MWP

Environmental Impact Assessment Report (EIAR)

Chapter 07 Water

Dernacart Wind Farm
110kV Substation and Grid Connection

Statkraft Ireland

October 2024

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7. Water

7.1 Introduction

This chapter describes the existing hydrological and hydrogeological characteristics in the Environmental Impact Assessment Report (EIAR) study area and considers the potential effects on the existing aquatic environment associated with the proposed development. The surface water features, and characteristics of the receiving environment are described, as well as the site drainage and groundwater attributes.

An impact assessment was carried out to determine whether the project is likely to have a significant adverse effect on the hydrology and hydrogeological aspects of the environment and to propose mitigation measures to reduce any potential negative effect of the proposed development. Refer to Chapter 02 Development Description for a full description of the overall proposed development.

7.1.1 Competency of Assessor

The assessment was completed by Kate Cain and reviewed by Caitríona Fox of MWP.

The assessment was completed by Kate Cain [BSc (Hons)]. Kate Cain is an environmental consultant at MWP and has over 15 years of experience. Kate has authored EIA Screening reports, Environmental Impact Assessment Reports (EIAR), Detailed Site Assessments, Environmental Reports and Construction and Environmental Management Plans (CEMPs) for a wide range of projects. She has a strong background in hydrology and has undertaken water chapters and Water Framework Directive assessments for a wide range of projects.

7.1.2 Relevant Legislation

This chapter has considered legislation specifically relating to water including:

7.1.2.1 The Water Framework Directive (WFD) (2000/60/EC)

Directive 2000/60/EC of the European Parliament and of the Council of 23rd October 2000 establishing a framework for Community action in the field of water policy; commonly known as the Water Framework Directive (WFD) establishes a framework for community action in the field of water policy.

The WFD requires 'Good Water Status' for all European waters to be achieved through a system of river basin management planning and extensive monitoring by 2015 or, at least, by 2027. 'Good status' means both 'Good Ecological Status' and 'Good Chemical Status'. In 2009 the first River Basin Management Plan (RBMP) 2009-2015 was published. The second cycle river basin management plan was carried out between 2018-2021 with the previous management districts now merged into one Ireland River Basin District (Ireland RBD). The third cycle (2022-2027) is currently being undertaken.

The Water Framework Directive (WFD) (2000/60/EC) establishes an integrated and coordinated framework for the sustainable management of water. Under the WFD1, the island of Ireland has been divided into a number of

[1] 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.

River Basin Districts (RBD) in order to facilitate the effective implementation of the WFD objectives. The proposed development site is located within the Barrow catchment area within the former South Eastern River Basin District (SERBD) (now the Irish River Basin District), as defined under the WFD.

The strategies and objectives of the WFD in Ireland have influenced a range of national legislation and regulations, since its inception in the year 2000. The WFD (1st Cycle) was transposed into national legislation in 2003, with the aim to:

- Prevent deterioration of status for surface and groundwaters and the protection, enhancement and restoration of all water bodies;
- Achieve good ecological status and good chemical status for surface waters and good chemical and good quantitative status for groundwaters;
- Progressively reduce pollution of priority substances and phase-out of priority hazardous substances in surface waters and prevention and limitation of input of pollutants in groundwater;
- Reverse any significant, upward trend of pollutants in groundwaters; and
- Achieve standards and objectives set for protected areas in Community legislation.

The objective for each surface water and groundwater body is to prevent deterioration, maintain high and good status waters, restore waters to at least good status where necessary, and ensure that the requirements of associated protected areas are met.

The draft River Basin Management Plan for Ireland 2022 - 2027 (RBMP), the third-cycle of river basin management planning under the WFD, provides for the targeted implementation of the two principle objectives of the WFD, namely:

1. To prevent the deterioration of water bodies and to protect, enhance and restore them with the aim of achieving at least good status; and
2. To achieve compliance with the requirements for designated protected areas.

Five key 'evidence-based' priorities form the pillar of this iteration of the RBMP and are outlined as follows:

1. Ensure full compliance with relevant EU legislation;
2. Prevent deterioration;
3. Meet the objectives for designated protected areas;
4. Protect high-status waters; and
5. Implement targeted actions and pilot schemes in focused sub-catchments aimed at:
    a) Targeting water bodies close to meeting their objective; and
    b) Addressing more complex issues that will build knowledge for the third cycle.

The assessment will determine the impact in accordance with the following regulations which give effect to the WFD:

- S.I No. 9 of 2010 European Communities Environmental Objectives (Groundwater) Regulations 2010 (as amended);
- S.I. No. 272 of 2009 European Communities Environmental Objectives (Surface Water Regulations) 2009 (as amended);
- S.I. No. 122/2014: European Union (Drinking Water) Regulations, arising from WFD 2000/60/EC (the Water Framework Directive);
- S.I. No. 293 of 1988: Quality of Salmonid Water Regulations;

- European Communities Environmental Objectives (Freshwater Pearl Mussel Regulations) 2009 to 2018 (as amended); and
- Urban Waste Water Treatment Regulations (SI No. 254 of 2001 as amended) (UWW Regulations).

These Regulations have been devised to implement the requirements of the WFD and establish Environmental Quality Standards (EQS) for the purpose of assessing the status of surface waters and groundwaters. The Surface Waters Regulations apply to all surface waters including lakes, rivers, canals, transitional waters, and coastal waters and supersede all previous water quality regulations.

MWP have considered the Water Framework Directive status of waterbodies within the vicinity of the proposed development, along with potential for increased risk of deterioration of this status due to the activities of the proposed development site in this Chapter of the EIAR.

7.1.2.2 Water Framework Directive - Protected Areas

The WFD requires a register of protected areas. These are protected for their use (such as fisheries or drinking water) or because they have important habitat and/or species that directly depend on water. The register includes areas identified by the WFD itself or other European Directives. These may include:

- Areas used for water abstraction - European Union (Water Policy) (Abstractions Registration) Regulations 2018 (S.I. No. 261 of 2018);
- Areas designated for the protection of economically significant aquatic species (Freshwater Fish Directive 78/659/EEC; Shellfish Directive 79/923/EEC);
- Recreational waters (Bathing Waters Directive 76/160/EEC);
- Nutrient Sensitive Areas (Nitrates Directive 91/676/EEC; Wastewater Treatment Directive 91/271/EEC);
- Areas of protected species or habitats where water quality is an important factor in their protection (Natura 2000 sites under Conservation of wild birds 2009/147/EC and Habitats Directive 92/43/EEC); and
- Surface waters (The European Communities Environmental Objectives (Surface Waters) Regulations [S.I. No 272 of 2009], and amendment regulations 2012 [S.I. 327 of 2012]), 2015 (S.I. 386/2015), 2019 (S.I. 77/2019), 2021 (S.I.659/2021), 2022 (S.I.288/2022), and 2023 (S.I. 410/2023).

The proposed development site has a hydrological pathway or connection with the River Barrow and River Nore Special Area of Conservation (SAC) through the local drainage network. Potential impacts of the proposed development on SACs and Special Protection Areas (SPA) are addressed in Chapter 05 Biodiversity of this EIAR and in the Appropriate Assessment (AA) Screening / Natura Impact Statement (NIS) submitted with the planning application.

7.2 Scope and Methodology

7.2.1 Scope of Assessment

A comprehensive assessment of the potential effect of the proposed grid connection on the hydrological and hydrogeological regime has been undertaken through a combination of a desktop study of resources, followed by a site walkover and field survey work. The scope of the chapter and assessment includes the following:

1. Establish the baseline conditions on site;
2. Identify the likely significant adverse effects on surface and groundwater of the proposed development during construction and operation;

3. Identify and develop mitigation measures to avoid, reduce or eliminate likely significant adverse effects; and
4. Identify any significant residual impacts, effects and possible cumulative effects after mitigation measures are implemented.

As part of consultation, Geological Survey Ireland (GSI) – a division of the Department of the Environment, Climate and Communications (DECC) were consulted, and a written response was received. The response provided a list of GSI's publicly available datasets. Consultation was also undertaken with Inland Fisheries Ireland(IFI) and a written response received. As part of the response, details pertaining to the surrounding water bodies was provided and recommended mitigation measures proposed. These have been incorporated into the chapter in the various sections. Copies of the written responses from GSI and IFI are included in Appendix 1 Volume 3 of this EIAR.

7.2.2 Guidelines and Best Practice

Relevant guidelines have been used to inform the preparation and assessment of impacts from the proposed development on surface water and groundwater, including:

- *Environmental Protection Agency (2022): Guidelines on the Information to be Contained in Environmental Impact Assessment Reports;*
- *National Roads Authority (2005): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;*
- *Wind Farm Development Guidelines for Planning Authorities (2006);*
- *Irish Wind Energy Industry Best Practice Guidelines (IWEA, 2012);*
- *Laois County Development Plan 2021-2027;*
- *Offaly County Development Plan 2021-2027*
- *The Code of Best Forest Practice and the Forestry and Water Quality guidelines2;*
- *Coillte (2009): Forest Operations & Water Protection Guidelines;*
- *Control of water pollution from linear construction projects. Technical guidance (C648) 234pp. CIRIA, UK (Murnane et al. 2006);*
- *Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes (NRA, 2008);*
- *Good Practice During Wind Farm Construction. Scottish Renewables 2019;*
- *The SuDS Manual (C753) - Construction Industry Research and Information Association (CIRIA), 2015;*
- *Developments on Peat Land - Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste'. Scottish Renewables (2012);*
- *Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters (IFI, 2016);*
- *CIRIA B14 Design of Flood Storage Reservoirs (Hall et al. 1993); and*
- *River Crossings and Migratory Fish: Design Guidance (Scottish Executive, 2012).*

[2] The Code of Best Forest Practice is a listing of all forestry operations and the manner in which they should be carried out to ensure the implementation of sustainable forest management in Ireland, as agreed at the Third Ministerial Conference on the Protection of Forests in Europe, Lisbon, 1998.

7.2.3 Desktop Study

A desktop study, involving a review of all available information, datasets and documentation sources pertaining to the proposed development site's natural environment was completed. The study involved the following:

- Examination of maps and aerial photography to identify any hydrological features, site topography and slope;
- Determination of the catchments and drainage regime on the site and downstream from the site;
- Review of legislation including the Water Framework Directive (WFD) and all previous water quality legislation along with the River Basin Management Plan (RBMP) for Ireland 2022 - 2027;
- Review of existing water quality data available from the Environmental Protection Agency (EPA);
- Review of WFD and its datasets, reports and maps;
- Examination of the Geological Survey of Ireland (GSI) online datasets pertaining to hydro-geology features such as aquifers, wells, groundwater bodies and groundwater protection schemes;
- Examination of National Parks and Wildlife Service (NPWS) nature conservation designations;
- Preparation of catchment and other site maps; and
- Examination of OPW Indicative Flood Maps (www.floodmaps.ie);
- Examination of the Environmental Protection Agency – "HydroTool" Map Viewer (www.epa.ie);
- Examination of CFRAM Preliminary Flood Risk Assessment (PFRA) maps (www.cfram.ie); and
- Examination of information on private wells or water supply available from the GSI online datasets and the EPA Water Abstraction Register.

7.2.4 Site Walk Over / Field Surveys

The site and surrounding lands were inspected by Malachy Walsh and Partners (MWP) on the 8th June 2023. This walkover survey was undertaken to obtain a good appraisal of the existing site conditions and to determine if there are any potential sources of flooding at the site including possible fluvial flooding or flooding from overland flows or groundwater

7.2.5 Assessment Criteria

7.2.5.1 Methodology

The method of impact assessment and prediction follows the EPA (2022) *Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR).*

On completion of the desk study and baseline field study, the sensitivity of the water environment receptors were assessed. Levels of sensitivity which are defined in Table 7.1 were then used to assess the potential effect that the proposed development may have on them.

Table 7.1: Receptor Sensitivities (adapted from www.sepa.org.uk)

Sensitivity of Receptor	
Not Sensitive	Receptor is of low environmental importance (e.g. surface water quality classified by EPA as A3 waters or seriously polluted, fish sporadically present or restricted). Heavily engineered or artificially modified and may dry up during summer months. Environmental equilibrium is stable and is resilient to changes which are considerably greater than natural fluctuations, without detriment to its present character. No abstractions for public or private water supplies. GSI groundwater vulnerability "Low" to "Medium" classification and "Poor" aquifer importance.
Sensitive	Receptor is of medium environmental importance or of regional value. Surface water quality classified by EPA as A2. Salmonid species may be present and may be locally important for fisheries. Abstractions for private water supplies. Environmental equilibrium copes well with all natural fluctuations but cannot absorb some changes greater than this without altering part of its present character. GSI groundwater vulnerability "High" classification and "Locally" important aquifer.
Very Sensitive	Receptor is of high environmental importance or of national or international value i.e. NHA or SAC. Surface water quality classified by EPA as A1 and salmonid spawning grounds present. Abstractions for public drinking water supply. GSI groundwater vulnerability "Extreme" classification and "Regionally" important aquifer.

7.2.5.2 Overview of the Assessment Citeria

The conventional source-pathway-target model (illustrated in Error! Reference source not found.) was applied to assess potential effects of the proposed development on hydrological and hydrogeological receptors.

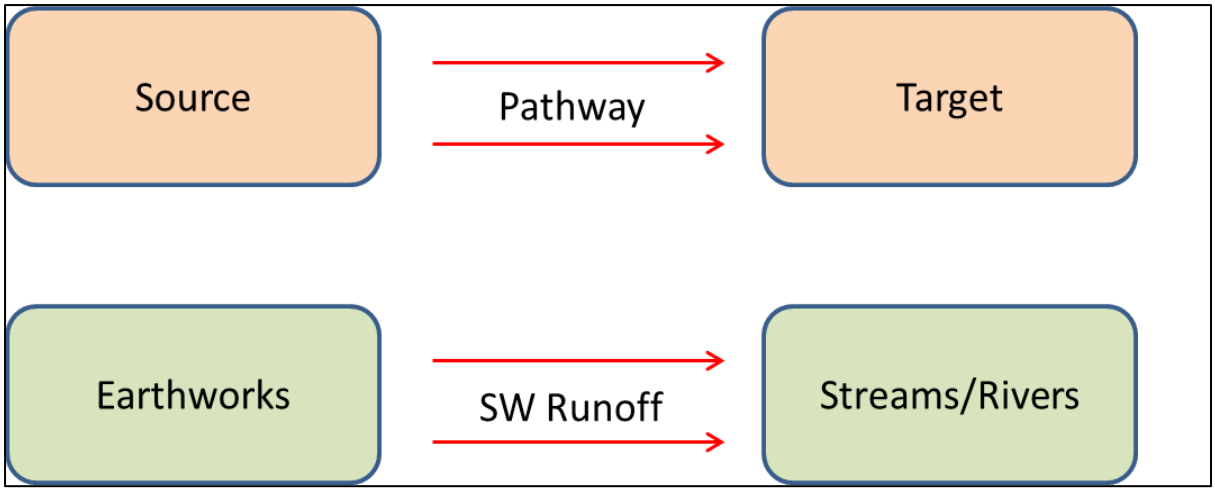

Figure 7.1: Source Pathway Target Model

Where potential effects are identified, the classification of these in the assessment follows the descriptors provided in the Glossary of Impacts contained in the following guidance documents produced by the Environmental Protection Agency (EPA):

- *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, 2022).*

The application of the assessment methodology identifies the key aspects of any potential impact source, namely its character, magnitude, duration, likelihood and whether it is of a direct or indirect effect.

In order to provide an understanding of the stepwise assessment process applied (see Section 7.4.2 and 7.4.3), Table 7.2 presents a summary guide that defines the steps (1 to 7) taken in each element of the impact assessment process. The guide also provides definitions and descriptions of the assessment process and shows how the source-pathway-target model and the EPA effect descriptors are combined.

Using this defined approach, the impact assessment process is then applied to all of the project construction, operation, and decommissioning activities which have the potential to generate negative effects on the geological and hydrological/ hydrogeological (including water quality) environments.

Table 7.2: Summary of Assessment Process

Step	Impact Assessment	Description
Step 1	Identification and Description of Potential Impact Source	This section presents and describes the activity that brings about the potential impact or the potential source of pollution. The significance of effects is briefly described.
Step 2	Pathway / Mechanism:	The route by which a potential source of impact can transfer or migrate to an identified receptor. In terms of this type of development, surface water and groundwater flows are the primary pathways, or for example, excavation or soil erosion are physical mechanisms by which a potential impact is generated.
Step 3	Receptor:	A receptor is a part of the natural environment which could potentially be impacted upon, e.g., human health, plant / animal species, aquatic habitats, soils/geology, water resources, water sources. The potential impact can only arise as a result of a source and pathway being present.
Step 4	Pre-mitigation Impact:	Impact descriptors which describe the magnitude, likelihood, duration and direct or indirect nature of the potential impact before mitigation is put in place.
Step 5	Proposed Mitigation Measures:	Control measures will be put in place to prevent or reduce all identified significant negative effects. In relation to this type of development, these measures are generally provided in two types: (1) mitigation by avoidance, and (2) mitigation by engineering design.
Step 6	Post Mitigation Residual Impact:	Impact descriptors which describe the magnitude, likelihood, duration and direct or indirect nature of the potential impacts after mitigation is put in place.
Step 7	Significance of Effects:	Describes the likely significant post mitigation effects of the identified potential impact source on the receiving environment.

7.2.5.3 Surface Water Quality

The Quality Rating (Q) System is the standard biotic index which is used by the EPA. This system was developed to determine the status of organic pollution in Irish rivers by assessing the occurrence of macro-invertebrate taxa of varying sensitivity to pollution[3]. Biological Water Quality data was examined as part of this assessment (see Section 7.3.2.6). The Q-index is a quality measurement ranging from Q1 to Q5 with Q1 being of the poorest quality and Q5 being pristine/unpolluted. The Quality Rating System has been shown to be a robust and sensitive measure of riverine water quality and has been linked with both chemical status and land-use pressures in catchments. The system facilitates rapid and effective assessment of the water quality of rivers and streams. There are nine Q-value scores, ranging from 1 to 5 (including intermediate scores such as Q4–5). High ecological quality is indicated by Q5 or Q4–5, while Q1 indicates bad quality. Biological Water Quality data was examined as part of this assessment (See Section 7.3.2.6).

[3]http://www.epa.ie/QValue/webusers/

https://gis.epa.ie/EPAMaps/

7.2.5.4 Groundwater Vulnerability

Groundwater vulnerability is a term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities. Groundwater vulnerability maps are based on the type and thicknesses of subsoils (sands, gravels, glacial tills (or boulder clays), peat, lake and alluvial silts and clays), and the presence of karst features. Groundwater is most at risk where the subsoils are absent or thin and, in areas of karstic limestone, where surface streams sink underground at swallow holes. All land area is assigned one of the following groundwater vulnerability categories, as presented in the GSI vulnerability mapping guidelines and outlined in Table 7.3 and Figure 7.13.

Table 7.3: Summary of Impact Assessment Process (Source: GSI)

Vulnerability Mapping Guidelines					
Vulnerability Rating	Hydrogeological Conditions				
	Subsoil Permeability (Type) and Thickness			Unsaturated Zone	Karst Features
	High Permeability (sand/gravel)	Moderate Permeability (e.g. Sandy subsoil)	Low Permeability (e.g. Clayey subsoil, clay, peat)	(Sand/gravel aquifers only)	
Extreme (E)	0-3.0m	0 – 3.0m	0 – 3.0m	0 – 3.0m	30m radius
High (H)	>3.0m	3.0 – 10.0m	3.0 – 5.0m	>3.0m	N/A
Moderate (M)	N/A	>10.0m	5.0 – 10.0m	N/A	N/A
Low (L)	N/A	N/A	>10.0m	N/A	N/A
Notes: N/A = not applicable Precise permeability values cannot be given at present Release point of contaminants is assumed to be 1-2 m below ground surface.					

7.2.5.5 Sensitivity Impact Assessment and Significance

An impact rating has been developed with reference to '*Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes*' (NRA, 2005). This document deals with major infrastructure developments and the assessment guidance is therefore deemed appropriate to the current project. The sensitivity of the receiving hydrological and hydrogeological environment was identified for the proposed development. The sensitivity of an environmental receptor is based on its ability to absorb an impact without perceptible change. Then, the magnitude of the potential hydrological impact was determined. The sensitivity rating, together with the magnitude of the potential impact, provides an overall rating of the significance of the effect prior to application of mitigation measures.

The assessment of the magnitude of an effect incorporates the timing, scale, size and duration of the potential impact. The magnitude criteria for hydrological effects are defined as set out in Table 7.4.

Table 7.4: Assessment of Magnitude of Hydrological Impact (Adapted from NRA, 2005)

Magnitude	Criterion	Description and Example
Major	Loss of attribute	Long term changes to the geology, hydrology, water quality and hydrogeology, e.g., loss of EU-designated salmonid fishery: change in water quality status of river reach, loss of flood storage/increased flood risk, pollution of potable source of abstraction.
Moderate	Impact on integrity of attribute or loss of part of attribute	Short to medium term changes to the geology, hydrology, water quality and hydrogeology: loss in productivity of a fishery, contribution of significant sediment and nutrient quantities in the receiving water, but insufficient to change its water quality status.

Minor	Minor impact on attribute	Detectable but non-material and transitory changes to the geology, hydrology, water quality and hydrogeology - measurable change in attribute, but of limited size and/or proportion.
Negligible	Impact on attribute but of insufficient magnitude to affect the use/integrity	No perceptible changes to the geology, hydrology, water quality and hydrogeology: discharges to watercourse but no loss in quality, fishery productivity or biodiversity, no increase in flood risk.

Potential effects are assessed as being of major, moderate, minor or negligible significance as shown in **Table 7.5.**

Table 7.5: Significance of Criteria

Magnitude	Sensitivity			
	Very High	High	Medium	Low
Major	Major	Major	Moderate	Minor
Moderate	Moderate	Moderate	Moderate	Minor
Minor	Minor	Minor	Minor	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

7.2.6 Statement on Limitations and Difficulties Encountered

There were no significant difficulties encountered in compiling the specified information for this **EIAR** chapter.

7.3 Baseline Environment

7.3.1 Proposed Development Description and Location

To facilitate the connection of the consented Dernacart Wind Farm (Laois County Council Planning Reference 20/78, An Bord Pleanála Planning Reference ABP-310312-21) to the National Grid, Statkraft Ireland (the Applicant) is applying to An Bord Pleanála for permission to construct the following:

- **Proposed 110kV Substation** - A 110kV substation in place of the permitted (but not yet constructed) Dernacart Wind Farm 110kV substation and an associated access track;
- **Underground Windfarm Collector Cable and Access Track** - An underground electrical cable from the Dernacart Wind Farm to the relocated substation; and
- **Underground Grid Connection Cable**- Install a 110kV underground electrical cable from the proposed relocated Dernacart Wind Farm substation to the consented Bracklone 110kV Substation (Planning Ref. 20/638) in Portarlington Co. Laois.

The proposed development is located within southeast Co. Offaly and northeast Co. Laois. Refer to **Chapter 02 Development Description** of the **EIAR** for a detailed description of the proposed development.

7.3.2 Hydrology

7.3.2.1 Catchment Areas

The proposed development site is located within Hydrometric Area No. 14, also known as the Barrow catchment. Refer to **Figure 7.2** for an overview of the catchment extents in relation to the proposed development.

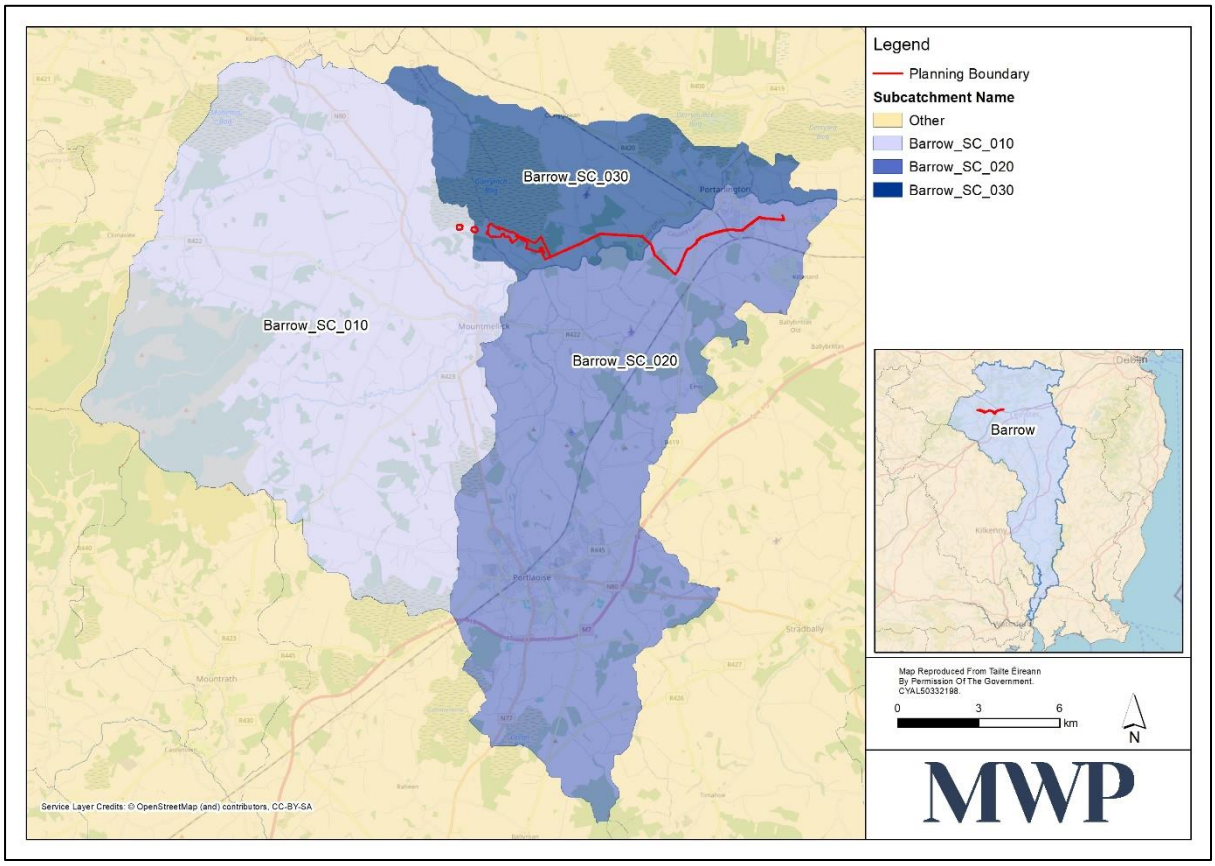

Figure 7.2: Catchment Areas

<u>Proposed 110kV Substation</u>

The proposed substation is located within sub catchment 14_1 (Barrow_SC_030) within the following river sub basins:

- Barrow_050.

<u>Underground Windfarm Collector Cable and Access Track</u>

The windfarm collector cable and access track are located within sub catchment 14_1 (Barrow_SC_030) within the following river sub basins:

- Cottoners Brook_010; and
- Barrow_050.

Underground Grid Connection Cable

The start of the 110kV Grid Connection is located within sub catchment 14_1 (Barrow_SC_030) with the remainder falling within sub-catchment 14_11 (Barrow_SC_020). The grid connections passes through the following river sub basins:

- Barrow_060;
- Clonygowan_010;
- Barrow_070; and
- Barrow_080.

7.3.2.2 EPA Mapped Surface Water Features

The River Barrow is the main surface water feature flowing in an easterly direction within close proximity to the proposed development. Refer to **Figure 7.3** for the location of the surface water features applicable to the assessment in relation to the proposed development.

The River Barrow is a designated Special Area of Conservation (SAC) named the River Barrow and River Nore SAC (002162). Refer to **Chapter 05 Biodiversity** and the **Natura Impact Statement (NIS)** submitted with the planning application package for further details.

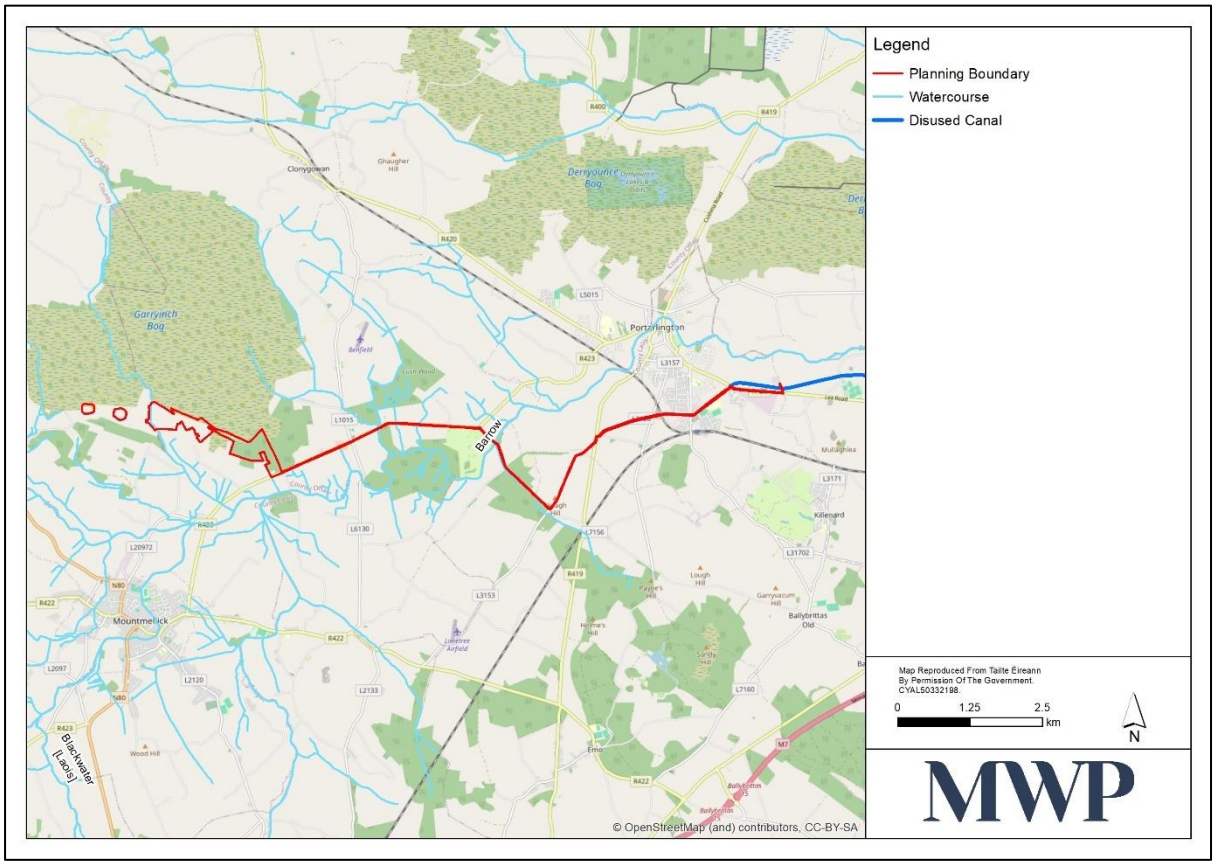

Figure 7.3: Hydrology Features within Proximity to the Proposed Development

Proposed 110kV Substation

There are no EPA mapped surface water features traversing the proposed substation site. The River Barrow (IE_SE_14B010550) flows in an easterly direction approximately 350m south of the proposed substation site on the opposite side of the R423 road. Field surveys have identified land drains along the northern, western, eastern and southern boundaries of the proposed substation field.

Underground Windfarm Collector Cable and Access Track

The wind farm collector cable starts from the permitted Dernacart wind farm and crosses Cottoner's brook (IE_SE_14C150500) EPA mapped water course. The crossing will be a new clear span bridge structure for both the collector cable and the access road. The Cottoners brook stream flows in a southerly direction for approximately 1.8km before the confluence with the River Barrow (IE_SE_14B010550). There are several deep drainage ditches and minor shallow ditches along the collector cable route. Refer to **Chapter 05 Biodiversity** for further details of these drainage ditches.

Underground Grid Connection Cable

The 110kV grid connection will be underground from the proposed substation until it connects to the permitted Bracklone substation southeast of Portarlington. The total length of the underground cable will follow existing road routes and will be installed under the following mapped water courses:

- Clonygowan (IE_SE_14C510940) – this water course flows in a southerly direction under the R423 for approximately 500m before the confluence with the River Barrow (IE_SE_14B010550);
- Unnamed tributary of the River Barrow (IE_SE_14B010700) – flowing under the R423 in a southerly direct for approximately 550m before the confluence with the River Barrow (IE_SE_14B010550);
- Rathmore 14 (IE_SE_14B010700) – this stream flows in a southerly direction under the R423 for approximately 420m before the confluence with the River Barrow (IE_SE_14B010550); and
- River Barrow (IE_SE_14B010700) – this river flows in an easterly direction through Portarlington before changing to a southerly direction after Monastervin. This river is the second longest river in Ireland at 192km. It is joined by the River Nore downstream and then by the River Suir before entering the Atlantic Ocean.

7.3.2.3 Watercourse Crossings

There are a total of sixteen (16) no. water crossings required to facilitate the proposed development. The number of crossings related to each element of the proposed development includes:

- One (1) crossing at the new site entrance to the proposed 110kV Substation;
- Four (4) crossings located along the route of the underground collector cable and access road; and
- Eleven (11) crossings along the route of the 110kV underground grid connection cable.

Refer to **Figure 7.4** for the location of these crossings. Details of each water crossing is provided in **Table 7.6**.

As part of the construction activities, no instream works will be undertaken within any watercourse. Crossing No. 1 and No. 5 will be achieved by the addition of new clear span structures so as to leave the natural bed and banks undisturbed. Details of new clear span crossings are shown on Drawing 23268-MWP-ZZ-00-DR-S-1101.

Crossings to be achieved by means of Horizontal Directional Drill (HDD) will require a service trench (launch pit) for the drill in the road either side of the watercourse. Refer to Drawing No. 23268-MWP-GR-XX-DR-C-5403 for further details.

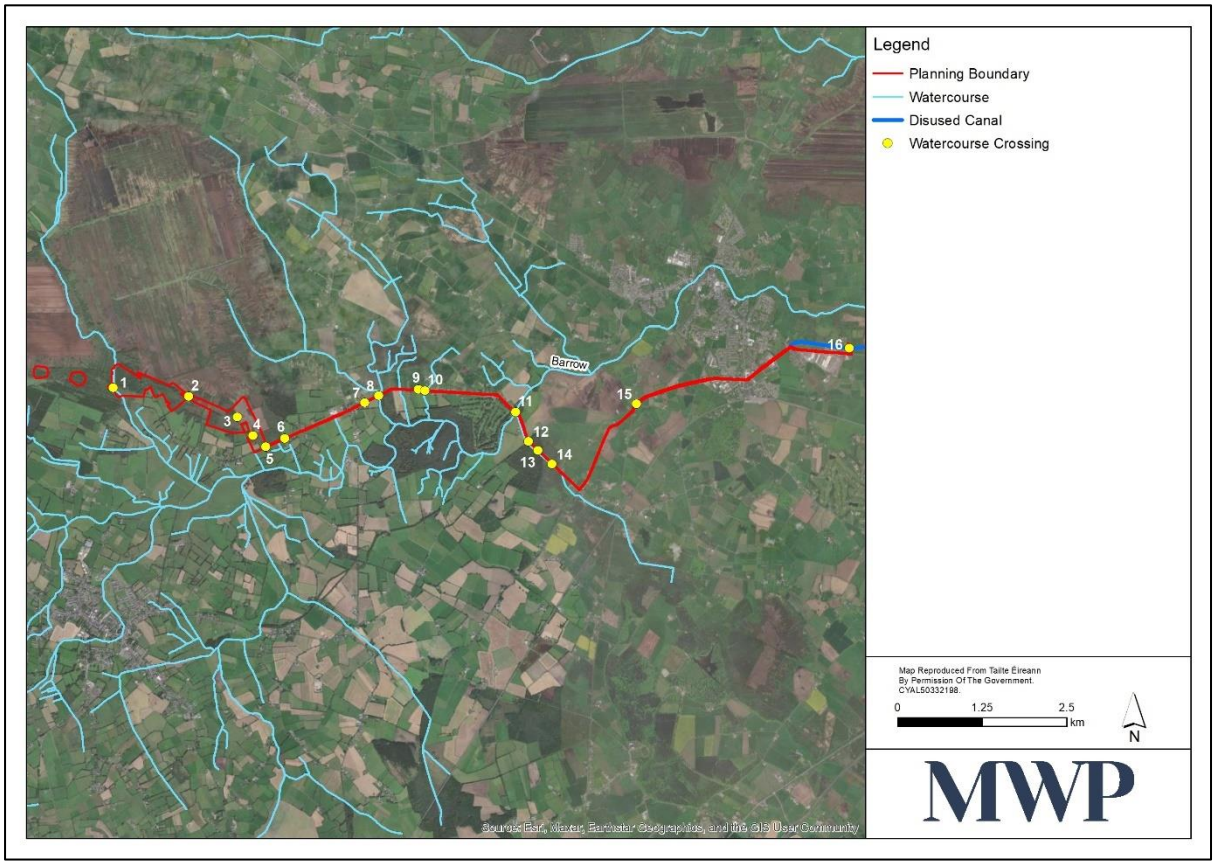

Figure 7.4: Watercourse Crossing Locations

Table 7.6: Watercourse Crossing Details

Water Crossing Number	ITM (X) easting	ITM (Y) northing	Crossing Type, Diameter and Span	EPA listed river waterbody	Anticipated options for UGC crossing method*
1	645343	711091	New crossing over Cottoners Brook for access track and wind farm collector cable	Yes	New clear span structure
2	646457	710961	New crossing over minor drain for access road and wind farm collector cable	No	Box Culvert or Pipe
3	647178	647405	New crossing over minor drain for access road and wind farm collector cable	No	Box Culvert or Pipe
4	647405	710380	New crossing over minor drain for access road and wind farm collector cable	No	Box Culvert or Pipe
5	647596	710217	New crossing over land drain for access road to substation	No	New clear span structure
6	647878	710339	Minor drain crossing	No	1, 2 or 3

Water Crossing Number	ITM (X) easting	ITM (Y) northing	Crossing Type, Diameter and Span	EPA listed river waterbody	Anticipated options for UGC crossing method*
7	649059	710868	Minor drain crossing	No	1, 2 or 3
8	649268	710973	Single stone arch	Yes	3
9	649582	711066	Single stone arch	Yes	3
10	649950	711046	Single stone arch	Yes	3
11	651294	710128	Stone Arch Bridge. Kilnahown Bridge over the river Barrow	Yes	3
12	651480	710296	Minor drain crossing	No	1, 2 or 3
13	651622	710161	Minor drain crossing	No	1, 2 or 3
14	651830	709960	Minor drain crossing	No	1, 2 or 3
15	653082	710849	Minor drain crossing	No	1, 2 or 3
16	656227	711672	900 diameter pipe which links to abandoned canal	No	1, 2 or 3

**Potential Crossing Methods;*

1. Standard trefoil/flatbed formation under piped culvert crossings via open trench.

2. Flatbed formation over bridges/culverts or under a pipe. UGC laid in existing road make up above the bridge/culvert or under an existing pipe.

3. Horizontal Directional Drill under the bridge/culvert.

7.3.2.4 Drainage

The River Barrow (EPA code 14B01) receives all surface waters draining the proposed project area. It is considered that all watercourses in the study area have been modified to some degree. The River Barrow is a drained river, and it appears that Cottoner's Brook has also been deepened.

A **Peat Stability Risk Assessment (PSRA)** was undertaken by MWP. The full assessment is attached as **Appendix 5** of **Volume 3** of this **EIAR**. In terms of hydrology and peat thickness, the following was noted in the assessment:

- Localised turf cutting;
- Manmade drains were noted near the perimeter of fields in the agricultural areas; and
- Manmade drains were noted in the forestry areas of the site.

As part of the proposed development, a site surface water management system will be constructed on the site so as to attenuate run-off, guard against soil erosion and safeguard downstream water quality. The drainage system

will be implemented along all works areas including all internal site access roads, storage areas, substation and temporary construction compound.

At the outset it is proposed to install clean water cut-off drains around the perimeter of the development areas to intercept surface water run-off from catchments uphill of the proposed development works. The cut-off drains will collect and divert the collected runoff around site infrastructure to prevent it entering the site and potentially coming in contact with site runoff containing suspended solids.

At the substation compound, it is proposed that surface water runoff from the roofs of the substation buildings, and hard-surfaced areas within the electrical yard, including areas where a risk of a contaminant leak or spill may be present (such as the transformer bund), will be collected in a series of filter drains, roof guttering and downpipes and routed to an underground gravity drainage network. All runoff collected in the stormwater sewer network will pass through an oil/petrol Interceptor prior to discharging to an attenuation unit on the south-east side of the substation compound. The attenuation unit will provide attenuation of the increased volumes of surface water runoff generated from the hard surfaces of the development when compared to the current greenfield condition. The attenuated surface water runoff is then proposed to overflow at a controlled rate equal to the greenfield runoff rate to an existing vegetated land drain on the western side of the compound.

A separate surface water run-off drainage system will be implemented along all internal access roads, to separate and collect 'dirty water' run-off from the roadway and to intercept clean over land surface water flows from crossing internal roadways. To achieve separation, clean water drains will be positioned on the upslope and dirty water drains positioned on the downslope of roadsides, with road surfaces sloped towards dirty drains. Clean water will be piped under both the access roads and downslope collection drains to avoid contamination. Piping the clean water under the service road allows the clean water to follow the course it would have taken before construction thus mimicking the existing surface water over land flow pattern of the site and thus not altering the natural existing hydrological regime on site.

Details of the proposed drainage system is provided in Planning Drawings No.23268-MWP-SS-00-DR-C-5207, 23268-MWP-SS-XX-DR-C-5404 and 263268-MWP-00-00-DR-C-5701 to 5707

7.3.2.5 Chemical Water Quality

Water quality monitoring is carried out by the EPA. There are five water quality monitoring stations that have monitoring data available for the waterbodies in close proximity to the proposed development. Refer to **Table 7.7** for the details of these monitoring stations and **Figure 7.5** for the location of these monitoring points.

Table 7.7: Water Quality Monitoring Stations

Map No	Waterbody Name	Station Code	Station Name
1	Cottoners Brook_010	RS14C150500	Cottoner's Bridge
2	Barrow_040	RS14B010500	Barranagh's Bridge
3	Barrow_050	RS14B010550	Bridge SE of Hammerlane
4	Barrow_060	RS14B010700	Kilnahown Bridge
5	Barrow_070	RS14B010780	Portarlington: Spa Bridge

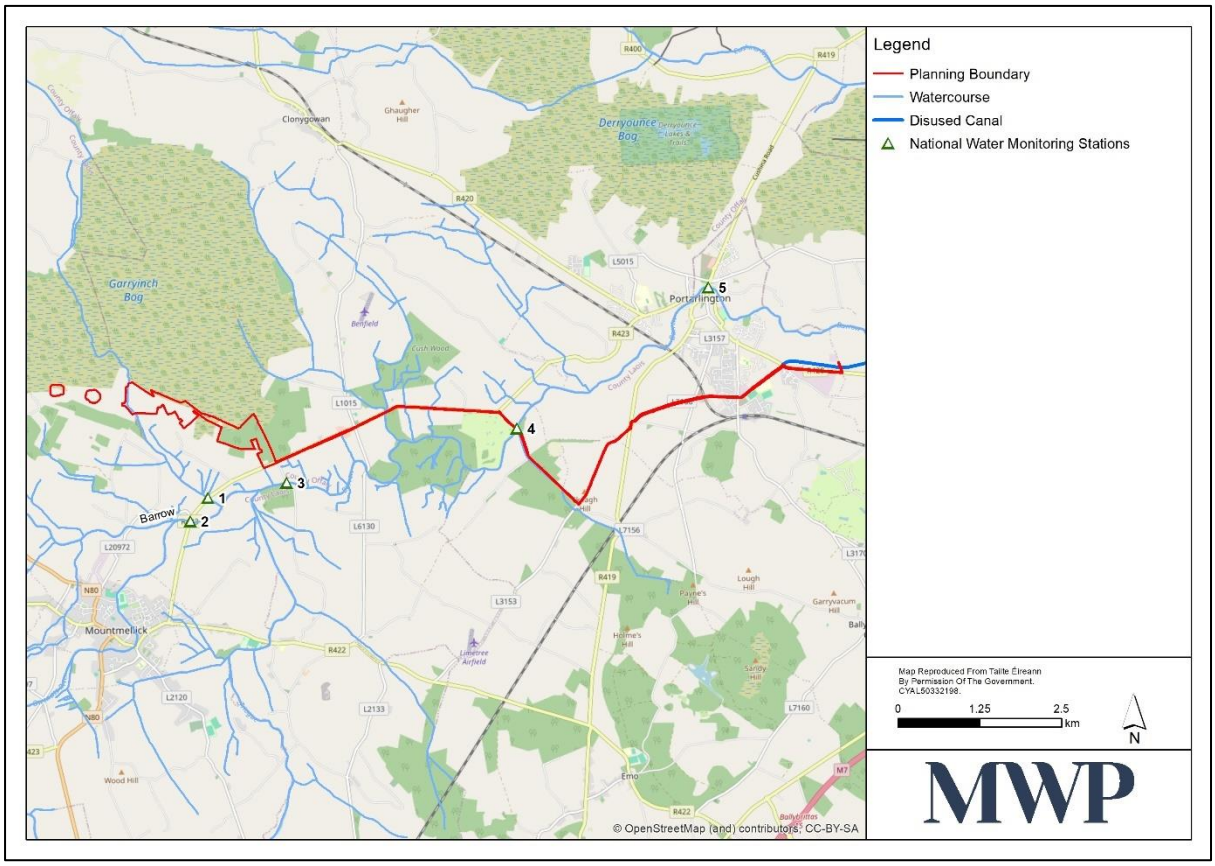

Figure 7.5: EPA Water Quality Monitoring Station Locations

The following water quality parameters were looked at for each of these monitoring points for 2022, 2023 and 2024:

- Ammonia;
- Biochemical Oxygen Demand (BOD); and
- Ortho-Phosphate.

Comparing the monitoring data available for the above parameters to the 95th percentile good status limit, provided in the European Union Environmental Objective s(Surface Waters) (Amendment) Regulations of 2019 (S.I. No. 77 of 2019), the following observations were made:

- Cottoner's Bridge: the station complied with the 95th percentile good status limit for Ammonia (0.14mg/l) and Ortho-Phosphate (0.075mg/l) for 2022, 2023 and 2024 (for samples take to date). BOD (2.6mg/l) was also complied with except for an exceedance in July 2024 where a measurement of 4.4mg/l was recorded;
- Barranagh's Bridge: the station complied with the 95th percentile good status limit for Ammonia (0.14mg/l) and Ortho-Phosphate (0.075mg/l) for 2022, 2023 and 2024 (for samples take to date). BOD (2.6mg/l) was also complied with except for an exceedance in January 2023 and January 2024 where a measurement of 3.7mg/l and 2.9mg/l was recorded respectively;
- Bridge SE of Hammerlane: the station complied with the 95th percentile good status limit for Ammonia (0.14mg/l) and Ortho-Phosphate (0.075mg/l) for 2022, 2023 and 2024 (for samples take to date). BOD (2.6mg/l) was also complied with except for an exceedance in January 2023 and January 2024 where a measurement of 3.6mg/l and 3.5mg/l was recorded respectively;

- Kilnahown Bridge: the station complied with the 95th percentile good status limit for Ammonia (0.14mg/l), BOD (2.6mg/l) and Ortho-Phosphate (0.075mg/l) for 2022, 2023 and 2024 (for samples take to date); and
- Portarlington: Spa Bridge: the station complied with the 95th percentile good status limit for Ammonia (0.14mg/l) and Ortho-Phosphate (0.075mg/l) for 2022, 2023 and 2024 (for samples take to date). BOD (2.6mg/l) was also complied with except for an exceedance in May 2022 where a measurement of 5.3mg/l was recorded.

7.3.2.6 Biological Water Quality

The EPA has several Q value monitoring stations along the River Barrow in close proximity to the proposed development. Refer to **Figure 7.6** for the location of these monitoring stations.

The latest water quality data for each of these stations is shown in **Table 7.8** and the WFD river waterbody risk illustrated in **Figure 7.7**. From the data, it is evident that the River Barrow (although Not at Risk through the proposed development site) is at Risk of not achieving the WFD objectives.

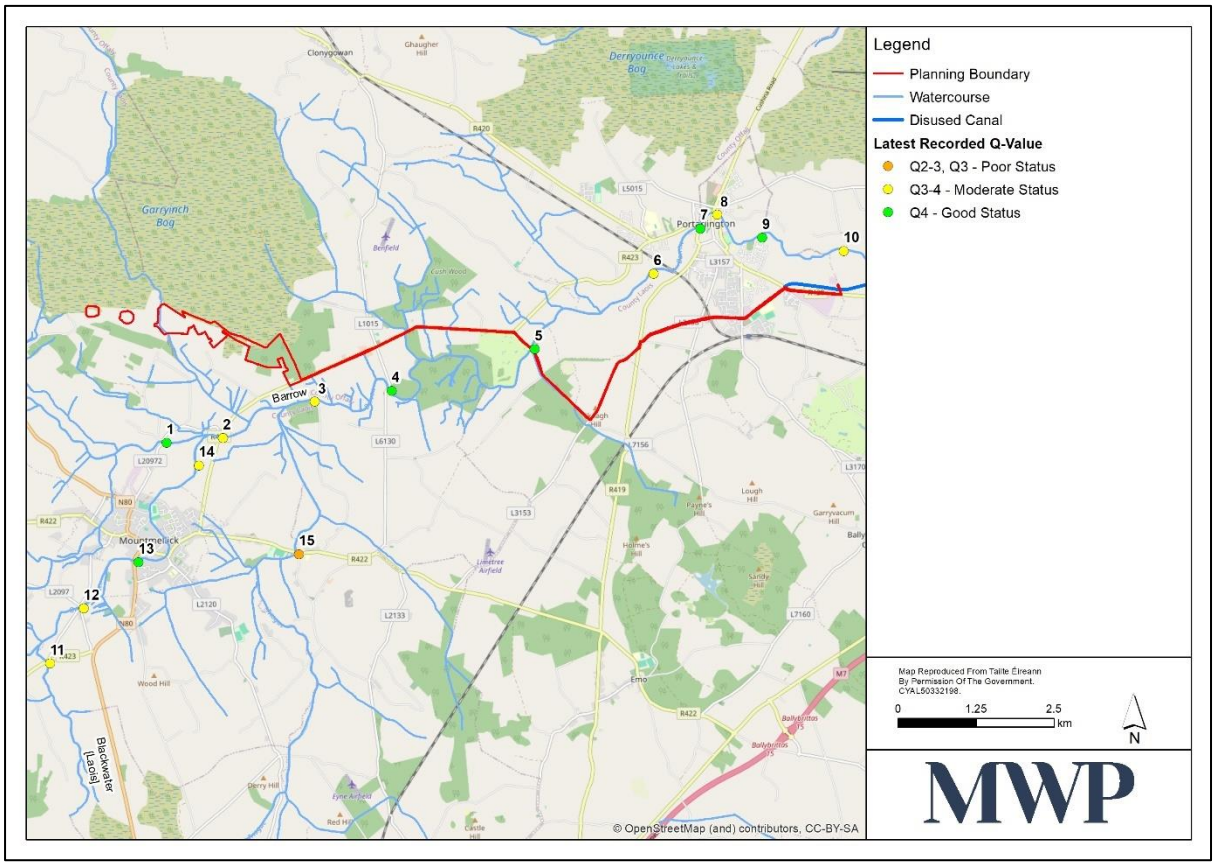

Figure 7.6: EPA Monitoring Point Locations

Table 7.8: River Water Quality at Relevant EPA Stations in Proximity to the Proposed Development Site

ID	River	Station Name/Location	Station ID	Q-rating	Corresponding WFD status*	Latest Rating (Year)*	River Waterbodies Risk
1	Barrow	Barrow - Bay Bridge	RS14B010400	4	Good	1989	At Risk
2	Barrow	Barranagh's Bridge	RS14B010500	3-4	Moderate	2020	At Risk
3	Barrow	Bridge SE of Hammerlane	RS14B010550	3-4	Moderate	1989	At Risk
4	Barrow	Barrow - Portnahinch Bridge (S of Garryhinch Hse)	RS14B010600	4	Good	2011	Review*
5	Barrow	Kilnahown Bridge	RS14B010700	4	Good	2020	Review*
6	Barrow	~100m u/s Portarlington SWO	RS14B010740	3	Poor	2021	At Risk
7	Barrow	Barrow - Portarlington-Upper Br	RS14B010760	4	Good	2000	At Risk
8	Barrow	Portarlington: Spa Bridge	RS14B010780	3-4	Moderate	2020	At Risk
9	Barrow	Barrow - 1km d/s Portarlington	RS14B010800	4	Good	1994	At Risk
10	Barrow	Barrow - D/s Portarlington STW (RHS)	RS14B010850	3	Poor	2021	At Risk
11	Blackwater (Laois)	Blackwater Br	RS14B031000	3-4	Moderate	2023	At Risk
12	Owenass	Owenass Br	RS14O010200	3-4	Moderate	1993	At Risk
13	Owenass	Br N of Irishtown Ho on N80	RS14O010220	4	Good	2023	At Risk
14	Owenass	1.7 km d/s Mountmellick	RS14O010300	3-4	Moderate	2020	At Risk
15	Triogue	Triogue Br (Br u/s Barrow R Con	RS14T010400	3	Poor	2023	At Risk

Note: It is noted that some of the data sourced from the EPA mapping portal is dated and unlikely to reflect the current status

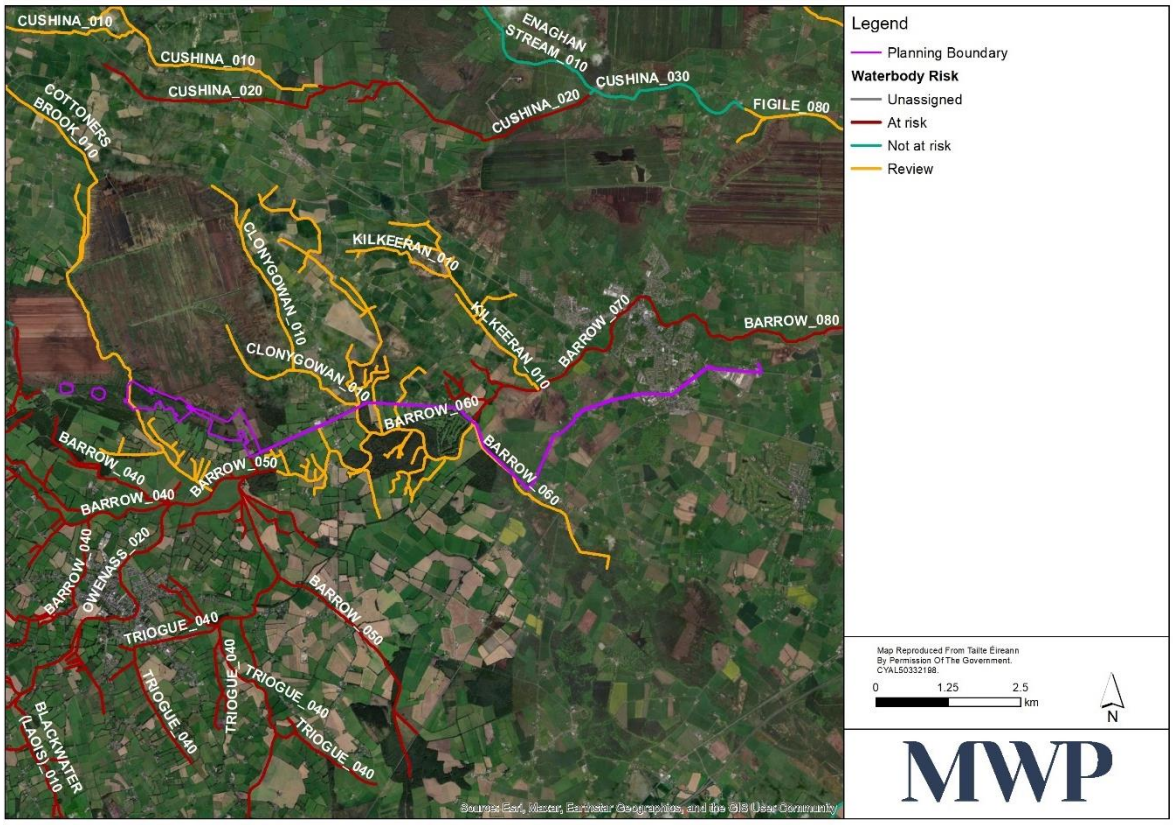

Figure 7.7: River Water Body Risk

Proposed 110kV Substation

The Bridge SE of Hammerlane (RS14B010550) monitoring station is located directly south of the proposed substation and has a Q Value Status of 3-4 (Moderate). The Q Value Status of the upstream monitoring station has the same Q Value Status [Barranagh's Bridge (RS14B010500)]. The monitoring station downstream [Barrow - Portnahinch Bridge (RS14B010600)] of the proposed substation however improves to a Q Value Status of 4 (Good).

Underground Windfarm Collector Cable and Access Track

The Twomile Bridge monitoring station upstream (RS14B010300) of the windfarm collector cable has a Q Value Status of 4 (Good). As the river flows in a southerly direction the Q Value Status changes to 3-4 (Moderate) at the Barranagh's Bridge (RS14B010500) and Bridge SE of Hammerlane (RS14B010550) stations located to the south of the collector cable.

Underground Grid Connection Cable

There are a range of Q value Status scores along the length of the grid connection. The Bridge SE of Hammerlane (RS14B010550) monitoring station south of the start of the underground grid route has a Q Value Status of 3-4 (Moderate). From there the Q Value Status fluctuates between 4 (Good) and 3 (Poor) until the Barrow - D/s Portarlington STW (RHS) monitoring location at the end of the grid route to the north with a Q Value Status of 3 (Poor).

7.3.2.7 Surface Water Sensitivity

Watercourse sensitivity was derived from the biological ratings in the EPA water quality results listed in **Table 7.8**. Based on the findings, it is considered that all surface waters within and near the proposed development site are of moderate sensitivity as indicated by the Biotic Indices of Q3 – Q4 at the sampling sites.

7.3.2.8 Flood Risk

A review of the available Catchment Flood Risk Assessment and Management (CFRAM)[4] or National Indicative Fluvial Mapping (NIFM) fluvial flood maps available for this site on the OPW flood information portal (www.floodinfo.ie) shows potential flooding areas within the proposed development site. **Figure 7.8** shows low to medium probability for flooding at the location of the wind farm collector cable and the proposed substation. There is also potential for flooding along portions of the 110kV grid connection route at the watercourse crossing locations. There is a low to medium probability for fluvial flooding along a small portion of the 110kV grid connection route.

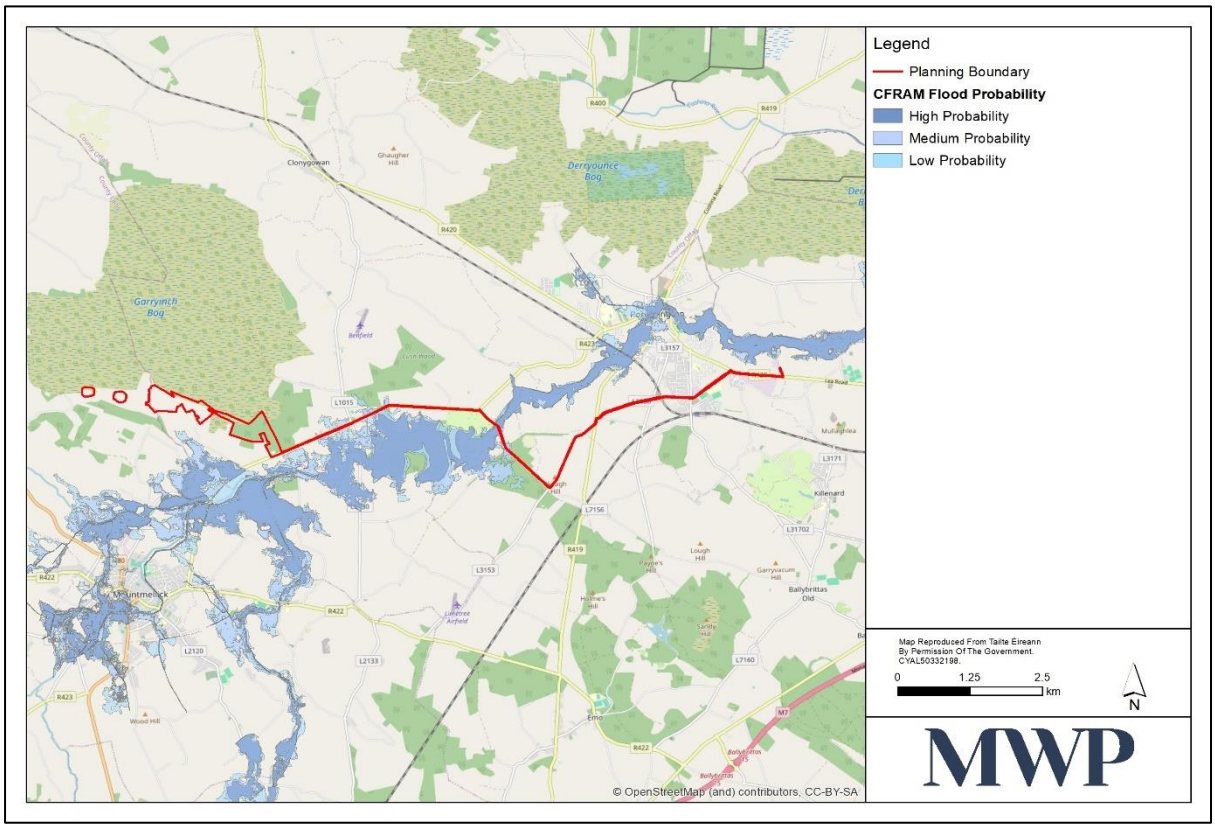

Figure 7.8: CFRAM Flood Map

<u>Proposed Substation</u>

A Flood Risk Assessment (FRA) was undertaken by MWP (refer to **Appendix 4** of **Volume 3** of this **EIAR**) for the proposed 110kV Substation. The report concludes that the proposed substation site is located in Flood Zone C

[4] https://www.floodinfo.ie/map/floodmaps/

(i.e. outside of Flood Zone A & B) therefore the site has a low probability of flooding as defined in the Flood Risk Management Guidelines. Furthermore the proposed substation does not interact with floodplains or flow paths, therefore the proposed development will not adversely impact on fluvial or groundwater flood risk elsewhere.

The proposed substation site will create impermeable areas that could increase storm water runoff rates. This will be adequately mitigated by incorporating appropriate Sustainable Urban Drainage Systems (SuDS) into the detailed design which will include limiting the discharge rate from the site to existing greenfield runoff rates.

7.3.3 Hydrogeology

7.3.3.1 Bedrock

The Geological Survey of Ireland (GSI) shows the proposed development site to be underlain by a combination of limestone and shale. Commencing in the west, where the underground wind farm collector cable and access road and the 110kV substation are proposed, with the dark muddy limestone and shale of the Ballysteen Formation.

The 10.5km long underground 110kV grid connection cable is then underlain by the massive un-bedded lime mudstone of the Waulsortian Limestones, the thick bedded limestone of the Allenwood Formation and, at the far eastern end of the proposed route, the dark limestone and shale of the Lucan Formation.

There is a fault underlying the route of the proposed underground 110kV grid connection cable, trending northeast –southwest, separating the Waulsortian and the Allenwood Formations. These faults are no longer active and do not present a hazard for construction of the proposed development.

The bedrock geology of the site and surrounding area is presented in Figure 7.9.

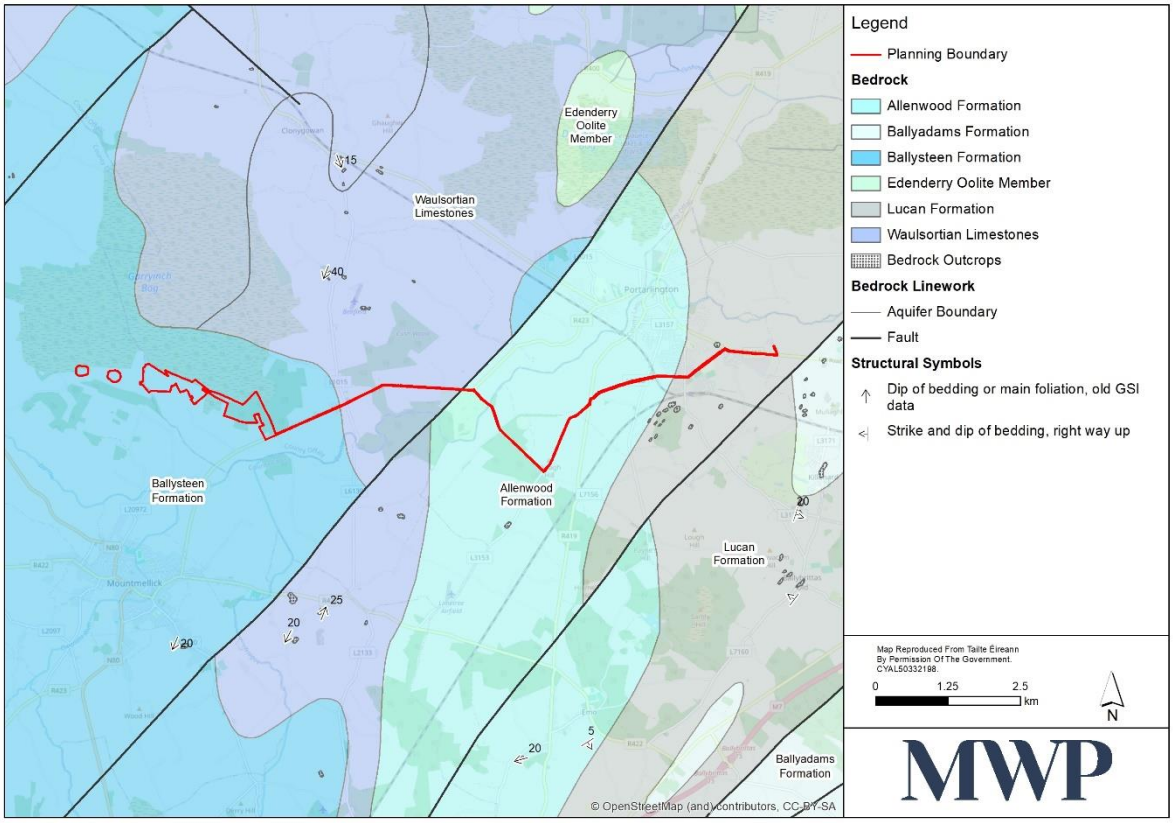

Figure 7.9: Bedrock Geology

7.3.3.2 Groundwater Body

The proposed development is situated within the groundwater bodies (GWB) detailed in Table 7.9.

Table 7.9: Groundwater Bodies related to the Proposed Development

GWB Name	European Code	Description	Project related Infrastructure
Portlaoise	IE_SE_G_107	Poorly productive bedrock	Windfarm Collector Cable and Access Road Proposed 110kV Substation Start and end portions of the 110kV Grid Connection Cable
Bagenalstown Upper	IE_SE_G_153	Karstic	110kV Grid Connection Cable

7.3.3.3 Aquifer Classification

An aquifer is defined as a geological formation that is capable of yielding quantities of water. While most rock types are aquifers, their supply varies. Geological strata are categorised for hydrogeological purposes as Major Aquifers (Regionally Important), Minor Aquifers (Locally Important) or Unproductive Rocks (Poor Aquifers/Aquitards).

The underground Windfarm Collector Cable and access road and the proposed 110kV Substation are located within an aquifer that is described by Geological Survey Ireland (GSI) as a Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones (LI).

Majority of the 110kV grid connection cable route is situated within an aquifer which is described as a Regionally Important Aquifer - Karstified (diffuse). The start and end section of the grid connection cable are located within a Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones (LI). Refer to **Figure 7.10** for the location of the proposed development within these aquifers.

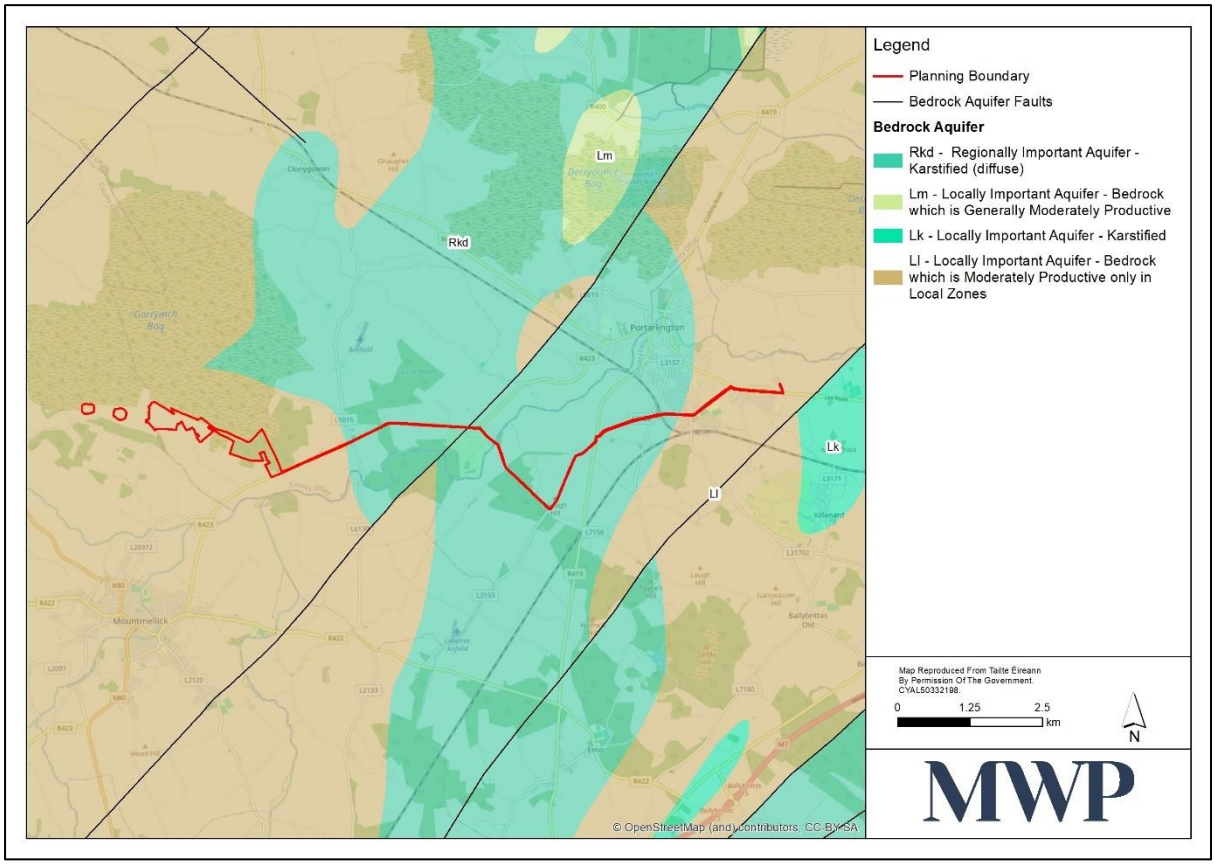

Figure 7.10: Aquifer Classification

7.3.3.4 Abstraction (Wells and Springs)

The GSI database lists six boreholes and eight dug wells in proximity to the proposed development site, which are labelled for domestic use and supply where the use is known. The Yield Class is described as Poor for all of these, with the exception of two dug wells and one borehole which have been assigned a medium yield class. There is one dug well and one borehole for which the yield class is unknow. Details of these boreholes/dug wells are provided in **Table 7.10** and their locations in **Figure 7.11.**

There is a public supply source protection area located approximately 2km south east of the proposed grid connection route. The scheme forms part of the Lough Public Water Supply: Portarlington Water Supply Scheme. There is an additional Mountmellick Derrygile supply source protection area located approximately 6km southwest. The Clonyquin group scheme (preliminary source protection area) is located approximately 4.3km north of the proposed development. Refer to **Figure 7.12** for the location of these protection areas. There is however no hydrological link between these and the proposed development site and therefore, these schemes will be unaffected by any activity associated with the proposed development. There may be other unmapped local wells for domestic or farming use and therefore, for the purpose of this EIAR, it will be assumed and assessed that

all residential properties downgradient of the proposed development have private water abstraction for drinking water use.

No groundwater will be abstracted as part of the proposed development. However, should any groundwater be intercepted during construction (e.g., by excavation works) and need to be removed to facilitate the works, the amount of water would not be of such a quantity as to exceed the recharge capacity of the groundwater body.

Table 7.10: Groundwater Wells and Springs

GSI Name	Well Type	Drill Date	Depth (m)	Well Use	Yield Class	Yield m3/d	Easting	Northing
2321SEW033	Dug well	01/08/1971	3.4	Domestic use only	Moderate	44	245200	210410
2321SEW034	Dug well	01/12/1972	3.4	Unknown	Poor	38.2	245200	210370
2321SEW014	Dug well	01/04/1962	3.2	Domestic use only	Poor	9.8	250150	211040
2321SEW013	Dug well	29/12/1899	4.3	Domestic use only	Unknown	Unknown	250750	210720
2321SEW001	Borehole	29/12/1899	2.5	Public Supply	Unknown	Unknown	250680	211050
2321SEW002	Borehole	29/12/1899	84	Unknown	Poor	Unknown	250780	211000
2321SEW015	Dug well	01/04/1962	2.1	Domestic use only	Poor	35.2	251360	211280
2319NEW004	Borehole	29/12/1899	11.3	Unknown	Moderate	49.1	250970	209270
2319NEW010	Dug well	01/01/1968	4.6	Unknown	Poor	14.2	250970	209170
2319NEW103	Dug well	01/10/1974	5.5	Unknown	Poor	16.4	250980	209080
2319NEW046	Borehole	20/10/1969	28	Unknown	Poor	17.7	250980	209130
2319NEW001	Borehole	08/05/1970	10.4	Unknown	Poor	38.2	253000	209620
2321SEW031	Borehole	29/12/1899	6.1	Unknown	Poor	3.6	253240	210670
2321SEW032	Dug well	01/09/1970	4.3	Unknown	Moderate	41.5	253230	210630

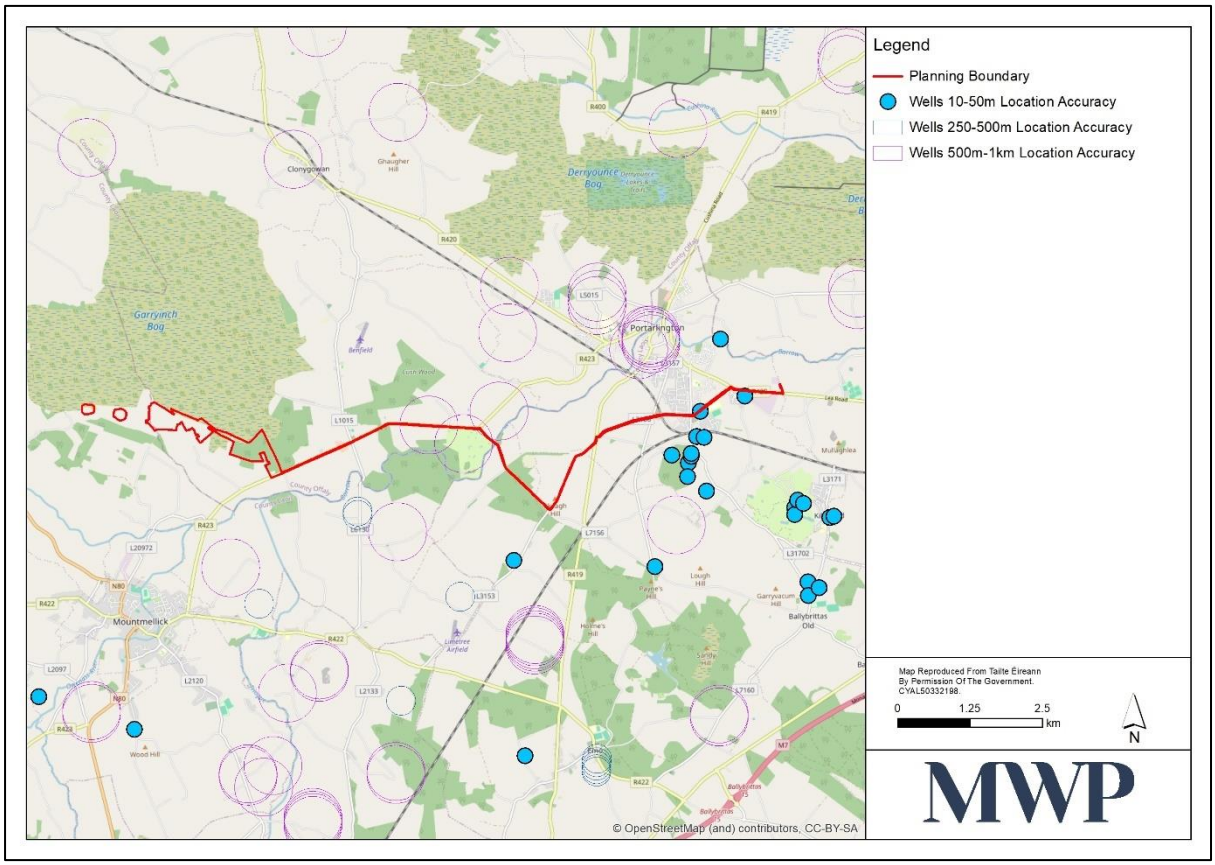

Figure 7.11: Groundwater Wells and Springs

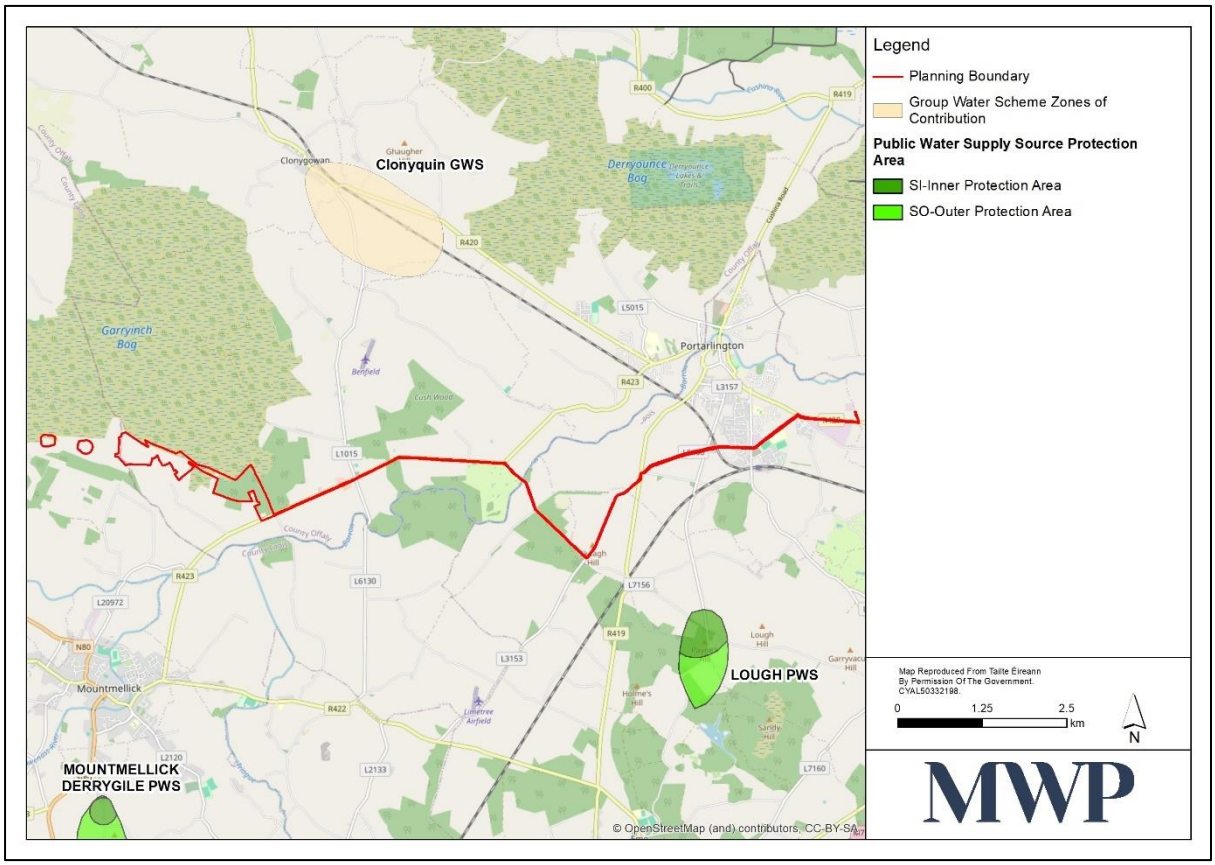

Figure 7.12: Groundwater Protection Area

7.3.3.5 Groundwater Vulnerability and Risk

The EPA classified the Groundwater Body underlying the underground Windfarm Collector Cable and access road and the proposed 110kV Substation as having a WFD Status (2016-2021) of 'Good', with a current risk score of 'Not at Risk'.

The groundwater body risk related to the 110kV grid connection cable route has a WFD Status (2016-2021) of 'Good', with a current risk score of 'Review[5]'. The section where the grid connection meets the Bracklone substation is classified as having a 'Poor' overall groundwater status and is 'at Risk' of not meeting the WFD objectives.

Figure 7.13 presents the most recent data from the EPA website on groundwater body risk relevant to the proposed development site.

[5] *Water bodies for Review are not considered to be At Risk but require further evidence that the objectives are being met, typically with ongoing monitoring and/or possibly modelling.

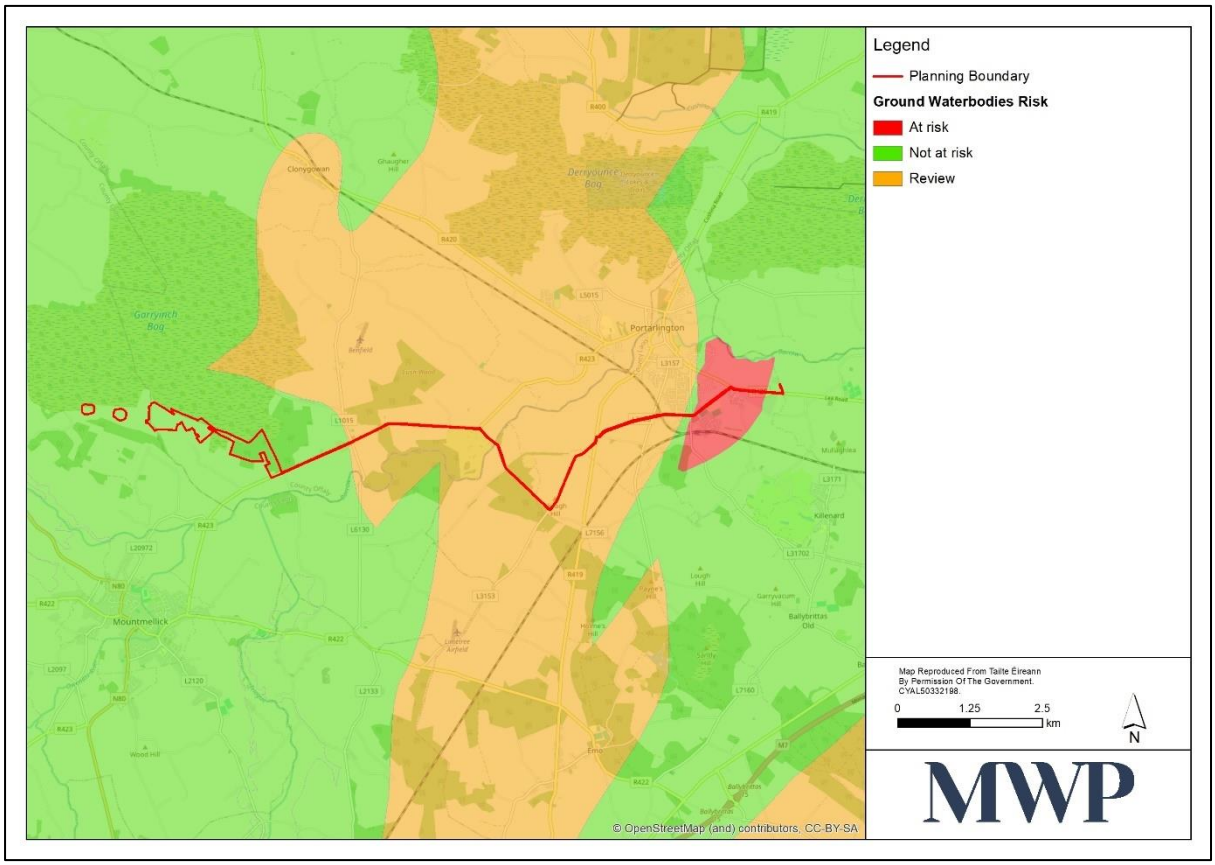

Figure 7.13: EPA Groundwater Body Risk

Groundwater vulnerability is a term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated generally by human activities. Mapping provided by the GSI indicates that the Windfarm Collector Cable and access road and the proposed 110kV Substation is underlain by aquifers of high vulnerability.

Majority of the 110kV underground grid connection cable route is underlain by an aquifer of moderate vulnerability with a small portion along the L3153 being highly vulnerable.

Refer to **Figure 7.14** for groundwater vulnerability mapping beneath the site and within the greater area.

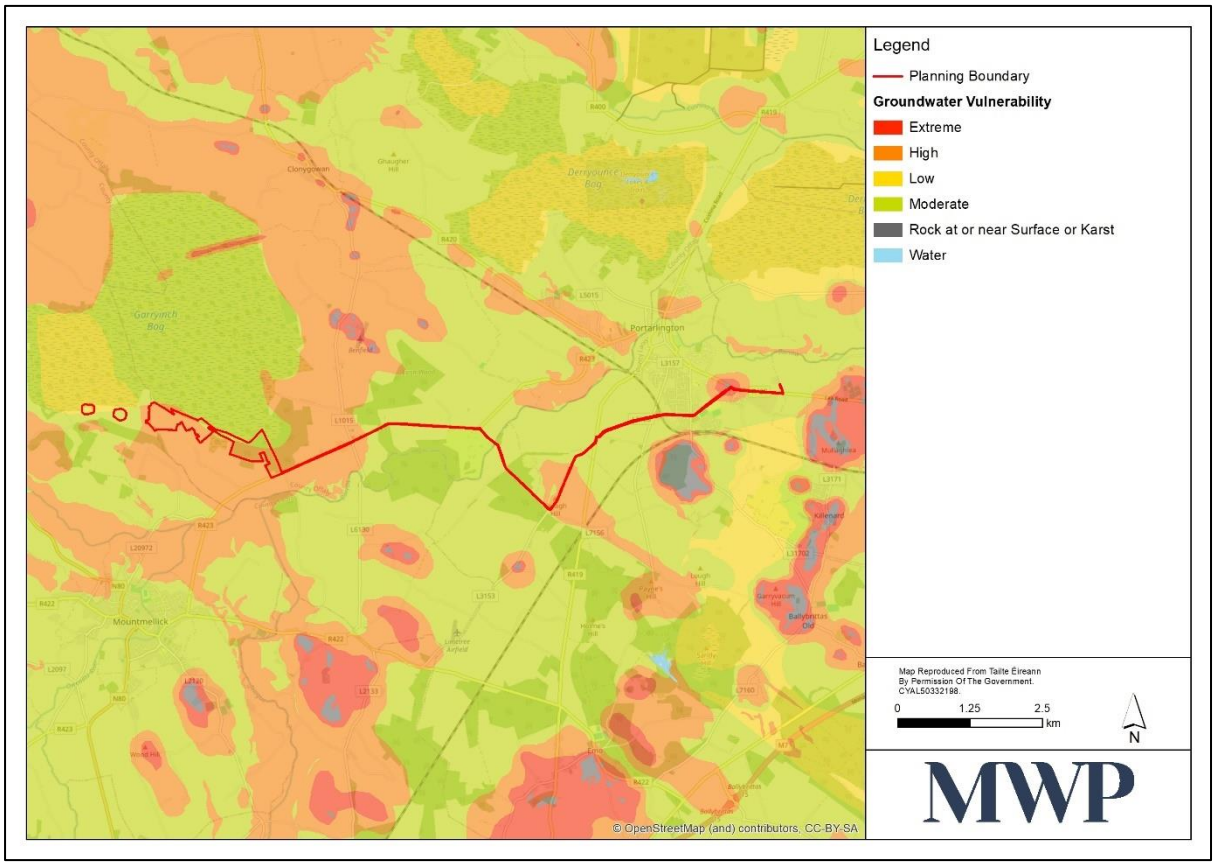

Figure 7.14: Groundwater vulnerability

7.3.4 Designated Sites and Habitats

Within the Republic of Ireland, designated sites include:

- Natural Heritage Areas (NHAs);
- Proposed Natural Heritage Areas (pNHAs);
- candidate Special Areas of Conservation (cSAC);
- Special Areas of Conservation (SAC); and
- Special Protection Areas (SPAs).

Local designated sites in the area of the proposed development site are shown on **Figure 7.15**. Surface waterbodies draining the proposed development flow into the River Barrow And River Nore SAC (Site Code: 002162).

Refer to **Chapter 05 Biodiversity** of this **EIAR** and the **Natura Impact Statement (NIS)** submitted with the planning application package for further details on these sites.

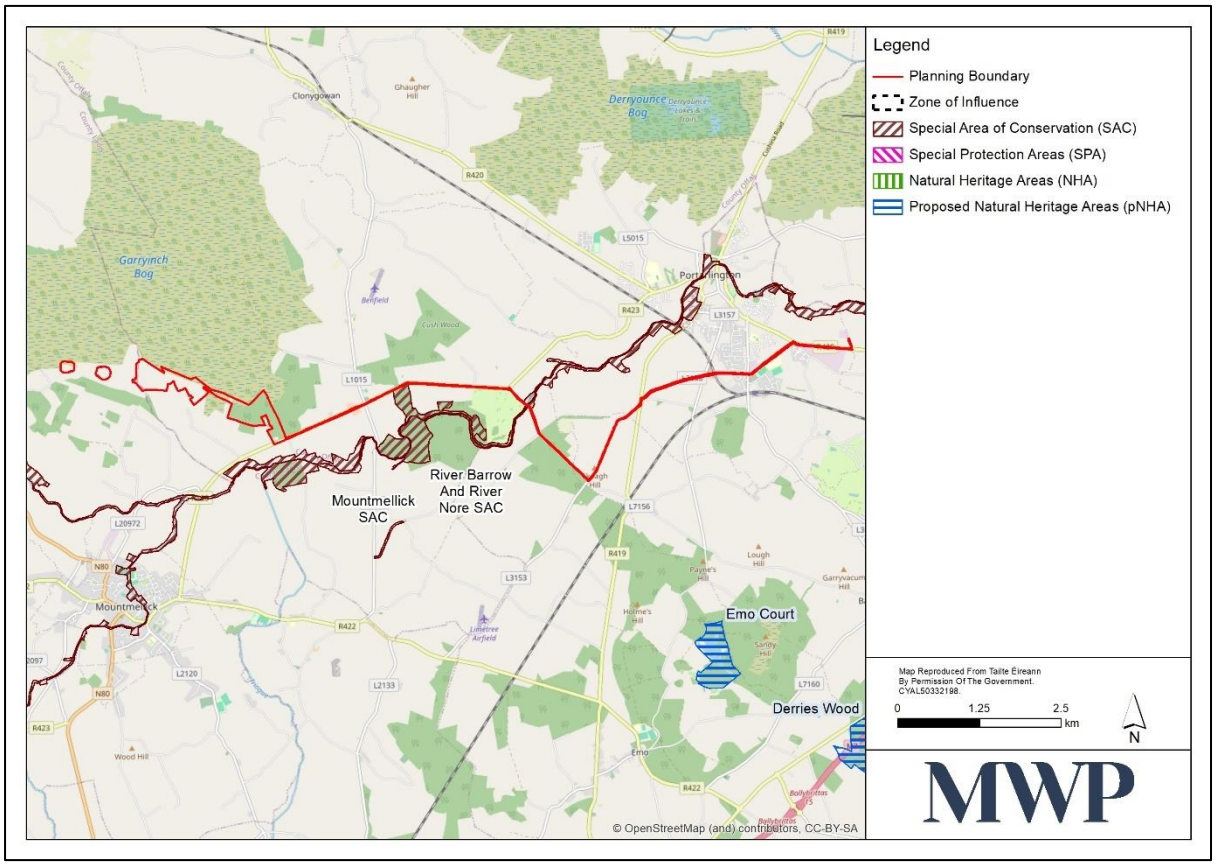

Figure 7.15: Designated Sites

7.3.5 Receptor Sensitivity

Due to the nature of the proposed development, being near surface construction activities, likely significant effects on groundwater are generally negligible and surface water is generally the main sensitive receptor assessed during impact assessments.

The primary risk to groundwater at the site would be from cementitious materials, hydrocarbon spillage and leakages. These are common potential impacts on all construction sites. All potential contamination sources are to be carefully managed at the site during the construction and operational phases of the development and mitigation measures are proposed below to deal with these potential minor impacts.

Based on criteria set out in Table 7.1, groundwater along the majority of the proposed development can be classed as Sensitive to pollution as permeabilities in the upper few metres of the bedrock are often high, and in places along the along the grid line route, the underlying bedrock is classified as a Regionally Important Aquifer. The ground water along the grid route within the Bagenalstown Upper GWB can also be classed as Sensitive, as there may be areas where the bedrock is karstified. In general, it is likely that any contaminants which may be accidently released during the construction works are more likely to travel to nearby streams within surface runoff. Surface waters such as the Cottoners Brook, Clonygowan, Rathmore, River Barrow and its associated tributaries are sensitive to potential contamination.

The designated site that is mapped within close proximity of and hydraulically connected (surface water flow paths only) to the proposed development is the River Barrow And River Nore SAC. This designated site can be considered very sensitive in terms of potential impacts.

Comprehensive surface water mitigation and controls are outlined in Section 7.5 to ensure protection of all receiving waters. Mitigation measures will ensure that surface runoff, specifically during the construction phase will be of a high quality and will therefore not impact on the quality of downstream surface water bodies. Any introduced drainage works at the site will mimic the existing hydrological regime thereby avoiding changes to flow volumes leaving the proposed development site.

7.4 Likely Significant Effects

This section addresses the potential effects on the hydrological and hydrogeological environment from activities arising during construction and operation of the proposed development and makes a determination on the likelihood of occurrence. The project has incorporated some elements of mitigation into the construction and operational design of the project. Assessments are therefore based on these measures being implemented.

7.4.1 Do-Nothing

If the proposed development for which this document has been prepared does not go ahead, it is assumed that the landuse will remain unchanged without the construction of the wind farm collector cable, proposed substation and 110kV underground grid connection. The land-use along the proposed development route comprising forestry, road transport, agriculture and residential will remain unchanged. There will be no alteration of the existing hydrological or hydrogeological regime.

7.4.2 Construction Phase

7.4.2.1 Construction Effect 1: Earthworks and Tree Felling resulting in Suspended Solids Entrainment in Surface Waters

Construction phase activities that will require earthworks resulting in removal of soils, and vegetation cover/ road pavement, are detailed in the Chapter 02 Development Description of the EIAR. Potential sources of sediment laden water include:

- Drainage and seepage water resulting from infrastructure excavation;
- Stockpiled excavated material providing a point source of exposed sediment;
- Construction of the grid connection cable trench resulting in entrainment of sediment from the excavations during construction; and
- Erosion of sediment from emplaced site drainage channels.

These activities can result in the release of suspended solids along drainage and surface water discharge routes to watercourses and could result in an increase in the suspended sediment load. An increase in sediment load leads to increased turbidity which in turn could affect the water quality and fish stocks of downstream water bodies. Receptors include down gradient rivers (water quality in the River Barrow and its tributaries) and dependent eco systems.

Felling of commercial conifer forestry is required to accommodate the construction of the underground collector cable and new access/service road from the windfarm to the 110kV substation. Overall felling of approximately 2.8ha of forestry will be required.

All tree felling will be undertaken in accordance with a tree felling licence, using good working practices as outlined by the Department of Agriculture, Food and the Marine (DAFM) Standards for Felling and Reforestation (2019).

These standards deal with sensitive areas, buffer zone guidelines for aquatic zones, ground preparation and drainage, chemicals, fuel and machine oils. All conditions associated with a proposed felling licence will be complied with.

Given the relatively small, localised scale of the works, the volume of runoff from the construction works and felling area will be minimal in relation to the overall runoff to local waterbodies. Potential effects are significant if not mitigated against. Refer to Table 7.11 for the for the potential effect rating if left unmitigated.

7.4.2.2 Construction Effect 2: Excavation works resulting in an Effect on Groundwater Levels and Local Wells and Springs

Dewatering of water ingress into excavations has the potential to impact on local groundwater levels. This has the potential to effect local well supplies in close proximity of the site. However, due to the shallow nature of the excavations and the connection cable route along existing roads and services, no effects on groundwater levels will occur from the construction of the underground wind farm collector cable and access road, proposed substation or the underground grid connection cable.

Therefore, it is unlikely that there will be any impact on neighbouring wells as a result of the proposed development. Refer to Table 7.11 for the for the potential effect rating if left unmitigated.

7.4.2.3 Construction Effect 3: Potential Release of Hydrocarbons during Construction and Storage

Accidental spillage during refuelling of construction vehicles with petroleum hydrocarbons is a significant pollution risk to groundwater, surface water and associated ecosystems, and to terrestrial ecology. The accumulation of small spills of fuels and lubricants during routine use can also be a pollution risk. This can occur through seepage through soils into Groundwater flow paths and the site drainage network into the River Barrow and its tributaries.

Hydrocarbon has a high toxicity to humans, and all flora and fauna, including fish, and is persistent in the environment. It is also a nutrient supply for adapted micro-organisms, which can rapidly deplete dissolved oxygen in waters, resulting in death of aquatic organisms. No refuelling will take place near water resources and the welfare and storage units will have a built-in spill containment sump to prevent any liquid spills from escaping the container. Drainage systems will be constructed (refer to Section 7.3.2.4) to prevent any contaminated runoff from entering the receiving environment.

Refer to Table 7.11 for the for the potential effect rating if these migration measures were not implemented.

7.4.2.4 Construction Effect 4: Release of Cement Based Products

Concrete and other cement-based products are highly alkaline and corrosive and can have significant negative impacts on water quality. They generate very fine, highly alkaline silt (pH 11.5) that can physically damage fish by burning their skin and blocking their gills. A pH range of ≥ 6 ≤ 9 is set in S.I. No. 293/1988 Quality of Salmonid Water Regulations, with artificial variations not in excess of ± 0.5 of a pH unit. Entry of cement-based products into surface water runoff or seepage to groundwater represents a risk to the aquatic and groundwater environment during grid connection works.

Batching of wet concrete on site and washing out of transport and placement machinery are the activities most likely to generate a risk of cement-based pollution. On-site washing of concrete truck barrels will not be allowed.

The washing of the chutes at the rear of the trucks may be permitted in the designated and lined chute wash area. This area will retain the washout water, will be located within the construction compound and onsite drainage management system and there will be no other chute wash down activity on any other part of the wind farm site.

Refer to Table 7.11 for the for the potential effect rating if no mitigation measures are implemented.

7.4.2.5 Construction Effect 5: Morphological Changes to Surface Watercourses & Drainage Patterns from Drilling, Crossings and Culverts

There are a total of 16 no. watercourse crossings pertaining to the proposed development, several will be completed by means of Horizontal Directional Drill (HDD) which will require a service trench (launch pit) for the drill in the road either side of the watercourse; and two (2) of the watercourse crossings will be completed by means of clear span bridge. There will be no instream works will be undertaken within any watercourse.

Diversion, culverting and bridge crossing of surface watercourses can result in morphological changes, changes to drainage patterns and alteration of aquatic habitats. Construction of structures over water courses has the potential to significantly interfere with water quality and flows during the construction phase. The drainage system to be implemented and the piping the clean water under the service road allows the clean water to follow the course it would have taken before construction thus mimicking the existing surface water over land flow pattern of the site and thus not altering the natural existing hydrological regime on site.

Refer to Table 7.11 for the for the potential effect rating if no mitigation measures are implemented.

7.4.2.6 Construction Effect 6: Potential Effects on Hydrology and Designated Sites

River Barrow And River Nore SAC (Site Code: 002162) flows adjacent to a section of the 110kv grid cable route, all of which is located in the existing county roads, which itself carries no ecological value. The excavation and reinstatement of the grid route trench along this section will take less than 4 weeks of work, meaning the works will be temporary and transient. The shallow nature of the trench excavation works means that no impacts on groundwater will occur, and the main pathway for transmission of impacts to the water environment is via surface water.

The proposed development is hydrologically connected to the River Barrow And River Nore SAC. Surface water effects on downstream designated sites are unlikely to be significant due to dilution/assimilation capacity effects over such distances and the implementation of drainage management and mitigation measures to be implemented on site (refer to Section 7.3.2.4 and 7.5). Refer to Table 7.11 for the for the potential effect rating on the surface water resources and Chapter 05 Biodiversity of this EIAR for further details on the potential effects on the River Barrow And River Nore SAC.

Table 7.11: Summary of Construction Effects (Pre mitigation)

Impact	Quality of Effect	Significance	Spatial Extent	Duration
Earthworks and Tree Felling resulting in suspended solids entrainment in surface waters	Negative	Significant	Localised	Short term
Excavation works resulting in an Effect on Groundwater Levels and Local Wells and Springs	Negative	Imperceptible	Localised	Temporary
Potential Release of Hydrocarbons	Negative	Significant	Localised	Short Term
Release of Cement Based Products	Negative	Moderate	Localised	Short Term
Morphological Changes to Surface Watercourses & Drainage Patterns from Drilling, Crossings and Culverts	Negative	Moderate	Localised	Long Term
Potential Effects on Hydrology and Designated Sites	Negative	Slight	Localised	Short Term

7.4.3 Operational Phase

Potential impacts on the water environment during operation are limited by virtue of the fact that the proposed development site is relatively static during the operational phase, with all construction works being complete, and drainage and runoff will be clean therefore no impacts will occur. Some minor maintenance works may be completed throughout the operational phase. These works would be of a very minor scale and would be very infrequent. Mitigation measures will be put in place during any maintenance works throughout the operational phase, including drainage control measures, sediment control measures and mitigation measures related to spills/chemical releases which will ensure that the quality of runoff from along the grid route during maintenance will be good.

The increase in the rate of surface water run-off due to the increase in hard surface areas at the proposed substation could lead to an increase in flood risk downgradient of the site. The runoff control measures for the proposed development have been designed in the context of storm events of varying duration and intensity. The attenuation pond has been designed to cater for a maximum continuous flow rate associated with a medium-intensity rainfall event. Higher intensity runoff will be attenuated by the open drain collection system which provides temporary storage and limits the rate at which it enters the settlement ponds.

Table 7.12: Operational Effects

Impact	Quality of Effect	Significance	Spatial Extent	Duration
Increased surface water run-off	Neutral	Imperceptible	Localised	Short Term

7.4.4 Demolition or Decommissioning Phase

The potential impacts associated with decommissioning of the proposed development will be similar to those associated with construction but of a reduced magnitude, due to the reduced scale of the proposed decommissioning works in comparison to construction phase works.

During the decommissioning phase, the underground electrical collector cable from the wind farm to the substation would be disconnected and remain in place, minimising the environmental impact. The cables contain no materials that are harmful to the environment. The cable installation would include warning tape and tracer cable that would warn anyone that could be digging in the area of the cables both during and after project operation. The access roads will be left for use by the landowners.

All aboveground components including buildings, structures and equipment will be removed during decommissioning at the substation area. Disassembly of the substation would include the removal of the steel, transformers, switches, conductors, and other materials that could be reconditioned and reused or sold as scrap. All underground electrical collector cables coming to the substation from the wind turbines would be cut at the perimeter of the substation; with any cables less than 1m deep removed. Any hazardous material such as oils or lubricants will be removed in accordance with Waste Management standards. In addition to steel structures, the control building will be disassembled and removed from the site. The O&M containers would also be removed, relocated or reconditioned. All equipment, furniture, and materials within the O&M containers will be removed prior to removal. All fencing around the substation compound will be dismantled, removed and reused or sold as scrap. All foundations will be removed to a depth of at least 1meter below ground surface, backfilled, graded and then covered with topsoil. Based on discussions with landowners, access roads no longer needed will be removed and the disturbed land areas subsequently graded and reseeded.

The underground electrical 11kV cable would be disconnected and remain in place. All other underground elements (junction boxes, joint bay, cable ducts etc) would also remain insitu.

7.4.5 Cumulative Impacts and Effects

A recent (2024) desktop survey of proposed and permitted plans and projects within the adjacent townlands and large-scale developments (wind and solar) within 50km of the proposed development are detailed in Chapter 01 Introduction of this EIAR.

The proposed development will facilitate the export of electricity from the permitted Dernacart Wind Farm (Planning Ref ABP-310312-21) to the Bracklone 110kV substation (Planning Ref. 20/638).

The permitted Dernacart Wind Farm is located to the west of the proposed development and has not yet been constructed. The effects of the Dernacart Wind Farm on the receiving water environment were assessed as part of the EIAR undertaken for the permitted wind farm. The EIAR concluded that, with the implementation of appropriate mitigation, there would be no significant effects on hydrology and geohydrology. Mitigation measures to be implemented are outline in Chapter 14 of the Wind Farm EIAR. The majority of the wind farm (T1-T4, T7 and T8) is located in a separate catchment area (Barrow_SC_010) to the proposed development assessed in this chapter. Only two turbines (T5 and T6) are located within the Barrow_SC_030 catchment area where the underground collector cable, access track and substation are to be located.

The consented Bracklone 110kV substation is to be located at the end of the grid connection route in the Barrow_SC_020 sub-catchment. The only portion of the proposed development that falls within this catchment area is a portion of the underground grid connection cable. An NIS was undertaken as part of the planning application for the Bracklone substation. The NIS concluded that following the implementation of mitigation measures, the construction and operation of the Bracklone 110kV substation would not have any adverse effects to the integrity of any European site (i.e. the hydrological connection to the River Barrow And River Nore SAC). A

drainage plan was also compiled as part of Bracklone substation project to prevent any significant impacts on hydrology and hydrogeology.

With exception of the Dernacart Wind Farm and the Bracklone substation, for which the cumulative impacts have already been assessed, there are no other plans or projects in close proximity to cumulatively impact hydrology and hydrogeology. The potential cumulative water quality and quantity effects of the proposed development during the construction and operational phase will not have significant effects on downstream watercourses. This is due to the fact the proposed development is mainly located in a separate sub catchment area (Barrow_SC_030) to these two projects. In addition, the implementation of environmental protection measures and drainage design of the proposed development described in Section 7.5 and the measures in the EIAR for the Dernacart Wind Farm and the Bracklone substation mitigation measures will prevent any significant cumulative effects.

7.5 Mitigation Measures

7.5.1 Construction Phase

7.5.1.1 Earthworks (Removal of Vegetation Cover, Excavations and Stock Piling) Resulting in Suspended Solids Entrainment in Surface Waters

Temporary silt fencing/silt trap arrangements will be placed within existing roadside/field drainage features along the grid connection to capture any suspended sediments from the works area. The trapped sediment will be removed and disposed at an appropriate authorised facility.

All soils, subsoils, peat and stone generated from excavation works will be retained on site within the development boundary and reused in bunding, landscaping and reinstatement of the temporary construction compound. Excess spoil material will be stored on site in designated peat deposition areas.

Surface paving material from the excavation of the public road associated with the placement of the underground 110kV cable to the grid connection point at the Bracklone substation will be removed to a suitable approved waste facility.

7.5.1.2 Potential Impacts on Groundwater Levels and Local Well Supplies During Excavation works

No groundwater level impacts will occur from the construction of the underground wind farm collector cable and access road, proposed 110kV substation and underground grid connection cable due to the shallow nature of the excavation and temporary nature of the proposed works, therefore mitigation measures are not required.

7.5.1.3 Potential Release of Hydrocarbons during Construction

Mitigation measures proposed to avoid release of hydrocarbons at the proposed development site are as follows:

- Refuelling will be carried out using 110% capacity double bunded mobile bowsers. The refuelling bowser will be operated by trained personnel. The bowser will have spill containment equipment which the operators will be fully trained in using;
- Plant nappies or absorbent mats to be placed under refuelling point during all refuelling to absorb drips;
- Mobile bowsers, tanks and drums should be stored in secure, impermeable storage area, 50m away from drains and open water;

- Should there be an oil leak or spill, the leak or spill will be contained immediately using oil spill kits, all oil and any contaminated material will be removed and properly disposed of in a licensed facility;
- Immediate action will be facilitated by easy access to oil spill kits. An oil spill kit that includes absorbing pads and socks will be kept at the site compound and also in site vehicles and machinery;
- Correct action in the event of a leak or spill will be facilitated by training all vehicle/machinery operators in the use of the spill kits and the correct containment and cleaning up of oil spills or leaks. This training will be provided by the Environmental Manager at site induction;
- In the event of a major oil spill, a company who provide a rapid response emergency service for major fuel spills will be immediately called for assistance, their contact details will be kept in the site office and in the spill kits kept in site vehicles and machinery;
- Storage areas will be bunded appropriately for the fuel storage volume for the time period of the construction and fitted with a storm drainage system and an appropriate oil interceptor;
- The plant used during construction will be regularly inspected for leaks and fitness for purpose.

7.5.1.4 Release of Cement-Based Products

The following mitigation measures are proposed:

- No batching of wet-cement products will occur on site. Ready-mixed supply of wet concrete products and where possible, emplacement of pre-cast elements, will take place;
- Where concrete is delivered on site, only the chute will be cleaned, using the smallest volume of water practicable. No discharge of cement contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed. Chute cleaning water will be undertaken at lined cement washout ponds;
- Weather forecasting will be used to plan dry days for pouring concrete; and,
- The pour site will be kept free of standing water and plastic covers will be ready in case of sudden rainfall event.

7.5.1.5 Potential Hydrological Effects from Directional Drilling Works

The following mitigation measures are proposed where crossings are to be achieved by means of Horizontal Directional Drilling (HDD):

- Drilling fluid returns will be contained within a sealed tank / sump to prevent migration from the works area. Spills of drilling fluid will be cleaned up immediately and stored in an adequately sized skip before been taken off-site;
- The drilling fluid/bentonite will be non-toxic and naturally biodegradable (i.e., Clear Bore Drilling Fluid or similar will be used);
- The drilling process / pressure will be constantly monitored to avoid any possible leaks or breakouts into the surrounding geology or local watercourse;
- This will be gauged by observation and by monitoring the pumping rates and pressures. If any signs of breakout occur then drilling will be immediately stopped; and
- Any frac-out material will be contained and removed off-site.

7.5.1.6 Morphological Changes to Surface Watercourses & Drainage Patterns by Watercourse Crossings

General Best Practice Pollution Prevention Measures will also include:

- Protection of the riparian zone watercourses by implementing a constraints zone around stream crossings, in which construction activity will be limited to the minimum, i.e. works solely in connection with duct laying at the stream crossing;
- No stockpiling of construction materials will take place within the constraints zone;
- No concrete truck chute cleaning is permitted in this area;
- Works shall not take place at periods of high rainfall, and shall be scaled back or suspended if heavy rain is forecast;
- Plant will travel slowly across bare ground at a maximum of 5km/hr. Bog mats will be employed to protect tracked areas as necessary;
- Machinery deliveries shall be arranged using existing structures along the public road;
- All machinery operations shall take place away from the stream and ditch banks, apart from where crossings occur. Although no instream works are proposed or will occur;
- Any excess construction material shall be immediately removed from the area and taken to an appropriately licensed facility;
- No stockpiling of materials will be permitted in the constraint zones;
- Spill kits shall be available in each item of plant required to complete the stream crossing; and,
- Silt fencing will be erected on ground sloping towards watercourses at the stream crossings if required.

Mitigation Measures relating to the use and storage of fuels and chemicals in terms of groundwater protection:

- The plant used will be regularly inspected for leaks and fitness for purpose; and,
- Spill kits will be available to deal with accidental spillage.

7.5.1.7 Potential Hydrological Impacts on Designated Sites

As the River Barrow And River Nore SAC (Site Code: 002162) is adjacent to the proposed development site, the Proposed Development, mitigation measures outlined in Section 7.5.1.1 to Section 7.5.1.6 above will be implemented.

The proposed development has potential to effect downstream and hydrologically connected designated sites. Mitigation measures must be put in place during the construction phase, as surface waters from sections of the proposed development will potentially drain towards these areas.

Mitigation measures are outlined in Section 7.5.1.1 to Section 7.5.1.6 above which, when implemented, will provide the necessary protection to these hydrologically sensitive areas.

The proposed mitigation measures which will include drainage control measures, sediment control measures and mitigation measures related to spills/chemical releases will ensure that the quality of runoff from along the grid route during construction will be 'Good'. As stated in Section 7.4.2.1, there could potentially be a "short term, likely impact" on local streams and rivers but this would be very localised and over a very short time period (i.e. hours). Therefore, significant direct, or indirect impacts on the SAC's will not occur. The hydrological regime locally

will not be affected by the proposed works and so the regime of the SAC will not be affected as a result of the following:

- No significant dewatering is proposed during construction. Any pumping required will be temporary and at a very shallow depth;
- All building and trenching works are proposed at or very near existing ground levels with minimal ground disturbance proposed; and
- No deep foundations are required or are proposed. As such there will be no interruption or blocking of shallow or deep groundwater pathways below the proposed development site.

7.5.2 Operational Phase

A site-specific drainage system has been designed which will cater for the additional run off and reduce the velocities of flow. The maintenance of the development will incorporate effective maintenance of the drainage system. The maintenance regime will include inspecting the following:

- Drains, cross-drains and pipes for any blockages;
- Outfalls to existing field drains and watercourse;
- Existing roadside swales and gullies for any obstructions; and
- Progress of the re-establishment of vegetation.

All equipment with the potential for oil spillage will be bunded. Provision of spill kit facilities and training of operatives in use of same

7.6 Monitoring Measures (If relevant)

A programme of surface water quality monitoring will be prepared in consultation with Inland Fisheries Ireland (IFI) prior to the commencement of the construction of the proposed development. The plan will include surface water quality monitoring during the pre-construction, and construction phase.

Baseline water quality monitoring will be undertaken upstream and downstream of the site prior to construction to determine the baseline water. This baseline data will include the main components of a full hydrograph for the streams including both high spate flow and base flow where possible.

During the construction phase of the project, water quality in the streams and outflow from the drainage and attenuation system will be monitored, field-tested and laboratory tested on a regular basis during different weather conditions. This monitoring together with the visual monitoring will help to ensure that the mitigation measures that are in place to protect water quality are working effectively.

During the construction phase of the project, the development areas will be monitored regularly for evidence of groundwater seepage, water ponding and wetting of previously dry spots, and visual monitoring of the effectiveness of the constructed drainage and attenuation system to ensure it does not become blocked, eroded, or damaged during the construction process.

7.7 Residual Effects

By implementing the above mitigation measures, the significance of the residual effects on the water environment during the construction and operational phase of the development is assessed as being imperceptible to not significant. Mitigation by design has been implemented from the early concept and design stage to prevent adverse effects and mitigation measures will be implemented and monitored throughout the construction and

operation phases. It is considered that the proposed project design including control measures, together with mitigation measures, will ensure that there will be no significant negative effect on surface water quality, surface water flows or groundwater resources. Refer to **Table 7.13**.

Mitigation measures will, where required, be put in place before development work commences. Consequently, the proposed development is not expected to contribute to any cumulative negative effects with other existing or proposed developments in the vicinity. When the mitigation measures are implemented in full, a high degree of confidence can be assured that any negative effects on the receiving environment will be imperceptible/not significant. In particular, when undertaken as proposed, the development is not expected to have a significant negative effect on the groundwater regime. The risks associated with sedimentation and contamination of the aquifers due to erosion and runoff will be reduced to minimal levels as areas are re-vegetated and construction traffic is no longer present. Hydrological or hydrogeological conditions would not be altered to a degree that would affect the local or wider area.

Additionally, as previously mentioned, a **Natura Impact Statement (NIS)** has been completed for the proposed development and determined that there will be no adverse effects on any qualifying interests of protected Natura 2000 sites hydrologically linked and downstream of the proposed site. Therefore, there will be no significant adverse effects on the hydrological or hydrogeological regime pertaining to the development site.

Table 7.13: Summary of Residual Effects

Phase	Activity	Potential Impact	Quality of Effect	Significance	Spatial Extent	Duration
Construction Phase	Earthworks (Removal of Vegetation Cover, Excavations and Stock Piling) Resulting in Suspended Solids Entrainment in Surface Waters	Increase in Suspended Solids	Negative	Not significant	Localised	Temporary
	Potential Impacts on Groundwater Levels and Local Well Supplies During Excavation works	Impact on local groundwater levels	Neutral	Imperceptible	Localised	Temporary
	Potential release of Hydrocarbons during Construction and Storage	Pollution risk to groundwater, surface water and associated ecosystems, and to terrestrial ecology	Negative	Not significant	Localised	Short-term
	Potential release of Cement-Based Products during construction activities	Potential effect on surface water and groundwater quality	Negative	Not significant	Localised	Short-term
	Morphological Changes to Surface Watercourses & Drainage Patterns by Watercourse Crossings and Culverts	Surface water quality and Morphological changes	Negative	Not significant	Localised	Long-term
	Potential Effects on Hydrology of Designated Sites during construction activities	Designated Sites	Negative	Imperceptible	Localised	Short-term
Operational Phase	Increased surface water run-off	Flood risk	Neutral	Imperceptible	Localised	Temporary

7.8 Conclusion

During the construction and operation/maintenance phases of the proposed development, a number of activities will take place, some of which will have the potential to affect the hydrological and hydrogeological regime or water quality at the site or its vicinity.

Pollution control and other preventative measures have been incorporated into the project design to minimise adverse effects on water quality. Mitigation by design has been the principal means which will reduce suspended sediment run-off arising from construction activities. Preventative measures also include fuel, concrete, and waste management, which are incorporated into the project CEMP (Appendix 2 Volume 3 of this EIAR).

The implementation of the proposed mitigation measures will;

- Prevent a deterioration in status of bodies of surface and groundwater;
- Not jeopardise the attainment of good surface water chemical status;
- Not permanently exclude or compromise the achievement of the objectives of the WFD in other bodies of water within the same river basin district; and
- Is consistent with other Community Environmental legislation.

Due to the design of the project, and the mitigation and monitoring measures described which will be adopted, it is not likely that there will drawdown of groundwater, or that there will be a discharge of priority substances or priority hazardous substances from the proposed development. The proposed development alone or in combination with other developments is not likely to cause a deterioration in the quality of any body of surface water or groundwater, is not likely to alter the chemical status of any waters, is not likely to have a significant effect on any European site and is not likely to compromise the ability of any waters to meet the objectives of the Water Framework Directive and transposing legislation.

With implementation of the proposed mitigation measures, the construction of the wind farm and associated activities alone or in combination with other projects will not have a significant adverse effect on the hydrology and hydrogeology of the site and surrounding area.

7.9 References

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