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.

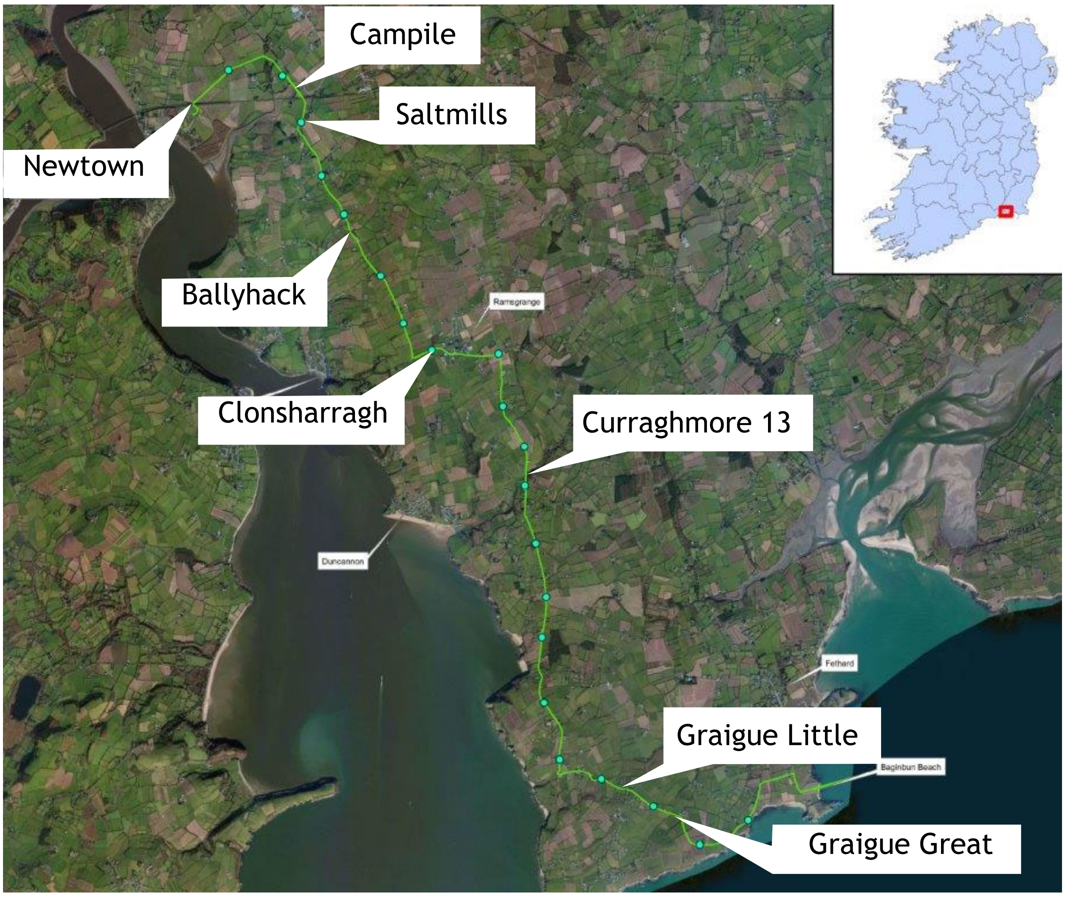

Figure 13.1 Watercourses Crossed by the Proposed Cable Route | mapping: Bing Maps © Microsoft 2020 | not to scale

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.

<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.

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.

13.6.1.3 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.

13.6.2 Monitoring

13.6.2.1 Construction 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.

13.6.2.2 Operational 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.

13.6.2.3 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.

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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