any continuous exceedances of criteria.

4.3.2 Inspections

Routine inspections of construction activities will be carried out by the Environmental Manager daily to ensure all necessary environmental measures relevant to the construction activities are being effectively implemented by construction staff, ensuring legal and contractual conformity.

More detailed inspections would be undertaken by the Environmental Manager on a weekly basis.

The weekly inspections would be appropriately documented by the Environmental Manager and copies of these records and any action required to be undertaken should be made available to the Employers Representative.

Each month one of the weekly inspections will include a review of environmental documentation and records. The monthly inspection will be recorded on a standard form and reported to the Employers Representative within five days of the inspection taking place. This standard form will address the following as a minimum:

- Summary of compliance/non-compliance with the CEMP(s);
- Results and interpretation of the monitoring programme;
- Key issues noted in inspections and/or audits;
- Summary record of non-conformities, incidents and corrective actions;
- Summary of environmental complaints and queries received in relation to environmental matters; and
- Summary record of environmental training undertaken by staff.

4.3.3 Audits

Greenlink Interconnector Limited will arrange for independent environmental audits to be carried out by a third-party during construction. External audits provide the opportunity for an independent auditor to advise on compliance with applicable environmental regulatory requirements, the efficacy of the environmental management approaches used, and recommendations for reducing identified environmental risks (if considered appropriate).

Further, regulatory and statutory bodies may undertake site visits to monitor compliance with legislative and regulatory requirements. These site visits may occur randomly throughout the construction period. The contractor will facilitate these visits and the Environmental Manager will be available to provide information as required and deal with any issues that may arise during, or as a result of, these visits.

Planned and documented audits aimed at evaluating the conformance of the EMS would also be carried out by the Environmental Manager. As part of the detailed CEMP(s), the Environmental Manager will establish a schedule for internal audits and this inspection calendar will be made available to the Employer's Representative. These environmental audits will be scheduled at least once every three months.

The contractor will be required to prepare standard forms for reporting and audit items shall include but not be limited to the following activities:

- Review of environmental documentation to establish if relevant requirements are being achieved and if continual improvement is occurring;
- Site inspection and interviews with onsite personnel; and
- Reporting with recommendations.

For any environmental nonconformities found, the auditor will prepare a Corrective Actions Report to describe and record the findings of the non-conformance. The verification of previous Corrective Actions Reports will be also recorded.

Upon completion of an audit, the auditor will review all Corrective Actions Reports and prepares an Audit Report to summarise:

- Corrective action requests raised;
- Previous corrective action requests closed; and
- Observations made during the audit.

The Environmental Manager will be entitled to participate in all audits. Notwithstanding this, the Employers Representative shall produce and provide the contractor with a copy of each audit report within five working days of the audit. Each audit report will detail the findings from the auditor, specify non-conformances identified and outline the proposed corrective action.

4.4 Incident Response

4.4.1 Corrective Actions

4.4.1.1 Overview

Corrective actions are measures to be implemented to rectify any non-conformances (i.e. exceedance of criteria or targets) identified during monitoring, inspections and/or audits.

In the first instance, an investigation should be undertaken by the Environmental Manager to identify the cause of any non-conformances. Appropriate remedial measures shall be identified and implemented as soon as practicable to prevent further exceedances. If necessary, the appropriate statutory authority and stakeholders will be notified.

Where new or amended measures are proposed, the relevant CEMP(s) will be updated accordingly by the Environmental Manager and the Employer’s Representative should be informed at the earliest opportunity.

4.4.1.2 Corrective Action Reports

A Corrective Actions Report is prepared on foot of any non-conformances identified during environmental monitoring, inspections and/or audits on site. The Corrective Actions Report will describe in detail the cause and effect of a non-conformance on site and describe the recommended corrective action that is required to remedy it.

An appropriate timeline for closing out the corrective actions will be identified by the contractor in their detailed CEMP as well as arrangements for the Environmental Manager verifying the Corrective Actions Report and informing appropriate authorities and stakeholders in a timely manner.

4.4.2 Emergency Incidents

4.4.2.1 Overview

Emergency incidents are those occurrences that give rise to significant negative environmental effects including but not limited to the following:

- Any malfunction of any mitigation measure and/or environmental protection system;
- Any emission that does not comply with the requirements of the contract and relevant licences;
- Any circumstance with the potential for environmental pollution; or
- Any emergency that may give rise to environmental effects (e.g. significant spillages or fire outbreak).

As discussed in **Section 3.3.4** an emergency contact list will be established and made available to all construction staff employed. The contact list shall be displayed prominently on site as well as at suitable locations where construction activity is being carried out around working areas. The contact list will include key environmental representatives that may need to be contacted in the event of an incident.

4.4.2.2 Spill Control Measures

Every effort will be made to prevent pollution incidents associated with spills during the construction of the proposed development. The risk of oil/fuel spillages will exist on the site and any such incidents will require an emergency response procedure. Given the scale and extent of the proposed development all contractors will carry spill kit materials in their cabins and mobile plant and machinery will be accompanied by a spill kit.

The following steps provide the procedure to be followed in the event of an oil/fuel spill occurring on site:

- Identify and stop the source of the spill and alert people working in the vicinity;
- Notify the Environmental Manager immediately giving information on the location, type and extent of the spill so that they can take appropriate action;
- If applicable, eliminate any sources of ignition in the immediate vicinity of the incident;
- Contain the spill using the spill control materials, track mats or other material as required. Do not spread or flush away the spill;
- If possible, cover or bund off any vulnerable areas where appropriate such as drains, watercourses and/or sensitive habitats;
- If possible, clean up as much as possible using the spill control materials;

- Contain any used spill control material and dispose of used materials appropriately using a fully licensed waste contractor with the appropriate permits so that further contamination is limited;
- The Environmental Manager shall inspect the site as soon as practicable and ensure the necessary measures are in place to contain and clean up the spill and prevent further spillage from occurring; and
- The Environmental Manager will notify the appropriate stakeholders such as Wexford County Council, National Parks and Wildlife Service, Department of Communications, Climate Action and Environment and Department of Housing, Planning and Local Government and/or the EPA.

Environmental incidents are not limited to just fuel spillages. Therefore, any environmental incident must be reported, recorded and investigated in accordance with the procedures described in **Section 4.4**.

4.4.2.3 Emergency Incident Response Plan

A set of standardised emergency response procedures will govern the management of emergency incidents. Detailed emergency incident response procedures will be incorporated in the CEMP and in addition to an Emergency Incident Response Plan.

The Emergency Incident Response Plan will contain emergency phone numbers and the method of notifying local authorities, statutory authorities and stakeholders. Contact numbers for key personnel will also be included therein. Contractors will be required to adhere to and implement these procedures and ensure that all staff and personnel on site are familiar with the emergency arrangements.

In the case of work required in an emergency, or which if not completed would be unsafe or harmful to workers, the public or local environment, Wexford County Council will be informed as soon as reasonably practicable of the reasons and likely duration. Examples may include where the ground needs stabilising if unexpected ground conditions are encountered, concrete pouring taking longer than anticipated due to delayed deliveries or equipment failure.

In the event of an emergency incident occurring, the contractor will be required to investigate and provide a report including the following, as a minimum:

- A description of the incident, including location, the type and quantity of contaminant and the likely receptor(s);
- Contributory causes;
- Negative effects;
- Measures implemented to mitigate adverse effects; and
- Any recommendations to reduce the risk of similar incidents occurring.

The relevant statutory authorities, stakeholders and relevant parties such as the Health and Safety Authority, the Fire Authority, the Ambulance Service, the EPA, utilities companies and Wexford County Council will be consulted when preparing and developing response measures. Further, if any sensitive receptor is impacted, the appropriate environmental specialists will be informed and consulted with accordingly.

Any response measures will be incorporated into an updated Emergency Incident Response Plan that should be disseminated accordingly to construction staff, Greenlink Interconnector Limited and the Employer's Representative.

4.4.2.4 Emergency Access

Emergency access routes will be maintained throughout construction and identify site access points for each working area.

This should be developed in partnership with the emergency services and documented as part of the detailed CEMP(s) and Emergency Incident Response Plan.

4.4.3 Extreme Weather Events

The effects of extreme weather events and related conditions during construction will be considered. Short to medium range weather forecasting service from Met Eireann or other approved meteorological data and weather forecast provider will be used to inform short to medium term programme management, environmental control and mitigation measures.

All measures deemed necessary and appropriate to manage extreme weather events will be taken, including training of personnel and prevention and monitoring arrangements for staff. As appropriate, method statements will also consider extreme weather events where risks have been identified, e.g. construction works adjacent to the Irish Sea.

4.4.4 Unexpected Discoveries

Appropriate procedures will be put in place, to be employed in the event of encountering unexpected archaeological or cultural heritage assets or subsurface contamination during intrusive ground works.

Appropriate procedures will be developed as part of the CEMP and the Environmental Manager will ensure that specialists (e.g. archaeologist) are facilitated to ensure management in accordance with industry best practice and effective compliance with the relevant legislation. All unexpected discoveries will be reported to the appropriate authorities and documented in an appropriate manner.

4.5 Reporting

4.5.1 Environmental Compliance Report

The contractor will be required to submit a monthly report to the Employer's Representative for review and approval. The report shall address the following as a minimum:

- Summary of compliance with the CEMP(s) including identification of any non-conformances;
- Interpretation of the results of ongoing monitoring;
- Detailed description of any issues and/or non-conformances identified during inspections and/or audits;
- Record of incidents and corrective actions (including Corrective Actions Reports as appropriate);
- Synopsis of environmental complaints received / queries raised by stakeholders; and
- Records of environmental training undertaken (as appropriate).

4.5.2 Incident Investigation Reports

The contractor will inform the Employer's Representative of all emergency incidents immediately and prepare an initial report within 24 hours setting out the details of the incident and cause(s) if known. The contractor will be required to complete the Environmental Incident Report and any further documentation requested by the Employer's Representative in relation to the incident within 7 days of the incident occurring. The Contractor will respond to all comments made by the ER on any incident.

The Environmental Incident Report will contain details of the incident including the location, known and suspected causes and weather conditions. It will define the scale and effects (short, medium, long term, temporary/permanent) as well as required corrective actions and mitigation/ remediation/compensation measures (as appropriate).

4.6 Environmental Records

Records of all environmental documentation will be maintained including monitoring, test results, method statements and plans. All records will be kept up to date and be made available for audits, inspections and periodical reporting. The Contractor will maintain the following environmental records (as a minimum) that will be made available for inspection to the Employer's Representative and the relevant authorities, if required:

- Management Plans;
- Records of environmental incidents;
- Monthly environmental reports;
- Records of environmental training;
- Register of environmental complaints;
- Corrective Action Reports;
- Environmental inspection and audit reports;
- All monitoring data;
- Waste and chemical inventories; and

- Health and Safety records.

5 General Requirements

5.1 Overview

5.2 Good Housekeeping

A "good housekeeping" policy will be employed at all times. This will include, but not necessarily be limited to, the following requirements:

- General maintenance of working areas and cleanliness of welfare facilities and storage areas;
- Provision of site layout map showing key areas such as first aid posts, material storage, spill kits, material and waste storage, welfare facilities etc;
- Maintain all plant, material and equipment required to complete the construction work in good order, clean, and tidy;
- Keep construction compounds, access routes and designated parking areas free and clear of excess dirt, rubbish piles, scrap wood, etc. at all times;
- Details of site managers, contact numbers (including out of hours) and public information signs (including warning signs) will be provided at the boundaries of the working areas;
- Provision of adequate welfare facilities for site personnel;
- Installation of appropriate security, lighting, fencing and hoarding at each working area;
- Effective prevention of oil, grease or other objectionable matter being discharged from any working area;
- Provision of appropriate waste management at each working area and regular collections to be arranged;
- Excavated material generated during construction will be reused on site as far as practicable and surplus materials/soil, should it be deemed a by-product, shall be recovered or if considered to be waste material, disposed of to a suitably authorised waste facility site;
- Effective prevention of infestation from pests or vermin including arrangements for regular disposal of food and material attractive to pests will be implemented. If infestation occurs appropriate action will be taken to eliminate and prevent further occurrence;
- Maintenance of self-contained wheel washing facilities at each of the construction compounds and other contaminant measures as required;
- No discharge of site runoff or water without agreement of the relevant authorities and an appropriate discharge licence, if relevant;
- Open fires will be prohibited at all times;

- The use of less intrusive noise alarms which meet the safety requirements, such as broadband reversing warnings, or proximity sensors to reduce the requirement for traditional reversing alarms;
- Maintenance of public rights of way, diversions and entry/exit areas around working areas for pedestrians and cyclists where practicable and to achieve inclusive access; and
- Material handling and/or stockpiling of materials, where permitted, will be appropriately located to minimise exposure to wind. Water misting or sprays shall be used as required if particularly dusty activities are necessary during dry or windy periods.

5.3 Working Hours

The timing of construction activities, core working hours and the rate of progress of construction works are a balance between efficiency of construction and minimising nuisance and significant effects.

The core construction working hours for the proposed development will be:

- 7am – 7pm: Monday to Friday; and
- 8am – 2pm: Saturday.

The hours above correspond to the current construction programme.

Underground activities (i.e. HDD tunnelling works to lay cables) will occur 24-hours a day, 7-days a week for the duration of the tunnelling activity.

All rock breaking/fracturing activities will be undertaken during daytime hours. The removal of waste material off site by road and regular deliveries to site would be generally confined to daytime hours but outside of peak traffic hours (i.e. 10am to 4pm).

It may be necessary in exceptional circumstances to undertake certain activities outside of the core construction working hours. Any construction outside of the core construction working hours will be agreed in advance with Wexford County Council and scheduling of such works will have regard to nearby sensitive receptors.

5.4 Security

Adequate security will be provided to prevent unauthorised entry to or exit from any working areas. The following measures may be used to prevent unauthorised access:

- Install CCTV and alarm systems where required;
- CCTV and security systems will be sited and directed so that they do not intrude into occupied residential properties;
- Provide adequate security guards and patrols;
- When there is no site activity, close and lock site gates and set appropriate site security provisions in motion;

- Consult with neighbouring properties and local crime prevention officers including Wexford County Council and An Garda Síochána on site security matters as required; and
- Prevent access to restricted areas and neighbouring properties by securing equipment on site such as scaffolding and ladders.

5.5 Hoarding and Fencing

A site boundary in the form of hoarding or fencing will be established around each of the working areas before any significant construction activity commences in that working area. The hoarding/fencing will be 2.4m high to provide a secure boundary to what can be a dangerous environment for those that have not received the proper training and are unfamiliar with construction operations.

Site hoarding also performs an important function in relation to minimising nuisance and effects including:

- Noise emissions (by providing a buffer);
- Visual impact (by screening the working areas, plant and equipment); and
- Dust minimisation (by providing a buffer).

The erection of hoarding would be of a similar nature to what is carried out on most construction sites. Mounting posts would be erected by using a mini-digger and the posts would be set in concrete. The size and nature of the posts and hoarding would depend on the requirements for any acoustic mitigation. Where practicable, hoarding and fencing would be retained and re-configured and re-used between working areas as the construction activities progress.

The following measures will be applied in relation to hoarding and fencing:

- Maintenance of adequate fencing and hoardings to an acceptable condition to prevent unwanted access to working areas and provide noise attenuation, screening, and site security where required;
- Appropriate sight lines/visibility splays will be maintained around working areas to ensure safety of both vehicles and pedestrians is preserved;
- Use of different types of fencing and hoarding (e.g. mesh fence of solid hoarding including hoardings used for noise control);
- Temporary fences may be used in certain areas, such as for short term occupation of working areas;
- Display information boards with out of hours contact details, telephone helpline number (for comments/complaints) and information on the works;
- Erect notices on site boundaries to warn of hazards on site such as deep excavations, construction access, etc.;
- Ensure suitable measures for tree protection are implemented as required;
- Keep hoarding and fencing free of graffiti or posters;

- Retain existing walls, fences, hedges and earth banks as far as reasonably practicable; and
- Appropriate positioning of the fencing or hoarding to minimise the noise transmitted to nearby receptors or from plant, equipment and vehicles entering or leaving the working area.

5.6 Services and Lighting

5.6.1 Services and Utilities

Site services will be installed as part of the enabling works in parallel with the rearrangement and diversion of existing utilities. Working areas will be powered by mains supplies or diesel generators where an electrical supply is not available.

5.6.2 Lighting

Site lighting would typically be provided by tower mounted 1000W metal halide floodlights. The floodlights would be cowled and angled downwards to minimise spillage to surrounding properties. The following measures will be applied in relation to site lighting:

- Lighting will be provided with the minimum luminosity sufficient for safety and security purposes. Where practicable, precautions will be taken to avoid shadows cast by the site hoarding on surrounding footpaths, roads and amenity areas;
- Motion sensor lighting and low energy consumption fittings will be installed to reduce usage and energy consumption; and
- Lighting will be positioned and directed as not to unnecessarily intrude on adjacent buildings and land uses, ecological receptors and structures used by protected species, nor to cause distraction or confusion to passing motorists, river users or navigation lights for air or water traffic.

5.7 Welfare Facilities

Welfare facilities will be provided, as appropriate, for construction staff and site personnel such as locker rooms, toilets, showers etc. The main cable contractor compounds, located at the proposed converter station site, Lewistown and the landfall site, will be used as the primary location for worker welfare facilities. Where required, mobile welfare facilities will be located along the road where duct installation is being carried out.

5.8 Reinstatement of Working Areas on Completion

All working areas and access routes will be reinstated as work proceeds during construction. All plant, equipment, materials, temporary infrastructure and vehicles will be removed at the earliest opportunity and the surface of the ground restored as near as practicable to its original condition.

5.9 Health and Safety

All Health & Safety, Fire Safety and security requirements will be provided for in co-ordination with Wexford County Council and Greenlink Interconnector Limited. The Construction Traffic Management Plan will protect the public in the vicinity of the working areas during the construction phase of the works and will include all suitable temporary signage, barriers and hoarding as necessary.

All construction staff and operatives will be inducted into the security, health and safety and logistic requirements on site prior to commencing work.

All Contractors will be required to progress their works with reasonable skill, care and diligence and to proactively manage the works in a manner most likely to ensure the safety, health and welfare of those carrying out construction works, all other persons in the vicinity of the working areas and interacting stakeholders.

All aspects of works and project facilities will comply with legislation, good industry practice and all necessary consents.

The requirements of the Safety, Health and Welfare at Work Act 2005 (Government of Ireland, 2005), the Safety, Health and Welfare at Work (Construction) Regulations, 2013 (Government of Ireland, 2013), as amended, (the “Regulations”) and other relevant Irish and EU safety legislation will be complied with at all times.

As required by the Regulations, a Health and Safety Plan will be formulated which will address health and safety issues from the design stages through to completion of the construction and maintenance phases. This plan will be reviewed and updated as required, as the development progresses.

In accordance with the Regulations, a ‘Project Supervisor Design Process’ has been appointed and a ‘Project Supervisor Construction Stage’ will be appointed as appropriate.

The Project Supervisor Construction Stage will assemble the Safety File as the project progresses.

5.10 Deliveries to Site

Deliveries of materials will be planned and programmed to ensure that the materials are delivered only as they are required at the working areas. Works requiring multiple vehicle deliveries, such as concrete pours, will be planned so as to ensure there will no queuing on the public roadways around the working areas. Deliveries will be limited to outside of peak hours.

5.11 Cranage

The construction works will require the use of standard mobile cranes on site. The cranes will be required for the moving of building materials on site such as concrete pipes, formwork for concrete, reinforcement, precast concrete, steelwork, façade, plant and general building materials. Again, the use of mobile cranes may be adopted to assist in the installation of the converter station, the converter station building façade and mechanical plant. Heavy machinery transport on the road network to and from the working areas will be restricted to outside of peak hours.

5.12 Converter Station Site

Steps will be taken to reduce the probability of an incident occurring and to also reduce the magnitude of any incident from a combination of good site environmental management procedures, including additional precautions when operating machinery close to watercourses, soil management, staff training, contingency equipment and emergency plans.

Key measures identified to reduce erosion and sedimentation include:

- Secure oil and chemical storage in over-ground bunded areas, limited to the minimum volume required to serve immediate needs with specified delivery and refuelling areas;
- Emergency spill kits retained onsite at sensitive locations and within contractor vehicles;
- Cessation of work and development of measures to contain and/or remove pollutant should an incident be identified;
- Silt traps will be employed and maintained in appropriate locations;
- Temporary interception bunds and drainage ditches will be constructed up slope of excavations to minimise surface runoff ingress and in advance of excavation activities; and
- Excavation and earthworks will be suspended during and immediately following periods of heavy rainfall to minimise sediment generation and soil damage.

5.13 Onshore Cable

The cables will be installed in ducts, so the only section of trench that will be open is that which is being excavated and in which ducts are being installed. Typically, 50m of trench will be fully open at any time, with up to 200m of trench backfilled to the level of the asphalt courses, that will then be reinstated at the end of each week.

Any groundwater or rainwater that collects in a trench will be pumped to locations agreed with the landowners and local authorities. Typically, this will be onto adjacent land, not directly into waterways, and through a filter medium, to avoid the build-up of silt, as some granular material will, inevitably, be pumped out with the water. The pump flowrates will match that of the water into the trench, as it must be kept generally free of water.

A single pump with a 75mm hose will usually be adequate to deal with rainwater running into a trench. A similar arrangement will apply at joint bays, where a sump will be cast into the concrete base for a pump. For the HDDs, any groundwater or rainwater that collects in an HDD drilling pit will be pumped away as described above. Any bentonite (or similar HDD drilling head lubrication material) will be handled and removed by the drilling contractor. The volume of bentonite required will be in the order of five cubic metres per shift at the Campile Estuary crossing, and 15 cubic metres per day at the landfall.

6 Environmental Management

This section describes the specific environmental requirements identified as part of the specimen design and EIAR and NIS that will be adhered to.

It should be noted that the measures in this CEMP provide a summary of minimum requirements that will be developed as the project progresses. It is intended that the measures set out herein will be discussed in more detail with relevant stakeholders as required to support the identification of any additional measures to be taken account of during construction.

6.1 Traffic and Transportation

The following measures will be implemented in relation to traffic and transportation during construction:

- Deliveries of materials will be planned and programmed to ensure that the materials are delivered only as they are required at the working areas along the cable route and will avoid peak hours for set-up and removal of equipment;
- Works requiring multiple vehicle deliveries, such as concrete pours, will be planned so as to ensure there will no queuing on the public roadways around the working areas;
- Deliveries of materials will be limited to outside of peak hours on the existing road network and/or likely commuter movement times;
- All trucks entering and exiting the working areas which are carrying materials which could become windborne will be covered with tarpaulin;
- Trucks will not be allowed to park on public roads either outside the working areas or on any of the approach roads leading to the working areas;
- All trucks entering the working areas will be restricted to suitable speed limits and will be directed to the relevant area by the site manager, avoiding school areas at drop off and collection times;
- Trucks required to wait at the working areas will switch off engines to avoid unnecessary fuel usage and noise;
- All trucks exiting the construction compounds will be required to pass through a wheel wash. All water from the wheel wash will be collected, treated to remove silt or other contaminants, and removed from site;
- Roads immediately adjacent to the construction compounds will be visually inspected on a daily basis and power swept and washed as and when required; and
- Adequate parking will be provided at the converter station site, landfall site, and the cable contractor compound in Lewistown to avoid queuing at the site entrances and prevent disruption to neighbouring businesses and residences.

6.2 Air Quality and Climate

Dust emissions will occur during construction, although the prevailing weather, the extent of the works and the distance from sensitive receptors will determine the extent of the effects. The focus of the control procedures will therefore be to reduce the generation of airborne material.

'Standard mitigation' measures will be implemented, as per guidance presented in the TII document *Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes* (TII, 2011). These will include the following:

- Spraying of exposed earthwork activities, stockpiles and site haul roads during dry weather;
- Provision of wheel washes at construction compounds;
- Covering of stockpiles;
- Control of vehicle speeds, speed restrictions and vehicle access; and
- Sweeping of hard surface roads.

In addition, 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 through regular servicing of machinery;
- During dry periods when dust generation is likely or during windy periods, working areas and vehicles delivering 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; and
- Truck loads will be covered when carrying material likely to generate dust.

Employee awareness is also an important way that dust may be controlled on any site. Staff training and the management of operations will ensure that all dust suppression methods are implemented and continuously inspected. Further details on employee training is provided in **Section 4.1** above.

The following mitigation measures will be implemented during the construction phase of the development to minimise CO_2 emissions:

- A Construction Traffic Management Plan has been prepared and will be implemented in full. This will minimise congestion and encourage car sharing and the use of public transport, where practicable;
- Materials will be handled efficiently on site to minimise the waiting time for loading and unloading, thereby reducing potential emissions;
- Engines will be turned off when machinery is not in use; and
- The regular maintenance of plant and equipment will be carried out.

6.3 Noise and Vibration

Specific noise abatement measures will be taken, to comply with the recommendations of BS 5228-1 and 2:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites: Noise and vibration* (BSI, 2014) and the *European Communities (Noise Emission by Equipment for Use Outdoors) Regulations, 2001* (EC, 2001).

The following specific measures will be implemented during the construction phase to ensure noise and vibration effects are minimised:

- Site representatives shall be appointed to be responsible for matters relating to noise and vibration;
- Equipment will be switched off when not required;
- Internal haul routes will be well maintained;
- Rubber linings shall be used in chutes and dumpers etc. to reduce impact noise;
- Drop heights of materials will be minimised;
- Plant and vehicles will be started sequentially rather than all together;
- Construction plant and activities to be employed on site will be reviewed to ensure that they are the quietest available for the required purpose;
- Generators will be located away from sensitive receivers and will be enclosed;
- Where required, improved sound reduction methods e.g. enclosures shall be used;
- For all construction works likely to generate off-site vibration, the vibration limits set out in BS 5228 will be met.
- Site equipment will be located away from noise sensitive areas, as much as is feasible;
- Regular and effective maintenance by trained personnel will be carried out to reduce noise and/or vibration from plant and machinery;
- Acoustic barriers with a density of at least 7kg per square metre will be provided around construction works to minimise the effects of noise and vibration generating activities in the vicinity of sensitive locations, including HDD compounds;

- Typically, site activities shall be limited to 7am – 7pm, Monday to Friday; and 8am – 2pm, Saturday. It may also be necessary in exceptional circumstances to undertake some other types of activities outside of normal construction core working hours. Underground activities (i.e. tunnelling works to lay cables) will occur 24-hours a day, 7-days a week for the duration of the contract. Any such working hours outside the normal construction core working hours will be agreed with Wexford County Council. The planning of such works will have regard to nearby sensitive receptors;
- A Community Liaison Plan will be prepared to provide for effective community liaison to help ensure the smooth running of construction activities and to address any issues that may arise;
- Construction work within 400 metres of the Gas Networks Ireland transmission pipeline will be carried out in accordance with the Code of Practice for Working in the Vicinity of the Gas Transmission Network (included as Appendix 4.2 to the EIAR). This may include the assessment of potential peak particle velocity effects associated with rock removal activities.
- For the locations where significant temporary noise effects are predicted during cable route excavation, Greenlink Interconnector Ltd and the appointed contractor will develop and implement specific measures to mitigate impacts, potentially including temporary acoustic screening and discretionary pre-condition surveys.
- The use of vibratory roller compactors will be in 'static' mode only, for compaction activities within 50m of properties.
- To minimise the impulsive noise and vibration associated with the driving of pre-cast piles, the following measures will be taken as required, to meet the established noise and vibration thresholds: acoustic screen for hammer head and top of pile and the use of a resilient pad (dolly) between the pile and the hammer head. The precast piles will only penetrate as far as the weathered top of the bedrock, not into the intact rock. The installation of the precast piles does not have the potential to impact the bedrock aquifer.
- At the converter station site, rock will be excavated using either rock splitting or blasting, or a combination of both techniques. Rock crushing may be required to reuse the excavated material. The noise levels associated with blasting (if it is deemed necessary) will not exceed those predicted for rock-breaking, and specific mitigation measures will be implemented, as set out in **Section 8.5.1** of **Chapter 8** *Noise and Vibration* to ensure that adverse effects on the Gas Networks Ireland transmission pipeline are avoided.
- Piling at the converter station site could potentially increase noise/vibration levels. The precast piles will only penetrate as far as the weathered top of the bedrock, not into the intact rock. To minimise the impulsive noise and vibration associated with the driving of pre-cast piles, the following measures will be taken as required, to meet the established noise and vibration thresholds: acoustic screen for hammer head and top of pile and the use of a resilient pad (dolly) between the pile and the hammer head.

6.4 Biodiversity

Environmental Protection Measures (of relevance in respect of any potential ecological effects) will be implemented throughout the project, including the preparation and implementation of detailed method statements. The works will incorporate the relevant elements of the guidelines outlined below:

- *The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads*. National Roads Authority, Dublin.
- *Control of water pollution from construction sites. Guidance for consultants and contractors* (C532). CIRIA. H. Masters-Williams et al (2001)
- *Control of water pollution from linear construction projects. Technical guidance* (C648). CIRIA. E. Murnane, A. Heap and A. Swain. (2006)

6.4.1 Water Quality

Mitigation measures in relation to water quality are outlined in **Section 6.8** below.

6.4.2 Noise

Best practice noise and vibration control measures will be employed. The best practice measures set out in BS 5228 (2009) Parts 1 and 2 will be complied with. This includes guidance on several aspects of construction site environmental measures, including, but not limited to the following:

- Specific noise abatement measures will be taken, to comply with the recommendations of BS 5228-1 and 2:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites: Noise and vibration* (BSI, 2014) and the *European Communities (Noise Emission by Equipment for Use Outdoors) Regulations, 2001* (EC, 2001);
- The following specific measures will be implemented during the construction phase to ensure noise and vibration effects are minimised;
- Site representatives shall be appointed to be responsible for matters relating to noise and vibration;
- Unnecessary revving of engines will be avoided and equipment will be switched off when not required;
- Internal haul routes will be well maintained;
- Rubber linings shall be used in chutes and dumpers etc. to reduce impact noise;
- Drop heights of materials will be minimised;
- Plant and vehicles will be started sequentially rather than all together;
- Construction plant and activities to be employed on site will be reviewed to ensure that they are the quietest available for the required purpose;

- Generators will be located away from sensitive receivers and will be enclosed;
- Where required, improved sound reduction methods e.g. enclosures shall be used;
- Site equipment will be located away from noise sensitive areas, as much as is feasible;
- Regular and effective maintenance by trained personnel will be carried out to reduce noise and/or vibration from plant and machinery;
- Acoustic barriers shall be provided around construction works to minimise the effects of noise and vibration generating activities in the vicinity of sensitive locations;
- Typically, site activities shall be limited to 7am – 7pm, Monday to Friday; and 7am – 2pm, Saturday; Underground activities (i.e. tunnelling works to lay cables) may occur 24-hours a day, 7-days a week for the duration of the HDD contract. The permissible noise levels are detailed in Chapter 8 Noise and Vibration from the EIAR where 'daytime' noise limits are defined as 7am to 7pm, and lower permissible noise levels are stipulated outside these hours;
- All rock breaking/fracturing activities will be undertaken during daytime hours;
- To minimise the impact of noise, the piling rigs, where practical, will be situated with the rear of the rig towards any sensitive receptor. Timber packers will be used between the pile and the hammer to reduce the noise level.

A site boundary will be established around each of the working areas before any significant construction activity commences, as described above. Site hoarding will be erected to minimise effects including:

- Noise emissions (by providing a buffer);
- Visual impact (by screening the working areas.

6.4.3 Lighting during construction

Potential impacts during construction and operation, from lighting, will be mitigated by the following measures:

- Floodlights will be cowled and angled downwards to minimise spillage;
- Lighting will be provided with the minimum luminosity sufficient for safety and security purposes;
- Lighting will be positioned and directed as not to unnecessarily impact on designated sites or woodland habitats.

6.4.4 Invasive Species

- A survey for invasive species will be carried out prior to the commencement of works. This is to confirm the extent of infestations as identified by invasive species surveys to date, and to determine whether any new infestations have established in the intervening period. A step by step procedure for the management of invasive species is set out in the ISMP which is included as Appendix 9.6 to the EIAR. This includes undertaking up to date surveys prior to commencement of construction and based on the results, proposed methodologies, in accordance with codes of practice and guidelines, for the elimination of these species. No significant effects on Natura 2000 sites will occur. However as invasive species are present within the overall study area and given their invasive nature, repeat surveys will be carried out and mitigation implemented.
- Prior notification will be given to all contractors that parts of the site are infested with Japanese knotweed, Rhododendron and Three-Cornered Leek and that they must adhere to this protocol to avoid the spread of the plant within and more importantly, outside of the works area. This includes any site investigation works in advance of commencement of excavation works.
- The location of the invasive species will be clearly delineated with hazard tape in a manner visible to machine operators prior to the commencement of works. Appropriate signage will be put in place to deter any entrance by people or machinery into the areas within which the invasive species are growing.
- The invasive species management plan (which is a live document), will ensure that risks are minimised. This includes any site investigation works which may proceed the commencement of site works. The management plan will include all provisions for site hygiene and appropriate disposal of contaminated soil and subsoil.
- If contaminated material is to be removed off site it will require a licence from the National Parks and Wildlife Service in advance of any removal, in accordance with the European Communities (Birds and Natural Habitats) Regulations 2011 (SI 477).

6.4.5 Protection of habitats

- The Wildlife Amendment Act 2000 (S.46.1) provides that it is an offence to cut, grub, burn or destroy any vegetation on uncultivated land or such growing in any hedge or ditch from the 01st of March to the 31st of August. Exemptions include the clearance of vegetation in the course of road or other construction works or in the development or preparation of sites on which any building or other structure is intended to be provided. Where possible, vegetation will be removed outside of the breeding season and in particular, removal during the peak-breeding season (April-June inclusive) will be avoided. This will also minimise the potential disturbance of breeding birds outside of the proposed development site boundary.
- To prevent incidental damage by machinery or by the deposition of spoil during site works, any habitats earmarked for retention in close proximity to the proposed works will be identified and will be securely fenced or sign posted early in the construction phase. These will be clearly visible to

machine operators. Hedgerow, tree and scrub vegetation that are to be retained which are located in close proximity to working areas will be clearly marked and fenced off to avoid accidental damage during excavations and site preparation.

- Habitats that are damaged and disturbed will be left to regenerate naturally or will be rehabilitated and landscaped once construction is complete. Disturbed areas will be seeded or planted using appropriate native grass or species native to the areas where necessary. Within the large field that accommodates the converter station site, a comprehensive landscaping scheme will be implemented, incorporating significant earthworks, berming, planting of approximately 15,000 native mixed-woodland trees, and zones of grassland meadow.
- There will be a defined working area which will be fenced off with designated haul routes to prevent inadvertent damage to adjoining habitats.
- To prevent incidental damage by machinery or by the deposition of spoil during site works, any habitats earmarked for retention nearby will be securely fenced or sign posted early in the construction phase. These will be clearly visible to machine operators.
- Habitats that are damaged and disturbed will be left to regenerate naturally or will be rehabilitated and landscaped once construction is complete. Disturbed areas will be seeded or planted using appropriate native grass or species native to the areas where necessary.
- Mature trees, particularly over mature trees with the potential to provide bat roosts will be avoided. Any hedgerows or treelined habitat disturbed during construction will be replanted using a suitable mix of native species.
- Tree root systems can be damaged during site clearance and groundworks. No materials will be stored within the root protection area of mature trees. Materials, especially soil and stones, can prevent air and water circulating to the roots. Retention of the existing networks of woodland/ tree lines/ hedgerows will provide natural screening and help to maintain biodiversity. Where tree root systems cannot be avoided the trees will be assessed by an arboriculturalist to determine if crown reduction is required. If a small number of trees are removed, they will be replanted.

6.4.6 Otter Mitigation Measures

- No signs of otter or otter holts were noted within 150m of cable route, HDD launch pits or proposed converter station, although otter was recorded utilising habitats along the Campile River Estuary and at Baginbun Beach. Otters could occur along the Newtown/Kilmannock River. A detailed pre-construction survey will confirm the absence of otter holts within 150m of the proposed development area.
- If otter holts are recorded at that time, the supervising ecologist will determine the appropriate means of minimising effects i.e. avoidance, moving works, timing of works etc. If required the ecologist will obtain a derogation licence from the NPWS, to facilitate licenced exclusion from the breeding or resting site in accordance with a plan approved by the NPWS.

- Any holts found to be present will be subject to monitoring and mitigation as set out in the NRA *Guidelines for the Treatment of Otter prior to the Construction of National Road Schemes (2006b)*. If found to be inactive, exclusion of holts may be carried out during any season. No wheeled or tracked vehicles (of any kind) will be used within 20m of active, but non-breeding, otter holts. Light work, such as digging by hand or scrub clearance will also not take place within 15m of such holts, except under license. The prohibited working area associated with otter holts will be fenced and appropriate signage erected. Where breeding females and cubs are present no evacuation procedures of any kind will be undertaken until after the otters have left the holt, as determined by a specialist ecologist. Breeding may take place at any season, so activity at a holt must be adjudged on a case by case basis. The exclusion process, if required, involves the installation of one-way gates on the entrances to the holt and a monitoring period of 21 days to ensure the otters have left the holt prior to removal.

6.4.7 Crossing of the Newtown/Kilmannock River Mitigation Measures

The key design mitigation measure for this watercourse crossing is the use of mini-HDD as the preferred construction methodology. Vegetation will not be significantly adversely affected as the majority of the access route to this location is on road, while off-road access is limited.

In the unlikely event that mini-HDD technology is not used, the following mitigation measures will be implemented:

- Works will comply with The IFI's Guidelines on protection of fisheries during construction works in and adjacent to waters (IFI, 2016) and IFI will be consulted with regard to any proposed over pumping at the Newtown River crossing.
- Construction activities at the Newtown River will be undertaken during daylight hours only This will ensure that there is potential for undisturbed fish passage at night. The works will be temporary and will not create a significant long-term barrier to fish movement
- Works will take place outside the most sensitive time for these species: during the summer periods from July – September inclusive. Due to dryer conditions in the summer period this will also minimise the risk of ground damage, minimises the potential for silt generation and thus minimises the risk of inadvertent ecological impacts.
- As the stream will be crossed via an open cut methodology dams will be put in place. The height of the dams and method of construction will take into account the potential impacts from high tide events downstream. Works during high spring tides will be avoided.
- Over-pumping of the stream will take into account that pumping may be required from downstream to upstream during high tides.
- A fish salvage operation will be carried out by the supervising ecologist and fish, if present, will be relocated to suitable habitats in proximity to the proposed works. This will be carried out following receipt of a section 14

licence from Inland Fisheries Ireland and in consultation with Inland Fisheries Ireland.

- Sediment from the stream bed will be stockpiled at a minimum of 10 metres from the river and used to re-create the stream bed.
- Dams will be removed gradually, with silt curtains in place and under ecological supervision to minimise the potential for silt generation.
- Bankside impacts will be minimised, and any disturbed areas will be reseeded as soon as practicably possible after completion of works.

6.4.8 Badger Mitigation Measures

As a precautionary measure, the site will be surveyed for badgers immediately prior to the commencement of site works, to confirm the absence of badgers within the zone of influence of the development. If badgers are discovered at that time, the mitigation measures outlined in the NRA publication, *Guidelines for the Treatment of Badgers Prior to the Construction of a National Road Scheme* (NRA, 2006c), are to be followed. If necessary, the following measures will be employed for all construction works where badger issues arise:

- Badger sett tunnel systems can extend up to c. 20m from sett entrances. Therefore, no heavy machinery will be used within 30m of badger setts (unless carried out under licence); lighter machinery (generally wheeled vehicles) will not be used within 20m of a sett entrance; light work, such as digging by hand or scrub clearance will not take place within 10m of sett entrances. Based on the results of badger surveys to date the HDD works at the Campile River Estuary will not take place within these buffer zones.
- During the breeding season (December to June inclusive), none of the above works will be undertaken within 50m of active setts or pile driving within 150m of active setts. Based on the results of badger surveys to date the HDD works at the Campile River Estuary will not take place within these buffer zones.
- Where badger setts are likely to be affected, they will be clearly marked and buffer zones for vehicles clearly marked by fencing and signage;
- Works close to badger setts or removal of badgers from a site will only be carried out under the supervision of a qualified ecologist under license from the NPWS;
- Where affected setts do not require destruction, construction works may commence once recommended mitigation measures to address the badger issues as identified by the supervising ecologist and agreed with NPWS, have been complied with. Such mitigation may include hoarding or visual screens.

In the unlikely event that destruction of a badger sett is required this can only be carried out under licence from the NPWS. In these circumstances, which are highly unlikely to arise, badgers must have an alternative sett within their territory that can be utilised or an alternative artificial sett will be provided.

6.4.9 Bat Mitigation Measures

The first aim of the developer will be to entirely avoid or minimise the potential effect of the proposed development on bats and their breeding and resting places. During the site works, general mitigation measures for bats will follow the National Road Authority's '*Guidelines for the Treatment of Bats during the Construction of National Road Schemes' NRA (2005)* and *'Bat Mitigation Guidelines for Ireland: Irish Wildlife Manuals, No. 25'* (Kelleher, C. & Marnell, F. (2006)). These documents outline the requirements that will be met in the pre-construction (site clearance) stage to minimise negative effects on roosting bats, or prevent avoidable effects resulting from significant alterations to the immediate landscape. All reasonable steps will be taken to ensure works do not harm individuals by altering working methods or timing to avoid bats, if necessary. No bat roosts were recorded within the proposed development areas. The following mitigation measures will be implemented:

- Any required felling of mature trees, as identified by the supervising ecologist, will be undertaken in autumn (September-November) or spring (April-May) to avoid the destruction of maternity roosts and hibernating sites. Young bats are unable to escape injury because they cannot fly. Equally, hibernating bats may not arouse sufficiently to avoid fatal injuries;
- Felled trees will not be mulched immediately. Such trees should be left lying several hours and preferably overnight before any further sawing or mulching. This would allow any bats within the tree to emerge and avoid accidental death. A bat ecologist will be on-hand during felling operations to inspect felled trees for bats. If bats are seen or heard in a tree that has been felled, work should cease and the local NPWS Conservation Ranger should be contacted for advice;
- Bat roosting sites can change depending on a variety of factors and therefore the presence of bats should never be ruled out completely;
- Retain mature to semi-mature trees in external boundaries where possible and resist 'tidying up' dead wood and spilt limbs on tree specimens;
- Any inadvertent damage to treelines outside the proposed development area but adjacent to it and thus at risk, will be clearly marked by the supervising ecologist.
- During construction lighting will typically be provided by tower mounted 1000W metal halide floodlights that will be cowled and angled downwards to minimise spillage. The primary area of concern is the potential impact on woodland habitat at the HDD site at the Campile River Estuary HDD site. There will be no directional lighting focused towards this woodland and as noted above by cowling and focusing lights downwards light spillage will be minimised.
- Felling of trees with no potential for roosting bats (features such as tree holes, crevices, loose bark, spilt limbs and dead wood are absent) does not require a bat specialist to be present;
- If bats are recorded by the bat ecologist within any vegetation or structure on site i.e. trees, or walls to be removed or impacted on, no works will proceed without a relevant derogation licence from the NPWS.

- Upon completion external lighting will be installed at the converter station. To avoid creating any unnecessary glare external lighting will be turned off during hours of darkness with the exception being for emergency outdoor works.

6.4.10 Bird Mitigation Measures

Works in close proximity to the Campile River Estuary will take place outside the peak season for wintering birds which runs from October to March inclusive. This will prevent any disturbance to wintering species utilising the sites during this period.

The Wildlife Act 1976, as amended, provides that it is an offence to cut, grub, burn or destroy any vegetation on uncultivated land, or any such growing in any hedge or ditch from the 1st of March to the 31st of August. Exemptions include the clearance of vegetation in the course of road or other construction works or in the development or preparation of sites on which any building or other structure is intended to be provided. Nonetheless, it is recommended that vegetation be removed outside of the breeding season.

Retention of the native tree lines, hedgerows and woodland along the site boundaries will reduce the loss of breeding and nesting habitat for birds. NRA guidelines on the protection of trees and hedges prior to and during construction should be followed (NRA, 2006b).

Prior to the commencement of construction works a full survey for evidence of Barn owl occupation will be carried in relation to an abandoned structure to the south of the converter station site, out by a suitably qualified person to ensure no offence is committed under the Wildlife Act. No demolition of this structure is required. If evidence of Barn owl is found within the building, no construction work shall take place within 30 metres of any part of the site containing material evidence unless survey-based evidence has been provided to the Local Planning Authority that no birds are nesting at the site to which the consent applies. If a nesting site were to be removed it would be necessary to create as a minimum the same amount of suitable Barn owl foraging habitat to that which is being lost to ensure no net loss in biodiversity. This can be on or off-site. A habitat management plan should specify a topping regime of not more than once a year and not before 15th July. Annual topping on a rotational basis can help ensure there is always some optimum foraging habitat available for the barn owls.

6.4.11 Biodiversity and Landscaping

A comprehensive landscaping scheme is proposed for the converter station and tail station site, leading to long-term local improvements in habitat and species diversity in the area.

6.5 Archaeology, Architectural and Cultural Heritage

The following mitigation measures will be implemented –

- All ground disturbance within the four complexes of archaeological monuments, all greenfield areas, including off-road locations of works and any ground disturbance associated with the excavation of launch and reception pits, the development of a converter station and tail station at Great Island including a converter station construction compound, the cable contractor compounds at Great Island, Lewistown and the landfall site and the HDD compounds at the Campile River Estuary and landfall site 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 archaeologist will secure an excavation licence for monitoring in the event of an archaeological discovery. The licence is issued by The Heritage Service, Department of Culture, Heritage and The Gaeltacht and approved by the National Museum of Ireland.
- The monitoring archaeologist will have the power to halt the development if buried archaeological features or finds are uncovered. If archaeological remains are uncovered, these sites become an archaeological site and are protected by the National Monuments Acts 1930 – 2004, which give rise to the following obligations: Further work on the site will require consultation with the archaeological staff of The Heritage Service, Department of Culture, Heritage and The Gaeltacht. Any newly discovered site will be archaeologically resolved, for example by excavation and preservation by record under licence, or avoidance where feasible.
- At the site of the proposed converter station, tail station and converter station construction compound, where a number of archaeological sites are extant in the wider area, and where previous works during gas pipeline construction uncovered previously unknown archaeological sites, a geophysical survey will be undertaken, under licence. If potential archaeological material is detected, this will be archaeologically resolved prior to construction.
- Financial support and sufficient time within the construction programme will be provided at the outset of the proposed development to facilitate any excavation or recording of archaeological material that may be uncovered during the developmental works. The construction programme will be developed and implemented to reflect this provision, to ensure the preservation of such archaeological material.
- All test pits for engineering purposes will also be archaeologically monitored to prevent accidental damage to buried archaeological features and to record any accidental discovery of features and/or finds. Previous archaeological monitoring of test pits is discussed further in Appendix 10.3 to the EIAR.
- As the proposed route for much of the cable route is along the existing road network it is not expected that any townland boundaries will be breached. If townland boundaries are impacted in greenfield areas, these will be archaeologically recorded.
- A 2.4m hoarding will be provided around contractors' compounds, which will mitigate temporary effects on visual receptors, in particular in the vicinity of the works near Baginbun Beach.

- If the preferred method for crossing the Kilmannock Stream is not used (mini-HDD), and open-cut techniques are used, a wade survey and metal detector survey of the crossing area will be carried out, under licence.

6.6 Landscape and Visual

To mitigate visual impacts during construction, solid board hoarding or heras fencing with opaque fabric will be erected to screen views of the works from adjacent houses.

6.7 Soils, Geology and Hydrogeology

6.7.1 General

Regulatory Compliance: The adopted construction techniques will comply with the requirements of statutory bodies and construction will be completed in accordance with the CEMP.

Ground Contamination: Good housekeeping (daily site clean-ups, use of disposal bins, etc.) will be carried out on sites during construction, and the proper use, storage and disposal of all substances and their containers will help prevent soil contamination. For all activities involving the use of potential pollutants or hazardous materials, there will be a requirement to ensure that the material such as concrete, fuels, lubricants and hydraulic fluids will be carefully handled and stored to avoid spillages. Potential pollutants shall also be adequately secured against vandalism and will be provided with proper containment according to codes of best practice. Any spillages will be immediately contained, and contaminated soil removed from site and disposed of in a licenced waste facility.

Ground Contamination: Excavations in made ground will be monitored by an appropriately qualified person to ensure that any hotspots of contamination encountered are identified, segregated and disposed of appropriately. Care will be taken to ensure that the hotspot does not cross contaminate clean soils elsewhere throughout the sites.

Ground Contamination: Potential soil and water pollution will be minimised by the implementation of good construction practices. Such practices will include adequate bunding for oil containers, wheel washers and dust suppression on site roads, and regular plant maintenance. The Construction Industry Research and Information Association (CIRIA) provides guidance on the control and management of water pollution from construction sites in their publication Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors (Masters-Williams et al, 2001) and this will be reflected in the detailed CEMP. A contingency plan for pollution emergencies will also be developed prior to the commencement of works and regularly updated, which would identify the actions to be taken in the event of a pollution incident. The CIRIA document recommends that a contingency plan for pollution emergencies will address the following:

- Containment measures;
- Emergency discharge routes;

- List of appropriate equipment and clean-up materials;
- Maintenance schedule for equipment;
- Details of trained staff, location and provision for 24-hour cover;
- Details of staff responsibilities;
- Notification procedures to inform the relevant environmental protection authority;
- Audit and review schedule;
- Telephone numbers of statutory water undertakers and local water company; and
- List of specialist pollution clean-up companies and their telephone numbers.

Compression of substrata

Excavation support: Excavations shall be kept to a minimum, using shoring or trench boxes where appropriate. For more extensive excavations, a temporary works designer shall be appointed to design excavation support measures in accordance with all relevant guidelines

Loss of Agricultural Land and Solid Geology

Material Reuse: The ground level of the converter station platform has been chosen to balance the volume of excavated material with the volume of fill. Excavated material will be used in the screening berms, which will be located to the south and the east of the converter station platform. Thus, the export of spoil, or import of fill, will be avoided.

Effects on the surrounding Ground

Movement Monitoring: Ground settlement, horizontal movement and vibration monitoring will be implemented during the construction activities where required to ensure that the construction does not exceed the design limitations.

Ground Settlement Control: Ground settlements will be controlled through the selection of a foundation type and method of construction which are suitable for the particular ground conditions.

Effects of excavation of mineral soils beneath the cable route

Movement Monitoring: Ground settlement, horizontal movement and vibration monitoring in the immediate vicinity of roadside buildings will be established during the construction activities to ensure that the construction does not exceed the design limitations.

Ground Settlement Control: Ground settlement will be controlled through the selection and method of construction which are suitable for the particular ground conditions.

6.8 Water and Hydrology

The following best practice water management measures will be implemented during the construction phase:

Water Quality

General

As part of the assessment of the required construction mitigation, best practice construction measures which will be implemented for the proposed development were considered. A summary of the measures relevant to hydrology are provided as follows and are in accordance with Construction Industry Research and Information Association (CIRIA) guidance – Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors (Masters-Williams et al, 2001).

To minimise the potential for elevated silt levels in surface water run-off, the working area used during construction will be clearly outlined prior to the commencement of works and will be kept to the minimum area necessary to effectively complete the works. Vegetation will be retained where possible.

A set of standardised emergency response procedures will govern the management of emergency incidents. These are provided in the CEMP (which is a live document which will be updated/added to as construction progresses), together with the Emergency Incident Response Plan.

A detailed spillage procedure will be put in place and all will be trained with respect to the relevant procedures to be undertaken in the event of the release of any sediment, hydrocarbons into a watercourse. Spill kits will be maintained on site and relevant staff will be trained in their effective usage. All site personnel will be trained and aware of the appropriate action in the event of an emergency, such as the spillage of potentially polluting substances. In the event of spillage of any polluting substance and/or pollution of a watercourse, Wexford County Council, Inland Fisheries Ireland and the NPWS shall be notified. Further measures include:

- A monitoring regime/programme for water quality will be put in place;
- All works undertaken will be fully consolidated to prevent run-off of silt;
- Silt fences/swales shall be provided at all locations where surface water run-off may enter/leave the working areas, and adjacent to the haul roads;
- There will be no tracking of machinery within watercourses;
- Dewatering, where required, will incorporate the use of filter media;
- Self-contained wheel wash facilities will be provided to protect watercourses from the carriage of silt on vehicles with the waste liquid contained on site, and dispatched off-site for disposal at an appropriately permitted facility;

- The length of trench excavation at any particular section of the cable route will be limited to ensure that the trench will not act as a conduit for stormwater run-off.
- Access/haul roads shall be set back from watercourses by at least 10m where possible.
- Refuelling of vehicles will take place at designated locations at a distance of 10m or greater from the nearest watercourse;
- Any fuel stored on site will be stored in double skinned, appropriately sized bunded containers and will be located in a designated work compound;
- No vehicles will be left unattended when refuelling;
- A spill kit including an oil containment boom and absorbent pads will be on site at all time;
- All vehicles will be regularly maintained, washed and checked for fuel and oil leaks;
- Concreting works will be carried out in dry conditions where possible and concrete works will be strictly controlled and monitored;
- No concrete washout will be allowed to discharge to watercourses. Wash out of concrete trucks will not be permitted on site;
- There will be no direct pumping of contaminated water from the works to a watercourse at any time; and
- All discharges will be in compliance with the European Communities (Surface Water) Regulations, 2009 (European Communities, 2009) and the European Communities (Groundwater) Regulations, 2010 (European Communities, 2010).

The following construction management measures will be implemented at all construction compounds, onshore cable routes and the converter station site;

Contractor Compounds

- Any containers of potential polluting materials such as fuels and oils will be stored in a bunded area (110% capacity) protected from flood damage and inundation;
- All bunded storage areas will be a minimum distance of 10m away from any watercourse;
- A designated bunded refuelling area on an impermeable surface will be provided at all construction compounds, again at a minimum distance of 10m away from any watercourse.

Converter Station Site

- Secure oil and chemical storage in over-ground bunded areas (110% capacity), limited to the minimum volume required to serve immediate needs with specified delivery and refuelling areas;
- Emergency spill kits retained onsite at sensitive locations;

- Cessation of work and development of measures to contain and/or remove pollutant should an incident be identified;
- Temporary measures will be provided to ensure only clean water is discharged from site i.e. de-silting and temporary oil interceptor. These will be subject to daily inspection to ensure they remain adequate and effective;
- Interceptor/dump/attenuation tanks will be secured at designated points, strapped down to the concrete slab. Backfill will be carefully controlled, ensuring this is balanced and even around all sides of the tank, while the tank is gradually filled internally with water, to avoid distortion or damage from external backfill pressures. The interceptor washdown slab will be constructed. Interceptors will be commissioned by a specialist contractor;
- Silt traps will be employed and maintained in appropriate locations;
- Temporary interception bunds and drainage ditches will be constructed up slope of excavations to minimise surface runoff ingress and in advance of excavation activities;
- Excavation and earthworks will be suspended during and immediately following periods of heavy rainfall in order to minimise sediment generation and soil damage;
- Below ground drainage will be installed prior to erection to completion of building superstructure/roof drainage. Final connection will be made when down pipes are installed to ensure accurate positioning;
- The treated water will discharge directly into the surface water drainage system as it is suitable for direct discharge into the local watercourses, having passed through the oil separator.

Surface Water Drainage from the Converter Station

Oily water is classified as rainwater runoff and/or surface wash down which may potentially contain small amounts of low hydrocarbon concentrates in oil containment areas. This is to be treated directly by oil separator facilities on site.

It is proposed to include a Class 1 full retention oil separator unit for the oily water system. Oil storage volume will be provided by the separator and the separator shall be fully capable of isolating all upstream oil flow in the event that the high-level oil alarm is activated. Oil resistant nitrile rubber seals will be employed throughout the oily water drainage systems. The oil separator will be vented in accordance with the manufacturer's recommendations, with vents located clear of all site operating areas, a minimum of 2000mm above ground level. Vent pipes will be supported by means of a concrete post and protected from vehicular traffic by means of spaced concrete bollards, if required.

The treated water will discharge directly into the surface water drainage system as it is suitable for direct discharge into the local watercourses, having passed through the oil separator described above.

Onshore Cable Route

- Any groundwater or rainwater that collects in a trench will be pumped into locations agreed with the landowners and local authorities. Typically, this will be onto adjacent land, not directly into waterways, and through a filter medium, to avoid the build-up of silt, as some granular material will, inevitably, be pumped out with the water. A similar arrangement will apply at joint bays, where a sump will be cast into the concrete base for a pump.

- The flowrates will have to match that of the water into the trench, as it must be kept generally free of water. A single pump with a 75mm hose will usually be adequate to deal with rainwater running into a trench.
- For the HDDs, any groundwater or rainwater that collects in a HDD drilling pit shall be pumped away as described above. Any bentonite (or similar HDD drilling head lubrication material) shall be handled and removed by the drilling contractor. Typically for a land-based HDD the volume of bentonite would be approximately 5 cubic metres per shift, and for the landfall HDD the volume of bentonite would be approximately 15 cubic metres per shift. Further information on bentonite is provided in **Section 6.8.1** below.

Watercourse Crossing – Newtown River

- The preferred method to cross the Newtown River is a HDD using a mini rig. The non-preferred alternative is an open-cut methodology. For the open-cut method the watercourse will be temporarily dammed to allow for cable installation. At the stream crossing, the cable trenching detail will not differ, however, a one metre separation between the protective measures and the bed of the watercourse will be maintained to account for any future erosion. If the open-cut methodology is required the Newtown River watercourse will be temporarily dammed immediately upstream and downstream of the cable installation. Over-pumping will be employed to ensure continuous flow in the watercourse.
- Appropriate silt control measures such as silt fences will be employed where required. Once reinstatement of the cable trench is complete, the temporary dams will be removed and over pumping ceased. No haul road is proposed at the watercourse crossing; plant will utilise existing accesses used by landowners to avoid further works within the watercourse.

Foul Drainage

The temporary foul drainage at the construction compounds will cater for welfare facilities including a canteen, toilets, showers and hand wash basin only, and will comprise self-contained sanitary facilities, with wastewater stored and tankered off-site to appropriately licensed disposal facilities.

Flooding

The following best practice construction measures relevant to the hydrological regime and flooding will be implemented for the duration of the construction phase;

- All construction compounds will be in areas that are at low risk of flooding (outside 1:100-year flood zone);
- Material storage locations will be set back from watercourses and surrounded with silt fencing and covered. There will be no material storage in floodplains or areas at risk of pluvial flooding. Material excavated from trenches along the roads will be loaded onto trucks and removed from the site;
- Weather warnings will be monitored during construction to ensure that there is no risk to construction workers installing the cable. A risk

assessment will be carried out in the case of a weather warning to determine what works can proceed, and what works need to be postponed;
- No material will be stored in flood plains or in areas which would impede flood flow paths;
- Temporary works (including haul roads) will be designed so as not to affect the connectivity between the relevant channel and the floodplain to maintain adequate flood storage during the construction phase;
- Where the proposed works encounter an existing drainage line, arrangements will be made to reinstate the existing drainage system. This will mitigate the risk of excess run-off from the proposed works. All road and drainage system modifications are to be designed following relevant best practice guidelines; and
- Road run-off will be channelled during excavation works for the cable, to avoid potential ponding on roads or flooding of adjacent lands during construction.

6.8.1 General mitigation / avoidance of bentonite breakout

Design
The first step in minimising drilling fluid breakout is through correct design of the HDD. The depth of cover of the drill will be maximised but must be balanced with the requirements of the cable, particularly dissipation of heat from the cable. Hydrofracture analysis of the design – comparing drilling fluid pressures to the inherent ground strength along each point of the design – will be used to optimise the design and identify any locations with increased risk of breakout.

Construction
Identification of higher risk locations allows the contractor to instigate additional measures such as optimising the drilling fluid properties and instigating additional hole cleaning to increase the margin of safety against drilling fluid losses. The use of downhole pressure monitoring tools during pilot hole drilling gives the driller live readings of the drilling fluid pressure in the borehole near the drilling bit. This allows early warning of downhole pressures that are higher or lower than a safe working window at any point along the drill. The safe working window is determined by the hydrofracture modelling of the design prior to construction using ground strength parameters determined by testing results in ground investigation boreholes and samples.

The drilling fluid properties can be optimised during the drilling by the drilling fluids engineer. The formulation will be changed to suit the requirements at particular locations; in zones with low risk of bentonite breakout the fluid viscosity will be increased to ensure all cuttings are removed from the hole, thereby increasing the cross sectional area available for fluid flow resulting in a reduction in the drilling fluid pressure in the hole.

6.8.1.1 Campile Estuary

The conceptual HDD design for Campile Estuary has 16m depth of cover beneath the bed of the Estuary. Unfortunately, there is no ground investigation information directly beneath the estuary, however the geophysics just to the south of the estuary indicates that the HDD will have 6m of stiff clay and 10m of rock overlying it when drilling beneath the estuary. As a general rule of thumb, 10m cover in rock alone is sufficient to avoid risk of drilling fluid breakout and the risk at the estuary is assessed as low.

Bentonite drilling fluid is composed of approximately 30kg of bentonite clay, a natural occurring clay, per 1m3 of fresh water. Depending on ground conditions, polymer additives may be added. The polymer additives (e.g. polyacrylamide (PHPA) and polyanionic cellulose (PAC)) are organic, usually starch or sugar based. Polymers can be used as a drilling fluid themselves, instead of bentonite, however they are not as effective as bentonite.

The environmental risk from bentonite is that in freshwater environments they are not readily dispersed and, having a higher specific gravity than water, cover the bottom of the watercourse, smothering benthic flora and breeding sites for fauna. In saltwater environments the bentonite drilling fluid is quickly degraded by to ionic exchange between the salts in the seawater and the bentonite clays in the fluid. The bentonite flocculates and is dispersed by currents and wave action with turbidity (discolouration) the only noticeable effect.

Polymer drilling fluids are biodegradable so for most environments they are acceptable. However, they are not recommended where there is a risk of dispersal in artesian water, particularly if the aquifer is used for potable water. When the starches and sugars decay or are broken down by microbes they can affect the water quality.

For the Campile Estuary, if fluid was lost it would be in the order of 1-5m3 which would have a clay content of 30-150kg. The saltwater in the estuary would flocculate the bentonite fluid and the clay content would initially be in suspension before settling. It is important to stress that the bentonite clay is inert. It used because of its swelling properties in water, however when it contacts seawater, ionic exchange removes its capacity and it is equivalent in properties to the silt and clay that forms the bed and banks of the Campile Estuary.

6.8.1.2 Baginbun

Beach

The conceptual design for Baginbun has its minimum depth of cover at the base of the cliffs where the cover is 18m. As a general rule of thumb, 10m cover in rock alone is sufficient to avoid risk of drilling fluid breakout and the risk of breakout on the beach is assessed as very low. For a breakout to occur it would require an open fracture extending from the drill to surface. The risk of this is extremely low – any fracture will be infilled with sediment and even very soft clay would provide sufficient resistance at 18m depth to prevent breakout.

While the design is sufficient to minimise the risk ALARP (as low as reasonably practicable), annular pressure monitoring and good drilling practices will be used as a precaution.

Exit

It must be understood that there will be unavoidable loss of drilling fluid when the HDD exits at the sea floor; this occurs on all landfall HDD's. Containment of the fluid at the exit point is not a practical option in active coastal environments; silt curtains are ineffective and liable to be damaged or lost by wave and current action and engineered solutions such as exit casing and coffer dams introduce much greater environmental risk.

As discussed above, when the loss of bentonite drilling fluid to marine environment results in the bentonite being quickly broken down and dispersed, localised discolouration of the water around the exit point typically lasts for 20-60 minutes before it is dispersed by currents. A strategy that can be used is to drill the majority of the HDD with bentonite drilling fluid and then switch to a biodegradable polymer fluid (starch and sugar based) for the exit.

The volume of losses at the exit point depends on the methodology and the strength of the ground at exit. For Baginbun the HDD contractor will stop the pilot hole 50m before the exit then forward ream the hole to the final diameter by push reaming from land towards the exit. The pilot hole is then continued to the seafloor and drilling fluid in the bore is lost to the sea. The final 50m must then be reamed to final diameter and drilling fluid used during this time will mostly be lost to the sea. Finally, when the duct is inserted into the hole drilling fluid will be displaced from the hole and lost to the sea.

Very approximate volumes are 20 m^3 for pilot hole exit, 100 m3 for reaming exit, and 50 m3 for the duct installation. Note that these are fluid volumes; the clay percentage is typically 3% if bentonite fluid is used, the cuttings percentage (rock chippings, generally coarse sand size) is typically 1-5%.

Note that on dozens of previous landfall projects, even on those in very quiet coastal environments, there has been no observable sediment on the beach due to the losses at the exit point, so the beach at Baginbun will not be affected by the exit losses.

6.9 Resource and Waste Management

Construction and Demolition Waste Management Strategy

The following is the Construction Waste Management Strategy (CWMS) for the proposed development.

- Description of the proposed development;
- Quantities of wastes arising including procedures for minimisation/reuse/recycling and storage;
- Estimated cost of waste management;
- Management structure, roles and responsibilities C&D waste including names of responsible persons, qualifications and training;
- Procedures for education of workforce and planned dissemination programme;
- Record keeping procedures;

- Details of waste contractors and recycling and disposal sites, including names of relevant permits or licences;
- Waste auditing protocols; and
- Procedures change management and approval protocols.

The CWMP addresses waste generation and arrangements made for prevention, reuse, recycling disposal and collection of recyclables and wastes.

Construction – General

In addition to the measures inherent in the design of the project, which will be implemented during the construction phase, the following mitigation measures will be implemented:

- Waste disposal will be minimised so far as is reasonably practicable;
- Waste from the proposed development will be transported by authorised waste collectors in accordance with the relevant Irish waste legislation;
- Waste from the proposed development will be delivered to authorised waste facilities in accordance with the relevant Irish waste legislation;
- Source segregation: Where possible, metal, timber, glass and other recyclable material will be segregated during construction works and removed off site to a permitted/licensed facility for recycling. Waste stream colour coding, and photographs of wastes to be placed in each container as required, will be used to facilitate segregation. Where waste generation cannot be avoided this will maximise the quantity and quality of waste delivered for recycling and facilitate its movement up the waste hierarchy away from landfill disposal and reduce its environmental effect;
- Material management: 'Just-in-time' delivery will be used so far as is reasonably practicable to minimise material wastage;
- Supply chain partners: The contractor will engage with the supply chain to supply products and materials that use minimal packaging, and segregate packaging for reuse;
- Waste Auditing: The quantity in tonnes and types of waste and materials leaving site will be recorded during the construction phase;
- Waste fuels/oils will be generated from equipment used on-site during construction and will be classified as hazardous waste. Such wastes will be stored in a secure, bunded area on-site prior to collection by a Contractor who holds the appropriate waste collection permit;
- Possibilities for re-use of clean non-hazardous excavation material as fill on the site or in landscaping works will be considered following appropriate testing to ensure material is suitable for its proposed end use. Where excavation material cannot be re-used within the proposed works, every effort will be made to send material for re-use as a by-product, recovery or recycling so far as is reasonably practicable. Re-use as a by-product can be done under an Article 27 notification once the established EPA criteria for such re-use are met;

- The name, address and authorisation details of all facilities and locations to which waste and materials are delivered will be recorded along with the quantity of waste in tonnes delivered to each facility. Records will show material which is recovered, and which is disposed of; and
- Any off-site interim storage or waste management facilities for excavated material will have the appropriate waste licences or waste facility permits in place.

6.10 Population and Human Health

Measures which will be implemented to minimise effects on the general amenity of residents will include:

- The erection of directional and information signage where paths are temporarily closed;
- The provision of information to local householders during the construction phase;
- The provision of community liaison and nomination of personnel to manage community relations; and
- The preparation of an emergency response plan to cover foreseeable risks; and
- Construction works in the landfall site (close to Baginbun Beach), Dunbrody, Ramsgrange and wider cycle routes will be completed outside of July and August to avoid effects during the peak season in the area.

Industry-standard traffic management measures will be put in place to alleviate construction-related traffic disruptions. Refer to **Section 6.1** for further details.

Dust emissions will be controlled throughout the construction phase. Refer to **Section 6.2** for details of dust mitigation measures.

Noise and vibration disturbance will also be minimised. Best practice measures for noise control on construction sites will be adhered to during construction. Refer to **Section 6.3** for further details of noise and vibration mitigation measures.

As required by regulation and legislation, a Health and Safety Plan will be prepared to address health and safety issues during the construction phase. This plan will be reviewed and updated as required, as the development progresses. The Project Supervisor Construction Stage will assemble the Safety File as the project progresses. Further details are provided in **Section 5.9.**

6.11 Material Assets

GIL will require the contractor to put measures in place to ensure that there are no interruptions to existing services unless this has been agreed in advance with the relevant service provider. Adequate separation distances will be established between the cables and the existing services. Further methods that will be used to mitigate the risk of damage to existing services will be as follows.

- Assessing route records for existing assets to understand their depth, location and proximity to the planned cable trenches;
- The use of Ground Penetration Radar (GPR), to provide greater confirmation of the locations of existing assets;
- The use of trial holes, again to provide greater knowledge on the exact location of existing assets; and
- Full liaison with asset owners to discuss and agree clearances and where necessary designs.

All works near existing services and utilities will be carried out in ongoing consultation with the relevant utility company or local authority and will follow any requirements or guidelines they may have.

6.12 Major Accidents and Disasters

The proposed development will be designed and built in line with best international current practice and, as such, mitigation against the risk of major accidents and/or disasters will be embedded throughout the design.

The scenarios with the highest risk score in terms of a major accident and/or disaster during the construction phase was identified as fire and/or explosion, with a secondary effect of fire water/foam/powder reaching nearby receptors, and a vehicle collision (involving construction traffic or at temporary on-road works).

The mitigation measures, which will limit the likelihood and consequence of a fire or explosion, will include:

- The storage of fuels and oils in contained and bunded areas will mitigate, by prevention, the risk of fire/explosion resulting from the potential spillage of fuels or oils.
- Portable fire extinguishers will be available for use at each of the onshore working areas.
- The proposed development will be subject to a fire safety risk assessment which will assist in the identification of any major risks of fire on site, and mitigation of the same during the construction phase.
- All fire safety requirements will be provided for in co-ordination with Wexford County Council and Greenlink Interconnector Limited. Appropriate site personnel will be trained as first aiders and fire marshals. An emergency response plan will be maintained which will cover all foreseeable risks i.e. fire. In preparing this plan the emergency response services will be consulted.

The mitigation measures, which will limit the likelihood and consequence of a vehicle collision, include a construction traffic management plan.

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Appendices

Preliminary Environmental Control Plans

Greenlink Interconnector Ltd

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Appendix 4.1.1: Frack-out contingency plan

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Contents

1 Frack-Out

Frac-Out" occurs when fluid pathways are developed between the bore hole and surface, due to the hydraulic pressure of drill fluid within the annulus of the bore exceeding the confining formation strength of the surrounding lithology.

Stakeholders should be reminded that Drilling Fluids are freshwater suspensions of inert clay particles. Although slippery, they are environmentally benign and in fact can be utilised to improve the water retention of poor quality soils. Control Of Substances Hazardous to Health, (COSHH), and Material Safety Data Sheets, (MSDS), are kept on site for all products involved in the drilling operation.

During the drilling of the pilot hole entry and exit curves, when the depth of cover, formation consolidation and confining strength are at a minimum, Frac-Out is most likely.

Frac-Out can also travel to surface via existing pathways, e.g. previously installed utilities, foundation piles and existing boreholes. Any Site Investigation bores sunk must be offset to the proposed drill line and sealed up on completion.

Once punch out at exit point has been achieved, the annular pressure within the bore is relieved. Frac-Out during Hole Opening and Pipe Pulling operations is therefore much less likely to occur.

There are three stages to the management of Frac-Out:

1) Prevention 2) Containment 3) Control

1.1 Prevention

As previously noted, Frac-Out occurs when annular fluid pressures exceed formation fracture pressures. Annular fluid pressures are minimised by constant monitoring of the drilling fluid parameters.

The Drill Fluids Operator will monitor Drill Fluid density, viscosity and solids content on a regular basis, (hourly), to ensure that the fluid does not increase in viscosity, requiring additional pressure to maintain mobility.

In critical cases, viscometers will be used to measure Drill Fluid gel strength and shear strength so that Reynolds Numbers can be monitored. Filtrate can also be

measured to calculate the amount of wall cake building up on the internal wall of the bore.

The Driller will monitor the Drill Fluid pressures, volumes, viscosities and densities of mud being pumped through the bore. Any increases in pump pressure will be investigated immediately to prevent the risk of pressure build up within the annulus.

The Fluids Technician will monitor active fluid tank volumes and account for any unexpected changes. The amount of fluid being taken by the additional hole volume drilled will be calculated. (The Drill Fluid is designed to allow water loss in porous formations in order to build filter cake).

The bore hole will be reamed on a regular basis to keep the annulus clear. Rates of Penetration and circulated cuttings volumes will be monitored to ensure that drilled cuttings are being flushed from the bore and are not building up creating pressure restrictions.

Annular fluid velocity will be kept below Critical Velocity to prevent eddying and subsequent erosion caused by turbulent flow.

When drilling clay based formations, inhibitors may be used to prevent the absorption of water and subsequent swelling and sloughing of the formations.

1.2 Containment

A Frac-Watch programme will be operated at all times whilst circulating, particularly when drilling past potential pathways. Frac-Out may occur some distance from the bore path.

Prior to drilling, potential Frac-Out pathways will be identified and contingency plans put in place. Sand Bags will be available to control drill fluid at surface. Traffic Management systems will be available in the event that drill fluid spills onto a road.

An excavator will be available to dig a pit to contain fluid. Vacuum trucks will be available to transfer drill fluid from the containment point back to the recycling system.

If Frac-Out occurs in a riverbed, pressure relief bores may have to be drilled on the river bank.

If drilling is being undertaken in contaminated land, Frac-Out may be contaminated.

In the event that Frac-Out is experienced, the rig will immediately shut off the pumps and the drilling assembly will be pulled off bottom to reduce annular pressures.

1.3 Control

The freshwater based, bentonite suspension, drill fluid systems utilised by Südkabel are, essentially, low viscosity grouts. In most cases, the fracture pathways will quickly seal up.

Frac-Out is likely to indicate that the bore hole requires reaming to reduce the pressure required to return drill fluid to surface. A Wiper Trip may be sufficient to prevent further Frac-Out.

Various Lost Circulation Material (LCM) drill fluid additives are available to seal fractures in the formation. These vary from locally available substances such as sawdust, wheat chaff, kapok, etc to specifically produced materials such as mica flakes and proprietary chemical additives such as Diamond Seal™ or Micro-Fill™.

As a worst case scenario, cement may be forced into the bore to seal up the pathways. The cement plug can subsequently be drilled out or side-tracked. It is often the case that a combination of containment and control will be required to enable economic completion of the bore.

2 Drilling Fluids

2.1 DRILLING FLUIDS – Loss of Circulation

Loss of fluid to the surface in accessible areas or into the river remains our priority at all times. Should mud circulation be lost or become visible during drilling operations we will cease operations immediately. An inspection of the drilling line will be implemented to determine if the fluid loss is to the surface, or being lost down-hole into the surrounding ground formations.

If the fluid loss is upwards towards the surface, then the muds will be contained either by bunding or digging a retaining pit and if possible pumped back to the drilling m/c mud containment pit.

To reduce or halt the mud fracture, the drilling string will be drawn from the hole to a position where mud returns are regained to the rig site.

The pulling back in of the drill-rod string will not only recondition the drilled hole but will also have allowed time for any surface fracture to self-seal.

Once the hole has been re-conditioned, drilling can achieve sealing the fracture whereby new cuttings generated build up in the fracture to the surface eventually packing it off.

Loss of fluid to the surface in accessible areas or into a river remains a priority. This will be contained and controlled immediately. Should the frac-out be under the river then we will have straw bales on the bank ready to place into the river to control and filter the loss whilst any drilling fluid is sucked away by the vacuum tanker.

2.2 DRILLING FLUIDS-General

We will have on hand an Enviro-Formfill (or similar) to deal with any major frac out which may occur whilst drilling. During drilling of the bore hole, the drilling fluid lubricates the drill-rod string, removes solids from the borehole, and cools the drilling bit which contains the “downhole instrumentation”.

The drilling fluid system design will be based on expected ground conditions, to be confirmed by yourselves prior to commencement and adjusted as required by the “mud engineer” throughout the drilling operations. The drilling mud has very good sealing properties and is often used in construction of dams, where the water table is close to ground level.

One of the primary functions of drilling mud in Horizontal Directional Drilling, is that it provides a very good “filter cake". This means that, due to the flat, snake like, platelets of clay and the minute size of the particles, the mud soaks into permeable and porous drilled hole walls, and provides a seal.

Mud viscosity will be varied according to the prevailing conditions and monitoring will be an ongoing operation. It is envisaged that a viscosity of 40-90 seconds will be maintained. Mud pump volumes and pressures will vary according to conditions and the nozzle sizes used in the tools.

2.3 DRILLING FLUIDS – Cleaning, Spoil Separation and Disposal

During the drilling of the holes, cuttings will be produced. The cuttings will be carried back along the drilled path by the drilling fluids to the mud pit. The mud holding pit or tank is a pit that is excavated as close as possible to the HDD entry point. The sidewalls of the mud pit are built-up or embanked to form a bund around the mud pit.

The level of drilling fluid in the mud pit is monitored at all times during drilling operations. The drill rig hands will be able to monitor the level of the drilling fluid in the mud pit. The drilling engineer will keep the circulating drilling fluid system in balance and control the rate of pumping from the mud pit to the drilling fluid recycling system.

Fluid and suspended solids will be pumped from the mud pit using bentonite type via vortex type pumps into the fluids re-cycling unit. The cuttings are there separated from the drilling fluids using a series of desander screens, and finally de-silters with hydrocyclones. The solids are separated and vibrated into a holding skip and the cleaned fluid pumped back down the borehole via a mud pump.

At exit, or pipe side of the crossing a tractor and vacuum bowser/tanker combination unit is used to transfer drilling fluid back to rig side.

Cuttings are generated from the drilling process, (similar to a swarf when drilling a hole in wood or metal say) and brought to the mud recycling system by the drilling fluid. The cuttings are then separated from the drilling fluid in the drilling fluid recycling system, and the recycled drilling fluid is used again for drilling. The cuttings fall from shaker screens as a relatively dry product with a small percentage of drilling mud.

Any waste drilling fluids remaining at the completion of all Horizontal Drilling Operations will be removed from site and disposed of by a licensed fluid /solid waste contractors to the nearest appropriate landfill site.

We may use a “Supasorb granule” to absorb the water content and solidify the remaining sludge which can then be excavated and removed by conventional grab wagon and disposed of as Solid waste.

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Appendix 4.1.2: Pollution Prevention & Emergency Incident Response Plan

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Contents

Pollution Prevention & Emergency Incident Response Plan

1.0 Purpose

To detail the Company's arrangements for the prevention of pollution.

2.0 Compliance

OHSAS 18001 Section
EN ISO 14001
QHSE Manual
Water Resource Act
Environment Act
Pollution Prevention & Control Act
Waste Management Regulations
Control of Substances Hazardous to Health Regulations

3.0 Applicability and Responsibility

3.1 Applicability

This Procedure is applicable to all works in the vicinity of water courses.

- If you discharge or have the potential to discharge anything into surface waters or groundwater
- If there is a chance that substances from your site could enter surface waters or groundwater accidentally, for example by spillage or run-off.

3.2 Responsibility

The HSQE Manger has responsibility for maintenance of this Procedure.
All Project Managers have responsibility for the implementation of this procedure.
All persons have a duty to abide by the contents of this procedure.

4.0 Procedure

Discharges to Water
Almost any solid, liquid or gaseous substance entering surface waters or groundwater could be a pollutant. This includes chemicals, salt, wash waters, waste products, trade effluents, and fuels. Rainwater that runs across your site can also be classed as a pollutant if it becomes contaminated by substances from your site.

Almost all substances used and disposed of are unsuitable for discharge to surface waters or groundwater without prior treatment. Even hot water can be classified as a pollutant.

Surface waters include rivers, lakes, lochs, loughs, reservoirs, ponds, streams, canals, ditches, coastal waters and estuaries.

Groundwater is all water which is below the surface of the ground in the saturation zone (that is, below the water table) and in direct contact with the ground or subsoil.

If you intend to discharge anything other than clean, uncontaminated surface water to surface waters or groundwater, you must contact the HSQE department in order to obtain prior written authorisation from the environmental regulator. This could be in the form of:

- a discharge consent
- a groundwater authorisation
- an environmental permit (England and Wales)
- an integrated pollution control (IPC) authorisation or pollution prevention and control (PPC) permit (Northern Ireland and Scotland)
- an authorisation under the Controlled Activity Regulations (CAR) in Scotland.
- Waste Water Discharge Authorisation – Environmental Protection Agency (Ireland)

If you discharge any quantity of potentially polluting material (including sewage or trade effluent) to surface waters or groundwater and you do not have written authorisation, then you should contact the HSQE department and report the matter. The HSQE department will discuss with the environmental regulator to the best means of tackling the problem. Failure to do so in a timely fashion could lead to enforcement action.

Upon receipt of a written authorisation from the environmental regulator, then works must comply with all of the conditions included in it. Failure to do so may result in enforcement action or prosecution.

Accidental Spills
Where a significant impact could result from an accidental spillage then a Pollution Response plan needs to be put in place for such eventualities.

Furthermore, in the event of spillage or pipeline damage the following must be implemented:

Assess the Risk	Establish what the substance is to enable appropriate Personal Protective Equipment to be used or whether the substance should be approached
Stop	If possible stop any leaks at source
Contain	Use an Emergency Spill Kit or spoil, earth, sand etc to contain the leak. Note: Appropriate equipment including absorbent materials must be kept readily available within each depot.
Divert	Ensure, wherever possible, that the spillage does not enter any drainage system or any watercourse. Note: on no account must anything be deliberately washed into drains or streams

Contact	Contact the HSQE department in order to alert them to the situation and inform line management of the incident as soon as possible. If there is any risk that ground or surface waters have been contaminated contact the Environmental Agency immediately via the Emergency Hot Line Number 0800 807060 or Environment Protection Agency via 053-916 0600
Disposal	After a spillage all contaminated materials must be double bagged and disposed of as Hazardous Waste. Depending on the nature of the contaminant additional special disposal requirements may be required, further guidance can be obtained from the HSQE department.
Report	An environmental incident report must be completed and sent to the HSQE Department.

5.0 Documentation

Environmental Impact Assessments
Project/Site Environmental Plan

Environmental Incidents

Südkabel provide a 24/7 telephone line for reporting of all incidents and near misses. The Office in the UK can be utilised for complaints, feedback or queries submitted in writing. All incidents are recorded on the incident reporting log. Investigations of significant incident will be performed by a member of the SHEQ team in line with Südkabel and Client requirements.

All depots and construction sites will be provided with instructions, contact information and equipment to manage minor incidents on the site, for example; all commercial vehicles and locations for fuel stores have a spill kit with them. A specialist contractor will be available on call to respond to a major incident.

We retain the following specialists: Briggs Marine & Adler and Allan. Both offer a 24/7 service.

All incidents (including complaints, prosecutions, notices and cautions relating to the works) on the contract will also be reported to the Client's Project Manager and any Client systems as required.

The Project Manager and SHEQ Manager will instigate an investigation into the occurrence of the incident. The findings from which will be provided to Client to be sent to the appropriate enforcing authority where necessary. Südkabel will use the findings to produce an action plan to determine why the incident occurred and assess whether modifications to working practices are required to prevent a recurrence.

Emergency Response Procedure

All environmental incidents should be reported to the Südkabel Helpline (07428 465 966) and

Client.

Spillage Control

For plant/equipment leaks

- STOP the source of the spill or leak if possible
- CONTAIN the spill using spill kits, sand or soil
- DIVERT the spill away from drains and watercourses
- Clean up the spill. Put all used spill kit materials and contaminated soil in a waste bag and dispose of as hazardous waste
- REPORT the spill to your supervisor and ensure it is reported to the Südkabel Helpline (07428 465 966) and the Client.

Our emergency spill response contractors for large spills are Briggs Marine & Adler and Allan. Both offer a 24/7 service.

Other Environmental Incidents

If there is any other type of environmental incident, stop what you are doing and report it to your supervisor. These may include:

- Complaints from third parties e.g. noise and dust
- Discovery of suspected contaminated land
- Discovery of protected animals
- Damage to trees and hedgerows
- Near misses – where events could have led to a 'minor incident'

REPORT all incidents to the Südkabel Helpline (07428 465 966).

Flood Emergency Response

If there are flood alerts in the vicinity of the site:

- CONTACT the Environment Agency flood warning line on 0845 988 1188
- OBTAIN as much information as possible from the Environment Agency i.e. what timescales are involved and what level of flooding is expected
- If flooding is IMMINENT ensure that fuel, oil and other potential contaminants are moved out of danger or stored as securely as possible
- If the extent of the flooding becomes serious and an EVACUATION of the site is deemed necessary, a decision to evacuate will be made by a senior person on site.

REPORT instances of flooding to the Helpline on Südkabel Helpline (07428 465966)

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Appendix 4.1.3: Dealing with Silty Water

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Dealing with silty water

Silty water can arise from excavations, exposed ground, stockpiles, wheel-washing and site roads and water containing silt will not be discharged directly into rivers, streams or surface water drains.

Wherever possible, silty water should be avoided. However, where is does occur it is vital that the silt that is held in suspension is allowed to settle out before the water reaches a watercourse.

Drainage treatments during the construction phase of any engineering project vary in cost, complexity and appropriateness. Several solutions Südkabel may adopt for dealing with silty water are presented here:

Flat grassed area - Where the topography allows, existing grassed depressions are ideal for the natural filtration of run-off containing silt. However it is important to ensure that water issuing onto such areas is not causing erosion en-route, and also that the volume of silt being deposited in the settlement area is tolerable.

Sumps - A sump dug prior to any site drainage reaching an existing watercourse will act as a settlement lagoon. The level of accumulated silt should be monitored and lowered through controlled removal (such as a sludge tanker) when necessary. Series of sumps may be necessary to deal with larger discharges.

Settlement/separation tanks - These proprietary tanks operate on the same principle as the sump. Their performance is often enhanced by the inclusion of a baffle which prevents water overshooting the settlement tank. This baffle arrangement has the added advantage of acting as an oil separator in the event of such pollution reaching the tank.

Sophisticated separators, or interceptors, which monitor the silt/oil level trapped are available. The tank size, layout and number of baffles can all be selected to identify the most appropriate arrangement.

Excavations - Where possible, water will be prevented from entering excavations. Use of cut-off ditches and well point dewatering may be necessary.

Water discharged by any pumping arrangement will be dealt with according to a site drainage plan.

Topsoil Stripping and Reinstatement - It is of paramount importance to minimise disturbance to flora and fauna whilst carrying out the construction works, and to ensure that disturbed habitats will regenerate quickly after completion of the works.

Topsoil and vegetation (stored separately from subsoil) will be retained and reinstated over the track shoulders and all other areas of stripped ground, as soon as possible to prevent erosion and leaching.

On wet and marshy ground it may be necessary to store excavated materials on a geotextile in order to minimise disturbance to the vegetation below.

Exposed ground and stockpiles - The total quantity of exposed ground and stockpiles, and storage duration will be minimised in order to minimise generation of silt and dust. If long-term storage is required then stockpiles can be seeded or covered and silt fences constructed from a suitable geotextile. In dry weather dust suppression measures may be required.

Greenlink Interconnector Ltd

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Appendix 4.1.4: Draft Environmental Preparedness Plan

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Contents

Draft

Environmental Preparedness Plan

Introduction

This document identifies environmentally safe working procedures and standards for particular Operation's that must be implemented by all Operatives and subcontractors when working on site managed by Südkabel.

The procedures have been developed to ensure that Südkabel and all its subcontractors comply with Environment Agency (EA) or Environment Protection Agency Guidelines and additional planning requirements set out by the Local Planning Authority, as well as other enforcing bodies.

As part of the procedure an environmental checklist has been created, which is completed on site every 2-3 weeks by the site manager.

Detailed below is the scope of the procedures contained within the document and a brief summary of what is required of the subcontractors on-site.

Emergency Preparedness, Response and Spillage Procedures

Südkabel Project Services use an Environmental Management System (EMS) in accordance with the ISO14001 standard. The EMS identified activities that Südkabel Project Services undertakes that may have an effect on the environment; preventative and improvement procedures have been put in place to address these activities and are used on Südkabel construction sites.

Environmental Emergency Preparedness and Response Plan

The Südkabel Environmental Emergency Preparedness and Response Plan provides guidance to Südkabel staff and subcontractors working on construction and operational sites.
The Plan details the system for the identification of, potential for, and response to, environmental accidents and emergency situations occurring on a Südkabel construction site; in order that the environmental impacts can be prevented or mitigated for.

In the event of an environmental emergency occurring on site, the member of Südkabel Project Services staff or subcontractor who noticed the emergency will follow the work instruction put in place to address the situation e.g. oil spills; this will provide guidance on contacting the Environment Agency for further advice on dealing with the emergency.

1) **Site establishment location –** In the event of an emergency situation occurring within the site establishment, contact the site manager, the Site Manger or Supervisor shall sound two blasts of the air horn. All persons shall then proceed to the emergency assembly point as defined within the site induction brief and displayed within the site CDM drawing.

   The person in charge of the site at that time must ensure that everyone is accounted for and should then contact the respective emergency service, advising the nature and location of the incident. Immediately following the initial report to the emergency services, the site Manger shall report the incident to the Client Construction Manager.

All works must cease until advised it is safe to do so by the emergency services or Client Representatives.

2) **Point of work location –** In the event of an emergency situation occurring at the point of work or adjacent vicinity, the Site Supervisor or team leader shall sound two blasts of air horn; All persons shall then proceed to the team vehicle and await further instructions from the site Manager.

   The person in charge of the site at that time must ensure that everyone is accounted for and should then contact the respective emergency service, advising the nature and location of the incident. Immediately following the initial report to the emergency services, the site Manger shall report the incident to Client Construction Manager.

   All works must cease until advised it is safe to do so by the emergency services or Client Representatives.

Emergency Procedure in the event of a spillage

This procedure details the emergency procedure to be followed and actions to be taken in the event of an oil, fuel and chemical spill occurring on a Südkabel construction site or an operational site. Spill kits of appropriate form and size for the controlled substances being used are supplied on site; they are also present on any mobile refuelling bowser's on construction sites. In the event of a spill occurring on a construction site trained personnel shall immediately deploy the spill kit in accordance with the manufacturer's instructions. Used spill kits and any other contaminated material e.g. rags used during the incident are disposed of in accordance with the Environmental waste management regulations, by a licensed disposal company. Waste transfer certificates are retained. The EA will be informed of the incident and further advice sought if required.

1.0 Existing Features

1.1 Contaminated land

Any remediation or disposal of contaminated land will only be carried out following consultation with the local environmental authority, if no work is required on the contaminated land it will be fenced off to prevent disturbance.

1.2 Underground services

Assessment of the hazards for underground services where present shall include an assessment of the environmental impact of damage during construction

1.3 Existing storage tanks

Any old containers found on site will be checked and emptied by a Licensed Waste Carrier before removal. Copy of licence certificate will be obtained and handed to the Südkabel Site Manager for inclusion in the Project Health and Safety File.

1.4 Protection from vandalism

Vandalism, theft and tipping are common causes of pollution and the compound area should be adequately protected by fencing and locked to discourage unauthorised access. Any occurrence of tipping on the site will be reported to site management who will inform the local environmental authority and the police if necessary

2.0 Site Drainage

2.1 Surface and foul water drains

Surface water drains should carry uncontaminated rainwater only and shall be protected from ingress of silt, or any other contaminants. Wet cement and raw concrete shall never be allowed to enter any watercourse

3.0 Deliveries

3.1 Fuels and oils

Fuel and oil deliveries shall take place within the designated refuelling area only; a responsible person will supervise site deliveries to ensure that the correct amount of material is delivered to the correct tank and that the level is checked prior to refilling to avoid spillage

4.0 Storage of Fuels, Oils and Chemicals

All fuels and oils will be stored in a designated area only, including mobile bowser's when not in use. Generators permanently stationed in site compound (used for powering site cabins) will be kept in the designated refuelling area, or be bunded (the bund shall be capable of containing 110% of the fuel tank's capacity) or shall have a double skinned fuel tank. Chemicals on site will be stored in accordance with their COSHH assessment and appropriate spill kit kept by subcontractor.

4.1 Security

All bowsers will be stored so as to minimise the risk of collision, run-away and vandalism. They will not be stored adjacent to watercourses. When not in use, bowsers will be securely stored in the designated refuelling area.

4.2 Marking

The contents of any tanks on site will be clearly marked. Warning notices including "No smoking" and "Close valves when not in use" shall also be displayed.

4.3 Removal

No tanks or containers may be perforated or dismantled on site. A competent operator will empty all contents and residues for safe disposal elsewhere.

5.0 Waste management

5.1 Treatment and storage

All waste will be stored in designated areas that are isolated from surface drains, prior to removal from site. Skips will be covered to prevent refuse blowing away and rainwater accumulating. They will be replaced when full and the contents disposed of in accordance with statutory requirements

5.2 Disposal

Chemical containers, used oil and filters, solvents, paints, electrical items, contaminated materials and hazardous refuse are all classified as "special waste" and, as such, will be stored in a bunded area away from watercourses and disposed of by licensed contractors in a controlled manner.

6.0 Earthworks

6.1 Dealing with silty water

Silty water can arise from excavations, exposed ground, stockpiles, wheel-washing and site roads and water containing silt will not be discharged directly into rivers, streams or surface water drains.
Wherever possible, silty water should be avoided. However, where is does occur it is vital that the silt that is held in suspension is allowed to settle out before the water reaches a watercourse.
Drainage treatments during the construction phase of a wind farm vary in cost, complexity and appropriateness. Several solutions Südkabel Project Services may adopt for dealing with silty water are presented here:

Flat grassed area - Where the topography allows, existing grassed depressions are ideal for the natural filtration of run-off containing silt. However it is important to ensure that water issuing onto such areas is not causing erosion en route, and also that the volume of silt being deposited in the settlement area is tolerable.

Sumps - A sump dug prior to any site drainage reaching an existing watercourse will act as a settlement lagoon. The level of accumulated silt should be monitored and lowered through controlled removal (such as a sludge tanker) when necessary. Series of sumps may be necessary to deal with larger discharges.

Settlement/separation tanks - These proprietary tanks operate on the same principle as the sump. Their performance is often enhanced by the inclusion of a baffle which prevents water overshooting the settlement tank, as shown below. This baffle arrangement has the added advantage of acting as an oil separator in the event of such pollution reaching the tank. Sophisticated separators, or interceptors, which monitor the silt/oil level trapped are available. The tank size, layout and number of baffles can all be selected to identify the most appropriate arrangement.

6.2 Excavations

Where possible, water will be prevented from entering excavations. Use of cut-off ditches and well point dewatering may be necessary. Water discharged by any pumping arrangement will be dealt with according to the site drainage plan

6.3 Topsoil Stripping and Reinstatement It is of paramount importance to minimise disturbance to flora and fauna whilst carrying out the construction works, and to ensure that disturbed habitats will regenerate quickly after completion of the works. Topsoil and vegetation (stored separately from subsoil) will be retained and reinstated over the track shoulders and all other areas of stripped ground, as soon as possible to prevent erosion and leaching.
On wet and marshy ground it may be necessary to store excavated materials on a geotextile in order to minimise disturbance to the vegetation below.

6.4 Exposed ground and stockpiles

The total quantity of exposed ground and stockpiles, and storage duration will be minimised in order to minimise generation of silt and dust. If long-term storage is required then stockpiles can be seeded or covered and silt fences constructed from a suitable geotextile. In dry weather dust suppression measures may be required.

6.5 HDD Operations

All HDD operations require the use of a drilling fluid / mud which consists of fresh water / bentonite / polymer lubricant. All fluids generated during the drilling process will be contained within the launch / reception pits excavated to enable drilling procedures. This will prevent a potential overspill into surrounding water courses and if it is deemed necessary the excess fluids will be transferred into an onsite tanker or a settlement lagoon. On larger drills water recycling units may be utilised.

7.0 Plant

7.1 Refuelling

Where possible, mobile plant will be refueled in the designated area. Where plant is to be refueled outside this area a double skinned bowser must be used and re-fuelling will take place over a drip tray. Refuelling shall always take place away from watercourses or surface drains

7.2 Maintenance

Plant and site vehicles are to be well maintained and any vehicles leaking fluids must be repaired or removed from site immediately. Any servicing operations will take place over drip trays.

8.0 Road Cleanliness

8.1 Site roads

Site Roads will be brushed or scraped as required to minimise dust and mud deposits, especially at site entrances and any watercourse crossings. If necessary during dry weather, dust suppression may be achieved by spraying water onto the site tracks to dampen down the airborne dust particulate.

8.2 Public Highways

Measures will be undertaken throughout the construction phase of the project to ensure that dust and mud does not migrate onto the adjacent public highways, private roads or accesses. This may require the establishment of a wheel washing station comprising an apron onto which vehicles will drive in order to clear the wheels and undersides using a power washer. Any water used during the wheel washing process will be collected and passed through a silt trap before discharging into a soak away. Run off water will be channelled via a silt trap into a purpose made soak away and will not be discharged directly into watercourses.

9.0 Drip Trays

After use the drip tray will be cleaned using an appropriate absorbent material which will be disposed of in accordance with COSHH regulations. Drip trays will be regularly checked and cleaned.

10.0 Concrete

Concrete is highly alkaline and corrosive and can have a detrimental impact on watercourses. Washing-out of concrete wagons on site will not be permitted, unless in a designated sealed wash-out pit. No tools, equipment or materials will be washed in watercourses. Mortar mixing and material storage areas must be away from watercourses. Sulphate resistant concrete shall be used where geological conditions dictate, to prevent long term corrosion of concrete (local release of alkaline compounds) due to sulphate attack.

11.0 Wildlife

Wildlife shall be protected from entering and becoming trapped in any part of the works on the site. For excavations this may mean that fences, crossings or escape routes are necessary.
If during the works you encounter any evidence of protected species please contact the Südkabel Site Manager who will in turn contact the relevant ecologist.

12.0 Contact Details

In the event of any incident however small, or in the event of an emergency on site please contact the Südkabel Site Management on the numbers listed below, please detail the problem and the location it has occurred.
If for any reason you are unable to make contact with the site based management team please make contact with Südkabel Project staff listed below:

……………………….

Contact No's

EA Control Centre:

Emergency Telephone No: 0845 988 1188
Pollution Hotline; 0800 80 70 60

Environmental Protection Agency:

(053) 916 0600

Appendix 6: *Chapter 8 Noise and Vibration* from the Environmental Impact Assessment Report

Contents

8 Noise and Vibration

8.1 Introduction

This chapter describes the likely noise and vibration effects of the proposed development, during its construction, operational and decommissioning phases. Mitigation measures are also detailed that minimise noise and vibration effects, where required.

The proposed development consists of the following permanent and temporary elements:

Landfall Compound – a temporary landfall compound at Baginbun, where the high voltage direct current (HVDC) cable will be installed underground, below the beach and cliff at Baginbun Beach, by horizontal directional drilling (HDD);

HVDC Cables – two HVDC electricity cables with a nominal capacity of 500 megawatts (MW), installed underground from the landfall at Baginbun to the converter station, including jointing bays and ground level marker posts at intervals along the route;

Converter Station – a converter station situated close to the existing Great Island substation in Wexford;

Tail Station - a 220kV substation located beside the converter station. The Loughtown tail station connects the HVAC 220kV cable into the 220kV grid via the existing Great Island substation;

MV Substation – an ESB MV substation will be located outside the converter station and tail station perimeter fences but within the landholding. This substation will provide the MV and LV connections required for the development;

Converter station construction compound - temporary compound for the construction of the converter station and tail station at Great Island;

Cable Contractor compound – three temporary cable contractor compounds will be required (i) at the landfall site close to Baginbun Beach (ii) at the proposed converter station and (iii) one along the onshore route in the townland of Lewistown;

HDD Compounds – temporary HDD contractor compounds are required. One will be located close to the cable contractor compound at Baginbun Beach with another HDD compound located at either side of the Campile River Estuary crossing;

High Voltage Alternating Current (HVAC) Cables – one 220 kV HVAC electricity cable circuit consisting of three cables, installed underground connecting the converter station via the tail station to the EirGrid Great Island substation;

Fibre Optic Cables – fibre optic cables for operation and control purposes, laid underground with the HVDC and HVAC cables;

Community Gain Roadside Car Parking near Baginbun Beach – in consultation with Wexford County Council, circa 54 roadside car parking spaces will be constructed; and

Community Gain in Ramsgrange Village – in consultation with Wexford County Council, extension to existing footpaths, four new street lights and a speed activated sign at Ramsgrange.

A detailed description of the proposed development, including design, operation and decommissioning of the proposed development are described in **Chapter 3** whilst **Chapter 4** provides a description of the general activities associated with the construction of the proposed development.

During the construction phase, the potential noise and vibration impacts are associated with site preparation works at the converter station and tail station site, trench and HDD excavation, foundation construction activities and construction vehicle movements.

During the operational phase, the main potential for noise impact is due to the continuous low-level noise emissions from the converter station plant and equipment. The plant and equipment on the site are not expected to generate vibration, and therefore there is no potential for vibration impacts associated with the operation of the development.

During the decommissioning phase, the potential noise and vibration impacts will be similar-to but less intensive, less extensive and of shorter duration than those associated with the construction phase, as discussed below in **Section 8.4.4**.

This chapter has been prepared by Simon Grennan and Cormac McKenna of Arup. A description of the authors' qualifications and experience is presented in **Appendix 1.1**.

8.2 Assessment Methodology

8.2.1 General

This assessment considers the potential for generating significant noise and vibration effects during all phases of the proposed development and the likely significant effects of noise and vibration on noise sensitive locations (NSLs). NSLs are defined as "*any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or other area of high amenity which for its proper enjoyment requires the absence of noise at nuisance levels*" (EPA, 2016).

The assessment methodology is set out below, addressing potential sources of noise and vibration and the appropriate limits. The baseline environment is then described, the potential effects of construction, operation and decommissioning are assessed, and following this, a description of appropriate mitigation and monitoring measures that will be implemented is provided. Finally, residual, cumulative and transboundary effects are described.

8.2.2 Guidance and Legislation

The noise and vibration assessment has been undertaken in accordance with:

- EPA (2016) *Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)*;
- Transport Infrastructure Ireland (TII, formerly NRA) (2014) *Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes*;
- TII (2004) *Guidelines for the Treatment of Noise and Vibration in National Road Schemes*; and
- British Standards Institution (BSI) (2014) 5228-1 and 2:2009+A1:2014. *Code of practice for noise and vibration control on construction and open sites. Noise and Vibration.*
- British Standards Institution (BSI) (1993) 7385-2:1993 *Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration.*
- (ISO, 2007) ISO 1996: *Acoustics – Description, measurement and assessment of environmental noise (Part 1 & Part 2) (ISO, 2003 & 2007).*
- Department for Communities and Local Government (1994) *Planning Policy Guidance 24: Planning and Noise*
- British Standards Institution (BSI) (2019) *BS4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound*

The TII guidance documents, along with British Standard guidance documents, have set out noise and vibration limits during construction which are generally applied by planning authorities to all construction projects in Ireland. The TII Guidance is the most appropriate guidance due to its semi-quantitative approach to determine the likelihood of a significant effect, combined with an assessment of the proposed mitigation measures, during the construction phase.

Although the proposed convertor station and tail station will not be subject to licence by the EPA, cognisance was given to the EPA guidance above in relation to the operational noise assessment as the limits therein are typically considered by planning authorities for noise-generating developments, whether or not they are subject to licence by the EPA.

8.2.3 Study Area

The study area for the noise and vibration assessment focused on the closest residential properties or other noise sensitive receptors around the landfall, cable route, converter station and tail station for potential construction noise and vibration effects. The assessment considered areas beyond the closest receptors if significant effects were identified to review the spatial extent of any effects. Given the types of construction operation and the duration of the works (particularly the transient nature of the moving cable route works), this is considered a sufficient area to assess likely significant effects.

For operational noise, the study area included the nearest sensitive receptors to the converter station site.

8.2.4 Traffic Volumes (Construction and Operation)

The TII *Guidelines for the Treatment of Noise and Vibration in National Road Schemes* (TII, 2004) state that routes should be considered for further assessment where traffic flow is likely to increase or decrease by 25% or more in both the construction and operational phases.

It is predicted that, during construction, there will be short-term increases in traffic volumes on the local road to Great Island which exceed 25% (refer to **Chapter 6** *Traffic and Transportation*), but this is in the context of existing low traffic volumes on the road, and addressed in **Section 8.4.2**.

Increases in traffic during the operational phase of the proposed development are predicted to be imperceptible.

8.2.5 Baseline Survey Methodology

8.2.5.1 Introduction

The baseline noise environment was determined by conducting surveys at sensitive locations near the proposed development in July and August 2019 and by consulting noise data gathered from the SSE Great Island Generating Station's Annual Environmental Reports (AERs) from 2016-2018. All noise monitoring carried out was attended. It is considered that noise monitoring in 2020 would not be representative of the baseline, due to the travel restrictions which were imposed during the pandemic.

All noise surveys were conducted in general accordance with *ISO 1996: Acoustics – Description, measurement and assessment of environmental noise (Part 1 & Part 2) (ISO, 2003 & 2007)* (ISO, 2007).

8.2.5.2 Survey Locations

Most of the site comprises roadway which will be subject to short-term impacts while construction of the cable trench is carried out in the vicinity of roadside receptors, for a period of one to two weeks.

There are four locations where the duration of construction-phase noise impacts will be longer than this: the converter station and tail station site, the crossing of the Campile Estuary, the temporary contractor's compound at Lewistown, and the landfall site.

Attended noise measurements were conducted in 2019 at these four locations, as set out in **Table 8.1**. Noise monitoring conducted for the Great Island Generating Station's AERs was carried out at a bungalow to the north west of the proposed development site (NSL1).

These four locations are considered representative of the general area, which is rural in nature.

Table 8.1 Noise Monitoring Locations

Reference	Location	Co-ordinates (ITM)
NML1	Converter station site	669094, 615043
NML2	Southern bank of Campile Estuary	671118, 615344
NML3	Temporary construction compound site in Lewistown	675366, 605679
NML4	Temporary construction compound site near Baginbun Beach	679869, 603433
NSL1	Bungalow near Great Island Power Station	668452, 615145

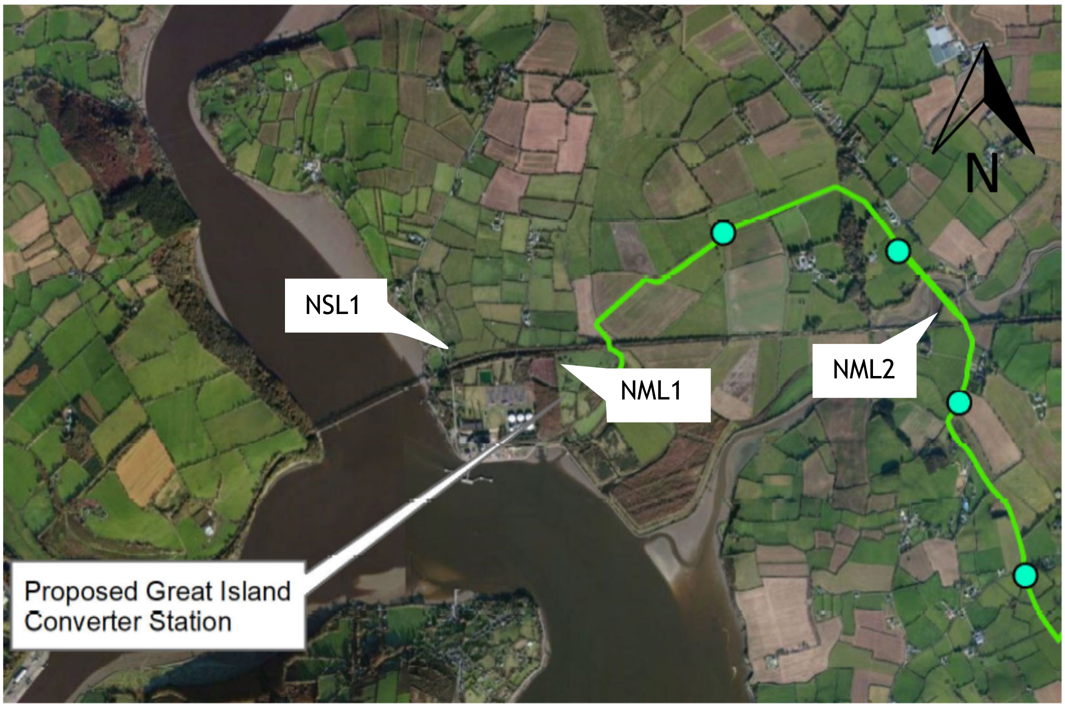


Figure 8.1 Noise Monitoring Locations | mapping: Bing Maps © Microsoft 2020 | not to scale

8.2.6 Survey Periods

The attended noise measurements in 2019 were conducted during the daytime, evening and night time on 30 July and 01 August.

All surveys were carried out during time periods which were selected to provide a typical snapshot of the existing baseline noise climate in the area.

The results were initially noted onto a survey record sheet immediately following each sample and were also saved to the instrument memory for later analysis where appropriate. Survey personnel noted all primary noise sources contributing to noise.

Noise monitoring conducted and reported in the Great Island Generating Station's AERs was conducted during various day time, evening time and night time periods on the 13th November 2018, 21st and 22nd September 2017 and 14th and 15th December 2016.

8.2.6.1 Instrumentation

Brüel & Kjær 2250 Light Class 1 Sound Level Meters were used to carry out the noise surveys. This meter complies with the International Electro-technical Commission (IEC) Specification for Sound Level Meters (IEC, 2002). For each survey, the noise meter was calibrated before and after each measurement using a Brüel & Kjær 4231 Acoustic Calibrator. A windshield was used to provide the microphone with effective wind protection.

8.2.6.2 Meteorological Conditions

Meteorological conditions over the monitoring periods are set out in **Table 8.2** below, as taken from the Johnstown Castle weather station, the nearest weather station to the site. Available SSE reporting does not include meteorological data for the monitoring periods at NSL1.

Table 8.2 Meteorological conditions for 2019 survey periods

Date	Rainfall (mm)	Max Temp (˚C)	Min Temp (˚C)	Mean Wind Speed (m/s)
30/07/2019	0.0	22	11	4.1
01/08/2019	0.0	18.9	12.4	2.6

8.2.6.3 Measurement Parameters

The following parameters were recorded and reported:

- L_{Aeq} – this is the continuous steady sound level during the sample period and effectively represents an average value;
- L_{A10} – this is the sound level that is exceeded for 10% of the sample period. It is typically used as a descriptor for traffic noise;
- L_{A90} – this is the sound level that is exceeded for 90% of the sample period. It is typically used as a descriptor for background noise; and
- L_{Amax} or L_{AFmax} - this is the maximum sound level, with the inclusion of "F" to indicate measured using the fast time constant.

The "A" suffix denotes the fact that the sound levels are "A-weighted" to account for the non-linear nature of human hearing.

8.2.7 Methodology for Assessment of Effects During Construction and Decommissioning

8.2.7.1 Introduction

The approach to the assessment of construction noise and vibration is described in the following sections. The noise and vibration effects associated with decommissioning are also considered, with these effects likely to be similar, but less intensive than those associated with the construction phase.

8.2.7.2 Construction Noise - Limits and Significance Criteria

BS 5228-1/2:2009+A1:2014 *Code of Practice for Noise and Vibration Control on Construction and Open Sites – Noise and Vibration* outlines guidance on construction noise criteria with reference to the existing noise environment, as well as prediction methodologies to estimate the impact. This guidance is considered the most appropriate to apply in this instance as it considers the existing baseline noise environment and includes night-time limits. BS 5228[Error! Bookmark not defined.] states that *a potential significant effect is indicated if the $L_{Aeq,\,T}$ noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level.*

The average daily noise levels at surrounding receptors have been calculated for the worst-case month by considering the individual source noise levels of key noise-generating plant, the numbers of plant operating for different times of the day, the distance to the receptors, and any intervening screening.

Table 8.3 sets out the ABC method for establishing the impact criteria of construction noise as presented in BS5228.

Table 8.3 BS5228 (Part 1) ABC assessment categories and thresholds at dwellings

Assessment Category and Threshold Value Period $L_{Aeq,\,1\ hour}$	Threshold Value in Decibels (dB)		
	A[A)]	B[B)]	C[C)]
Night (23:00-07:00hrs)	45	50	55
Evening and weekends [D)]	55	60	65
Day (07:00-19:00hrs) and Saturdays (08:00-14:00)	65	70	75

Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than category A values.

Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.

Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values.

19:00 – 23:00hrs weekdays, 14:00-23:00hrs Saturdays and 07:00-23:00hrs Sundays.

The construction noise criteria outlined in **Table 8.4** have been applied at the nearest sensitive receptor to the construction works based on the BS5228**Error! Bookmark not defined.** criteria.

Table 8.4Noise limits to be applied based on BS5228 criteria

Assessment Category and Threshold Value Period L_{Aeq}	Standard noise limits at sensitive receptors $L_{Aeq, 1 hour}$
Night (23:00-07:00hrs) (L_{Aeq}, dB)	(Cat A) 45
Evening (19:00-23:00hrs) (L_{Aeq}, dB)	(Cat A) 55
Day (07:00-19:00hrs) (L_{Aeq}, dB)	(Cat A) 65

Where an exceedance of the construction noise criteria, as outlined **in Table 8.4**, is predicted, the impact associated with the noise increase is rated in accordance with **Table 8.5.**

Table 8.5 Likely impact associated with exceedance of construction noise criteria

Extent of Noise Impact (Exceedance of Assessment Criteria)	Noise Impact Magnitude	Magnitude Rating
Less than 3dB	No significant change/Imperceptible	Neutral to Slight Impact
Increase of 3-5dB	Slight increase	Slight to Moderate Impact
Increase of 6-10dB	Moderate Increase	Moderate to Major Impact
Increase of more than 10dB	Substantial Increase	Significant Impact

Table 8.6 outlines the duration and frequency of effect based on EPA guidance[1].

Table 8.6 Duration and frequency of effects

Effect Type	Duration
Momentary Effects	Effects lasting from seconds to minutes
Brief Effects	Effects lasting less than a day
Temporary Effects	Effects lasting less than a year
Short-term Effects	Effects lasting one to seven years
Medium-term Effects	Effects lasting seven to fifteen years
Long-term Effects	Effects lasting fifteen to sixty years
Permanent Effects	Effects lasting over sixty years

[1] EPA (2017) Guidelines on the information to be contained in Environmental Impact Assessment Reports.

8.2.8 Construction Vibration

Table 1 in BS 7385-2[2] and Table B.2 in BS5228-2**Error! Bookmark not defined.** outline vibration limit values for transient vibration for cosmetic damage[3]. Both standards state that, *where the dynamic loading caused by continuous vibration is such as to give rise to dynamic magnification due to resonance, especially at the lower* frequencies *where lower guide values apply, then the guide values in Table 1 may need to be reduced by up to 50%.*

As the BS 7385-2 limits are directly applicable to vibration in buildings, for continuous and transient vibration, and are also more onerous at lower frequencies compared to the TII limits, they have been carried through for assessment purposes. **Table 8.7** outlines the vibration limits, for transient vibration, applied in this assessment and recommended for the construction phase of the proposed development.

Vibration from construction traffic was not scoped-in to the assessment as there is no reason to assume construction traffic would give rise to higher vibration than existing heavy goods vehicles traffic using the road network.

Table 8.7 Vibration limits at the nearest sensitive receptor

Type of building	Peak component particle velocity in frequency range of predominant pulse			
	Transient		*Continuous*	
	4 Hz to 15 Hz	15 Hz and above	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures (Industrial and heavy commercial buildings)	50 mm/s		25 mm/s	
Unreinforced or light framed structures (Residential or light commercial type buildings)	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50mm/s at 40 Hz and above	7.5 mm/s at 4 Hz increasing to 10 mm/s at 15 Hz	10 mm/s at 15 Hz increasing to 25mm/s at 40 Hz and above

BS 5228 also outlines guidance on the effects of vibration levels for humans. Vibration levels above 0.3mm/s PPV are likely to be perceptible but higher values can be tolerated if affected residents are given prior warning and explanation. **Table 8.8** outlines the likely human response to vibration levels.

2 BS 7385-2 (1993) Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from groundborne vibration

3 'Cosmetic' damage is defined in BS ISO 4866:2010 as *The formation of hairline cracks on drywall surfaces or the growth of existing cracks in plaster or drywall surfaces; in addition, the formation of hairline cracks in mortar joints of brick/concrete block construction.*

Table 8.8 Human perception of vibration levels

Vibration level	Significance Level
0.14 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration
0.3 mm/s	Vibration might be just perceptible in residential environments.
1.0 mm/s	It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents.
10mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level

8.2.9 Construction Equipment

As per TII guidance, noise levels associated with construction may be calculated in accordance with the methodology set out in BS 5228: Part 1. This standard sets out sound power levels for plant items normally encountered on construction sites, which in turn enables the prediction of noise levels at selected locations. The TII guidance notes that definitive construction methods and number of plant items are not usually set out at this stage and that the overriding requirement of the contractor will be to construct the proposed scheme to the final design ensuring that the development complies with the noise levels/ limits set out in this chapter. This will require the contractor to quantify existing ambient noise levels before fixed noise thresholds can be set. These limits are set out in **Table 8.3**.

8.2.10 Methodology for the Assessment of Operational Effects

Operational noise will be confined to that generated at the converter station site at Great Island, County Wexford.

The effect of the proposed development during the operational phase is assessed through the application of significance criteria based on predicted changes in noise level due to the proposed development. This was done by calculating the change in L_{Aeq} and categorising the significance (refer to **Table 8.9**).

Table 8.9: Changes in Noise Level - Significance Criteria

Change in Sound Level (dB)	Subjective Reaction	Significance Level
None	**No change**	**No change**
< or ~3	Imperceptible	Negligible
4-5	Perceptible	Slight
6-10	Up to doubling of loudness	Moderate
11-15		Significant

Change in Sound Level (dB)	Subjective Reaction	Significance Level
None	**No change**	**No change**
>16	Over a doubling of loudness	Profound

Source: Based on a number of noise documents including EPA Guidelines

EPA guidance [4](EPA, 2016) also sets out permissible noise levels for industrial facilities. These noise levels are also typically used by planning authorities for other noise-generating developments, whether or not they are subject to licence from the EPA. Typical limit values (free field) for noise from industrial sites at sensitive receptors are:

- Daytime (07:00 to 19:00hrs) – 55dB $L_{Ar,T}$;
- Evening time (19:00 to 23:00hrs) – 50dB $L_{Ar,T}$; and
- Night-time (23:00 to 07:00hrs) – 45dB $L_{Aeq,T}$. with no tonal or impulsive noise clearly audible or measurable.

$L_{Ar,T}$ is the rated noise level, equal to the L_{Aeq} during a specified time interval (T), plus specified adjustments for tonal character and/or impulsiveness of the sound, using the EPA guidance for penalties.

$L_{Aeq,T}$ is the equivalent continuous sound level. It is an average and is used to describe a fluctuating noise in terms of a single noise level over the sample period (T).

The proposed converter station will operate on a 24-hour basis. The limits above are applied to assess the effect of operational sources at the nearest sensitive receptor.

8.2.11 Assessment of Overall Significance

The identified sources of noise were evaluated to determine if there would be adverse impacts, and the potential to cause significant effects according to the criteria described above for construction, operational and decommissioning impacts.

However, other factors specific to individual receptors and the character of the noise impact were also considered in reaching a final assessment decision. Therefore, if potentially significant effects are identified, the overall assessment of significance is evaluated using professional judgement based on the following factors:

Residential Receptors

- the magnitude of the impact and effect identified (based on overall noise level and/or noise change);
- the level and character of the existing noise environment;

[4] EPA (2016) *Guidance Note for Noise Licence Applications, Surveys and Assessments in relation to Scheduled Activities (NG4)*

- any unique features of the source or receiving environment in the local area;
- duration of impact and effect (for construction); and
- the effectiveness of mitigation measures that could avoid or reduce the adverse effects.

Non-residential Receptors

- the generic use (e.g. educational, healthcare, religious buildings or community uses);
- the times of use of the receptor in relation to the impacts;
- the design of the receptor (especially windows, doors and ventilation systems) and hence ability of receptor to experience changes in external noise environment without significant change in internal noise conditions);
- the layout - whether the most sensitive parts of the building are closest to and face the Proposed Development, or are located further away, or on the opposite side of a building;
- duration of impact and effect (for construction); and
- the effectiveness of mitigation measures that could avoid or reduce the adverse effects.

8.3 Baseline Environment

The proposed development, including the converter station site, landfall site, onshore cable route and all associated construction compounds is located in very rural areas, with low ambient noise levels. These noise levels are summarised in **Table 8.10**, including references to the typical sources of the ambient noise at each location, where known (this information was not available for the surveys included in the AERs for Great Island Power Station).

Sensitive receptors (residences) near the proposed converter station site are shown in **Figure 8.2**. The closest residential receptor is 450 metres from the proposed converter station. The converter station is the only element of the proposed development which will generate noise in operation.

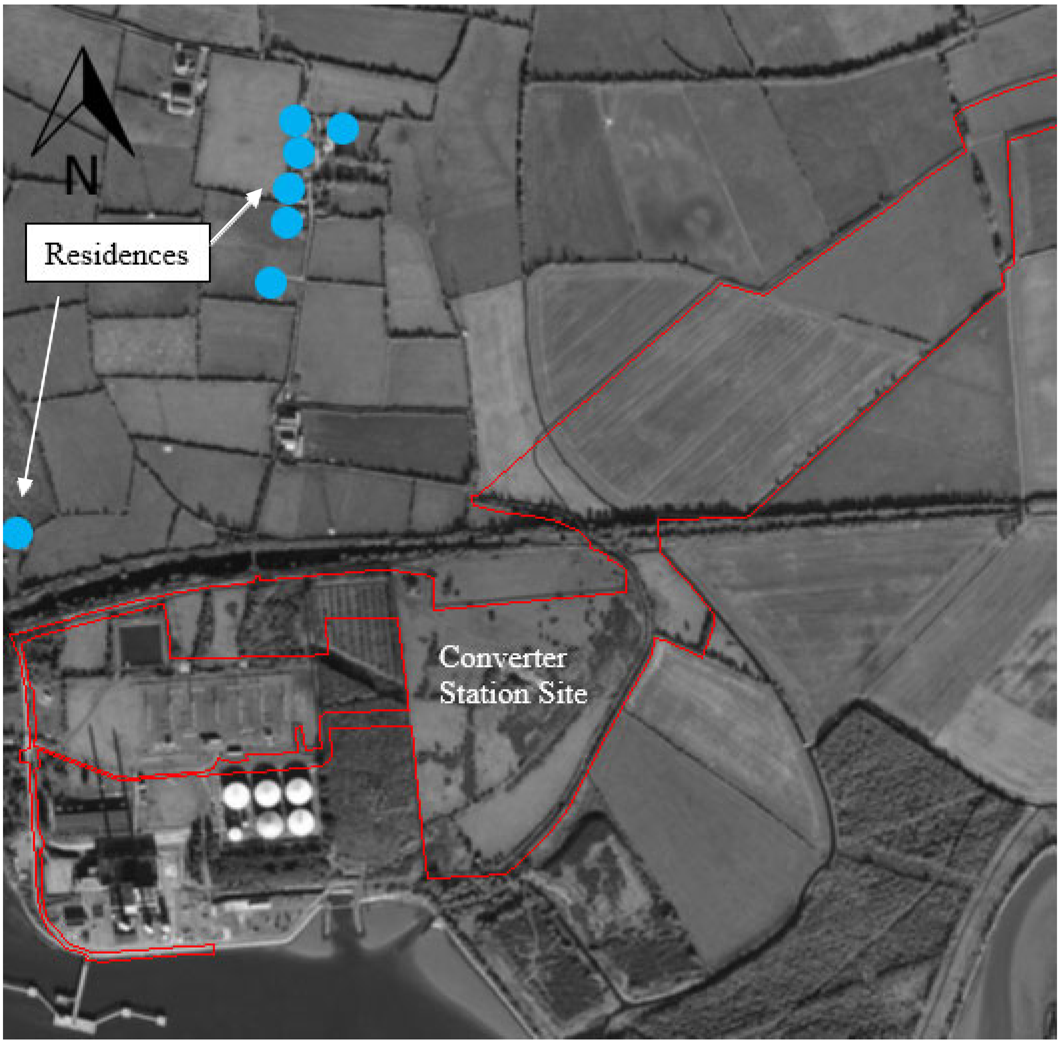


Figure 8.2 Residences near the Converter Station and Tail Station Site | not to scale | background mapping Bing © Microsoft 2020

The study area along the cable route between Great Island and Baginbun Beach is generally sparsely populated, with intermittent ribbon residential development characterising the settlement pattern. Approximately 250 residences are located close to the cable route. The area between Ramsgrange and Baginbun Beach through which the cable route passes is a popular tourist location, as shown in **Figure 8.1**. **Chapter 15** *Population and Human Health* includes further details of the demographic and population characteristics of the study area. The baseline noise environment at the noise survey locations is as outlined in **Table 8.10** below and is considered representative of the overall cable route.

At the proposed horizontal direction drill (HDD) location under the Campile Estuary, noise will be generated by drilling activities, which will be carried out approximately 100 metres from the nearest residence as indicated in **Figure 4.3**. At the landfall site, the closest residence is approximately 150 metres from the planned location of the drilling activity as indicated in **Figure 3.8**.

Table 8.10 Baseline Noise Conditions

Survey Date and Time		Survey Location	L_{Aeq} (dB)	L_{AFmax} (dB)	L_{A10} (dB)	L_{A90} (dB)	Qualitative Description
Day - 30 July 2019	16:56 - 17:56	NML1	38	62	41	32	The dominant noise source at this location was the nearby power station. Other sources of noise included farm animals, trees rustling and birdsong.
	15:37 - 16:37	NML2	41	58	43	35	The dominant noise source at this location was passing local traffic. Other sources of noise included distant traffic, farm animals, trees rustling and birdsong.
	14:12 - 15:16	NML3	47	78	47	39	The dominant noise source at this location was passing local traffic. Other sources of noise included distant traffic, construction work, pedestrians, trees rustling and birdsong.
	12:46 - 13:46	NML4	42	62	46	35	The dominant noise source at this location was passing local traffic. Other sources of noise included distant traffic, pedestrians, trees rustling and birdsong.
Day - 13 November 2018	12:42 - 13:12	NSL1	49	77		39	No information available
	13:12 - 13:42	NSL1	54	81		40	No information available
	13:42 - 14:12	NSL1	52	73		46	No information available
Day - 21 September 2017	08:44 - 09:14	NSL1	53	82		36	No information available
	09:14 - 09:44	NSL1	53	79		36	No information available
	09:44 - 10:14	NSL1	53	78		35	No information available
Day - 30 July 2019	13:58 - 14:28	NSL1	57	86		35	No information available
	14:28 - 14:58	NSL1	58	82		34	No information available
	14:58 - 15:28	NSL1	57	83		38	No information available

Survey Date and Time		Survey Location	L_{Aeq} (dB)	L_{AFmax} (dB)	L_{A10} (dB)	L_{A90} (dB)	Qualitative Description
Evening - 30 July 2019	20:22 - 20:52	NML1	37	59	40	30	The dominant noise source at this location was the nearby power station. Other sources of noise included trees rustling and birdsong.
	21:10 - 21:40	NML2	40	64	42	33	The dominant noise source at this location was passing local traffic. Other sources of noise included distant traffic, farm animals, trees rustling and birdsong.
	22:02 - 22:32	NML3	41	61	44	31	The dominant noise source at this location was passing local traffic. Other sources of noise included distant traffic, trees rustling and birdsong.
	22:54 - 22:59	NML4	37	55	40	33	The dominant noise source at this location was passing local traffic. Other sources of noise included distant traffic, pedestrians, trees rustling and birdsong.
Night - 1 August 2019	05:54 - 06:04	NML1	34	49	38	29	The dominant noise source at this location was the nearby power station. Other sources of noise included farm animals, trees rustling and birdsong.
	06:18 - 06:28	NML2	40	53	44	33	The dominant noise source at this location was passing local traffic. Other sources of noise included distant traffic, farm animals, trees rustling and birdsong.
	NA	NML3	NA	NA	NA	NA	Site was not accessible
	06:49 - 06:59	NML4	36	54	38	32	The dominant noise source at this location was passing local traffic. Other sources of noise included trees rustling and birdsong.
Night - 13 November 2018	23:08 - 23:38	NSL1	44	73		40	No information available
	23:38 - 00:08	NSL1	43	68		40	No information available

Survey Date and Time		Survey Location	L_{Aeq} (dB)	L_{AFmax} (dB)	L_{A10} (dB)	L_{A90} (dB)	Qualitative Description
Night - 22 September 2017	01:48 - 02:18	NSL1	36	55		34	No information available
	02:18 - 02:48	NSL1	39	55		37	No information available
Night - 15 December 2016	00:54 - 01:24	NSL1	39	33[5]		33	No information available
	01:24 - 01:54	NSL1	57[6]	34[7]		34	No information available

Monitoring Locations:

NML1 - Converter Station

NML2 - Campile Estuary

NML3 - Lewistown Compound

NML4 - Baginbun Beach

NSL1 - Bungalow near Great Island Power Station (grey fill indicates that no data was provided in SSE reporting)

[5] This figure appears anomalous in the context of the other recorded noise levels and has been dismissed as a likely typographical error in the record.
[6] This figure appears anomalous in the context of the other recorded noise levels and has been dismissed as a likely typographical error in the record.
[7] This figure appears anomalous in the context of the other recorded noise levels and has been dismissed as a likely typographical error in the record.

8.4 Potential Effects

8.4.1 Do-Nothing Scenario

In the scenario where the proposed development does not proceed as planned, none of the effects as set out in this chapter would occur. Under the 'do nothing' scenario, the existing baseline as presented in **Section 8.3** is likely to persist and no significant effects would arise in the absence of other developments.

8.4.2 Construction Phase

8.4.2.1 Construction Activities, Phasing and Plant

The construction phase of the proposed development will involve the construction of a HVAC cable between the existing Great Island substation and the proposed converter station, the construction of a converter station and associated infrastructure, together with the construction of a 'tail station' adjacent to the proposed converter station, an onshore HVDC underground cable between Great Island and the landfall site near Baginbun Beach, the establishment of contractor compounds at Great Island, in Lewistown, and near Baginbun Beach, and horizontal directional drilling (HDD) activities to construct the cable under the Campile Estuary, and at the landfall site near Baginbun Beach.

The highest noise levels will be generated during the site preparation, excavation and foundation stage at the site of the converter station and tail station. For the cable construction, again the excavation activities will give rise to the highest noise levels, with the joint bay activities also contributing to the predicted noise levels. The operation of the horizontal directional drill at the crossing of the Campile Estuary and at the landfall site will give rise to relatively lower noise levels, but the duration will be greater. There is potential for vibration impacts to occur during the construction phase, associated with vehicle movements and excavation activities.

Given the distances of the most intensive ground works from surrounding dwellings for the cable route excavation and the converter station works, it is not considered that vibration disturbance would occur. The highest vibration generation is likely to result from vibratory roller compaction, which are predicted to be between 0.1 and 0.3mm/s. BS 5228-2 notes that complaints are likely where levels occur above 1.0mm/s PPV at residential properties. The highest level in this range could result in perceptible vibration, but the exposure would be well below the level where there is a likelihood of complaint. Appropriate liaison with residents would be conducted, and given the vibration level of even the highest potential exposure, this is assessed as not significant.

At the converter station site, rock will be excavated using either rock splitting or blasting, or a combination of both techniques. Rock crushing may be required to reuse the excavated material. No works of this nature will be carried out in close proximity to Dunbrody Bridge.

The construction methodology modelled represents the worst-case for rock excavation activities with regard to noise (rock breaker mounted on an excavator). The noise levels associated with blasting will not exceed those predicted for rock-breaking, and specific mitigation measures will be implemented, as set out in **Section 8.5.1** to ensure that adverse effects on the Gas Networks Ireland transmission pipeline are avoided.

It is not possible at this stage to predict the exact equipment that will be chosen by the Contractor(s) and predicted calculations are indicative only and used for the purposes of comparison with the adopted criteria. Nonetheless, the contractor must comply with all relevant limits at all times. Based on the indicative construction programme available, a reasonable worst-case assessment has been undertaken. For the purposes of this assessment, the following construction phases are considered.

- **Cable**

  HDD at the Campile Estuary and the landfall near Baginbun Beach (24/7 operation)

  Cable route excavation including breaking of road surface

  Cable route excavation without breaking of road surface

  Joint Bay Activities

- **Converter Station (and construction compounds)**

  Site preparation

  General site activities, such as vehicle movements

  Building construction

The calculations assume that plant items are operating simultaneously, as outlined in the following sections.

Typically, construction will be from 7am to 7pm, Monday to Friday and 8am to 2pm on Saturday. Civil works to construct the converter station and tail station will take approximately 22 months. **Section 4.2** of **Chapter 4** provides more information on the duration and phasing of the proposed development.

It is anticipated that there will be times due to exceptional circumstances that construction works will be necessary outside of the standard hours (such as for HDD operations). This will be agreed in advance with Wexford County Council and communicated to local residents with an estimation of the timing and duration.

BS 5228: 2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise, sets out typical noise levels for equipment used in the construction of new developments. **Table 8.11** and **8.12** sets out assumed plant items during the construction phase.

Table 8.11: Assumed Construction Plant for Cable Route Excavation, HDD and Joint Bay Activities

Item of Plant	BS 5228-1 data reference	Sound Power Level (dB(A)) (from BS 5228)	% on-time (i.e. proportion of day operating)	Number of plant items
Horizontal Directional Drilling				
Directional Drill (Generator)	C 2-44	106	100	1
Water Pump	C 2-45	93	100	1
Landscaping				
Tractor (Towing trailer)	C 4-75	107	50	1
Tracked Crusher	C 1-14	110	50	1
Breaker Mounted on Excavator	C 1-9	118	50	1
Cable route excavation including breaking of road surface				
Hand-held Circular Saw (Petrol)	C 5-36	115	5	1
Mini Excavator with Hydraulic Breaker	C 5-2	111	10	1
Road Breaker (Hand-held Pneumatic)	C 5-3	110	10	1
Mini Tracked Excavator	C 4-68	93	10	1
Dumper (Idling)	C 4-8	84	40	1
Diesel water pump	C 11-2	99	5	1
Concrete Pump + Cement Mixer Truck (Discharging)	C 4-24	95	10	1
Dump Truck (Tipping Fill)	C 2-30	107	20	1
Telescopic Handler	C 2-35	99	10	1
Diesel Generator	C 4-82	84	100	1
Vibratory Roller	C 5-27	95	10	1
Dump Truck (Tipping Fill)	C 2-30	107	5	1
Cable route excavation without breaking of road surface				
Mini Tracked Excavator	C 4-68	93	10	1
Dumper (Idling)	C 4-8	84	40	1
Diesel water pump	C 11-2	99	5	1
Concrete Pump + Cement Mixer Truck (Discharging)	C 4-24	95	10	1
Dump Truck (Tipping Fill)	C 2-30	107	20	1
Telescopic Handler	C 2-35	99	10	1
Diesel Generator	C 4-82	84	100	1
Joint Bay activities Phase 1				
Hand-held Circular Saw (Petrol)	C 5-36	115	5	1
Mini Excavator with Hydraulic Breaker	C 5-2	111	10	1
Tracked Excavator	C 4-65	99	40	1
Vibratory Plate (Petrol)	C 2-41	108	40	1
Concrete Pump + Cement Mixer Truck (Discharging)	C 4-24	95	20	1
Diesel Generator	C 4-82	84	100	1
Joint Bay activities Phase 2				

Item of Plant	BS 5228-1 data reference	Sound Power Level (dB(A)) (from BS 5228)	% on-time (i.e. proportion of day operating)	Number of plant items
Telescopic Handler	C 2-35	99	10	1
Diesel Generator	C 4-76	89	40	1
Diesel Generator	C 4-82	84	100	1
Joint Bay activities Phase 3				
Diesel Generator	C 4-76	89	100	1
Diesel water pump	C 11-2	99	10	1
Diesel Generator	C 4-82	84	100	1
Joint Bay activities Phase 4				
Concrete Pump + Cement Mixer Truck (Discharging)	C 4-24	95	10	1
Dump Truck (Tipping Fill)	C 2-30	107	40	1
Telescopic Handler	C 2-35	99	10	1
Diesel Generator	C 4-82	84	100	1
Joint Bay activities Phase 5				
Vibratory Roller	C 5-27	95	50	1
Dump Truck (Tipping Fill)	C 2-30	107	20	1
Diesel Generator	C 4-82	84	100	1

Table 8.12: Assumed Construction Plant for the Converter Station and Associated Infrastructure (including construction compounds)

Item of Plant	BS 5228-1 data reference	Sound Power Level (dB(A)) (from BS 5228)	% on-time (i.e. proportion of day operating)	No. of plant items
Wheeled Loader	C.2.26	107	50	2
Mobile Telescopic Crane	C.4.39	105	50	1
Compressor for Hand-held Pneumatic Breaker	C.5.5	93	50	2
Diesel Generator	C.4.76	89	50	2
Large Concrete Mixer	C.4.22	104	50	1
Tractor (Towing trailer)	C 4-75	107	50	1
Tracked Crusher	C 1-14	110	50	1
Breaker Mounted on Excavator	C 1-9	118	50	1
Tracked Excavator	C.2.3	106	50	2
Articulated Dump Truck	C.4.2	106	50	3
Dozer	C.2.12	109	50	1
Roller	C.2.38	101	50	1
Pre-cast Concrete Piling – Hydraulic Hammer	C.3.1	112	50	1
Asphalt Paver (+Tipper Lorry)	C.5.30	103	50	1
Crawler Mounted Rig	C.3.21	107	50	1
Tracked Excavator	C.3.23	96	50	1
Concrete Pump	C.3.25	106	50	1

Table 8.13 shows the results calculated assuming the simultaneous operation of the plant machinery summarised in **Tables 8.11** and **8.12.** The calculations were carried out for two scenarios as follows:

- Cable route construction (including HDD activities and joint bay works)
- Converter station, tail station and associated infrastructure works (including the construction compound works).

Noise levels for cable construction have been predicted based on an assumption that the cable route trenching works will progress at a rate of 50 metres per day. This is a conservative assumption, as the actual rate is likely to be in the range 70m per day to 200m per day, as described in **Chapter 4 Construction Strategy**.

It is also assumed that all relevant works at that location are taking place at the same time to simulate a worst-case scenario. Most of the cable route is on-road, where additional machinery will be required to break and re-surface the road, and this activity has been included in the modelling and assessment.

The final locations of the proposed joint bays have not been determined, so it has been assumed that they will be constructed close to sensitive receptors and located at approximately one-kilometre intervals along the cable route, to ensure a conservative assessment, and that a worst-case scenario has been addressed.

8.4.2.2 Predicted Construction Noise and Vibration Levels

Cable Route Construction

The average daily noise levels at surrounding receptors have been calculated for the worst-case month by considering the individual source noise levels of key noise-generating plant, the numbers of pieces of plant operating for different periods of the day, the distance to the receptors, and any intervening screening.

The worst case month average noise levels are calculated on the basis of the periods and distances of the works moving along the linear route over the month and are assumed to be as follows:

- 2 days works at 5m from the receptor along road;
- 4 days work at 50m from the receptor along road;
- 8 days work at 150m from the receptor along road;
- 14 days work at 350m from the receptor along road.

The results in **Table 8.13** show the logarithmic average of construction noise at a series of setback distances (for the worst case month) from the cable route construction activity. The number of residential properties within these buffer zones are also shown.

This assessment is based on the following assumptions:

- Assumed straight road (in reality the road may curve around some properties and therefore the noise levels will be sustained for longer at a few locations).
- There is no screening between the cable route excavation and noise sensitive receptors.
- All ground between the cable route excavation and the nearest noise sensitive receptors is soft (acoustically absorptive).
- Existing ambient noise levels are assumed to be less than 62.5dB(A), i.e. this would relate to the most sensitive BS 5228 ABC category (category A) for all receptors.
- Assumed 50m per day progress rate of works.

Table 8.13: Construction Noise Levels Associated with Cable Route Excavation

Buffer Zone from Work Area	10m	25m	50m	100m	150m	250m
Number of Properties in Zone	18	96	185	225	259	345
Worst case month Log Average dB(A)	79	73	70	66	64	61

The noise associated with cable route construction will exceed the daytime 65dB$_{LAeq}$ criterion for short periods of time at residences along the route. Noise levels are expected to exceed 65dB for a distance of 150m from the route prior to mitigation. Hence, approximately 250 properties would be potentially subject to significant effects from cable route excavation works (ABC criterion), in the absence of acoustic barriers and the other proposed mitigation measures.

Although the noise impacts for the construction of the cables in the roadway will be temporary and discontinuous, the effects will be **temporary and locally significant** for residences adjacent to the cable route during the daytime. It is expected that the duration of effect would be relatively short, i.e. no more than a few weeks. Mitigation measures that will be implemented to lessen these impacts are set out in **Section 8.5.1**. Routine construction works are not planned for evening and night-time, so no impacts from construction within the roadway are predicted for these periods.

All joint bays have been assumed to be located at the closest point to nearby receptors, to ensure that the worst-case scenario has been considered. At these locations, the effects at the closest receptors are predicted to be **temporary and locally significant**.

Wildlife Receptors

Wildlife receptors in the surrounding area will already be habituated to road traffic noise and the intermittent operation of agricultural machinery. Although construction noise can be louder and more intensive than that typically generated by traffic and agricultural activity, the wildlife species of conservation interest in the vicinity of the proposed works are generally mobile, and likely to respond to temporary disturbance (should it occur) by moving to similar habitats in the wider area. However, the particular sensitivity of the Campile River Estuary crossing has been noted, with the mud flats and surrounding area being of particular value to wintering bird species. To eliminate the potential for adverse noise and vibration effects on these species, no construction works will take place at this location during the months of October to March inclusive.

HDD

HDD will be used to construct the cables at the landfall and under the Campile Estuary. At the Campile Estuary, the HDD works is likely to be carried out in 12-hour shifts.

During the daytime, even in the absence of standard 2.4m high site hoarding, the daytime limits at the nearest sensitive receptor will be complied with. In the evening time, in the absence of site hoarding a moderate temporary negative impact would be experienced, and in the unlikely event that drilling activity were carried out at night-time at the Campile Estuary, significant temporary negative impacts would be experienced at the closest receptor in the absence of site hoarding. **Section 8.5.1** describes the hoarding that will be provided at this location to ensure that the limits at the closest receptor will be complied with.

At the landfall, the HDD works are likely to be continuous (24-hour operation), and in the absence of site hoarding, again slight to significant negative impacts would be experienced at the closest receptor. With the hoarding, daytime and evening limits will be complied with, and there will be slight temporary negative impacts at night time at the closest receptor only.

No significant vibration impacts are envisaged during the construction phase and compliance with the limits outlined in **Table 8.6** will be achieved.

Converter Station, Tail Station, Associated Infrastructure and Contractors' Compounds

For the construction of the converter station and tail station (and associated infrastructure such as construction compounds), results are presented in **Table 8.14** for receptors at distances of 300m, 400m and 700m from the construction site. This assessment has been based on the following conservative assumptions prior to mitigation:

- It was assumed activities take place at the closest point of the construction site to the surrounding receptors.
- All activities associated with constructing the facility occur simultaneously.
- All ground between the construction site and the nearest noise sensitive receptor is soft.
- There is no screening between the construction site and noise sensitive receptors.

Table 8.14 Noise Levels at Given Distances from the Site

Distance to Receptor (m)	Noise Level at Receptor dB(A)
300	64
400	61
700	56

The nearest receptor is 450m from the proposed construction works and contractors' compounds at the converter and tail station, so no exceedances of the 65dB(A) criterion are predicted from this worst-case scenario.

For the contractor's compounds near Baginbun Beach and at Lewistown, the closest activity to a residential receptor will be approximately 100 metres, to the north of the compounds. The construction activity here will be restricted to fencing, site clearance, laying of temporary hard-standing, and these activities in reverse on completion of construction activities. No significant noise or vibration effects are predicted at these locations.

There is likely to be some ground-breaking/rock-breaking as part of the excavation works at the converter station site. Further, piling will also likely be required in this location. The equipment associated with these construction activities has been included in the assessment. Specific mitigation measures have also been committed to in **Section 8.5.1** with regard to the impulsive noise associated with the pre-cast piling activity.

Vibration Effects

In terms of vibration effects, vibratory roller compaction will also be used, generating vibration with a magnitude of between 0.1 and 0.3mm/s. BS 5228-2 notes that complaints are likely where levels occur above 1.0mm/s PPV at residential properties.

Construction Traffic

Chapter 6, **Section 6.5.1** describes the temporary increase in traffic associated with the construction activities, identifying two roads which will be subject to moderate to significant temporary negative effects relating to traffic. It is noted that the large percentage increase in traffic predicted (70-74% on the local road to Great Island, and 17-21% on the R733 North of Horeswood Nurseries) is in the context of existing low traffic volumes on the roads, and that the predicted temporary increase in traffic is within the carrying capacity of the roads.

The predicted temporary increase in traffic will give rise to associated noise and vibration effects at roadside receptors along the identified roads. These are illustrated in **Figure 8.3** below.

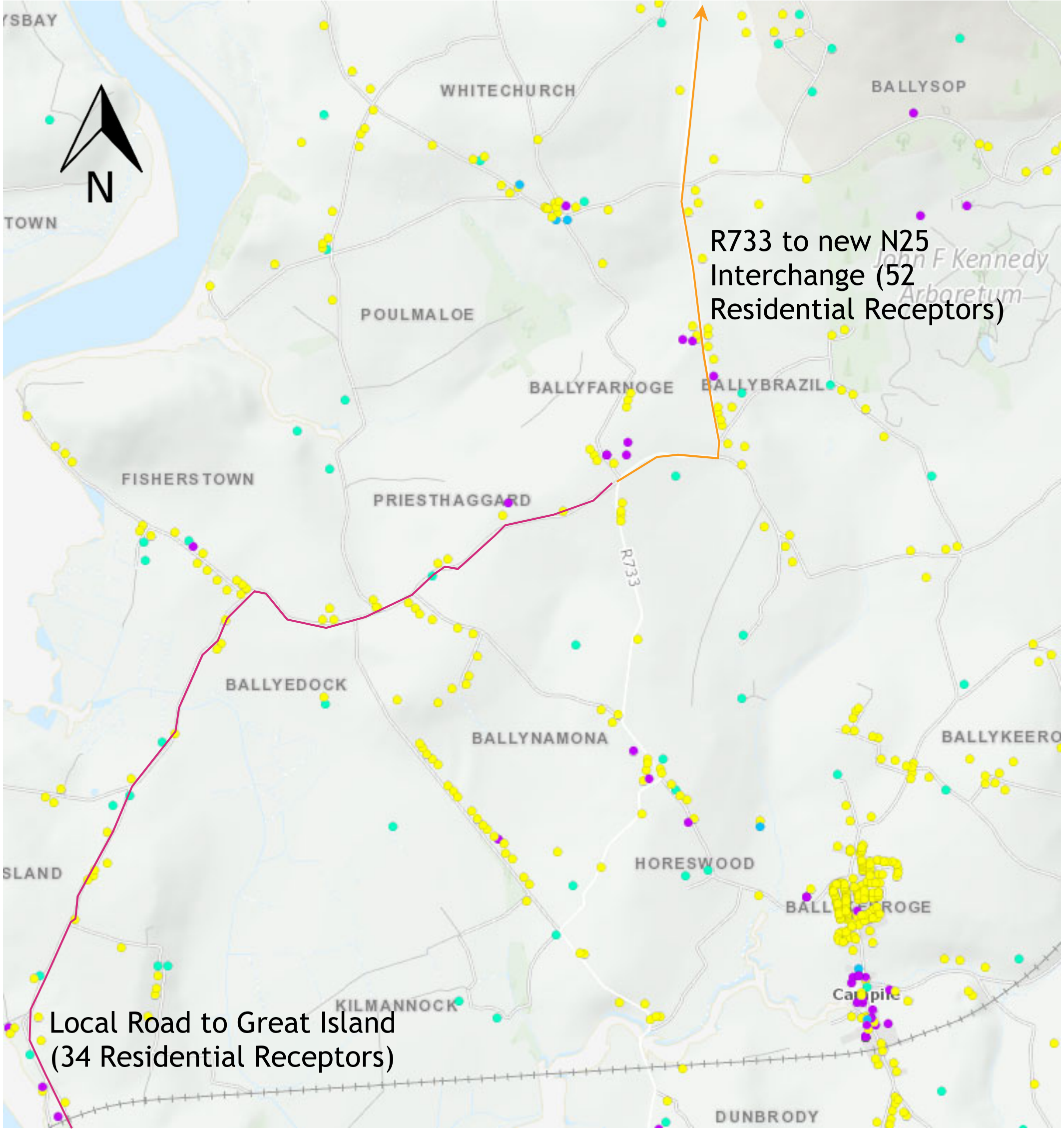


Figure 8.3: Residential Receptors Adjacent to Construction Haul Route | not to scale [source: myplan.ie 2020]

Noise associated with predicted additional heavy goods vehicles movements has been estimated from a reference noise level of 80dBL_{Aeq} at 10m (from BS5228, Table C6 item 21). Although the temporary increase in traffic noise will be noticeable at these locations, particularly at times of peak activity, the total L_{Aeq} noise contribution across the working day from construction vehicles at these receptors is not predicted to the Category A threshold values as set out in **Table 8.1**.

Vibration associated with construction traffic movements is not predicted to exceed the level of 1.0mm/s PPV as set out in **Table 8.6**.

Heavy goods vehicle movements associated with cable route excavation and cable laying would be minimal, and would be negligible in terms of noise and vibration impact.

8.4.3 Operational Phase

8.4.3.1 Cable Installation

The cable will be underground hence there will be no operational noise effects. Occasional maintenance and testing of the cable will not give rise to any significant noise and vibration effects.

8.4.3.2 Converter Station and Tail Station

The converter station and tail station will operate 24-7. Receptors were modelled near the site to the northwest, and also at Cheekpoint across the estuary to the southwest. Modelling was carried out using SoundPLAN – ISO9613-2 Propagation Method, for receptors illustrated in **Figures 8.4, 8.5** and **8.6**.

The following assumptions were made in developing the model:

- Terrain was modelled as flat ground, which is likely to represent a worst-case scenario. Ground areas were input in to the model – soft ground for grass, hard ground for water, etc.
- Addresses of potential sensitive receptor locations were compiled from the myplan.ie website.
- Typical built fabric was assumed with vents, louvres and doors as shown in the associated planning drawings ('Kingspan' panels for the main buildings, or equivalent).

The operation of the plant and equipment listed in **Table 8.15** was modelled.

Table 8.15: Acoustic Characteristics of Modelled Plant and Equipment

Plant equipment	Octave band centre frequency (Hz)									Sound Power Level, Lw (dBA)	Quantity	Height (m)	Environment	% on time
	31	63	125	250	500	1000	2000	4000	8000					
Valve/converter coolers	82	100	95	92	92	88	85	76	66	93*	10	3	outdoor	100
Air conditioning unit	70	75	73	72	74	71	64	61	62	75	2	1.5	outdoor	100
Valve reactor (DC) - [smoothing reactor]	76	76	93	90	89	71	66	70	62	88	2	6	Indoor	100
Valve reactor (AC) - [smoothing reactor]	76	76	93	90	89	71	66	70	62	88	3	6	indoor	100
Converter transformers	78	95	92	91	73	68	72	64	78	90^	3	5	within acoustic enclosure	100
Converter transformer coolers	80	97	93	90	90	85	83	73	80	94*	18	5	outdoor	100
AC harmonic filter reactors	*91*	91	91.6	75	78.3	74.1	50	*50*	*50*	80	3	5	outdoor	100
AC harmonic filter capacitors	*81*	81	81	74	78	*78*	*78*	*50*	*50*	76	3	7	outdoor	100
Auxiliary transformer	63	63	80	77	76	58	53	57	49	75	1	2	outdoor	100
Limb reactor (VSC)	101	101	118	115	114	96	91	95	87	113	1	6	indoor	100

* indicates sound power level for *group* of items, i.e. for the total quantity. The other given levels are *per item*.
^ indicates sound power level for item when inside enclosure, i.e. the noise reduction qualities of the enclosure do *not* need to be calculated.
Values in *blue italics* has been estimated as data missing in these octave bands.

Figure 8.4: Receptors and Potential Receptors to the northwest of the Site | not to scale [mapping: Bing Maps © Microsoft 2020] (note that the nearest occupied residence is Receptor 68) (the worst-case configuration of the converter station was assessed and is indicated in this Figure)

Figure 8.5: Receptors at Cheekpoint to the southwest of the Site | not to scale [mapping: Bing Maps © 2020 Microsoft] (the worst-case configuration of the converter station was assessed and is indicated in this Figure)

Figure 8.6: Receptors at Cheekpoint to the southwest of the Site | not to scale [mapping: Bing Maps © 2020 Microsoft]

Predicted noise levels associated with the operation of the proposed development were generated using ISO9613-2 Propagation Method, using a worst-case option for the layout of equipment on the converter station site, and are summarised in **Table 8.17** and illustrated in **Figure 8.7**.

Table 8.17: Predicted Operational Noise Levels at Identified Receptors

Receptor	Baseline Night-time Noise L_{Aeq}	Predicted L_{Aeq} (24 hour)
3	36-44	35.1
4	36-44	36.7
5	36-44	36.5
16	36-44	32.0
19	36-44	37.1
21	36-44	35.0
33	36-44	33.9
46	36-44	31.6
47	36-44	40.6
48	36-44	41.1
51	36-44	37.1
57	36-44	35.5
59	36-44	40.3
60	36-44	34.0
62	36-44	34.2
68	36-44	39.6
70	36-44	35.4
100	36-44	29.7

Receptor	Baseline Night-time Noise L_{Aeq}	Predicted L_{Aeq} (24 hour)
102	36-44	34.5
105	36-44	30.5
106	36-44	34.4
107	36-44	30.9
108	36-44	33.0
109	36-44	35.0
110	36-44	34.7
111	36-44	34.5
112	36-44	33.9
114	36-44	34.1
115	36-44	34.9
118	36-44	34.6
119	36-44	30.9
124	36-44	34.4
125	36-44	33.3
131	36-44	31.5
132	36-44	33.3
135	36-44	34.0
139	36-44	34.3
140	36-44	34.7
141	36-44	34.3
142	36-44	30.2

Note that the closest occupied sensitive receptor (68) is highlighted, with a predicted noise level of 39.6dB L_{Aeq}. Note that receptors 47, 48 and 59 are not occupied.

With reference to the baseline noise data for that location (including baseline noise data) (night-time values ranging from 36dB(A) to 44dB(A)), and with regard to the impact significance criteria outlined in Table 8.8, the worst-case predicted change in noise levels at this location is 5db(A) and is **long-term slight negative,** but within EPA limits.

The next-closest receptor is number 51, with a predicted noise level of 37.1 L_{Aeq}. The worst-case change in noise levels at this location is **imperceptible** and **negligible**, as are all other occupied modelled receptors.

At all receptors the predicted noise levels are within the EPA guidelines for typical noise limits from licensed industrial facilities. As noted above, these limits are typically used by planning authorities for a wide range of proposed developments which have the potential for generating noise.

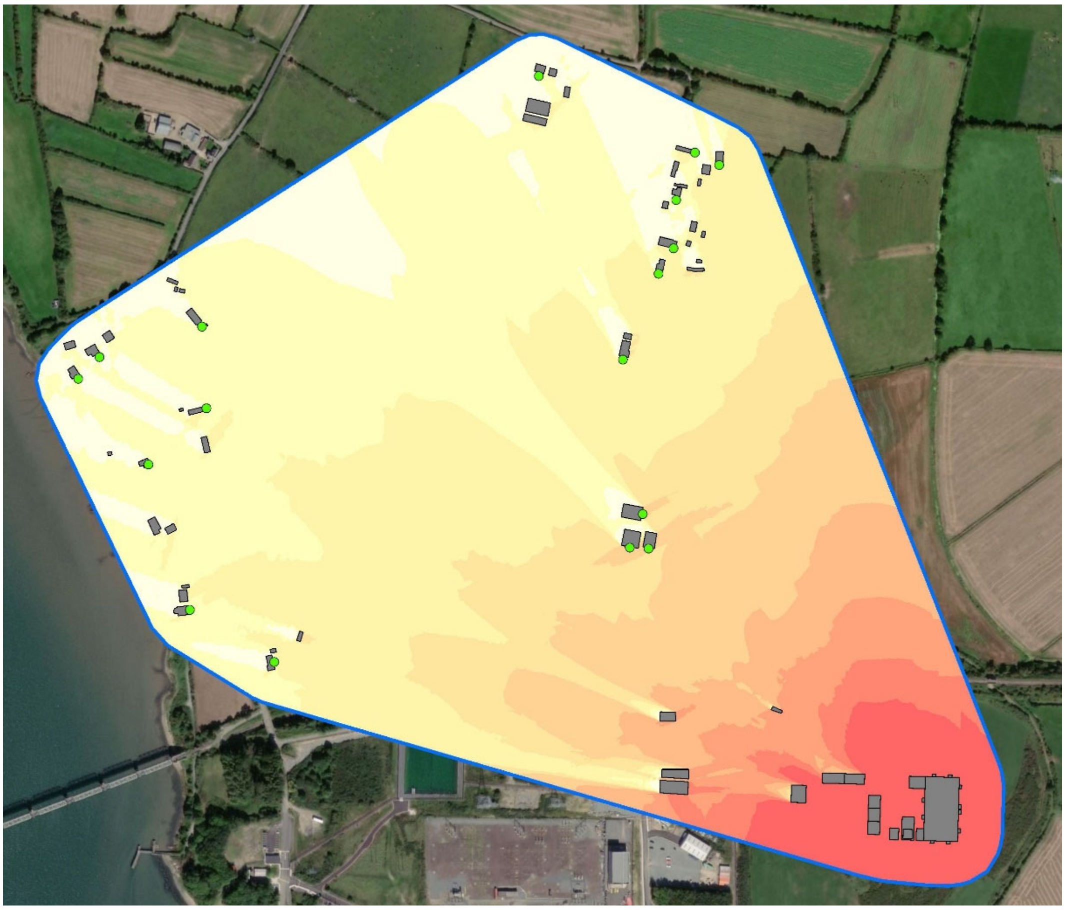
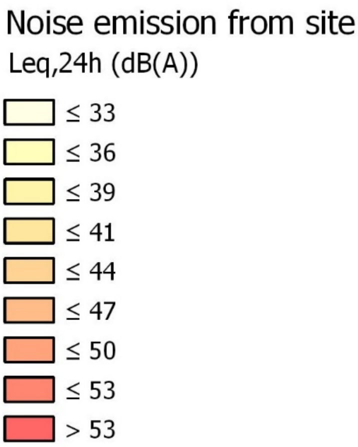


Figure 8.7: Operation Noise Emissions from the Site | not to scale



8.4.4 Decommissioning

As mentioned in **Chapter 3** *Proposed Development*, once the interconnector ceases operation the proposed development will be decommissioned. Equipment and all above ground civil works at the converter station will be removed and the site returned to its previous state. Underground cables will remain in-situ as there would be more of an environmental impact in their removal. Above ground structures will be removed, and their locations reinstated.

Noise and vibration will be generated by the decommissioning activities, as they will be similar to many of the proposed construction activities, albeit less intensive and geographically extensive and for shorter durations. The activity will be focussed at the converter and tail station site, and the impacts will be less than those summarised in **Table 8.14** above.

8.5 Mitigation Measures and Monitoring

8.5.1 Mitigation

8.5.1.1 Construction Phase

This section describes measures that will be taken to minimise the potential for noise and vibration disturbance to the surrounding area which will be employed in the construction phase of the proposed development.

Specific noise abatement measures will be taken to comply with the recommendations of BS 5228-1 and 2:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites: Noise and vibration* (BSI, 2014) and the *European Communities (Noise Emission by Equipment for Use Outdoors) Regulations, 2001* (EC, 2001).

The following specific measures will be implemented during the construction phase to ensure noise and vibration effects are minimised:

- Site representatives shall be appointed to be responsible for matters relating to noise and vibration;
- Equipment will be switched off when not required;
- Internal haul routes will be well maintained;
- Rubber linings shall be used in chutes and dumpers etc. to reduce impact noise;
- Drop heights of materials will be minimised;
- Plant and vehicles will be started sequentially rather than all together;
- Construction plant and activities to be employed on site will be reviewed to ensure that they are the quietest available for the required purpose;
- Generators will be located away from sensitive receivers and will be enclosed;
- Where required, improved sound reduction methods e.g. enclosures shall be used;
- Site equipment will be located away from noise sensitive areas, as much as is feasible;
- Regular and effective maintenance by trained personnel will be carried out to reduce noise and/or vibration from plant and machinery;
- Acoustic barriers with a density of at least 7kg per square metre will be provided around construction works to minimise the effects of noise

generating activities in the vicinity of sensitive locations, including HDD compounds;

- Typically, site activities shall be limited to 7am – 7pm, Monday to Friday; and 7am – 2pm, Saturday. It may also be necessary in exceptional circumstances to undertake some other types of activities outside of normal construction core working hours. Any such working hours outside the normal construction core working hours will be agreed with Wexford County Council. The planning of such works will have regard to nearby sensitive receptors; and
- A Community Liaison Plan will be prepared to provide for effective community liaison to help ensure the smooth running of construction activities and to address any issues that may arise.
- Construction work within 400 metres of the Gas Networks Ireland transmission pipeline will be carried out in accordance with the Code of Practice for Working in the Vicinity of the Gas Transmission Network (included as **Appendix 4.2** to this EIAR). This may include the assessment of potential peak particle velocity effects associated with rock removal activities.
- For the locations where significant temporary noise effects are predicted during cable route excavation, Greenlink Interconnector Ltd and the appointed contractor will develop and implement specific measures to mitigate impacts, potentially including temporary acoustic screening and discretionary pre-condition surveys.
- The use of vibratory roller compactors will be in 'static' mode only, for compaction activities within 50m of properties.
- To minimise the impulsive noise and vibration associated with the driving of pre-cast piles, the following measures will be taken as required, to meet the established noise and vibration thresholds: acoustic screen for hammer head and top of pile and the use of a resilient pad (dolly) between the pile and the hammer head.

8.5.1.2 Operational Phase

The key operational mitigations are the enclosure of key noise-emitting equipment. This includes acoustic enclosures for transformers, and the placing of particular items of plant at the converter station within buildings, thereby already limiting noise breakout to the atmosphere.

8.5.1.3 Decommissioning Phase

The mitigation measures, described above for the construction phase, updated to reflect best practice at the time, will be implemented for the decommissioning phase where required.

8.5.2 Monitoring

8.5.2.1 Construction Phase

Noise and vibration monitoring will be carried out at sensitive receptors nearby the working areas during the construction phase to demonstrate the effectiveness of the mitigation measures and compliance with the limit values outlined in **Table 8.1**. If exceedances are recorded, alternative construction methodologies will be proposed to ensure limits are complied with.

Vibration monitoring will take place at the nearest sensitive receptors to the site during the construction phase to confirm that the limits outlined in **Table 8.2** are being complied with.

8.5.2.2 Operational Phase

No monitoring is proposed during the operational phase of the proposed development.

8.5.2.3 Decommissioning Phase

The monitoring measures, described above for the construction phase, updated to reflect best practice at the time, will be implemented for the decommissioning phase if required.

8.6 Residual Effects

8.6.1 Construction Phase

There will be temporary and locally significant noise effects at residences located adjacent to the cable route. At any given location these effects will be of short duration, and mitigation measures outlined above will be implemented to ensure that the adverse effects are minimised. No significant vibration effects are predicted associated with the cable route construction. There will be no significant residual noise or vibration effects arising from the construction works at the site of the converter station and tail station.

8.6.2 Operational Phase

A noise assessment of the operational phase effects has shown that the relevant noise limits are predicted to be complied with at all sensitive receptors near the proposed development. No significant residual negative noise and vibration effects are envisaged during the operational phase.

8.6.3 Decommissioning

Following the implementation of the mitigation measures committed to in this chapter, updated as required to reflect current best practice, no significant negative residual noise and vibration effects associated with decommissioning are predicted.

8.7 Cumulative and Transboundary Effects

8.7.1 Cumulative Effects

The proposed development forms part of the Greenlink project, which also includes offshore elements, and works in the United Kingdom. The only potential for cumulative or interactive effects with the wider project occur at the landfall site near Baginbun Beach. The potential effects at this location have been fully documented in **Chapter 18** *Cumulative, Transboundary and Interactive Effects*.

The proposed development may also give rise to cumulative effects with regard to other proposed developments, either consented or currently under construction. Two projects have been identified which may give rise to cumulative effects –

- Great Island – Kilkenny 110kV Line Uprate Project
- Great Island Energy Storage System.

The uprate project has sufficient physical separation from the site of the proposed development to reduce the potential for cumulative noise and vibration effects to a negligible level.

If the construction of the energy storage system is concurrent with the bulk excavation works on the site of the converter there is potential for cumulative effects, as the sites are located adjacent to each other. Should this situation arise, noisy construction activities will be planned and phased, in consultation with the construction management team for the energy storage system project, to ensure that the relevant noise limits are achieved as set out in this chapter.

No other proposed developments have been identified which could have cumulative noise and vibration effects.

8.7.2 Transboundary Effects

Considering the nature and location of the proposed development as described in **Chapter 3** and **Chapter 4** no transboundary noise or vibration effects are predicted.

8.8 Impact Assessment Summary

Receptor	Potential Effects	Mitigation	Monitoring	Residual Effects
All Noise and Vibration Receptors	Noise and vibration from construction processes associated with the cable construction	Specific noise abatement measures will be taken to comply with the recommendations of BS 5228-1 and 2:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites: Noise and vibration* (BSI, 2014) and the *European Communities (Noise Emission by Equipment for Use Outdoors) Regulations, 2001* (EC, 2001). The following specific measures will be implemented during the construction phase to ensure noise and vibration effects are minimised: • Site representatives shall be appointed to be responsible for matters relating to noise and vibration; • Equipment will be switched off when not required; • Internal haul routes will be well maintained; • Rubber linings shall be used in chutes and dumpers etc. to reduce impact noise; • Drop heights of materials will be minimised;	• Noise and vibration monitoring will be carried out at sensitive receptors nearby the working areas during the construction phase to demonstrate the effectiveness of the mitigation measures and compliance with the limit values. If exceedances are recorded, alternative construction methodologies will be proposed to ensure limits are complied with.	Temporary significant noise effects for receptors adjacent to the cable route

		• Plant and vehicles will be started sequentially rather than all together; • Construction plant and activities to be employed on site will be reviewed to ensure that they are the quietest available for the required purpose; • Generators will be located away from sensitive receivers and will be enclosed; • Where required, improved sound reduction methods e.g. enclosures shall be used; • Site equipment will be located away from noise sensitive areas, as much as is feasible; • Regular and effective maintenance by trained personnel will be carried out to reduce noise and/or vibration from plant and machinery; • Acoustic barriers will be provided around construction works to minimise the effects of noise and vibration generating activities in the vicinity of sensitive locations; • Typically, site activities will be limited to 7am - 7pm, Monday to Friday; and 7am – 2pm, Saturday. It may also be necessary in exceptional circumstances to undertake some other types of activities outside of normal construction core working hours. Any such working hours outside the normal construction core working hours will be agreed with Wexford County Council. The planning		

		of such works will have regard to nearby sensitive receptors; and • A Community Liaison Plan shall be prepared to provide for effective community liaison to help ensure the smooth running of construction activities and to address any issues that may arise.		
All Noise and Vibration Receptors	Noise and vibration from construction processes associated with the construction of the converter station and the tail station, and temporary contractors' compounds.	Greenlink Interconnector Ltd will ensure that the following specific noise abatement measures are taken to comply with the recommendations of BS 5228-1 and 2:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites: Noise and vibration* (BSI, 2014) and the *European Communities (Noise Emission by Equipment for Use Outdoors) Regulations, 2001* (EC, 2001). The following specific measures will be implemented during the construction phase to ensure noise and vibration effects are minimised: • Site representatives shall be appointed to be responsible for matters relating to noise and vibration; • Unnecessary revving of engines will be avoided and equipment will be switched off when not required; • Internal haul routes will be well maintained; • Rubber linings shall be used in chutes and dumpers etc. to reduce impact noise;	Noise and vibration monitoring will be carried out at sensitive receptors nearby the working areas during the construction phase to monitor the effectiveness of the mitigation measures and compliance with the limit values. If exceedances are recorded, alternative construction methodologies will be proposed to ensure limits are complied with.	No significant effects

		• Drop heights of materials will be minimised; • Plant and vehicles will be started sequentially rather than all together; • Construction plant and activities to be employed on site will be reviewed to ensure that they are the quietest available for the required purpose; • Generators will be located away from sensitive receivers and will be enclosed; • Where required, improved sound reduction methods e.g. enclosures shall be used; • Site equipment will be located away from noise sensitive areas, as much as is feasible; • Regular and effective maintenance by trained personnel will be carried out to reduce noise and/or vibration from plant and machinery; • Acoustic barriers will be provided around construction works to minimise the effects of noise and vibration generating activities in the vicinity of sensitive locations; • Typically, site activities will be limited to 7am - 7pm, Monday to Friday; and 7am - 2pm, Saturday. It may also be necessary in exceptional circumstances to undertake some other types of activities outside of normal construction core working hours. Any such working hours outside the normal construction core working hours will be		

		agreed with Wexford County Council. The planning of such works will have regard to nearby sensitive receptors; • A Community Liaison Plan will be prepared to provide for effective community liaison to help ensure the smooth running of construction activities and to address any issues that may arise. • Construction work within 400 metres of the Gas Networks Ireland transmission pipeline will be carried out in accordance with the Code of Practice for Working in the Vicinity of the Gas Transmission Network (included as **Appendix 4.2** to this EIAR). This may include the assessment of potential peak particle velocity effects associated with rock removal activities. • For the locations where significant temporary noise effects are predicted during cable route excavation, Greenlink Interconnector Ltd and the appointed contractor will develop and implement specific measures to mitigate impacts, potentially including temporary acoustic screening and discretionary pre-condition surveys. • The use of vibratory roller compactors will be in ‘static’ mode only, for compaction activities within 50m of properties. • To minimise the impulsive noise and vibration associated with the driving of pre-cast piles, the		

		following measures will be taken as required, to meet the established noise and vibration thresholds: acoustic screen for hammer head and top of pile and the use of a resilient pad (dolly) between the pile and the hammer head.		
All Noise and Vibration Receptors	Operation of the Proposed Development	The key operational mitigations are the enclosure of key noise-emitting equipment. This includes acoustic enclosures for transformers, and the placing of particular items of plant at the converter station within buildings, thereby already limiting noise breakout to the atmosphere.	None	Within EPA limits, with a slight to moderate negative effect at the closest receptor only.

8.9 Conclusion

The proposed development will give rise to temporary noise effects at construction stage, particularly associated with trench excavation activities. The duration of these effects at any one location will be in the order of weeks, as the construction of the cable is a linear and sequential process along the cable route. No significant negative noise and vibration effects are predicted relating to the construction of the converter station, tail station or contractors' compounds.

The operation of the proposed development is predicted to comply with industry-standard EPA guidelines for industrial developments, with a slight to moderate negative effect predicted at one receptor, closest to the converter station site, based on comparison with the lowest levels of background noise recorded at that location.

Following the implementation of the mitigation measures committed to in this chapter, updated as required to reflect current best practice, no significant negative residual noise and vibration effects associated with decommissioning are predicted.

8.10 References

British Standards Institution (BSI) (2014) *BS 5228-1 and 2:2009+A1:2014. Code of practice for noise and vibration control on construction and open sites. Noise and Vibration.*

EPA (2016) *Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4).*

European Communities (EC) (2001) *European Communities (Noise Emission by Equipment for Use Outdoors) Regulations, 2001.*

International Electrotechnical Commission (IEC), 2002. *IEC 61672-1: Electroacoustics – Sound Level Meters – Part 1: Specifications*. IEC, Geneva, Switzerland.

ISO (2007) ISO *1996-2: Acoustics – Description, measurement and assessment of environmental noise - Part 2: Determination of environmental noise levels*. ISO, Geneva, Switzerland (2nd edition).

Transport Infrastructure Ireland (TII, formerly the NRA) (2014) *Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes.*

TII (2004) *Guidelines for the Treatment of Noise and Vibration in National Roads Schemes.*

SSE (2017, 2018, 2019) *Annual Environmental* Reports (viewed online at www.epa.ie on 04 December 2019 at 11:00)

Appendix 7: *Chapter 13 Water and Hydrology* from the Environmental Impact Assessment Report

Contents

13 Water and Hydrology

13.1 Introduction

This chapter describes the likely significant effects of the proposed development in relation to surface water, water quality, the existing hydrological regime and flood risk, both during the construction, operational and the decommissioning phases, where relevant. Mitigation measures are also detailed that minimise effects, where required.

Groundwater features of relevance and hydrogeology have been considered separately in **Chapter 14**.

This chapter has been prepared by Alan Leen of Arup. A description of the authors' qualifications and experience is presented in **Appendix 1.1**.

The proposed development comprises the following permanent and temporary elements:

The proposed development (encompassing the onshore elements in Ireland only) will comprise:

- **Landfall Compound** – a temporary landfall compound at Baginbun, where the high voltage direct current (HVDC) cable will be installed underground, below the beach and cliff at Baginbun Beach, by horizontal directional drilling (HDD);
- **HVDC Cables** – two HVDC electricity cables with a nominal capacity of 500 megawatts (MW), installed underground from the landfall at Baginbun to the converter station, including jointing bays and ground level marker posts at intervals along the route;
- **Converter Station** – a converter station situated close to the existing Eirgrid 220kV Great Island substation in Wexford;
- **Tail Station -** a 220kV Loughtown substation located beside the converter station. The Loughtown tail station connects the HVAC 220kV cable into the 220kV grid via the existing Eirgrid Great Island substation;
- **MV Substation** – an ESB MV substation will be located outside the converter station and tail station perimeter fences but within the landholding. This substation will provide the MV and LV connections required for the development;
- **Converter Station Construction Compound -** temporary compound for the construction of the converter station and tail station at Great Island;
- **Cable Contractor Compounds** – three temporary cable contractor compounds will be required (i) at the landfall site close to Baginbun Beach (ii) at the proposed converter station and (iii) one along the onshore route in the townland of Lewistown;
- **HDD Compounds** – temporary HDD contractor compounds are required. One will be located close to the cable contractor compound at Baginbun Beach

with another HDD compound located at either side of the Campile River Estuary crossing;

- **High Voltage Alternating Current (HVAC) Cables** – one 220 kV HVAC electricity cable circuit consisting of three cables, installed underground connecting the converter station via the Loughtown tail station to the existing EirGrid Great Island substation;
- **Fibre Optic Cables** – fibre optic cables for operation and control purposes, laid underground with the HVDC and HVAC cables;
- **Community Gain Roadside Car Parking near Baginbun Beach** – in consultation with Wexford County Council, circa 54 roadside car parking spaces will be constructed; and
- **Community Gain in Ramsgrange Village** – in consultation with Wexford County Council, extension to existing footpaths, four new street lights and a speed activated sign at Ramsgrange.

A detailed description of the proposed development, including design, operation and decommissioning of the proposed development are described in **Chapter 3** whilst **Chapter 4** provides an outline of the general activities associated with the construction of the proposed development.

13.2 Assessment Methodology

A detailed consultation and scoping process was completed to inform the preparation of this EIAR. This is documented in **Chapter 1**, and **Appendices 1.2** and **1.3**.

13.2.1 General

The following section outlines the legislation and guidelines considered, and the adopted methodology for preparing this chapter and undertaking the hydrology assessment.

13.2.2 Guidance and Legislation

Water resource management in Ireland is dealt with in the following key pieces of legislation which were taken into consideration in this assessment:

- The EU Water Framework Directive (WFD), 2000/60/EC;
- The Groundwater Directive, 2006/118/EC;
- European Communities (Water Policy) Regulations 2014 (S.I. No. 350 of 2014);
- European Communities Environmental Objectives (Groundwater) Regulations 2016 (S.I. No. 366 of 2016);
- European Communities Environmental Objectives (Surface Water) Regulations 2015 (S.I. No. 386 of 2015);
- European Union (Surface Water) (Amendment) Regulations 2019 (S.I. No. 77/2019);

- European Communities (Drinking Water) Regulations 2014 (S.I. No. 122 of 2014);
- European Union (Drinking Water) (Amendment) Regulations 2017 (S.I. No. 464/2017);
- European Communities (Quality of Salmonid Waters) Regulations 1988 (S.I. No. 293 of 1988);
- Water Services Acts (2007 – 2014);
- The EU Floods Directive, 2007/60/EC.
- European Communities (Assessment and Management of Flood Risks) Regulations 2010 (S.I. No. 122/2010)
- Wexford County Development Plan 2013 – 2019;
- Wexford County Development Plan 2013 – 2019 Strategic Flood Risk Assessment;

The following guidance documents were adhered to in the preparation of this chapter:

- Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA, 2017)
- Environmental Impact Assessment of Projects – Guidance on the Preparation of the Environmental Impact Assessment Report (European Commission, 2017)
- NRA (2009) –Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes
- IFI (2016) – Guidelines on Protection of Fisheries during Construction works in and adjacent to waters
- OPW and Department of Environment, Heritage and Local Government (2009) – The Planning System and Flood Risk Management; Guidelines for Planning Authorities

13.2.3 Impact Assessment Methodology

The existing environment of the site was analysed using data collected from a desk study, following the statutory guidance summarised above. The relevant site information has been derived from several different sources, including:

- Online aerial photography available from Ordnance Survey Ireland (OSI) (www.geohive.ie), Bing and Google Maps.
- Environmental Protection Agency Envision Mapping website (https://gis.epa.ie/EPAMaps/)
- Informar Interactive mapping (www.infomar.ie)
- South Eastern River Basin Management Plan 2009-2015
- National Flood Hazard Mapping, OPW (www.floodinfo.ie);
- Geological maps, Geological Survey of Ireland (GSI) (www.gsi.ie);
- Water Features, Rivers and Streams, EPA (gis.epa.ie/Envision);
- Flood history of the site from the OPW National Flood Hazard Mapping website (www.floodmaps.ie);

- Catchment Flood Risk Assessment and Management (CFRAM) Mapping produced by the OPW (map.opw.ie/floodplans);
- Preliminary Flood Risk Assessment (PFRA) Mapping produced by the OPW (www.myplan.ie)
- Predicted extreme water levels and flood extent maps from the Irish Coastal Protection Strategy Study (ICPSS);
- Site Geological and hydrogeological data from the Geological Survey of Ireland website (www.gsi.ie);
- Aerial photography and mapping from Bing Maps and Google Maps.

Potential effects on hydrology, flooding and water quality were then evaluated in the context of the baseline environment, having regard to the relevant EPA guidance for the preparation of EIARs, as set out in **Section 13.2.2** above. The issue of flooding was not raised during the public consultation for the project.

The baseline environment is described in **Section 13.3**, followed by a description of the characteristics of the proposed development in **Section 13.4**. Potential environmental effects at each stage of the projects are then identified in **Section 13.5**, followed by a summary of the mitigation and monitoring measures that will be implemented in **Section 13.6**.

With the implementation of the mitigation measures, the residual effects of the proposed development are set out in **Section 13.7**, followed by an assessment of cumulative and transboundary effects. The predicted impacts are then summarised in **Section 13.9**.

Note that a separate Flood Risk Assessment (FRA) report has been prepared and is included as **Appendix 13.1** to this EIAR. The FRA has been prepared in accordance Guidelines for Planning Authorities on 'The Planning System and Flood Risk Management' published in November 2009, jointly by the Office of Public Works (OPW) and the then Department of Environment, Heritage and Local Government (DEHLG). The main findings from the FRA report are included in the text of this chapter.

13.3 Baseline Environment

Site Location and Setting

The site was visited on a number of occasions by EIAR team members, reviewing the watercourses and hydrology features across the extent of the proposed development. Most of the site is roadway, with areas where the cable route and the permanent structures are constructed in farmland. No likely change to this baseline environment was identified in the absence of the proposed development.

The proposed development is located in County Wexford and stretches approximately 23km from Baginbun Beach to Great Island. The proposed development is located within two catchment areas; Ballyteigue-Bannon catchment (Code:13) and the Barrow catchment (Code: 14). The proposed landfall site, Baginbun Beach, is surrounded by the Celtic Sea and the proposed converter station site is located close to the River Suir / Barrow Estuary. Several stream and rivers cross the onshore cable route.

This section of the report provides relevant information with regards to the regional water environment in terms of the catchments present, water quality status and flood risk.

Surface Water Quality

EPA Maps (EPA, 2018) identify that the Newtown stream (also referred-to as Kilmannock Stream) is located close to the eastern and southern boundaries of the converter station site. The Barrow and Campile Estuaries are also located c. 250m east and south of the converter station site respectively. These converge and discharge to Waterford Harbour.

No streams or rivers are located in close vicinity to the landfall site at Baginbun Beach, which is located at the land-marine interface with the Celtic Sea.

Given its linear nature, several streams and rivers cross the onshore cable route in Ireland between the converter station site and the landfall site. The largest rivers crossed by the cable route are the Curraghmore River and the Campile River. **Table 13.1** lists the watercourses crossed by the proposed onshore cable. The locations of these watercourses are indicated in **Figure 13.1**.

Table 13.1 Watercourses crossed by the proposed cable route

EPA Name	Alternative Name	Nature of Proposed Cable Crossing
Newtown 14	Kilmannock Stream	Open cut
Campile	N/A	Horizontal Directional Drill
Saltmills	N/A	Within existing bridge
Ballyhack 13	N/A	Within existing bridge
Clonsharragh	N/A	Within existing bridge
Curraghmore 13	N/A	Within existing bridge
Graigue Little	N/A	Within existing bridge
Graigue_Great	N/A	Within existing bridge

There is adequate cover / depth at each of the crossings where it is proposed to construct the cable within the existing bridge structures.

No surface water Q values[1] for the watercourses near the proposed development were available from the EPA website. Under WFD categorisation, the watercourses are generally categorised as “review”. As there is no planned intervention in the watercourses (apart from the Kilmannock Stream), it was not necessary to establish further details on existing water quality.

[1] The EPA scheme of Biotic Indices or Quality (Q) Values was developed to determine the status of organic pollution in Irish rivers by assessing the occurrence of macroinvertebrate taxa of varying sensitivity to pollution.

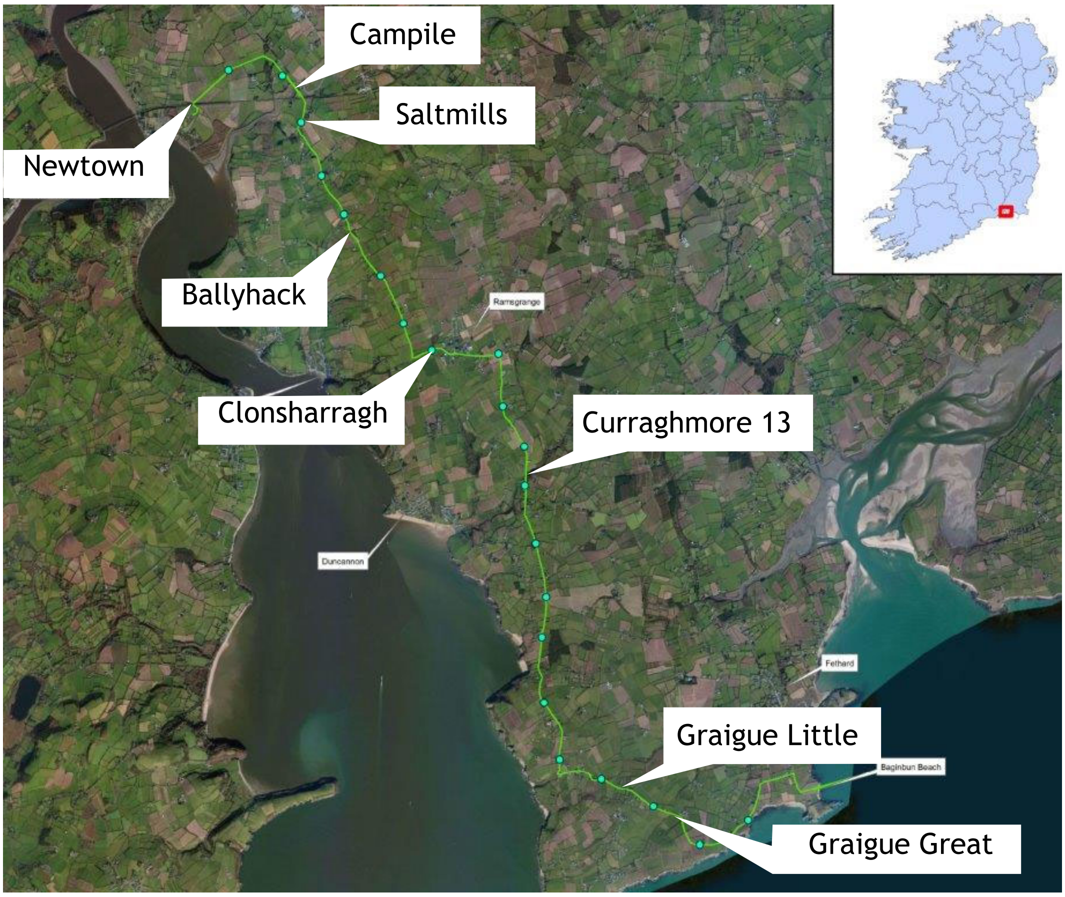


Figure 13.1 Watercourses Crossed by the Proposed Cable Route | mapping: Bing Maps © Microsoft 2020 | not to scale

Transitional Water Quality

The proposed converter station is located adjacent to the Barrow- Suir- Nore estuary, which is classified as a transitional water body. The proposed cable route traverses the Campile River estuary, which is part of the same water body. The ecological value and sensitivity of the estuary is addressed in **Chapter 9** *Biodiversity* and also the **Natura Impact Statement** for the proposed development.

The Barrow- Suir- Nore estuary covers an area of approximately 28km^2 and is situated where the Barrow, Suir and Nore rivers enter the sea at Waterford Harbour. The Barrow- Suir- Nore estuary is located within the River Barrow and Nore SAC (Site Code: 002162), which is a designated Natura 2000 site as it supports many annexed habitats and Annex II animal species.

The EPA has assigned an “intermediate” water quality status to the Barrow Suir Nore estuary, and it is classified as “not at risk” downstream of the converter station site (including the Campile River Estuary).

The Transitional Waterbody Water Framework Directive[2] Status 2013-2018 is shown in **Table 13.2**.

[2] EU Water Framework Directive (2000/60/EC). The overall aim is the attainment of good status in waterbodies that are of lesser status at present and retaining good status or better where such status exists.

Table 13.2 Barrow Suir Nore Estuary Transitional Water Quality Status 2013-2018

Criterion	Status
Status	Moderate
Bio_Status	Good
Chemical_SW_Status	Good
Dissolved_Oxygen_Saturation	Moderate
Fish_Status	Good
General_Conditions	Moderate
Hydromorphological_Cond	Good
Invertebrate_Status	High
Nutrient_Conditions	Moderate
Other_Nutrient_Conditions	Moderate
Other_Oxygenation_Conditions	Good
Oxygenation_Conditions	Moderate
Phytoplankton_Status	Good
Specific_Pollutant_Conditions	Pass
Supporting_Chemistry_Conditions	Moderate

Flood Risk

The FRA report (**Appendix 13.1**) notes that there are some recorded flood events in the vicinity of the proposed development. Records of historic fluvial and tidal floods obtained from the OPW National Flood Hazard Mapping website, indicated that 5no past flood events have been recorded within 1.5km of the proposed development, of which 4no. records relate to the same flood event on February 3rd, 2014. The permanent above-ground elements of the project (converter station and tail station) are outside the areas of historic flood.

Predictive flood risk mapping[3] indicates areas of fluvial and/or tidal flood risk associated with the various watercourse crossings along the cable route.

It is notable that the Kilmannock Stream (Newtown Stream) lies within a "Drainage District" (DD). Drainage Districts were carried out by the Commissioners of Public Works under a number of drainage and navigation acts from 1842 to the 1930s to improve land for agriculture and to mitigate flooding. The Kilmannock DD is defended from coastal inundation by two networks of embankments:

- Approximately 2.4km long embankment along the bank of the Campile Estuary and the Barrow/Suir Estuary to the south and east of the proposed converter station site,

[3] Ballyteigue - Bannow Catchment Flood Risk Management Plan (FRMP);
OPW: National Flood Hazard Mapping and Preliminary Flood Risk Assessment (PFRA)

- Approximately 0.5km long concrete flood defence wall along the L4033 road in the townlands of Great Island and Ballyedock, 2km north of the converter station site.

The proposed converter station adjoins the Kilmannock DD, and the onshore cable passes through the Kilmannock DD over approximately 800 metres length. The access road to the converter station also passes through the drainage district over a circa 500m length. The converter and tail station site, and the landfall site are not at risk of flooding.

13.4 Characteristics of Proposed Development

A description of the proposed development is provided in **Chapter 3** of this EIAR *Proposed Development*, and construction activities are described in **Chapter 4**.

13.5 Potential Effects

13.5.1 Do-Nothing Scenario

The current baseline as described in **Section 13.3** would represent the 'Do Nothing Scenario' as required under the EC Guidance. A conservative approach would be to assume no major changes to the baseline condition of the various working areas over time. No potential developments or environmental features have been identified which are likely to lead to further pressure on the baseline over time.

13.5.2 Construction Phase

The potential water quality and flood risk impacts during the construction phase are presented in this section. Construction methodologies for the various elements of the proposed development is presented in **Chapter 4** *Construction Strategy*.

There are numerous substances on construction sites that are potential pollutants to surface water if not managed correctly and may result in short term significant negative effects. Potential pollutants are fuels, lubricants, cement, mortar, silt and soils. The introduction of excessive suspended solids in a water column may result in interference with fish navigation and feeding, while also affecting populations of aquatic invertebrates, on which the fish diet is based. When excess amount of silt is deposited it can affect bottom-dwelling aquatic invertebrates and damage nursery habitat for young fish.

The identified potential effects on surface water during the construction phase (based on previous relevant experience of similar projects in similar contexts) include the following:

- There is the potential for silt-laden surface run-off during site preparation, site clearance and construction of site access roads. The potential for this silt laden surface run–off is likely to continue through the construction phase of the works, and until the ground has been completely consolidated;

- The washing of construction vehicles and equipment may pose a pollution risk to watercourses in the area if undertaken in inappropriate locations. Spillages of fuel and oil and concrete / cement run-off are a potential short term significant negative effect, from the use of vehicles and plant on the construction sites.
- Excavations at the converter stations site, landfall site and trench excavation for the onshore cable may require temporary dewatering at some locations, which has the potential to generate runoff containing silt/sediment.
- Silt laden run-off from the storage of excavated material may present a pollution risk to watercourses
- It is intended that the crossing of the Kilmannock Stream will be by mini-HDD, and in the unlikely event of open-cut trench crossing of the stream, which may incorporate temporary overpumping (subject to the approval of Inland Fisheries Ireland, as required) there is the potential to release silt into the watercourse and result in scour and increased velocities in fishery sensitive streams.
- The proposed horizontal directional drill across the Campile estuary has the potential to generate runoff containing silt/sediment onto the adjoining land and/or into the estuary.
- The proposed road-side carparking near Baginbun Beach includes the widening of the existing roadway. Stormwater run-off will continue to naturally infiltrate on both sides of the road in accordance with Wexford County Council's requirements.
- Bentonite drilling fluid is composed of approximately 30kg of bentonite clay, a natural occurring clay, per 1m^3 of fresh water. Depending on ground conditions, polymer additives may be added. The polymer additives (e.g. polyacrylamide (PHPA) and polyanionic cellulose (PAC)) are organic, usually starch or sugar based. Polymers can be used as a drilling fluid themselves, instead of bentonite, however they are not as effective as bentonite.
- The environmental risk from bentonite is that in freshwater environments they are not readily dispersed and, having a higher specific gravity than water, cover the bottom of the watercourse, smothering benthic flora and breeding sites for fauna. In saltwater environments the bentonite drilling fluid is quickly degraded by to ionic exchange between the salts in the seawater and the bentonite clays in the fluid. The bentonite flocculates and is dispersed by currents and wave action with turbidity (discolouration) the only noticeable effect.
- Polymer drilling fluids are biodegradable so for most environments they are acceptable. However, they are not recommended where there is a risk of dispersal in artesian water, particularly if the aquifer is used for potable water. When the starches and sugars decay or are broken down by microbes they can affect the water quality.
- For the Campile Estuary, if fluid was lost it would be in the order of 1-5m^3 which would have a clay content of 30-150kg. The saltwater in the estuary would flocculate the bentonite fluid and the clay content would initially be

in suspension before settling. Bentonite clay is inert. It used because of its swelling properties in water, however when it contacts seawater, ionic exchange removes its capacity and it is equivalent in properties to the silt and clay that forms the bed and banks of the Campile Estuary.

All of the above would be likely short term significant negative effects.

Flood Risk

The majority of watercourse crossings will take place within existing bridge structures. Therefore, the existing conveyance capacity of the watercourses and the existing floodplain storage will not be altered at these locations.

Some of the river crossings are located in flood risk areas and construction personnel installing the cables would be at risk during a flood event.

The proposed horizontal directional drill beneath the Campile estuary will similarly not affect flood risk in that area, as the launch and reception pits for the HDD activity are located outside areas which are subject to flooding.

Surface water run-off associated with the excavation for cabling along roads has the potential to cause temporary ponding.

It is intended that the Kilmannock Stream will be crossed using trenchless techniques (mini-HDD), which will result in no direct effects on the watercourse. In the unlikely event that trenchless techniques are not used, the proposed open-cut trench crossing of the Kilmannock Stream, which may incorporate temporary damming and overpumping, has the potential to locally increase flood risk to adjoining agricultural land, and associated risk to construction personnel. This would have a potential **temporary slight negative effect**.

Further information on the management of water at HDD sites is provided in **Chapter 4** *Construction Strategy*.

13.5.3 Operational Phase

There will be two personnel stationed at the converter station at all times operating the interconnector. However, potential effects on hydrology during the operational phase will be solely as a result of maintenance of the proposed development. On an annual basis, four consecutive days each year, the converter station will undergo maintenance work that may be undertaken on a shift pattern to allow 24-hour working. Potential operational effects, should they occur, will be temporary and minimal. The main contaminants potentially arising from maintenance activities include:

- Hydrocarbons: accidental spillage from plant and equipment;
- Faecal coliforms: contamination from coliforms can arise if there is inadequate containment and treatment of on-site toilet and washing facilities; and
- Concrete/cementitious products: arising from construction materials.

Contamination of surface water systems by the above pollutants may potentially occur due to:

- Inappropriate handling and storage;

- Leakage of foul water sources; and
- Solid (municipal) wastes being disposed or blown into watercourses or drainage systems.

It is noted that fire suppression systems within the converter station site will be dry, eliminating the risk of any substantial pollution event associated with uncontrolled firewater discharge.

Stormwater will be attenuated to greenfield rates within the site and will discharge to a local watercourse. Refer to planning drawings C-CS-010-01, C-CS-010-02, C-CS-011-01, and C-CS-011-02.

13.5.4 Decommissioning

As mentioned in **Chapter 3** *Proposed Development,* once the interconnector ceases operation the proposed development will be decommissioned. Equipment and all above ground civil works at the converter station will be removed and the site returned to its previous state. Underground cables will remain in-situ as there would be more of an environmental impact in their removal. Above ground structures will be removed, and their locations reinstated. With the implementation of mitigation measures outlined in **Section 13.6** below, no significant effects on water and hydrology are predicted. The receptors and impacts will mirror those identified for the construction phase of the proposed development, as outlined above in **Section 13.5.2**.

13.6 Mitigation Measures and Monitoring

13.6.1 Mitigation

13.6.1.1Construction Phase

Water Quality

General

As part of the assessment of the required construction mitigation, best practice construction measures which will be implemented for the proposed development were considered. A summary of the measures relevant to hydrology are provided as follows and are in accordance with Construction Industry Research and Information Association (CIRIA) guidance – Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors (Masters-Williams et al, 2001).

To minimise the potential for elevated silt levels in surface water run-off, the working area used during construction will be clearly outlined prior to the commencement of works and will be kept to the minimum area necessary to effectively complete the works. Vegetation will be retained where possible.

A set of standardised emergency response procedures will govern the management of emergency incidents. These are provided in the CEMP (which is a live document which will be updated/added to as construction progresses), together with the Emergency Incident Response Plan.

A detailed spillage procedure will be put in place and all will be trained with respect to the relevant procedures to be undertaken in the event of the release of any sediment, hydrocarbons into a watercourse. Spill kits will be maintained on site and relevant staff will be trained in their effective usage. All site personnel will be trained and aware of the appropriate action in the event of an emergency, such as the spillage of potentially polluting substances. In the event of spillage of any polluting substance and/or pollution of a watercourse, Wexford County Council, Inland Fisheries Ireland and the NPWS shall be notified. Further measures include:

- A monitoring regime/programme for water quality will be put in place;
- All works undertaken will be fully consolidated to prevent run-off of silt;
- Silt fences/swales shall be provided at all locations where surface water run-off may enter/leave the working areas, and adjacent to the haul roads;
- There will be no tracking of machinery within watercourses;
- Dewatering, where required, will incorporate the use of filter media;
- Self-contained wheel wash facilities will be provided to protect watercourses from the carriage of silt on vehicles with the waste liquid contained on site, and dispatched off-site for disposal at an appropriately permitted facility;
- The length of trench excavation at any particular section of the cable route will be limited to ensure that the trench will not act as a conduit for stormwater run-off.
- Access/haul roads shall be set back from watercourses by at least 10m where possible.
- Refuelling of vehicles will take place at designated locations at a distance of 10m or greater from the nearest watercourse;
- Any fuel stored on site will be stored in double skinned, appropriately sized bunded containers and will be located in a designated work compound;
- No vehicles will be left unattended when refuelling;
- A spill kit including an oil containment boom and absorbent pads will be on site at all time;
- All vehicles will be regularly maintained, washed and checked for fuel and oil leaks;
- Concreting works will be carried out in dry conditions where possible and concrete works will be strictly controlled and monitored;

- No concrete washout will be allowed to discharge to watercourses. Wash out of concrete trucks will not be permitted on site;
- There will be no direct pumping of contaminated water from the works to a watercourse at any time; and
- All discharges will be in compliance with the European Communities (Surface Water) Regulations, 2009 (European Communities, 2009) and the European Communities (Groundwater) Regulations, 2010 (European Communities, 2010).

The following construction management measures will be implemented at all construction compounds, onshore cable routes and the converter station site;

Contractor Compounds

- Any containers of potential polluting materials such as fuels and oils will be stored in a bunded area (110% capacity) protected from flood damage and inundation;
- All bunded storage areas will be a minimum distance of 10m away from any watercourse;
- A designated bunded refuelling area on an impermeable surface will be provided at all construction compounds, again at a minimum distance of 10m away from any watercourse.

Converter Station Site

- Secure oil and chemical storage in over-ground bunded areas (110% capacity), limited to the minimum volume required to serve immediate needs with specified delivery and refuelling areas;
- Emergency spill kits retained onsite at sensitive locations;
- Cessation of work and development of measures to contain and/or remove pollutant should an incident be identified;
- Temporary measures will be provided to ensure only clean water is discharged from site i.e. de-silting and temporary oil interceptor. These will be subject to daily inspection to ensure they remain adequate and effective;
- Interceptor/dump/attenuation tanks will be secured at designated points, strapped down to the concrete slab. Backfill will be carefully controlled, ensuring this is balanced and even around all sides of the tank, while the tank is gradually filled internally with water, to avoid distortion or damage from external backfill pressures. The interceptor washdown slab will be constructed. Interceptors will be commissioned by a specialist contractor;
- Silt traps will be employed and maintained in appropriate locations;
- Temporary interception bunds and drainage ditches will be constructed up slope of excavations to minimise surface runoff ingress and in advance of excavation activities;

- Excavation and earthworks will be suspended during and immediately following periods of heavy rainfall in order to minimise sediment generation and soil damage;
- Below ground drainage will be installed prior to erection to completion of building superstructure/roof drainage. Final connection will be made when down pipes are installed to ensure accurate positioning;
- The treated water will discharge directly into the surface water drainage system as it is suitable for direct discharge into the local watercourses, having passed through the oil separator.

Surface Water Drainage from the Converter Station

Oily water is classified as rainwater runoff and/or surface wash down which may potentially contain small amounts of low hydrocarbon concentrates in oil containment areas. This is to be treated directly by oil separator facilities on site.

It is proposed to include a Class 1 full retention oil separator unit for the oily water system. Oil storage volume will be provided by the separator and the separator shall be fully capable of isolating all upstream oil flow in the event that the high-level oil alarm is activated. Oil resistant nitrile rubber seals will be employed throughout the oily water drainage systems. The oil separator will be vented in accordance with the manufacturer's recommendations, with vents located clear of all site operating areas, a minimum of 2000mm above ground level. Vent pipes will be supported by means of a concrete post and protected from vehicular traffic by means of spaced concrete bollards, if required.

The treated water will discharge directly into the surface water drainage system as it is suitable for direct discharge into the local watercourses, having passed through the oil separator described above.

Onshore Cable Route

- Any groundwater or rainwater that collects in a trench will be pumped into locations agreed with the landowners and local authorities. Typically, this will be onto adjacent land, not directly into waterways, and through a filter medium, to avoid the build-up of silt, as some granular material will, inevitably, be pumped out with the water. A similar arrangement will apply at joint bays, where a sump will be cast into the concrete base for a pump.
- The flowrates will have to match that of the water into the trench, as it must be kept generally free of water. A single pump with a 75mm hose will usually be adequate to deal with rainwater running into a trench.

HDD Controls on Drilling Fluid

- The first step in minimising drilling fluid breakout is through correct design of the HDD. The depth of cover of the drill will be maximised but must be balanced with the requirements of the cable, particularly dissipation of heat from the cable. Hydrofracture analysis of the design – comparing drilling fluid pressures to the inherent ground strength along each point of the design – will be used to optimise the design and identify any locations with increased risk of breakout.

- For the HDDs, any groundwater or rainwater that collects in a HDD drilling pit shall be pumped away as described above. Any bentonite (or similar HDD drilling head lubrication material) shall be handled and removed by the drilling contractor. Typically for a land-based HDD the volume of bentonite would be approximately 5 cubic metres per shift, and for the landfall HDD the volume of bentonite would be approximately 15 cubic metres per shift. Further information on bentonite is discussed in **Section 4.11.2.1** of **Chapter 4** *Construction Strategy.*
- Where appropriate, the contractor will instigate additional measures such as optimising the drilling fluid properties and instigating additional hole cleaning to increase the margin of safety against drilling fluid losses. The use of downhole pressure monitoring tools during pilot hole drilling will give the driller live readings of the drilling fluid pressure in the borehole near the drilling bit. This will allow early warning of downhole pressures that are higher or lower than a safe working window at any point along the drill. The safe working window is determined by the hydrofracture modelling of the design prior to construction using ground strength parameters determined by testing results in ground investigation boreholes and samples.
- The drilling fluid properties will be optimised during the drilling by the drilling fluids engineer. The formulation will be changed to suit the requirements at particular locations; in zones with low risk of bentonite breakout the fluid viscosity will be increased to ensure all cuttings are removed from the hole, thereby increasing the cross sectional area available for fluid flow resulting in a reduction in the drilling fluid pressure in the hole.
- At the Campile Estuary, the conceptual HDD design has 16m depth of cover beneath the bed of the estuary. Geophysical analysis just to the south of the estuary indicates that the HDD will have 6m of stiff clay and 10m of rock overlying it when drilling beneath the estuary. As a general rule of thumb, 10m cover in rock alone is sufficient to avoid risk of drilling fluid breakout and the risk to the estuary is assessed as low.

Watercourse Crossing – Newtown River

- The preferred method to cross the Newtown River is a HDD using a mini-rig. The non-preferred alternative is an open-cut methodology. For the open-cut method the watercourse will be temporarily dammed to allow for cable installation. At the stream crossing, the cable trenching detail will not differ, however, a one metre separation between the protective measures and the bed of the watercourse will be maintained to account for any future erosion. If the open-cut methodology is required, the Newtown River watercourse will be temporarily dammed immediately upstream and downstream of the cable installation. Over-pumping will be employed to ensure continuous flow in the watercourse.
- Appropriate silt control measures such as silt fences will be employed where required. Once reinstatement of the cable trench is complete, the temporary dams will be removed and over pumping ceased. No haul road is proposed at the watercourse crossing; plant will utilise existing accesses used by landowners to avoid further works within the watercourse.

Foul Drainage

- The temporary foul drainage at the construction compounds will cater for welfare facilities including a canteen, toilets, showers and hand wash basin only, and will comprise self-contained sanitary facilities, with wastewater stored and tankered off-site to appropriately licensed disposal facilities.

Flooding

The following best practice construction measures relevant to the hydrological regime and flooding will be implemented for the duration of the construction phase;

- All construction compounds will be in areas that are at low risk of flooding (outside 1:100 year flood zone);
- Material storage locations will be set back from watercourses and surrounded with silt fencing and covered. There will be no material storage in floodplains or areas at risk of pluvial flooding. Material excavated from trenches along the roads will be loaded onto trucks and removed from the site;
- Weather warnings will be monitored during construction to ensure that there is no risk to construction workers installing the cable. A risk assessment will be carried out in the case of a weather warning to determine what works can proceed, and what works need to be postponed;
- No material will be stored in flood plains or in areas which would impede flood flow paths;
- Temporary works (including haul roads) will be designed so as not to effect the connectivity between the relevant channel and the floodplain to maintain adequate flood storage during the construction phase;
- Where the proposed works encounter an existing drainage line, arrangements will be made to reinstate the existing drainage system. This will mitigate the risk of excess run-off from the proposed works. All road and drainage system modifications are to be designed following relevant best practice guidelines; and
- Road run-off will be channelled during excavation works for the cable, to avoid potential ponding on roads or flooding of adjacent lands during construction.

13.6.1.2Operational Phase

The mitigation measures which will be implemented during the operational phase are outlined below:

- A hydrocarbon interceptor will be installed on the proposed surface water drainage network to prevent any hydrocarbons from leaving the site of the proposed converter station.
- Foul water services will be provided via portable welfare units which will be maintained by licensed contractors, and the contents disposed-of to a local

licensed sewage treatment plant facility, which has significant spare capacity.

- Stormwater will be attenuated at the converter station site, as illustrated in the planning drawings associated with the proposed development (refer to C-CS-011-01 and C-CS-011-02).

Flooding

- There will be two personnel stationed at the converter station at all times operating the interconnector, who will continue to manage on-site infrastructure in the event of a local flood. The tail station will not require any permanent staff stationed on-site. No mitigation measures are considered necessary for the operational phase of the proposed development as no significant effects are predicted.

13.6.1.3Decommissioning Phase

The mitigation measures, described above for the construction phase, updated to reflect best practice at the time, will be implemented for the decommissioning phase.

13.6.2 Monitoring

13.6.2.1Construction Phase

Visual monitoring will be undertaken as part of the regular site audits during the construction of the proposed development to ensure existing surface water drainage runoff and natural infiltration to ground is not affected by the proposed development. Refer to **Appendix 4.1** *CEMP* for further details.

Flood Risk

As mentioned in the outlined Construction Environmental Management Plan (CEMP) attached as **Appendix 4.1**, weather forecasts will be monitored to inform the programming of earthworks and stockpiling of materials. Particular regard will be given to trench excavations and other works which may be vulnerable to the generation or conveyance of run-off, and for the protection of site personnel, plant and equipment in flood prone areas.

13.6.2.2Operational Phase

Considering operational works are predominately related to the operation of the interconnector at the converter station site no monitoring measures are required during the operational phase, as there will be no potential for ongoing adverse impacts on water and hydrology.

13.6.2.3Decommissioning Phase

The monitoring measures, described above for the construction phase, updated to reflect best practice at the time, will be implemented for the decommissioning phase.

13.7 Residual Effects

13.7.1 Construction Phase

Following the implementation of the mitigation measures outlined above, no significant residual effects on water and hydrology are envisaged during the construction phase.

13.7.2 Operational Phase

No significant residual effects on water and hydrology are envisaged during the operational phase.

13.7.3 Decommissioning Phase

Following the implementation of the mitigation measures outlined above, no significant residual effects on water and hydrology are envisaged during the decommissioning phase.

13.8 Cumulative and Transboundary Effects

13.8.1 Cumulative Effects

Cumulative effects are considered regarding other known and consented projects which have the potential to exacerbate or alter the significance of the effects predicted for the proposed development. Other elements of the Greenlink project as a whole, namely the offshore cable development and the onshore cable and converter station in Wales, have also been considered.

As described in more detail in **Chapter 18** of this EIAR, two proposed electrical infrastructure projects have been identified which may be constructed at the same time as Greenlink: Great Island – Kilkenny 110kV Line Uprate Project, and Great Island Energy Storage System.

In both of these cases, no potential for cumulative effects on water and hydrology has been identified, at either the construction or operational phases.

Similarly, with regard to potential cumulative effects of the proposed development with the Greenlink project as a whole, no potential for additional cumulative effects has been identified.

13.8.2 Transboundary Effects

Considering the nature and location of the proposed development as described in **Chapter 3** and **Chapter 4** no transboundary effects are predicted.

13.9 Impact Assessment Summary

Receptor	Potential Effects	Mitigation	Monitoring	Residual Effects
Existing watercourses and land	Pollution associated with silt-laden or cementitious construction run-off	Preparation and implementation of the CEMP (refer to **Appendix 4.1**)	Controls and management established in the CEMP to be implemented	No significant effects
Existing watercourses and land	Pollution associated with washing of vehicles and equipment during construction	Preparation and implementation of the CEMP (refer to **Appendix 4.1**)	Controls and management established in the CEMP to be implemented	No significant effects
Existing watercourses and land	Pollution associated with spills of fuel or oils during construction	Preparation and implementation of the CEMP (refer to **Appendix 4.1**)	Controls and management established in the CEMP to be implemented	No significant effects
Existing watercourses and land	Accidental spillage of hydrocarbons during operation	Installation of hydrocarbon interceptors in the surface water drainage network at the converter station site	Hydrocarbon interceptors to be checked and maintained on an ongoing basis	No significant effects
Existing watercourses and land	Contamination due to coliforms during operation	Installation and maintenance of a portable welfare wastewater collection unit	Wastewater collection unit to be checked and maintained on an ongoing basis	No significant effects

13.10 Conclusion

With the implementation of the proposed mitigation measures and monitoring, the residual effects of the proposed development on water and hydrology during construction, operation and decommissioning are predicted to be not significant.

13.11 References

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Wexford County Development Plan 2013 – 2019;

Wexford County Development Plan 2013 – 2019 Strategic Flood Risk Assessment;

Appendix 8: *Cvs of authors*

APPENDIX 8 CVs of Authors

Curriculum Vitae Carl Dixon

Key Skills

Senior ecological/environmental consultant with over 20 year's experience. I have managed hundreds of large and small-scale projects. I have a detailed knowledge of environmental issues and legislation with particular experience in Habitat Directive Assessments for large-scale infrastructural projects. Experience includes Project management, Ecological Assessment, Mammal and bird surveys, Aquatic Surveys, Report writing, Environmental monitoring, Assimilative Capacity Studies, Air Quality Assessments, Landscape Assessment, Project Supervision, Habitats Directive Assessments and EIA.

Education

2008-2009	University College Cork MSc. In Ecological Monitoring
1988-1993	University College Cork. BSc. in Applied Ecology.

Employment

2000-present Owner Dixon.Brosnan Environmental Consultants.
Specialised ecological consultancy with particular expertise in freshwater ecology, habitat mapping and bird/mammal surveys.

1997 – 2000 Core Environmental Services.
Services include Rural Environmental Protection Scheme (REPS) planning, freshwater surveys, ecological surveys for Environmental Impact Statements.

1994-1996 Coomhola Salmon Trust, Coomhola, Bantry, Co. Cork.
Research on fisheries management and conservation issues. Brood stock fishing. Design and implementation of educational programs. Development of specialised website funded by the Marine Institute.

Selection of relevant projects:

- Ecologist (terrestrial) for Arklow Windfarm Terrestirial Connection
- Ecologist for secondary containment facility at Whitegate Oil, Refinery, Cork
- Ecological Assessments including bat surveys for the Irish Distillers Site, Cork City.
- Ecologist for upgrade of Mallow WWTP. Detailed assessments relating to the Blackwater River SAC for detailed NIS and EIAR.
- Ecologist Indaver Waste-to-Energy Facility Ringaskiddy 2009 – present. Including detailed ecological surveys and detailed NIS and EIAR

- Ecologist Greenlink for a proposed electrical interconnector between Ireland and Wales 2015-present. Detailed NIS and EIAR.
- Ecological project management and assessment at the site of a proposed 500 million euro LNG facility at Ballylongford, Co Kerry, 2009 to present. Detailed long term, monitoring, coordination of ecological specialists. Detailed NIS and EIAR. Issues include bats, badger, otter, birds, Annex 1 habitats, invertebrates etc.
- Ecologist for the proposed extentsion to the Pepsi Facility Cork.
- Ecologist for office extensions and car parking at the Apple Campus, Cork.
- Ecologist for the Skibbereen Flood Relief Scheme (Constraints, viable option, EIS)
- Biological assessment of commercial discharges in Cork and Wicklow via annual kick sampling programme.
- Fish stock assessment for a proposed hydroelectric scheme in West Cork.
- Ecological Assessment and supervising ecologist for the Douglas and Togher Flood Relief Schemes in Cork.
- Supervising Ecologist Fermoy Flood Relief Scheme including bat and otter surveys
- Lamprey and fish stock survey for the Mallow Flood Relief Scheme
- Fish stock assessment for a proposed hydroelectric scheme in West Cork
- Aquatic surveys for the Limerick-Clare section of the gas pipeline to the west, included fish stock assessment (electro-fishing) and biological monitoring (macro-invertebrates).
- Natura Impact Assessment (Stage 2 Appropriate Assessment) for upgrading of the Clareville Canal which supplies water to Limerick City.
- Ballyvouskill 220kV station, Millstreet, Co. Cork. Ecological consultancy
- Assessment of impacts including otter and freshwater pearl mussel for works associated with the removal of a gravel bank Mallow Flood Relief Scheme.
- Fish stock assessment for a proposed hydroelectric scheme in West Cork.
- EIS and Ecological supervision Great Island Gas Pipeline
- Natura Impact Statements for telecommunications masts in Cork, Kerry, Leitrim, Galway and Mayo, Wexford Flood Relief Scheme, a proposed waste to energy facility Cork Harbour, commercial discharges i.e. Teagasc Moorepark, Lidl Charleville etc, individual houses, agricultural units, harbour works etc
- Bat and Otter survey for Fermoy Flood Relief Scheme
- Ecological assessment of the impacts of discharging treated wastewater from an upgraded treatment plants at Dunmanway and Ardgroom, Co. Cork. Includes assessments of impacts on designated areas i.e SAC, NHA etc and species i.e. freshwater mussel (*Margitifera* sp.).
- Biological assessment of commercial discharges in Cork and Wicklow via annual kick sampling programme.
- Fish stock assessment for a proposed hydroelectric scheme in West Cork.
- Air quality assessments for a range of projects including quarries, landfills etc.
- Ecology surveys and NIS/EIAR for a range of quarry developments including Mid Cork Quarries, MF Quirkes, Gleesons Concrete, Eurostone/Buckley Quarries Ltd, Healy Brothers Ltd, Gleeson Precast etc
- Winter bird counts and hen harrier surveys for a range for projects including windfarms, industrial developments etc.
- Air and landscape Chapters EIA/EIAR for quarries in Cork, Kerry and Tipperary.
- Air, surface water and groundwater monitoring at quarries and landfills in Cork, Kerry and Tipperary.

Other skills and interests

- Chairperson of Sample Studios – non-profit organisation providing affordable artist studios to 50 artists.
- Biological monitoring/ fish stock survey at 17 sites in West Cork for a M.Sc. project over 2 years.
- Completed Training scheme for the Native Woodland Scheme.
- Completed training BCT (UK) training course on bats in buildings. “Surveying buildings for bats”.
- Fieldwork coordinator for the UCC diploma in pest control.
- Experienced in collating and analysing data, Experienced in technical report writing.
- Expert witness at oral hearings Completed training course “Succeeding at oral hearings” (La Touche Training)

Ian McDermott
B.Sc. Zoology
M.Sc. in Ecological Assessment
Mobile: 087 7067018
E-mail: ianmctash@gmail.com

Key Skills: Ecologist with a wide range of identification and survey experience and particular expertise in bird, mammal, habitat mapping and aquatic surveys. Highly motivated and organised, with excellent communication and report writing skills. I am a proven team player, with the ability to deal with a high level of responsibility and confident under pressure.

Education:

University College Cork, Ireland:

2008 to 2009: Master of Science - Honours Degree in Ecological Assessment.
2004 to 2008: Bachelor of Science - Honours degree in Zoology.

Certificates & Memberships:

- C permit holder in bird ringing and banding, with a mist net endorsement.
- BirdWatch Ireland member
- Irish Wildlife Trust member
- FETAC Level 5 Certificate in Occupational First Aid & Defibrillation.
- Site Safe Pass
- Manual Handling

Work Experience: DixonBrosnan Environmental Consultants.

Ecological consultant

Projects include Natura Impact Statements for a range of projects including large scale infrastructural works. Ecological survey work including habitat surveys to level 3 of Fossit, vantage point bird surveys, surveys for invasive species, mammal surveys, aquatic surveys and electro-fishing surveys. The position requires excellent communication, report writing skills, an ability to work under pressure, to quickly understand the client's requirements, to ensure that all aspects of the ecological brief are understood and dealt with effectively and the ability to liaise with governmental and non-governmental bodies. Specific projects include the following:

- Ecological surveys including Habitat mapping, mammal and bird surveys for (a) EIS for a proposed extension to existing piggery facility at Waterpark, Fermoy, Co. Cork. (b) EIS for a proposed quarry extension at Shannonvale, Co.Cork. (c) EIS for a proposed new quarry at Carrigtwohill, Co.Cork.
- Bat emergencies/activity/day-time roost assessment/winter hibernation surveys for (a) Bat emergence and activity survey in respect of a design for grills to allow bats to access caves at Beaumont Quarry, Cork (b) Bat activity survey for a proposed housing development at Mountain Road, Kilmoney, Carrigaline, Co. Cork (c) Bat survey (onsite day-time roost assessment/winter hibernation survey of external and internal structures) at Glencairn Abbey, Co Waterford.
- Electrofishing surveys as part of the ecological assessments: (a) Proposed development of the Dawn Meats facility, Co. Waterford; (b) Proposed gas pipeline in Co. Waterford; (c) Quarry at Crookstown, Co. Cork.

- Biological Assessment of the watercourses (a) watercourses surrounding Ballynagran landfill site, Ballynagran, Co. Wicklow (b) Biological Survey of Charleville Stream and additional monitoring at the Kerry Charleville Plant (c) Biological and Chemical Assessment of water quality in the Bunanumera Stream downstream of the Keohane Readymix facility, Ballingurteen, Clonakilty, Co. Cork.
- Assessment of aquatic ecology, fisheries and water quality constraints pertaining to the creation of a new walkway from Grange Road, through the existing woodland to Tramore Valley Park.
- Aquatic ecology survey for Magherareagh solar farm, Ardfinnan, Co. Tipperary.
- Winter Bird Surveys for: (a) 4 landfall options for the Greenlink project Co. Wexford (b) Extentsion to the Wyeth Nutritionals plant Askeaton, Limerick (c) Construction of a pipeline at bridge of N25 over the River Brickey on the Dungarvan Harbour SPA or at the bridge in Twomilebridge.
- Invasive species surveys for (a) Ballyhaunis to Williamstown water pipeline, (b) Mallow Sewerage Scheme, (c) Irish Water, for the refurbishment and upgrade of facilities (WWTP, pump station, pipelines etc.) as part of the Courtmacsherry & Timoleague Scheme
- Ecological surveys including kingfisher and otter survey for the proposed new WWTP at Mullinahone, Co. Tipperary.
- Ecological survey for the appraisal of the potential impacts of the Douglas Flood Relief Scheme on terrestrial and aquatic flora and fauna.
- Vantage point bird surveys for a NIS for the extension of the Staunton's Food Processing Plant close to Courtmacsherry Bay SPA at Timoleague, Co. Cork.
- Ecological assessment of a site including mammals and birds for an NIS screening report for the Periglase Facility, Drogheda.
- Vantage point bird counts (rocky shore/marine) in relation to works on the existing bridges to Haulbowline Island, Cork Harbour.
- N22 Farranfore to Killarney road refinement scheme to assess the best options for each area based on the impact on designated sites and watercourses.

<u>Volunteer Work:</u>

I volunteered on a part-time basis as a wildlife officer with BirdWatch Ireland on Cape Clear Island undertaking various tasks including bird ringing, breeding bird surveys, sea watches and general wildlife surveys. I have also volunteered with the National Parks & Wildlife Service in Glengarriff Nature Reserve and surrounding areas undertaking various tasks, including assisting Conservation Rangers with seal surveys in Kenmare Bay & Roaringwater Bay and SPA monitoring in Clonakilty Bay SPA.

- CBS and I-WeBS surveys and training workshops with BirdWatch Ireland.
- Site inspection and maintenance with the Irish Wildlife Trust.
- All Ireland Daubenton's Bat Waterways Survey with Bat Conservation Ireland.
- Brown long-eared survey with Bat Conservation Ireland.
- Car Transect Survey (Bat Conservation Ireland).

<u>Projects Completed:</u>

<u>Graduate Studies.</u>

- **Baseline ecological surveying** – Desktop Review, Phase 1 habitat mapping, Scoping report, Phase 2 ecological survey of Ballincollig Regional Park, Co. Cork, Ireland.
- **Phase 1 ecological surveying** – Habitat Mapping of Harbour View, Co. Cork
- **Woodland survey** – structure & botanical composition.
- **Collection of Carabidae & their identification.**
- **Collection of Stream invertebrates & determination of their ecological significance.**
- **Lichen survey** of trees located in Cork City.
- **Phase 2 level scoping report** of Harbour View, Co. Cork.

- **Aquatic fauna & values** - A brief summary of information obtained for Kilkeran Lake & Castlefreke Dunes, Ireland.

<u>Under Graduate Studies.</u>

- **The effects of disturbance** on shore birds in Harbour View, Co.Cork, Ireland.
- **The study of bird behaviour** at Ballochmartin Bay, Millport, Isle of Cumbrea, Scotland.
- **Literature project**: Ancient Mariners – are the albatrosses doomed?
- **Behavioural study of Grants/Common Zebra** (*Equus burchelli*) in Fota Wildlife Park, Cork, Ireland.
- **Sandy shore diversity** practical, Kames Bay, Millport, Isle of Cumbrea, Scotland.
- **Rock pool diversity** practical, Kames Bay, Millport, Isle of Cumbrea, Scotland.
- **The study of solitary and non-solitary Barnacles** (*Chthamalus montagui*) and to note the settlement and recruitment density of adult Barnacles/metamorphs at Pira Da Oura Beach, Portugal.
- **Literature project**: Millennium Ecosystem Assessment: an Irish response.

Ecological Skills:

- Bird ringing.
- Avian surveys and monitoring.
- Bat identification & monitoring.
- Mammal surveys including badgers and otters.
- Vascular plant identification.
- Stream invertebrate identification.
- Identification of invertebrates/vertebrates (Terrestrial & Marine) & plants.
- Woodland surveying.
- Carabidae identification & sampling.
- Vantage point surveys, Focal sampling & Scan sampling.
- GIS utilisation.
- Statistical analysis.
- Lichen identification.
- Water chemistry analysis related to land use, soils & geology.

Appendix 9: *Draft Invasive Species Management Plan*

DixonBrosnan

environmental consultants

Project	**Draft Invasive Species Management Plan for the proposed Greenlink interconnector (Ireland Onshore)**			
Client	**Arup**			
Project ref	**Report no**	**Client ref**		
1935	1935.1	-		

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Date	**Rev**	**Status**	**Prepared by**	
20/02/20	0	Issue to client	Carl Dixon MSc.	
			Ian McDermott MSc	

v180907

Contents

1. Introduction

DixonBrosnan were commissioned to survey for invasive species within the proposed development area and develop an invasive species management plan.

2. Invasive species – desktop review

Non-native plants are defined as those plants which have been introduced outside of their native range by humans and their activities, either purposefully or accidentally. Invasive non-native species are so-called as they typically display one or more of the following characteristics or features: (1) prolific reproduction through seed dispersal and/or re-growth from plant fragments; (2) rapid growth patterns; and, (3) resistance to standard weed control methods.

Where a non-native species displays invasive qualities and is not managed it can potentially: (1) out compete native vegetation, affecting plant community structure and habitat for wildlife; (2) cause damage to infrastructure including road carriageways, footpaths, walls and foundations; and, (3) have an adverse effect on landscape quality. The NBDC lists several high impact invasive species which have been recorded within grid squares S61, S71, S70, S80 within which the development will be located (**Table 1**).

Table 1: NBDC list of high impact invasive species.

Grid Square	Common Name	Latin Name
S61	Chinese Mitten Crab	*Eriocheir sinensis*
S61, S71	Canadian Waterweed	*Elodea canadensis*
S61, S71, S70, S80	Cherry Laurel	*Prunus laurocerasus*
S61, S71, S70, S80	Common Cord-grass	*Spartina anglica*
S71, S70	Giant-rhubarb	*Gunnera tinctoria*
S61	Hybrid Knotweed	*Fallopia japonica x sachalinensis = F. x bohemica*
S61	Giant Knotweed	*Fallopia sachalinensis*
S61, S70	Indian Balsam	*Impatiens glandulifera*
S61, S71, S70, S80	Japanese Knotweed	*Fallopia japonica*
S61	New Zealand Pigmyweed	*Crassula helmsi*
S61, S71, S70, S80	Rhododendron	*Rhododendron ponticum*
S61, S71, S70, S80	Brown Rat	*Rattus norvegicus*
S61, S71, S70, S80	American Mink	*Mustela vison*
S61, S71, S70	Eastern Grey Squirrel	*Sciurus carolinensis*
S71	Feral Ferret	*Mustela furo*

S61, S71	House Mouse	*Mus musculus*
S61	Sika Deer	*Cervus nippon*

Regulations 49 and 50 of the European Communities (Birds and Natural Habitats) Regulations 2011 make it an offence to plant, disperse, allow dispersal or cause the spread of certain species e.g. Japanese knotweed, Himalayan balsam and Rhododendron, keep the plant in possession for purpose of sale, breeding, reproduction, propagation, distribution, introduction or release, keep anything from which the plant can be reproduced or propagated from the species, without a granted licence and keep any vector material for the purposes of breeding, distribution, introduction or release. Regulation 49 deals with the '*Prohibition on introduction and dispersal*' while Regulation 50 deals with the '*Prohibition on dealing with and keeping certain species*'. Regulation 50 has yet to be brought into Irish law. Regulation 74 is a transitional provision in relation to Regulation 49 and 50.

The Wildlife (Amendment) Act 2000 states that anyone who plants or otherwise causes to grow in a wild state in any place in the State any species of (exotic) flora, or the flowers, roots, seeds or spores of (exotic) flora shall be guilty of an offence.

There is a statutory obligation under S.I. 477 of 2011 of the European Communities (Birds and Natural Habitats) Regulations 2011 to address invasive species in Ireland. Rhododendron and Japanese Knotweed are listed under the *3rd Schedule: Part 1 – Plants; Non-native species subject to restrictions under Regulations 49 & 50*.

The non-native and invasive species Japanese Knotweed (*Fallopia japonica*), Rhododendron (*Rhododendron ponticum*) and Three Conered Leek (*Allium triquetrum*) were recorded within or in proximity to the proposed works area. All three species are listed on both the "Most Unwanted: Established Threat" and on the "High Risk: Recorded Species" list compiled by Invasive Species Ireland a joint initiative by the Northern Ireland Environment Agency and NPWS. All invasive species listed are also included in the NRA Guidelines on the Management of Noxious Weeds and Non-native Species on National Roads (NRA, 2010) as these species have been shown to have an adverse impact on landscape quality, native biodiversity or infrastructure; and are likely to be encountered during road schemes. The location of Japanese knotweed, Three Cornered Leek and Rhododendron within the or in proximity to the proposed development area is shown in **Figure 1**. The Amber listed species Winter Heliotrope was recorded within the works area and is ubiquitous along roadside verges in this area and was too prevalent to effectively map.

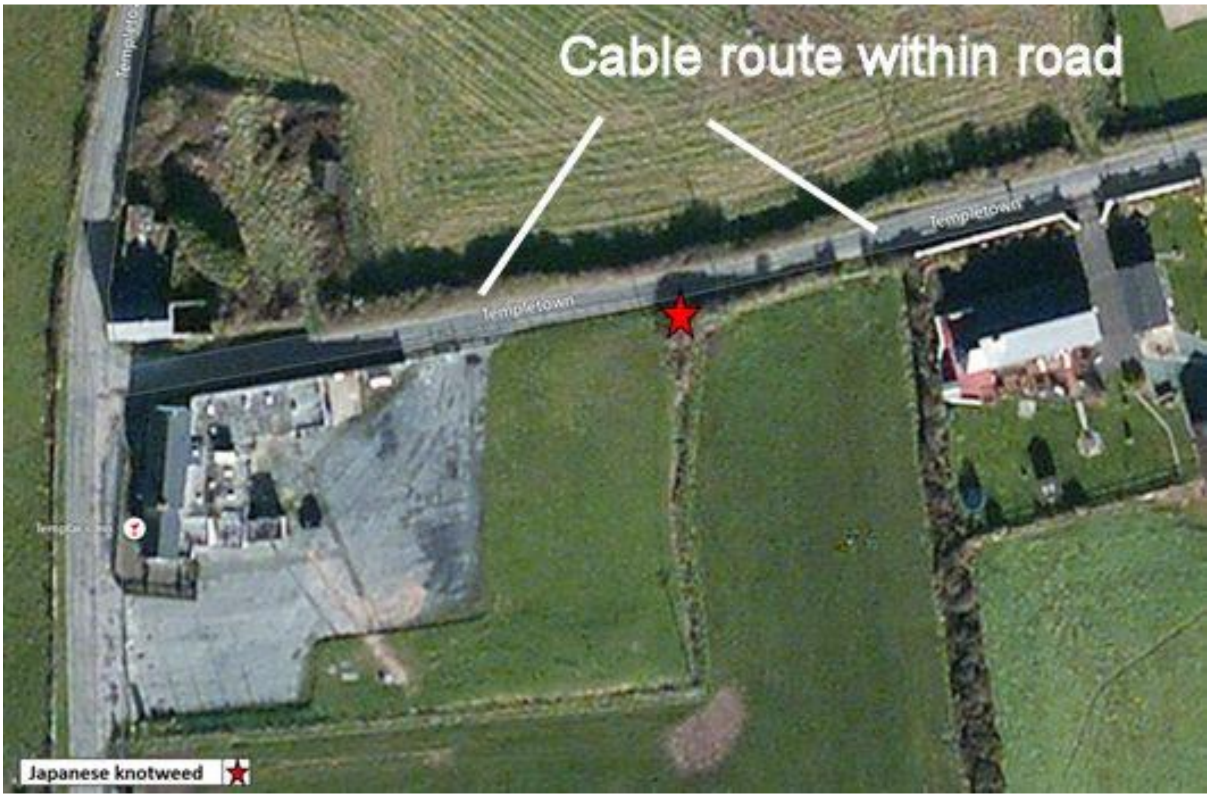

Figure 1. Location of the high-risk invasive species Japanese knotweed,

Figure 2 Location of Three-cornered Leek | not to scale

Figure 3 Location of Rhododendron| not to scale

3. Rhododendron (Rhododendron ponticum)

This species is listed on both the “Most Unwanted: Established Threat” and on the “High Risk: Recorded Species” list compiled by Invasive Species Ireland a joint initiative by the Northern Ireland Environment Agency and NPWS.

Under the right ecological condition, Rhododendron can become a highly invasive and once rhododendron has invaded an area, few native plants survive. Rhododendron can regenerate via seeds, suckers or rootlets. It forms extensive dense thickets which cast a very deep shade, leading in woodland to loss of ground flora, epiphytic bryophytes and lichens, modifying the fauna and preventing regeneration of trees. In addition to the effect of shade, it may produce biochemicals which can affect other plants, inhibiting the germination or seedling establishment of other species. There is also evidence for the prevention of mycorrhizal development in the roots of seedlings of competing plant species. *R. ponticum* is identified as a serious threat to upland oakwood. It is also identified as a threat for several lower plants and fungi including *Acrobolbus wilsonii, Arthothelium macounii, Lejeunea mandonii.* The characteristics of this species are illustrated in **Figure 2** & **Photographs 1.** Within the study area this species is strongly associated with woodland and hedgerow habitat.

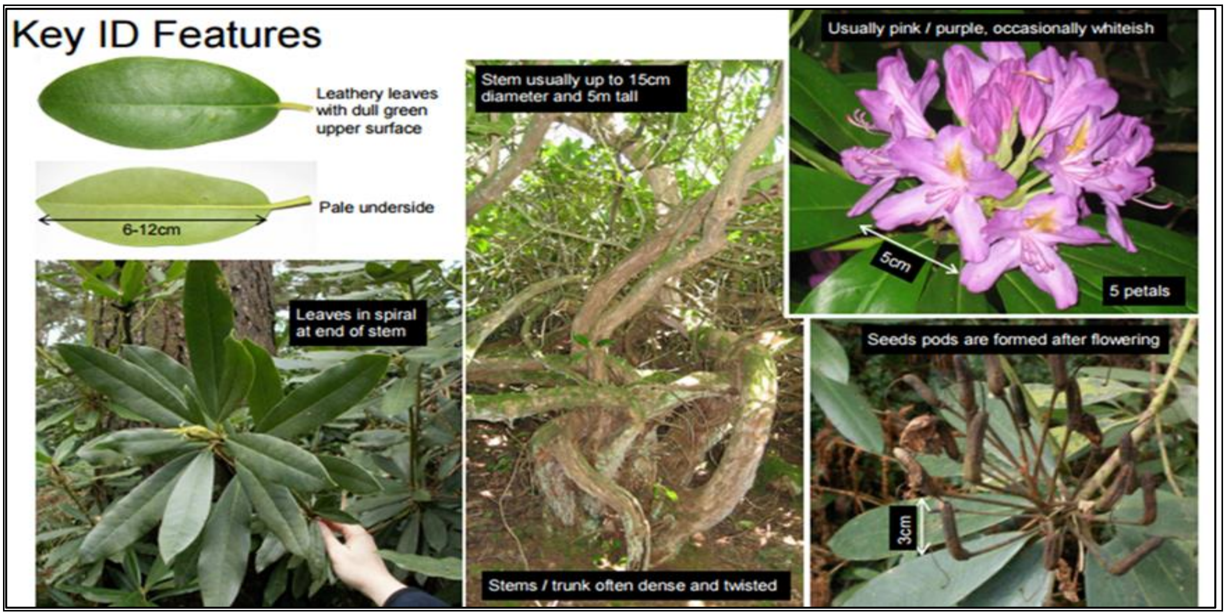

Figure 4. Key features of Rhododendron.

4. Japanese Knotweed (*Fallopia japonica*)

Japanese knotweed was recorded scattered within the western section of the existing quarry. It was recorded growing in stands of various ages and sizes, primarily in scrub/recolonising bare ground habitat. A small number of emerging shoots were noted in a recently cleared area of the site. Therefore, potential contamination of further sections of the quarry is possible due to anthropogenic causes e.g. movement of rhizomes around the site on caterpillar tracks.

Japanese knotweed is a highly invasive, non-native species which was originally introduced as an ornamental plant but has since spread along transport routes and rivers to become a serious problem. From an ecological viewpoint it out-competes native species by forming dense stands which suppresses growth of other species. It grows extremely vigorously and can penetrate through small faults in tarmac and concrete and thus can damage footpaths, roads and flood defence structures. As it can survive in poor quality soils, including spoil, it often thrives in brownfield sites and in urban areas. The key features of the plant are summarised below:

- Produces fleshy red tinged asparagus like shoots when it first breaks through the ground in an established stand.
- Has large, heart or spade-shaped green leaves which are approximately the size of your hand.
- Has leaves arranged in a zig-zag pattern along the stem.
- Grows up to 3 metres in height.
- Yellow / cream flowers in late summer (Typically the start forming from late July onwards).

- Hollow bamboo like stems which have distinctive ring like nodules at regular intervals along it.
- Brown stem remain in winter once it has died back.
- Extensive rhizome system (roots) (7m radius x 3m depth approximately)
- Orange centred rhizome.
- Spread entirely via the movement of plant and rhizome fragments.

The plant has woody underground rhizomes which can extend 7m laterally from a parent plant. The leaves and stems die back during winter, but growth is extremely rapid during spring. The plants spread mainly through fragments of rhizomes -as little as 0.7g of material or the size of a small fingernail is sufficient-and through cut stems. Stem material cannot regenerate once it has dried, but rhizome material may be viable for up to 20 years in the soil. Thus, control of this species is very difficult. The characteristics of this species is shown in **Figure 4** and **Photographs 2 and 3.**

Figure 5. Key features of Japanese Knotweed

5. Three Cornered Leek (*Allium triquetrum*)

Three-cornered leek (*Allium triquetrum*), a species also listed under Regulations 49 and 50 of the European Communities (Birds and Natural Habitats) Regulations 2011, was also recorded near the proposed cable route. Three-cornered leek is known to have serious impacts on the natural habitats that it invades and is very aggressive, having the potential to rapidly occupy large tracts of land. Plants form dense and persistent stands that totally dominate the ground-flora when conditions are suitable (*moist and shaded*). These stands crowd out and displace the indigenous grasses and groundcover and can also seriously impede the regeneration of the overstorey vegetation. It is noted that this species was recorded approximately 86m from the proposed car parking area, which is the closest point of the proposed development at Baginbun Beach. Therefore, other than avoidance and standard biosecurity measures as outlined below, a management plan is not required in relation to this species. An invasive species survey will be carried out prior to the commencement of works to ascertain if the distribution of this species has changed, the supervising ecologist will update this ISMP as required based on up to date data.

Figure 6: Three-Cornered Leek

6. Winter Heliotrope (*Petasites fragrans)*

Short hairy herbaceous perennial, up to 30cm with heart shaped leaves 20-50cm wide persisting in winter. White to lilac flowers, smelling strongly of almonds or Reproduces vegetative as only male plants found in Britain and Ireland. It occurs on unvegetated or sparsely vegetated habitats including constructed, industrial or other artificial habitats. It is also found in hedgerows, roadsides, stream banks, waste ground and the edges of woodland. Forms dense stands excluding native vegetation. Following best practice guidance, the Amber Listed species Winter Heliotrope (*Petasites fragrans*), can be readily managed through standard eradication/control methods post construction. On the basis of their invasive qualities, the ecological value and types of habitats recorded during the walkover survey and their Amber Listing by Invasive Species Ireland, this species will not have a significant effect on habitats outside the works area.

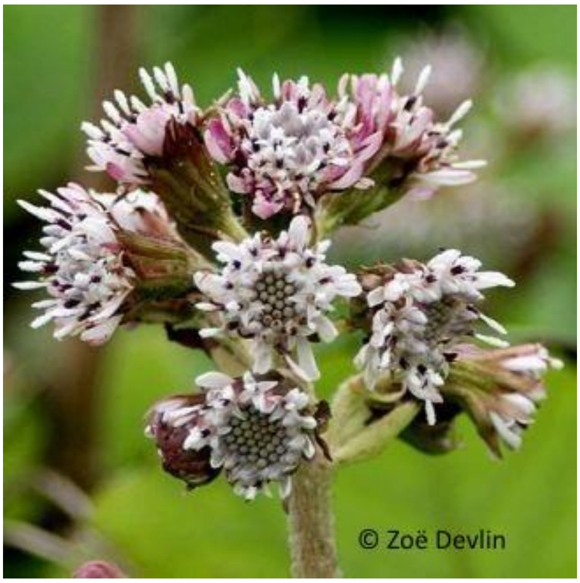

Figure 7 Winter Heliotrope

7. Development of a management plan for Japanese Knotweed and Rhododendron

The following factors are considered when developing a management plan.

- Timeframe in which the work needs to be completed.
- Structural or environmental features that might affect control action, such as proximity to watercourses, designated sites
- Future plans for the site, such as development or landscaping plans.
- Hazards or risks identified during the site inspection, such as underground services and chemical contamination.
- Availability of storage areas on or off site.
- Access for machinery through private residences
- Agreement with landowners where a stand is partially within the works area and partially within the landholding of another person or entity.
- Timeframe for works to be completed
- Seasonal restrictions to work
- Commencement date for proposed works.
- Financial constraints
- Location of underground services

- Site hygiene
- Rivers provide particular issues with respect to Japanese Knotweed and Giant Rhubarb treatment. During the excavation process small fragments of rhizome or stem falling into the river can lead to inadvertent spread of the plant downstream.

8. Management of Japanese knotweed

8.1 Literature on control of Japanese knotweed

There is an extensive body of literature on control of this species including the *NRA Guidelines on The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads (2008)*, *Best Practice Management Guidelines Japanese knotweed Fallopia japonica (2008)* and *Best Practice Management Guidelines Himalayan balsam Impatiens glandulifera (2008),* prepared for NIEA and NPWS as part of Invasive Species Ireland. The most extensive guidelines are available from the UK including *Managing Japanese knotweed on development sites - The Knotweed Code of Practice produced by the Environmental Agency*. Appropriate methods are also outlined in *Irish Water guidelines, (Irish Water Report Information and Guidance Document on Japanese Knotweed Asset Strategy and Sustainability)*

8.2 Potential treatment procedures

A number of different methodologies are employed to treat Japanese Knotweed. These include the following:

- Herbicide treatment in situ
- Combined treatment methods
- Excavation and Burial
- Excavation and Bund Method
- Excavation and Root Barrier Cell Method
- Removal of contaminated soil to landfill
- Pulling or digging out

8.3 Outline methodology

It is noted that the existing stand of Japanese Knotweed is located alongside a road along which the cable route will run. The preferred option is avoidance to within 7m of the stand. However, this species spreads rapidly and such avoidance may not be possible. This ISMP will be updated by the supervising ecologist prior to the commencement of works based on up to date survey data.

If the infestation cannot be avoided, then site investigations will be carried out to determine the extent of the infestation within the works area.

If there are visible rhizomes, then contaminated soils be excavated, and excavated materials will be placed directly into removal trucks for direct disposal to licensed facility. Any above ground visible units will be bagged and sealed to avoid spread during excavation. All bio-security protocols as detailed below will be taken to ensure site vehicles are fully washed down before movement of the materials through the site as detailed below.

The supervising ecologist will apply to the National Parks and Wildlife Services (NPWS) for the required license to remove Knotweed contaminated materials from site. This process will include an application inclusive of the Ecologist's updated Invasive Species Management Plan.

On receipt of NPWS license the removal of contaminated material from site to licensed facility will be carried out by the contractor and an approved licensed haulier who has the required permits from the National Waste Collection Permit Office (NWCPO) to transport Knotweed contaminated materials. All licenses and permits from hauliers and disposal facilities will be issued for approval prior to the commencement of any Knotweed removal.

8.4. Site hygiene

The following site hygiene protocols need to be put in place to prevent inadvertent spread of plant fragments during site investigations and during subsequent excavation and removal/treatment.

1. All biosecurity measures will be approved by the supervising ecologist prior to commencement of any works.

2. Ensure all site users are aware of measures to be taken and alert them to the presence of the Invasive Species Management Plan. Management of invasive species will be assigned to a nominated individual who will walk the entire works area with the supervising ecologist. In relation to knotweed species the information that the extent of the rhizome (root) system underground can extend up to 7m horizontally and 3 meters vertically must be clearly communicated

3. Prior to the commencement of works the works area will be resurveyed to accurately assess any changes in distribution in the intervening period.

4. All stands of Japanese Knotweed will be clearly delineated with hazard tape and fenced in a manner visible to machine operators prior to the commencement of works.

5. Appropriate signage will be put in place to deter any entrance by people or machinery into the areas within which the Japanese Knotweed is growing.

6. Prior notification will be given to all contractors that parts of the works area are contaminated with Japanese Knotweed and that they must adhere to this protocol to avoid the spread of the plant within and more importantly, outside of the works area.

This includes any site investigation works in advance of commencement of excavation works.

7. Only vehicles required for the works within the contaminated works area will be brought on site and the number of visits minimised as much as practicable. Vehicle movements within this area swill be kept a minimum. It is noted that vehicles will only enter these areas under the supervision of the supervising ecologist.

8. At each location a specialised wash down area will be created for machinery and footwear. All machinery and equipment (including footwear) should be power washed prior to leaving the contaminated works area within this wash down area. All water from the wheel wash will be collected, fully contained, and dispatched for treatment and disposal off-site. They will also be visually checked for clods of soil, bits of vegetation etc. and particular care is required with tracked machinery;

9. This wash down area will be located in close proximity to existing stands and the wash down area will be included in the post-works treatment programme for Japanese Knotweed.

10. Ideally works including site investigation works should be undertaken in dry weather to minimise the potential for dispersal of fragments of invasive species.

11. A supervising ecologist will be present on site to identify pieces of Japanese Knotweed fragments and to determine the volume of spoil to be removed. In the case of mature stands, spoil from a 7m buffer around the parent plant may require removal.

12 Should stockpiling of contaminated material be required, the areas will be clearly marked out on site. These areas will not be within 50m of the seashore or within a flood zone;

13. Any trucks used to transport spoil offsite must be sealed so that no fragments of material can escape on route. Vehicles leaving the site will be inspected for any plant material and washed down into a contained wash down area.

14. Vehicles used in the transport of contaminated material will need to be visually checked and washed down in the contained wash before being used for any other work, either on the same site or at a different site.

15. To prevent Japanese Knotweed from outside the site being inadvertently being brought into the site, the contractor will be required to inspect vehicles before using them on site and will pay particular attention to caterpillar tracks and where trucks and dumpers are stowed.

9. Management of Rhododendron

The eradication of rhododendron from an infested habitat can only be carried out effectively by understanding the ecology of the species and by strategically planning the clearance work. In order to rid a habitat of rhododendron, a number of steps should be followed, including cutting all standing rhododendron and killing the stumps by uprooting or herbicide treatment. All habitats cleared of rhododendron must be regularly and systematically re-visited to remove any seedlings that have germinated and become established. Appropriate guidelines are provided in The Control of Rhododendron in Native Woodlands (Native Woodland Scheme Information Note No. 3) and Higgins, G.T. (2008) *Rhododendron ponticum: A guide to management on nature conservation sites.* Irish Wildlife Manuals, No. 33.

9.1 Cutting and removal

The first operation in clearing rhododendron is the cutting of individual stems with hand or chainsaws. Stems will be cut as close to the ground as possible. The cut material will be removed from the area to allow for effective follow-up work. If the terrain and layout of the woodland are suitable, the material can be used to build a "dead hedge" around the area as a barrier to exclude grazing animals. Burning under the supervision of personnel with fire experience is another option. Rhododendron material can be burnt green immediately after being cut. Fires should be carefully located so as not to damage any trees or other vegetation close by, and old tyres or diesel should not be used. If burning is not an immediate option, the cut material can be piled neatly outside the treated area, allowing them to be dismantled easily to facilitate burning at a later stage (ideally 1-2 years later).

Where burning is envisaged, contact will be made with the Local Authority to obtain permission. Flailing is another method of rhododendron clearance. This involves the flailing of the thickets down to ground level, using a mechanical flail head mounted on a tracked machine. Although not suitable on all sites, especially those that are steeply sloping or very wet, it is a very effective as it mulches the material upon contact.

9.2 Killing rhododendron

Some method of killing must be used as rhododendron invariably grows back vigorously when cut. The following approaches can be considered:

9.2.1. Digging out

Digging the stumps out of the ground is an effective way of killing rhododendron. Its effectiveness is maximized by removing all viable roots. Digging out can be carried out manually or, if the terrain allows, by machine (e.g. a tractor and chain). To prevent regrowth, as much soil as possible should be knocked off the root system, and the stumps should be turned upside down to expose the roots to the air and to allow the rain to wash off any remaining soil. Stumps that are dug out should be burnt along with the cut material.

This method avoids any use of herbicides. However, the impact to tree root systems and the potential for soil compaction and disturbance caused by the use of machinery in certain habitats means that this option will only be implemented under ecological supervision to minimise inadvertent disturbance of habitats.

9.2.2. Direct stump treatment

Rhododendron kill can be achieved by direct stump treatment, whereby freshly cut stumps are painted or spot sprayed with a herbicide solution. Ideally this should be carried out when rain is not imminent, to avoid the solution from being washed off. Stems are cut as close to the ground as possible, and the fresh stump surfaces treated with herbicide immediately, i.e. within minutes. A vegetable dye is used to clearly identify which stumps have been treated. Painting of stumps with glyphosate solutions (25-100%) was found to be 100% effective when carried out between May and March at an experimental site in Scotland (Tabbush and Williamson, 1987). This method is regarded as being most effective outside the time of spring sap flow. The following are herbicides (including application rates, methods and timing) used in the control of rhododendron by stump treatment (after Willoughby and Dewar (1995)).

- Glyphosate: Apply 'Roundup' in a 20% solution in water to all freshly cut stump surfaces using one of the following: a knapsack sprayer at low pressure; a forestry spot gun fitted with a solid stream nozzle; a cleaning saw fitted with a suitable spray attachment; or a paint brush. Best results can be obtained during the period October to February.
- Tryclopyr: Apply 'Garlon 4' in an 8% solution in water using one of the following: a knapsack sprayer at low pressure; a forestry spot gun fitted with a solid stream nozzle; a cleaning saw fitted with a suitable spray attachment; or a paint brush. Apply at any time between cutting and the appearance of new growth.
- Ammonium sulphamate: Apply as a 40% solution between April and September. Optimum control resulting from treatments applied between June and September. Surfactant additives are not appropriate for stump application. It is important to ensure that all cut surfaces are treated. In Ireland, trials in Killarney using stump treatment resulted in extremely successful kill rates among a range of plant sizes throughout all months of the year. Chemical concentrations from 10% to 20% have been used effectively and further trials are ongoing.

A major advantage of stump treatment is that all initial clearance work can be carried out in a single sweep. Also, as the application of the herbicide is carried out with a handheld applicator, spray drift is avoided and the impact to the surrounding non-target area is minimal. In addition, small volumes of herbicide are used. Although stump treatments can result in total kill, regrowth from the cut stumps can occur. This regrowth is usually slow and stunted. Carefully timed foliar application of herbicide to the regrowth will subsequently achieve full kill.

9.2.3 Spraying of regrowth and large seedlings

Stumps and large seedlings (less than 1.5 m in height) can be effectively killed by spraying the regrowth with a suitable herbicide. Success is dependent on the plants being dry at the time of herbicide application and remaining dry for a sufficient time thereafter to allow the herbicide to be absorbed into the plant (at least 6 hours, preferably longer). The addition of a surfactant (e.g. Mixture B) can increase the rate of herbicide absorption and reduce the amount of 'dry-time' required after foliar herbicide application. Surfactants are often more environmentally damaging than the herbicides themselves and must be used with great care, especially adjacent to aquatic habitats. Spraying should be carried out in near windless conditions, to maximise herbicide contact and absorbance of the chemical into the plant. Conversely, spraying in windy conditions should be avoided at all costs, as this will lead to herbicide drift, resulting in 'collateral damage' which will kill nearby native flora, including herbaceous species and young regenerating trees. This delays the establishment of a ground cover and facilitates further rhododendron establishment.

It is important to ensure at all times that chemical solutions do not enter watercourses, as this can have a severe impact on the aquatic habitat and on aquatic life. At all times, adhere to best practice regarding safety and environmental protection, as set out in the manufacturer's guidelines, Ward (1998), and the Forest Service Forestry and Water Quality Guidelines and Forest Protection Guidelines. As spraying is not 100% effective, some plants may require two or more applications before they are killed. Since cut stumps generally produce multiple shoots of regrowth, delaying the spraying for more than three years after the initial stump cutting can actually result in the infestation becoming even more severe. At this stage, the regrowth is likely to be too tall to be sprayed effectively, forming dense impenetrable thickets. Regrowth is also likely to flower more vigorously than naturally regenerated rhododendron.

9.2.4. Stem injection

Stem injection, using the 'drill and drop' method (Edwards, 2006), can be used for the control of established rhododendron bushes, where access to the main stem is possible and where the stem is large enough for a hole to be drilled into it. One of the main advantages of this technique is that it facilitates the controlled application of herbicide to target plants, thereby reducing damage to other flora adjacent to treated bushes. It is a particularly useful method on difficult, sloping terrain, where other methods may be impractical.

A handheld cordless drill with several re-chargeable batteries and a spot gun are the only tools required. A 25% solution of glyphosate (i.e. 1:3 mix with water) is recommended. No additives are required. Applications during March, April and October have been successful in giving complete control of target bushes. Treated bushes can be left standing on site to rot. However, bear in mind that standing, dead rhododendron may persist for 10 to 15 years, is unsightly and can inhibit access to the woodland for management operations. Therefore, it may be better to cut and remove the treated bushes at a later date.

The effectiveness of control should be assessed initially every 12 months following the treatment. The main steps involved in stem injection are as follows.

1. Stems to be treated should be greater than 3 cm in diameter. In order to maximise the potential of killing the entire plant, choose a position on the stem as close to the main root system as possible, and at least below the lowest fork.

2. Drill as vertically as possible into the stem to create a hole that will hold the herbicide solution. The drill bit used should be 11-16 mm in diameter, depending on the stem diameter. There is no upper limit to the size of stem that can be treated.

3. Apply the herbicide to the hole immediately after drilling. The recommended amount is 2ml of herbicide solution per stem. Do not allow the herbicide to overflow from the hole. The use of a forestry spot gun with a calibrated 10ml chamber is recommended, as this allows for the accurate application of a calibrated 2ml of herbicide per hole.

4. It is recommended that each plant be marked immediately after treatment, to track progress. Treated plants can be marked with a spray of coloured paint or by attaching coloured biodegradable tape.

5. Applications can be made in light rain, provided that rainwater is not running down the stem into the application hole and washing the herbicide solution out into the surrounding area.

6. Bush death should occur between 9 and 31 months, depending on application date and bush size.

9.3. Outline methodology Rhododendron

The preferred option is to avoid any works within the area within which this species is growing. Where this is not possible the following will be carried out.

1. The exact treatment details will be outlined in a detailed management plant prepared by the treatment contractor and supervising ecologist will be finalized prior to the commencement of treatment. The following principles/guidelines will be implemented.

2. The entire site and adjacent area will be surveyed, and the level of infestation assessed and mapped prior to the commencement of treatment works.

3. The age, condition and any previous treatments of all stands will be noted and mapped.

4. Areas to be treated will be prioritized. However, the objective is complete removal within the works area.

5. An updated Rhododendron Management Plan will be prepared by the contractor with input from the supervising ecologist. The plan will encompass the entire site and include projections over a suitable timeframe. All work to be carried out in the area should be mapped and clearly dated and detailed in an accompanying schedule, along with a timeframe for follow-up work.

6. Treatment options will follow the following guideline methods:

Young plants - single stemmed, typically < 10 years old & up to 1m tall

- These plants will be cut off as close to the ground as possible (with secateurs or pruning saw) and the stem treated with herbicide.
- Plants may be pulled by hand, if necessary, loosening the adjacent soil with a mattock or pickaxe.
- Foliage will be treated with herbicide.

Isolated plants, typically >10 years old

- The plant may be cut down to the stump, as low to the ground as possible and the stump treated with herbicide.
- If access to the base of the main stems is possible, stem application of herbicide may be used.
- If low growing enough (usually less than 1.5m) foliage may be sprayed with herbicide.
- The plant may be cut to the ground/low stump and regrowth later treated with herbicide.
- The plants may be cut to c. 40cm above ground, each stem broken off from the root and the root treated with herbicide (New method under trial, see p. 28).
- If chemical treatments are not an option, the only alternative method of killing to rootstock is stump extraction. This may be done manually (using a mattock) or mechanically.

Mature stands of dense rhododendron

- The plant may be cut down to the stump, as low to the ground as possible and the stump may be treated with herbicide.
- If access to the base of the main stems is possible, stem application of herbicide may be used.
- The plant may be cut to the ground/low stump and regrowth later (after c. 18 months) treated with herbicide.
- The plant may be cut to the ground/low stump and regrowth later knocked off and the stump collar treated with herbicide.
- If chemical treatments are not an option, the only alternative method of killing the rootstock is stump extraction. This may be done manually (using a mattock) or mechanically, but the use of heavy machinery on nature conservation sites is often inadvisable.

7. In all sites, follow-up work will be necessary to ensure that any small plants or seedlings which were either missed on the previous visit or have entered the site subsequently from adjacent seed sources, are removed before they reach the flowering age (10-12 years). Ideally remove them when they are c. 0.5 m tall. At this stage, they are more easily seen, and any young seedlings likely to die naturally through desiccation will have done so. The systematic checking for re-infestation is necessary if the area is to be maintained free of seed-producing rhododendron. Also, re-infestation brought about by poor follow-up will negate the considerable time and cost invested in the initial clearance.

8. The use of track mounted machinery can offer a relatively fast approach to rhododendron clearance by this method. A fork or bucket can extract either entire standing plants or stumps. This method is not suitable where vehicular access to a site is very difficult, where very steep slopes require clearance and where terrain (e.g. boulders) hinders the movement of machinery around the clearance site. In addition, the disturbance caused by heavy machinery to soil and to tree roots requires consideration and there is also potential for damage to standing trees, although a good

operator can often avoid this. Extraction of the rootstock by this method gives good kill, although some regrowth from root fragments may require further treatment. Given that the applicant has access to suitable machinery this is preferred option on areas within the proposed extension area. How usage of this method on areas within the landholding outside the proposed extension area need to be carefully evaluated based on up to date survey results to ensure inadvertent damage of adjacent habitats is minimized.

9. The treatment programme will be carried out by a suitably qualified person who has experience of treating invasive species and will be carried out in line with the herbicide manufacturer's instructions. Site hygiene protocols to prevent spread of this species will be specified by the management plan and will be strictly enforced.

10. Conclusions

This invasive species management plan will be updated by the supervising ecologist, based on up to date data and in consultation with the contractor. No impediment to the removal of these species within proposed development area. as part of a detailed invasive species management plan, have been identified. No risk to local ecology has been identified from the spread of invasive species.

11. References

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