

Ballyfeeny Green Energy Project



Environmental Impact Assessment Report Volume II

Chapter 8 – Water, Hydrology (Flood Risk Assessment) and Hydrogeology

September 2025



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Acronyms

Term	Meaning
EIA	Environmental Impact Assessment
GCR	Grid Connection Route
TDR	Turbine Delivery Route
LA	Local Authority
EIAR	Environmental Impact Assessment Report
CEMP	Construction Environmental Management Plan
SWMP	Surface Water Management Plan
TMP	Traffic Management Plan
FRA	Flood Risk Assessment
WFD	Water Framework Directive
DHLGH	Department of Housing, Local Government and Heritage
IGI	Institute of Geologists of Ireland
EPA	Environmental Protection Agency
IFI	Inland Fisheries Ireland
WEDG	Wind Energy Development Guidelines
DoHPLG	Department of Housing, Planning and Local Government
EC	European Commission
CDP	County Development Plan
GSI	Geological Survey of Ireland
CFRAM	Catchment Flood Risk Assessment and Management
kV	Kilovolt
COF	Confirmation of Feasibility
PCE	Pre-Connection Enquiry
OPW	Office of Public Works
NPWS	National Parks and Wildlife Services
CDP	County Development Plan
NRA	National Roads Authority
T01	Turbine 1
T02	Turbine 2
T03	Turbine 3
T04	Turbine 4
T05	Turbine 5
T06	Turbine 6
SE1	Site Entrance 1
SE2	Site Entrance 2
SE3	Site Entrance 3
SE4	Site Entrance 4
SE5	Site Entrance 5
SE6	Site Entrance 6
SAC	Special Area Conservation
AOD	Above Ordnance Datum
ESB	Electrical Supply Board
PPAP	Priority Pathway Action Plans
GWS	Group Water Scheme
SSFRA	Site-Specific Flood Risk Assessment
PFRA	Preliminary Flood Risk Assessment
NIFM	National Indicative Fluvial Mapping
pNHA	Proposed Natural Heritage Ireland
AoI	Area of Influence

Term	Meaning
mS/cm	MilliSiemens per centimetre
mg/l	Milligram per litre
HDD	Horizontal Directional Drilling
ECoW	Environmental Clerk of Works
CO₂	Carbon dioxide
BESS	Battery Energy Storage System
EIS	Environmental Impact Statement
IWEA	Irish Wind Energy Association Ireland
COD	Chemical Oxygen Demand
ERP	Emergency Response Plan
COMAH	Control of Major Accident Hazards
BOD	Biological Oxygen Demand

8. Water, Hydrology (Flood Risk Assessment), and Hydrogeology

8.1 Introduction

This Chapter assesses the likely direct and indirect effects on the receiving surface waters (hydrology) and groundwater (hydrogeology) environment from the proposed Project during the construction, operational and decommissioning phases. It includes a baseline environment assessment of the water, hydrology and hydrogeology environmental setting and considers the likely impacts of the construction, operational and decommissioning phases within the study area. Where required, mitigation measures have been described to avoid, prevent and/or reduce or, if possible offset any likely significant adverse effects. The significance of any residual effects, after the implementation of mitigation measures are also detailed.

The proposed Project includes six no. turbines and all associated infrastructure including Turbine Foundations, Turbine Hardstands, Site Access Tracks, Wind Farm Internal Cabling, Grid Connection Route (GCR), Relay Tower, Onsite Substation and works required along the public road network for the two Turbine Delivery Route (TDR) options to facilitate the delivery of turbine components. A full description of the proposed Project is provided in **Chapter 2 – Project Description**

The Applicant is in receipt of a notification of opinion by the Local Authority on design flexibility. The notification is provided in **Appendix 1.5 – DFR-25-1 Notification of Opinion by Local Authority**. This opinion from the Local Authority (LA) confirmed that it was *‘appropriate that the proposed application be made and decided before the prospective applicant has confirmed certain details of the application’*.

Chapter 1 – Introduction, Section 1.6 Approach to Design Flexibility, outlines with respect to the notification of opinion by the Local Authority, the Applicant in this EIAR, proposes to assess three distinct Technology Options within the range outlined by the Local Authority and in accordance with the design flexibility parameters sought. **Chapter 1 – Introduction Table 1-3**, outlines the options and associated parameters that are used in the EIAR, comprising three potential turbines classified as Technology Option 1, 2 and 3. Further detail on the assessment of the Technology Options is provided in **Section 8.3.5**.

This Chapter is supported by the following appendices:

- **Appendix 2.1 – Construction Environmental Management Plan (CEMP);**
- **Appendix 2.1.1 – Surface Water Management Plan (SWMP);**

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- **Appendix 2.1.3 – Traffic Management Plan (TMP);**
- **Appendix 6.8 – Aquatic Ecology Technical Amendment;**
- **Appendix 7.1 – Soils & Geology Technical Assessment;**
- **Appendix 7.2 – Preliminary Ground Investigation;**
- **Appendix 8.1 – Flood Risk Assessment (FRA);**
- **Appendix 8.2 – Surface Water Sampling;**
- **Appendix 8.3 – Photolog; and**
- **Appendix 8.4 – WFD Assessment.**

This Chapter should be read in conjunction with

- **Chapter 2 – Project Description;**
- **Chapter 3 – Consideration of Reasonable Alternatives;**
- **Chapter 6 – Biodiversity;**
- **Chapter 7 – Land, Soils & Geology;**
- **Chapter 16 – Cumulative Effects**, which considers other plans and projects that may act cumulatively with the proposed Project; and
- **Chapter 17 – Inter-Related Effects**, which address the interactions between effects on different environmental aspects.

8.1.1 Statement of Authority

This Chapter of the EIAR has been prepared by JBA Consulting, on behalf of Ballyfeeny Green Energy Limited. This Chapter has been compiled by the following consultants:

- Alison Freeley holds a BA in Geography and Geoscience and an MSc in Risk, Resilience, and Sustainability, has undertaken numerous EIA Screenings and has contributed to the preparation of EIARs for large-scale flood relief schemes, along with the development of Construction Environmental Management Plans.
- Conor O'Neill BA (Mod) MSc Adv Dip has 5 years of environmental consultancy experience. He has been involved in all aspects of EIAR, from Screening and Scoping to EIAR co-ordination and chapter authoring for numerous projects, along with other developments including transport infrastructure, renewable energy, residential, and commercial.
- David Casey BSc MSc MCIWEM has 14 years of experience in environmental and flood risk assessment, specialising in Strategic Flood Risk Assessments, Flood Risk Assessments, and Environmental Impact Statements, with a focus on Soils & Geology and Hydrology & Hydrogeology. His work on Environmental Impact Assessments

spans large residential, commercial, and port developments, involving significant collaboration with architects, engineers, and planners.

8.2 Legislation, Guidance & Policy

8.2.1 Legislation

The EIAR has been prepared having regard to all relevant national and European legislation.

8.2.2 Guidance

The assessment was carried out in accordance with the following guidance and tailored accordingly based on professional judgement:

- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (August 2018) (Department of Housing, Local Government and Heritage (DHLGH), 2018);
- Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements (Institute of Geologists of Ireland (IGI), 2013);
- Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR) (hereafter referred to as the Environmental Protection Agency (EPA) Guidelines) (EPA, 2022);
- Advice Notes on current practice in the preparation of Environmental Impact Statements (EPA, 2003);
- Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (National Roads Authority, 2008);
- Guidelines on protections of fisheries during construction works in and adjacent to waters (hereafter referred to as the Inland Fisheries Ireland (IFI) Guidance) (IFI, 2016);
- Wind Energy Development Guidelines (Department of the Environment, Heritage and Local Government, 2006); (hereafter referred to as WEDG 2006);
- Draft Revised Wind Energy Development Guidelines (Department of Housing Planning and Local Government (DoHPLG), 2019) (hereafter referred to as Draft WEDG 2019);
- Renewable Energy Progress Report COM/2017/057 (EC, 2017);
- Environmental Impact Assessment of Projects – Guidance on the Preparation of the Environmental Impact Assessment Report (European Commission (EC), 2017);
- Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors. CIRIA C532 (CIRIA, 2001);
- Sustainable management of surplus soil and aggregates from construction. CIRIA C809 (CIRIA, 2023); and

- The Planning System and Flood Risk Management – Guidelines for Planning Authorities, (Nov 09) (DHLGH, 2009).

8.2.3 Policy

The overarching planning policy relevant to the proposed Project is detailed in **Chapter 4 – Planning and Policy**. A Planning Statement has been provided with the planning application documents.

Goals, policies and objectives relevant to the water environment in the Roscommon CDP 2022-2028 include:

- **(Strategic Goal 11)** *Protect and enhance the natural assets of County Roscommon, including clean water, biodiversity, landscape, green infrastructure, heritage and agricultural land.*
- **(ITC 7.36)** *Protect both ground and surface water resources including taking account of the impacts of climate change, support the implementation of the Rural Water Programme and to support Irish Water in the development and implementation of Drinking Water Safety Plans and the National Water Resources Plan;*
- **(ITC 7.42)** *Ensure that adequate storm water infrastructure is provided in order to accommodate planned levels of growth in the county and to ensure that appropriate flood management measures are implemented to protect property and infrastructure.*
- **(ITC 7.48)** *Ensure new development is adequately serviced with surface water drainage infrastructure which meets the requirements of the Water Framework Directive, associated River Basin Management Plans and CFRAM Management Plans. Furthermore, the Council will undertake its obligations under the European Union (Good Agricultural Practice for Protection of Waters) Regulations 2017;*
- **(ITC 7.51)** *Have regard to the EU Flood Risk Directive, the Flood Risk Regulations (S.I. No. 122 of 2010) and the Guidelines for Planning Authorities on the Planning System and Flood Risk Management and Circular PL2/2014, through the use of the sequential approach and application of the Justification Tests in Development Management.*
- **(ITC 7.52)** *Ensure that a flood risk assessment is carried out for development proposals impacting on flood risk areas, in accordance with the Guidelines for Planning Authorities on the Planning System and Flood Risk Management. This assessment shall be appropriate to the scale and nature of risk to the potential development.*
- **(ITC 7.54)** *Ensure that where flood risk management works take place that the natural and cultural heritage, rivers, streams and watercourses are protected and enhanced.*

- **(NH 10.8)** *Ensure that no plans, programmes, etc. or projects are permitted that give rise to significant cumulative, direct, indirect or secondary impacts on the integrity of European Sites arising from their size or scale, land take, proximity, resource requirements, emissions (disposal to land, water or air), transportation requirements, duration of construction, operation, decommissioning or from any other effects, (either individually or in combination with other plans, programmes, etc. or projects); and*
- **(NH 10.20)** *Protect waterbodies and watercourses from inappropriate development, including rivers, streams, associated undeveloped riparian strips, wetlands and natural floodplains. To this effect, consideration should be given to Inland Fisheries Ireland's guidance document Planning for Watercourses in the Urban Environment (2020);*

8.3 Methodology

8.3.1 Consultation

Scoping and consultation have been carried out in support of the proposed Project and in line with the EIA Directive, together with the EPA Guidelines and with due regard for the *Environmental Impact Assessment of Projects: Guidance on Scoping* (European Commission, 2017).

An EIA Scoping Report was issued to 48 Statutory and non-statutory stakeholders via email in September 2024, of which 10 responded. All scoping consultation responses are provided in **Appendix 1.3 – Scoping Consultation Responses**.

Table 8-1 summarises issues raised during this consultation process and relevant to the water environment.

Table 8-1: Consultation responses relevant to the water environment

Stakeholder Details	Stakeholder Comment	How comment has been addressed in the EIAR
Inland Fisheries Ireland (IFI) <i>(Response to the EIA Scoping Report)</i>	The response outlines the necessary environmental assessments and precautions required for construction projects relating to wind turbines, emphasising the importance of the protection of aquatic habitats, soil stability and hydrology, in addition to implementing proper waste management. It includes guidelines for scheduling construction to avoid disrupting fish spawning seasons, monitoring impacts, maintaining riparian zones, and obtaining necessary permits and licenses. A full summary of the IFI responses is available in Appendix 1.3 – Scoping Consultation Responses..	This Chapter assesses the potential for construction, operation and decommissioning phase effects on the water environment and details mitigation measures to avoid, prevent and/or reduce or, if possible, offset any significant adverse effects. The assessment has taken account of the IFI Guidance.
Uisce Éireann <i>(Response to the EIA Scoping Report)</i>	Summary of Scoping Document Key Points – Uisce Éireann Considerations <u>Watercourses & Drinking Water Protection</u> - The site is near the Ballymartin River (20m west) and Culliagh Stream (120m east), both within the catchment for Uisce Éireann's drinking water sources (Grange Lough, Lough Forbes); and - Hydrological and hydrogeological pathways must be assessed to ensure no risk to drinking water during construction or operation. <u>Grid Connection Routes</u>	The grid connection was selected parallel to the R371 which avoided the most infrastructure crossings. An assessment by the Civil Engineers of the utility database and the 'dial before you dig' mapping it was confirmed and noted through consultation that a Diversion was not required for this grid route with

Stakeholder Details	Stakeholder Comment	How comment has been addressed in the EIAR
	Route 1: Via R371 to Slieve Bawn 110kV substation – may impact underground infrastructure; a Diversions Enquiry is required; and Route 2: To Lanesborough 110kV substation via Lanesborough town – may interact with wastewater infrastructure and a water treatment plant. Potential impact to 250mm HDPE piping near Shannon must be considered; a Diversions Enquiry is also needed. <u>Planning & Consultation Requirements</u> - A Diversions Enquiry and Confirmation of Feasibility (COF) letter from Uisce Éireann are mandatory before submitting a planning application; and - Uisce Éireann will review the final Environmental Impact Assessment Report (EIAR) and provide a statutory response. <u>EIAR Scope Requirements</u> <u>The applicant must address the following in the EIAR:</u> - Protection measures for drinking water sources; - Waste sampling strategy for backfilled material; - Environmental management and incident response plans; - Assessment of impact on water services and capacity; - Required infrastructure upgrades; - Trade effluent discharge plans;	minimal interaction with any existing utilities anticipated. Chapter 8 – Water, Hydrology (Flood Risk Assessment) and Hydrogeology confirms no drinking water sources are within the Aol of the project, and the recommendations in terms of excavation and soil management have been included in Chapter 7 – Soil and Geology and the CEMP (Appendix 2.1) and Appendix 2.1.1 – Surface Water Management Plan controls. The developer will continue to consult with Uisce Éireann through the EIAR process.

Stakeholder Details	Stakeholder Comment	How comment has been addressed in the EIAR
	• Management of surface water and avoidance of combined sewer impacts; • Identification and protection of Uisce Éireann assets; • Potential impacts on receiving waters and protected areas; • Avoid building over existing water infrastructure; survey and maintain separation as per Irish Water standards; and • Submission of Pre-Connection Enquiry (PCE) and Diversions Enquiry where needed. <u>Additional Notes</u> • Uisce Éireann prohibits new surface water discharges to combined sewers; and • Connection agreements (new or revised) must be established before development begins.	

8.3.2 Study Area

This chapter has considered all possible water and hydrological sources in the study area across the river sub-basin scale. This includes all surface waterbodies, such as rivers, streams, ditches, drains and the stormwater network, and lake waterbodies, located within the three river sub-basins that encompass the proposed Project. Likely effects were assessed on this river sub-basin scale.

The wider context of the surface waters in terms of their designation as part of WFD bodies were also considered where relevant.

Hydrogeology has been assessed within a 3km buffer of the proposed Project and the TDR. This is in line with guidance from the 'Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements', which states that the minimum 2km distance should be extended where karst systems are present (IGI, 2013). Given their presence along parts of the TDR (where proposed changes are limited to accommodation works where interactions with groundwater are not likely) as outlined below in **Section 8.4.7**, it has been determined that an extension to 3km for hydrogeology is appropriate.

Figure 8-1 shows the hydrological study area encompassing the three river sub-basins in addition to the hydrogeological study area defined by the 3km buffer zone.

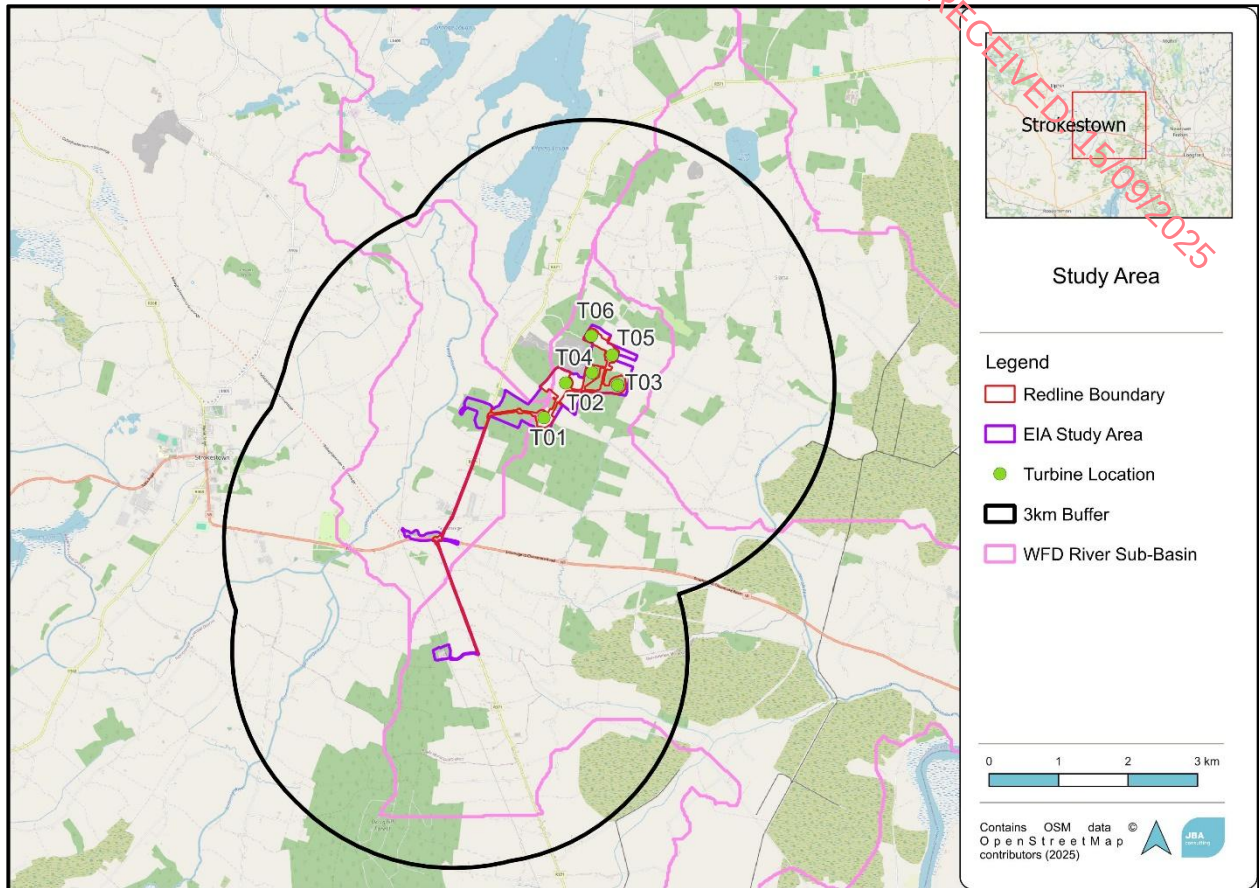


Figure 8-1: Hydrological and hydrogeological study area for the proposed wind farm site (Ref: EIAR Figure 8-1 (Volume 4)).

8.3.3 Desk Study

A desktop study of the proposed Project and its environs was carried out to gather all available and relevant geological, hydrogeological, hydrological and meteorological data for the study area. The following relevant resources were consulted for the proposed Project and the study area:

- Geological Survey of Ireland (GSI) Geological, Geotechnical and Geological Heritage site mapping (www.gsi.ie);
- GSI Groundwater, Landslides and Aggregate Potential mapping (www.gsi.ie);
- EPA online mapping database (www.epa.ie);
- OPW Indicative Flood Maps (www.floodinfo.ie);
- QGIS Geographic Information System;
- Met Éireann weather data (www.met.ie);
- IFI fishery datasets (www.wfdfish.ie);

- NPWS datasets (www.npws.ie); and
- Roscommon County Development Plan (CDP) 2022-2028.

8.3.4 Site Visits

Hydrological walkover surveys and surface water sampling were carried out by Rowan in May 2024. A discussion of these is included in **Section 8.5**.

8.3.5 Approach to Project Design

As set out in **Chapter 1 – Introduction**, under Section 32I of the Planning and Development Act 2000 (as amended), the Applicant is in receipt of an opinion on flexibility, relating to 3 no. options of Turbines. This opinion from the Local Authority confirmed that it was *‘appropriate that the proposed application be made and decided before the prospective applicant has confirmed certain details of the application’*.

As the differences in the three Technology Options listed in **Chapter 1 – Introduction, Table 1-3**, relates to only minor differences in the wind turbines rotor diameter, hub height and tip height, as such it is not expected to influence the significance of effects with respect to water, hydrology and hydrogeology environments, and on this basis, the identification of a specific assessment scenario was considered not applicable.

The installation of the three Technology Options will be managed by one Turbine Foundation and Turbine Hardstand design. The design has been considered in this assessment in terms of likely effects on the water, hydrology and hydrogeology environments. During the operational phase, there will be no direct interaction between the turbines with the water, hydrology and hydrogeology environments.

8.3.6 Approach to Impact Assessment

Following the completion of the desk study and baseline assessment, the importance and sensitivity of the notable water, hydrological or hydrogeological context of the study area was assessed. While it is noted the proposed Project does not relate to roads and does not need to comply with the NRA (2008) Guidance, the guidance provides a useful estimation of the importance / sensitivity of the hydrological and hydrogeological environments. This is presented in **Table 8-2** and **Table 8-3**.

Table 8-2: Estimation of Importance of Hydrological Attributes

Importance	Criteria	Typical Example
Extremely High	Attribute has a high quality or value on an international scale	River, wetland or surface water body ecosystem protected by EU legislation, e.g. 'European sites' designated under the Habitats Regulations or 'Salmonid waters' designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988.
Very High	Attribute has a high quality or value on a regional or national scale	River, wetland or surface water body ecosystem protected by national legislation – NHA status. Regionally important potable water source supplying >2500 homes. Quality Class A (Biotic Index Q4, Q5). Flood plain protecting more than 50 residential or commercial properties from flooding. Nationally important amenity site for wide range of leisure activities.
High	Attribute has a high quality or value on a local scale	Salmon fishery Locally important potable water source supplying >1000 homes. Quality Class B (Biotic Index Q3-4). Flood plain protecting between 5 and 50 residential or commercial properties from flooding.
Medium	Attribute has a medium quality or value on a local scale	Coarse fishery. Local potable water source supplying >50 homes Quality Class C (Biotic Index Q3, Q2-3). Flood plain protecting between 1 and 5 residential or commercial properties from flooding.
Low	Attribute has a low quality or value on a local scale	Locally important amenity site for small range of leisure activities. Local potable water source supplying <50 homes. Quality Class D (Biotic Index Q2, Q1) Flood plain protecting residential or commercial property from flooding. Amenity site used by small numbers of local people.

Table 8-3: Estimation of Importance of Hydrogeological Attributes

Importance	Criteria	Typical Example
Extremely High	Attribute has a high quality or value on an international scale	Groundwater supports river, wetland or surface water body ecosystem protected by EU legislation, e.g. SAC or SPA status.
Very High	Attribute has a high quality or value on a regional or national scale	Regionally Important Aquifer with multiple wellfields. Groundwater supports river, wetland or surface water body ecosystem protected by national legislation - NHA status. Regionally important potable water source supplying >2500 homes Inner source protection area for regionally important water source.
High	Attribute has a high quality or value on a local scale	Regionally Important Aquifer Groundwater provides large proportion of baseflow to local rivers. Locally important potable water source supplying >1000 homes. Outer source protection area for regionally important water source. Inner source protection area for locally important water source.
Medium	Attribute has a medium quality or value on a local scale	Locally Important Aquifer. Potable water source supplying >50 homes. Outer source protection area for locally important water source.
Low	Attribute has a low quality or value on a local scale	Poor Bedrock Aquifer Potable water source supplying <50 homes.

Table 8-4: Categories of impact significance in accordance with EPA Guidelines (2022)

Significance of Effects	Description
Imperceptible	An effect capable of measurement but without significant consequences.
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
Significant	An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
Profound	An effect which obliterates sensitive characteristics

Following the establishment of the importance and sensitivity of the hydrological and hydrogeological receptors, the conventional source-pathway-receptor model for groundwater/surface water protection has been applied to assess impacts on groundwater and surface water, specifically on downstream sensitive ecological receptors and local groundwater supplies.

Where likely impacts are identified, the classification of impacts in the assessment follows the descriptors provided in the Glossary of Impacts contained in the above referenced EPA guidance documents.

Table 8-5 outlines the criteria for estimating the magnitude of the impact on an attribute and **Figure 8-2** presents the matrix used to determine the significance of an impact, with the description of the effect compared to the sensitivity of the receiving environment.

Table 8-5: Criteria for estimating the magnitude of impact

Attribute	Status/occurrence	Importance
Step 1	Identification and Description of Potential Impact Source	This section presents and describes the activity that brings about the potential effects 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.
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.

Attribute	Status/occurrence	Importance
Step 4	Pre-mitigation Effects	Descriptors which describe the magnitude, likelihood, duration and direct or indirect nature of the potential effects before mitigation is put in place.
Step 5	Proposed Mitigation Measures	Control measures that will be put in place to prevent or reduce all identified significant adverse effects. These measures are provided in two types: • Mitigation by avoidance; and • Mitigation by practise and engineering design.
Step 6	Post Mitigation Residual Effects	Impact descriptors which describe the magnitude, likelihood, duration and direct or indirect nature of potential effects 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.

8.3.7 Determining the Significance of Effects

The significance of effects refers to the importance of the outcomes, which are assessed through a combination of objective scientific data and subjective social concerns. The significance of an effect was determined by considering the magnitude of the impact and the sensitivity of the receptor, with the classifications assigned in accordance with the EPA Guidelines, including **Imperceptible, Not Significant, Slight, Moderate, Significant, Very Significant** and **Profound**

Criteria such as quality, duration, probability, and type are considered, as detailed in **Table 3.4** of the EPA Guidelines (EPA, 2022) and are presented in **Table 1-6 of Chapter 1 - Introduction**. According to the guidelines, not all categories of these criteria need to be applied to every effect.

The use of the terms outlined in bold above when describing effects is mainly for descriptive purposes. For the purpose of this assessment, when considering the binary nature of effects in terms of EIAR (i.e., significant or not significant), effects described as '**Significant**' or above are Significant in EIA terms. Effects identified as '**Moderate**' significance or below are Not Significant in EIA terms.

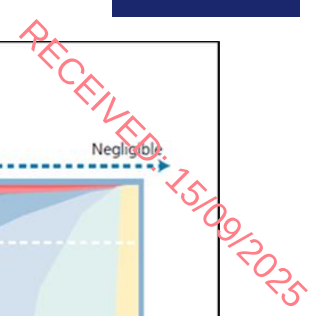


Figure 8-2: Assessment of significance of impacts (EPA, 2022)

8.3.8 Assumptions and Limitations

The identification of groundwater wells near the proposed Project was based on a review of the GSI groundwater wells and springs database. This database includes entries for boreholes, hand-dug wells, springs, and ground investigations, compiled from various sources such as local authorities, state bodies, private well grants and drillers. Information relating to the groundwater wells neighbouring the proposed Project is limited. The source use of two of these wells is classified as 'Unknown' by the GSI. Additionally, the precise locations of the wells are not known, with their accuracy restricted to within 1km for privacy reasons.

No other limitations were encountered during the preparation of this Chapter.

8.4 Baseline Environment

8.4.1 Receiving Environment

The proposed wind farm Site is located c. 4.5km east of Strokestown, Co. Roscommon and straddles the top and lower eastern flank of a small hill (**Figure 8-3**). The wind farm Site sits on lands that generally slope to the east in the cases of Turbines T02, T03, T04, T05 and T06. Lands slope to the south and east at Turbine T01 and are generally flat at the Onsite Substation. Ground elevations vary from 70m Above Ordnance Datum (AOD) to 124m AOD at the highest point.

The current land usage varies across the land holdings which make up the proposed Project with agricultural use dominating, as mainly rough hill grazing for livestock. In addition, there are areas of existing coniferous forestry at Turbines T03 and T04.

The closest active sand and gravel quarrying operation to the Site, at Ballyfeeney Rock Quarry, is located less than 150m from the closest wind farm infrastructure at turbine T04 and T06.

There are no residential dwellings within the Site, however, there are some uninhabited farm buildings located within the landholding. The closest habited buildings are more than 500m from the closest turbine.

A review of historical mapping, courtesy of GSI and Tailte Eireann, suggests that the Site has not changed in land use from that recorded on the 6" OSI Mapping, 1832 – 1846, 6" Cassini Mapping or 25" to one-mile Mapping.

Underground services are present within the carriageway and verge adjacent to the site boundary and site entrances onto the L6018 (see **Part 1 – Planning Drawings 23604-300 to 308**). ESB Networks overhead electricity cables are also along the edge of both the L6018 and L60498. Ballyfeeny Reservoir is located on lands to the north of the L6018. For further information refer to **Chapter 14 – Material Assets**.

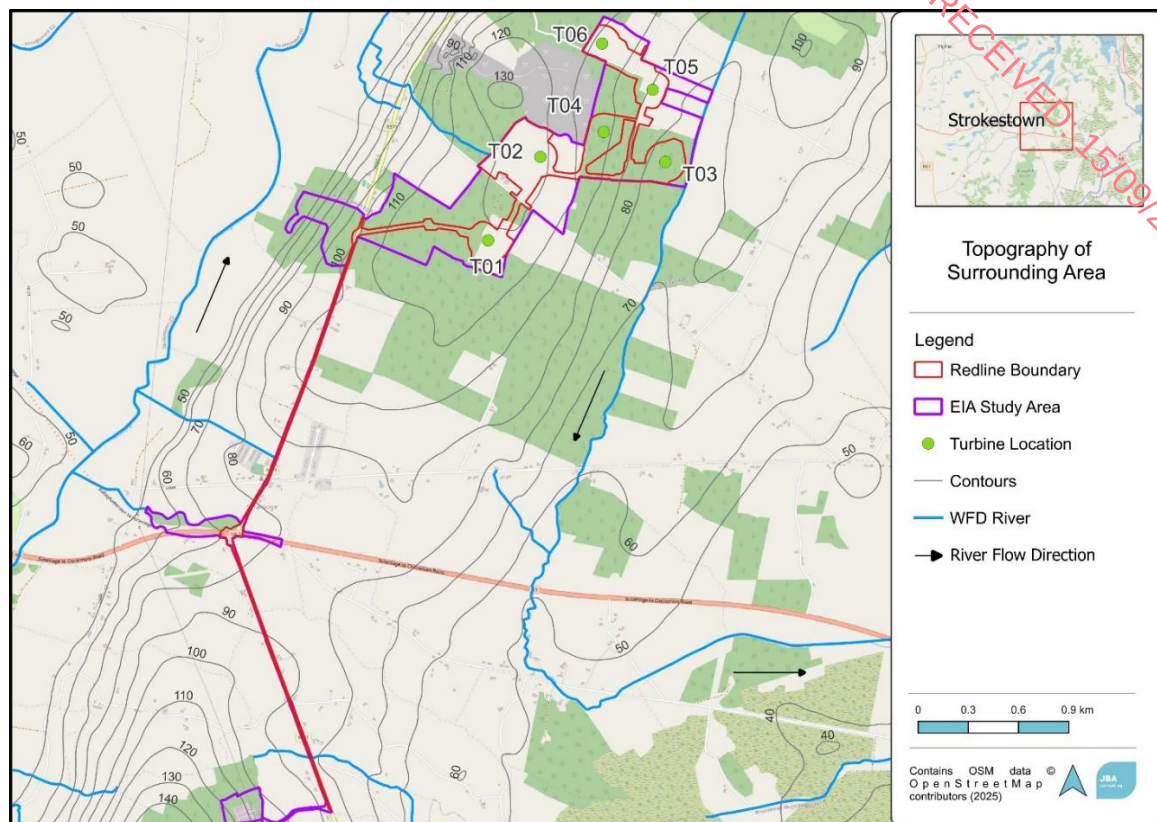


Figure 8-3: Local Topography on and immediately surrounding the proposed Project (Ref: EIAR Figure 8-3 (Volume 4))

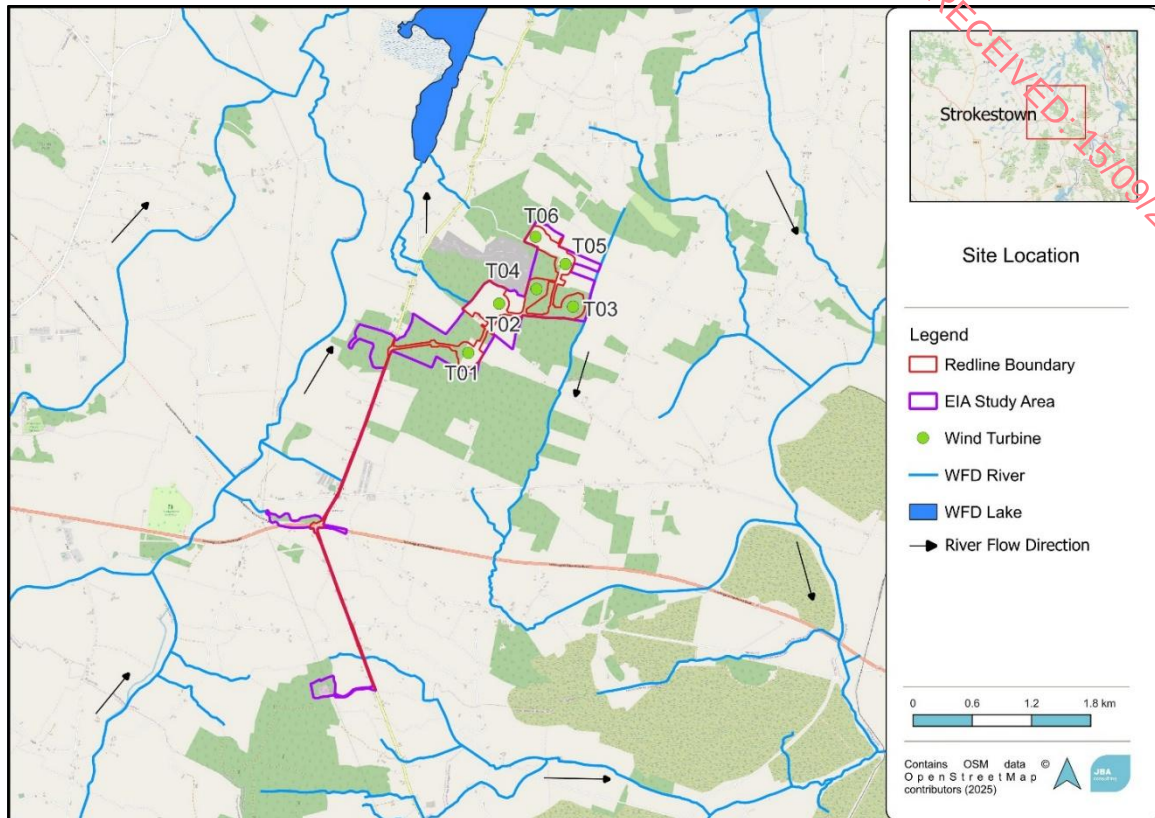


Figure 8-4: Site Location (Ref: EIAR Figure 8-4 (Volume 4)).

8.4.2 Water Framework Directive

For the purposes of the WFD, Ireland has been divided into large catchments, sub-catchments, sub-basins and smaller water bodies. The WFD (2000/60/EC) classifies catchment units within Ireland, assigning a status based primarily on chemical and ecological status. For example, river bodies are classified as ‘bad, poor, moderate, good, high.’ If a waterbody is unlikely to achieve good status, it is deemed to be ‘At Risk’. In accordance with the WFD, Ireland is required to protect and enhance the status of all waterbodies, prevent deterioration and achieve at least ‘Good’ status for surface and groundwater.

Due to the design of the proposed Project and the implementation of prevention and mitigation measures, it will not result in any direct or indirect deterioration in the status of any waterbodies. This includes impacts occurring alone or in combination with other projects. The proposed Project will not impair the ability of any waters to meet the objectives of the WFD or those outlined in the Water Action Plan 2024. The proposed Project will not cause or allow the release of priority substances, priority hazardous substances, or any toxic or dangerous materials to any waters. The proposed Project, either alone or in combination with other

projects, will not adversely affect the integrity of any designated European or natural heritage sites, in view of their conservation objectives. It will fully comply with all relevant environmental standards and objectives for protected areas, including adherence to Priority Pathway Action Plans (PPAP) relating to invasive species, soils, and spoil management, where applicable.

The proposed Project is located within the Upper Shannon Catchment, with the wind farm Site, GCR and TDR situated across three of the catchment's sub-catchments; the Scramoge_SC_010 to the west, the Shannon [Upper]_SC_070 to the east and the Shannon [Upper]_SC_040 sub-catchment to the north. The proposed Project is displayed in **Figure 8-5** in the context of its location within the Upper Shannon Catchment.

Note that a standalone WFD Assessment Report has been prepared by JBA and is included in **Appendix 8.4**. That report concluded that the proposed Project will not impact on the quality elements of any WFD waterbodies, as outlined in Annex V of the WFD. It was concluded that there will be no deterioration in status class, nor impacts to any WFD waterbodies as a result of the proposed Project, nor will the proposed Project activities jeopardise the attainment of the objectives of the WFD and the Water Action Plan 2024 for any WFD waterbody. The proposed Project therefore complies with the objectives of the WFD and does not require an exemption under Article 4(7).

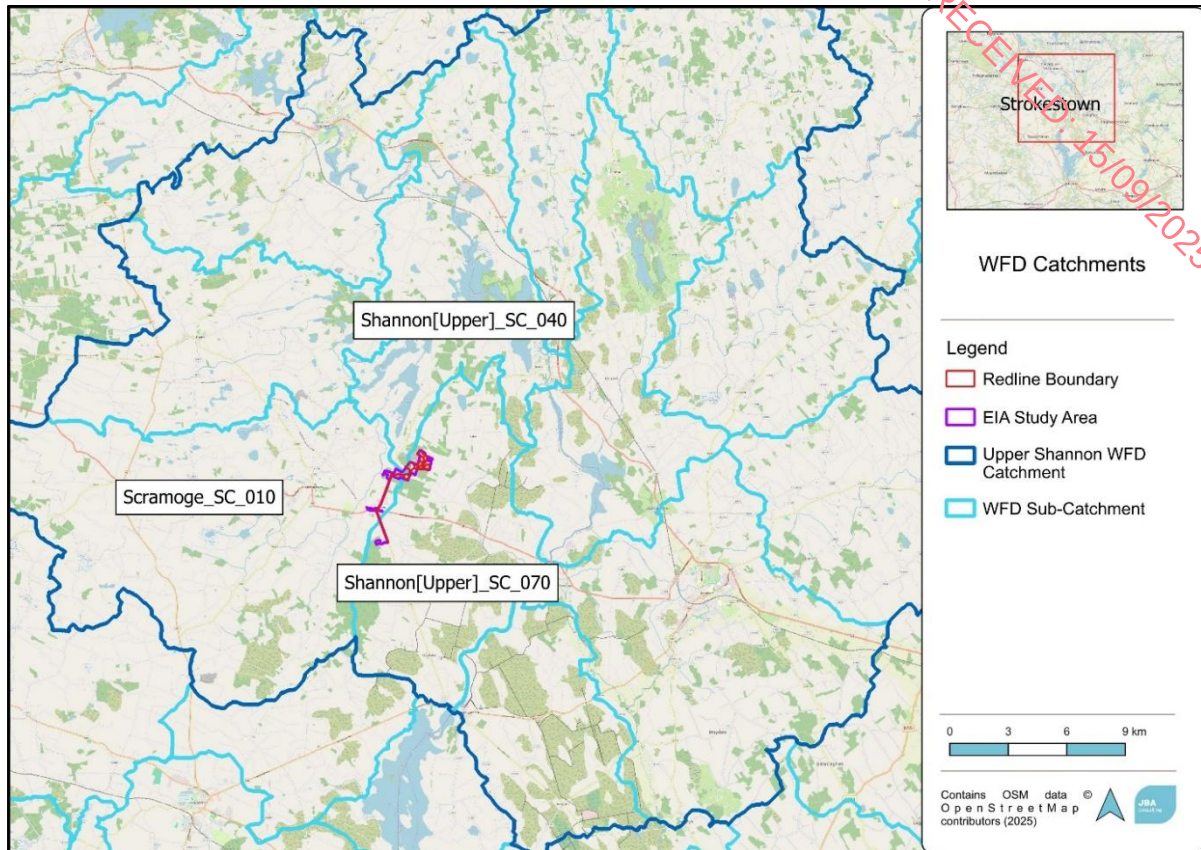


Figure 8-5: Water Framework Directive Catchments (Ref: EIA Figure 8-5 (Volume 4)).

The Upper Shannon catchment encompasses an area of 1,500km² which is characterised by karstified lowland area, including much of the western half of the catchment and the area underlying the main Shannon channel, north of Lough Ree. The upland areas in the catchment are underlain by a mix of sandstones and metamorphic rocks.

WFD sub-catchments are subdivided into river sub-basins, which are the WFD management and reporting divisions. The proposed Project and surrounding watercourse are situated across three river sub-basins. These are the MOUNTAIN(ROSCOMMON)_010 west of the Site, the OWENUR_030 north of the Site, and the FEORISH(TARMONBARRY)_020 east of the Site. The FEORISH(TARMONBARRY)_010 river sub-basin is located northeast of the Site, upstream of the FEORISH(TARMONBARRY)_020 and east of the OWENUR_030.

Surface water features within the vicinity of the wind farm Site can be seen in **Figure 8-6**. The local hydrology includes the Culliagh Stream (first order stream) which runs adjacent to the Site's eastern boundary and approximately 153m from turbine T03. The Culliagh Stream flows south and turns east to join the Feorish River (second order river) (and also referred to as the Tammonbary) before joining the Shannon Upper River (third order river).

The Ballymartin Stream (first order stream) is also located directly adjacent to the wind farm Site's western boundary and approximately 60m from the proposed Onsite Substation and Communications Relay Tower. The Ballymartin Stream flows west before turning north to flow into Kilglass Lough. There are no EPA mapped watercourse crossings within the proposed wind farm Site boundary.

The Gortlustia Stream (first order stream), rises west of the GCR, which flows into the Scramoge River (second order river). The Scramoge River then continues into the Mountain West River (third order river) and ultimately reaches Kilglass Lough.

The GCR crosses the Bellmount or Cloggernagh Stream (first order stream) further south, just before it turns west to join the existing Sliabh Bawn 110kV Substation. There are two watercourse crossings over EPA mapped waterbodies along the GCR to the existing Sliabh Bawn 110kV substation. The GCR water crossing is detailed in full in **Chapter 2 – Project Description** and will be discussed further within this Chapter in **Section 8.8, 8.9 and 8.10** as appropriate.

It is proposed to utilise Horizontal Directional Dig at (HDD) one location along the GCR – the N5/R371 road junction; to cross the N5 without open excavation of the road, see **Planning Drawing 23604-304 and 562 (Part-1)**. The HDD at this location will be approximately 50 m in length.

Table 8-6 details the closest infrastructure by straight line distance to each watercourse.

Table 8-6: Waterbodies within vicinity of wind farm Site

WFD Waterbody	Closest Features	Straight Line Distance to watercourse at closest point
OWENUR_030	Onsite Substation and Communications Relay Tower	c. 60m to the Ballymartin 26
FEORISH (TARMONBARRY)_020	GCR / T03	Transects GCR at Bellmount/Cloggernagh Stream Culliagh Stream is c.153m from T03
MOUNTAIN (ROSCOMMON)_010	GCR	Immediately adjacent
FEORISH (TARMONBARRY)_010	T05	1.1km
Kilglass Lough	T06	1.1km

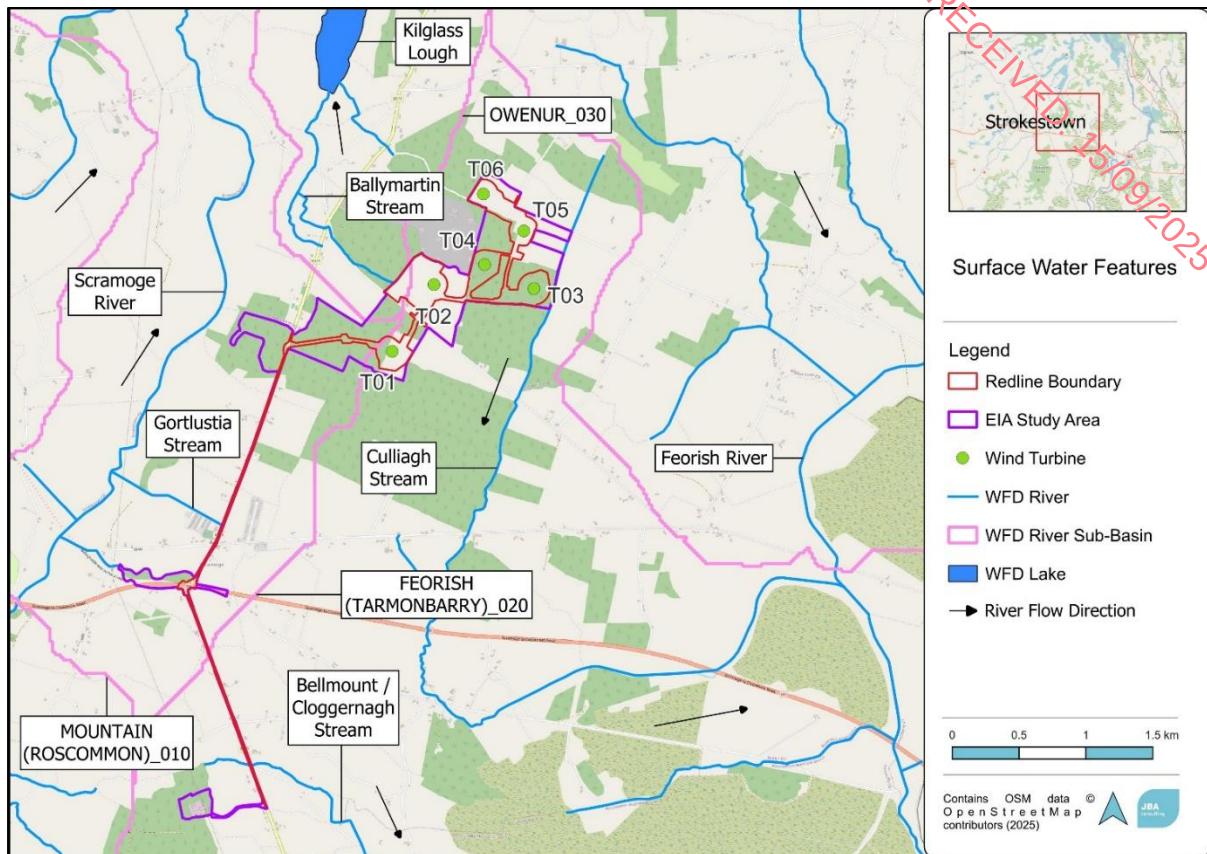


Figure 8-6: Local surface water features surrounding the proposed Project (Ref: EIAR Figure 8-6 (Volume 4)).

The TDR commences at Galway Port, travelling west along the N6 and onto the M6 to the south of Athenry and Ballinasloe to Athlone. At this point TDR 1a would utilise the proposed N5 Ballaghaderreen to Scramoge Realignment Scheme, if this new section of road is available at the time of deliveries. In the unlikely event that the new N5 Ballaghaderreen to Scramoge Road Scheme has not been completed by the time deliveries are due to commence, TDR 1b, which is routed through Strokestown would be utilised. The TDR is detailed further in **Chapter 2 – Project Description** and **Appendix 2.1.3 – TMP**.

Table 8-7 details the WFD river waterbodies that are located within 150m of the TDR Nodes, where proposed works will take place. The status of these rivers' ranges from 'Poor' to 'Good'. Watercourses highlighted in bold text flow directly beneath the road at the locations of the Nodes and proposed works.

Table 8-7: Rivers within 150m of TDR Nodes

WFD River	WFD Status	Closest Node
MOUNTAIN (ROSCOMMON)_010	Poor	No. 3075
MANTUA STREAM_010	Good	No. 3045
CARRICKNABRAHER_020	Poor	No. 3040
CARRICKNABRAHER_010	Good	No. 3030
TRIMOGE_010	Good	No. 3005
CHARLESTOWN STREAM_010	Moderate	No. 3010, No. 3015, No. 3020, No. 3025
CLARE (GALWAY)_060	Moderate	No. 2055
CLARE (GALWAY)_020	Good	No. 2065, No. 2070, No. 2080, No. 2085
BALLINDINE_010	Poor	No. 2090
BREEDOGE_010	Good	No. 4050
OWENNAFOREESHA_010	Moderate	No. 4050
SCRAMOGE_010	Moderate	No. 4095
SCRAMOGE_020	Good	No. 4115, No. 4125
STROKESTOWN_010	Poor	No. 4155

WFD River & Lake Waterbody Status

The EPA maps provide data on the status of rivers and lakes, recorded in line with European Communities (Water Policy) Regulations 2003 (SI no. 722/2003)- 2022 and the WFD (2000/60/EC). The objectives are to achieve or maintain at least good ecological status and chemical status. These regulations aim to improve waterbodies that currently have a lower status. The most recent WFD River Waterbody and Lake Status of rivers and lakes surrounding the Site is shown in **Figure 8-7**. The status's range from 'Poor' (orange), 'Moderate' (yellow) and 'Good' (green).

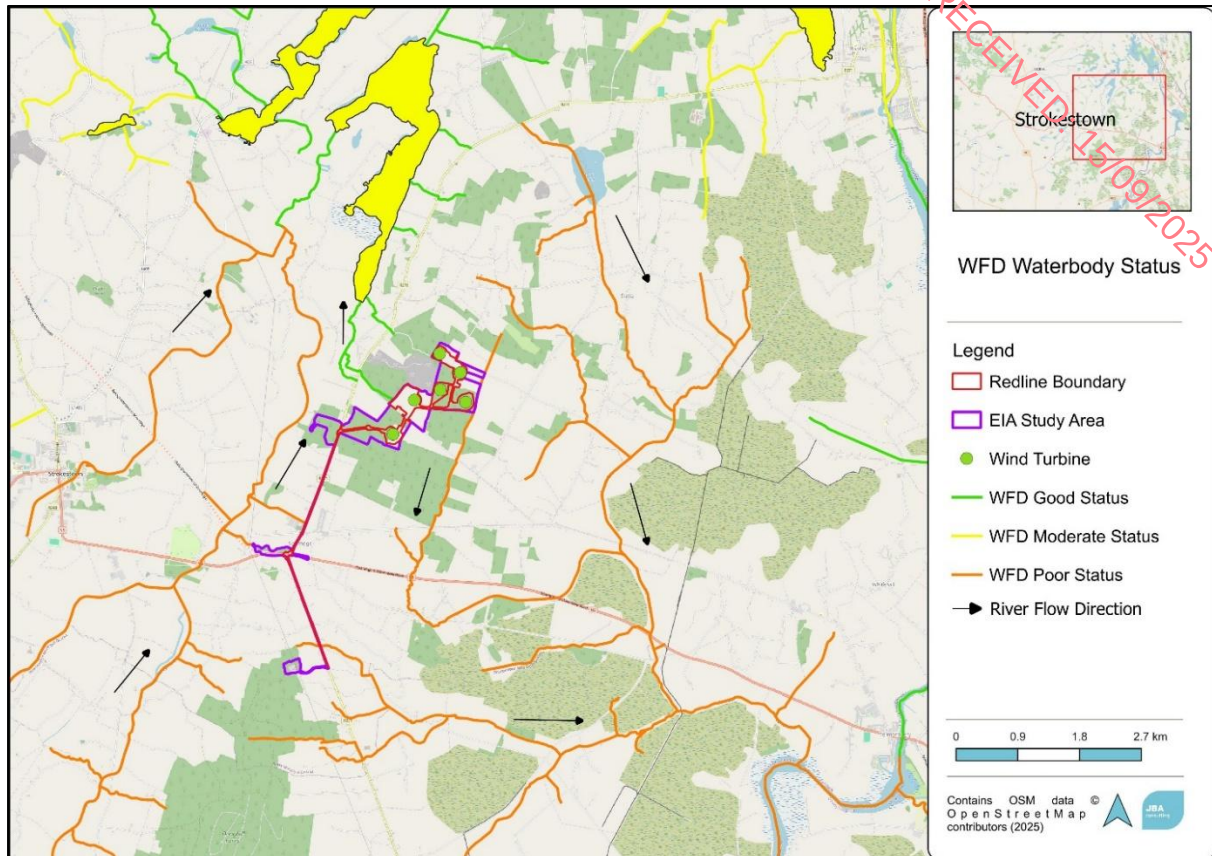


Figure 8-7: Overview of WFD River Waterbody and Lake Status 2016-2021 (Ref: EIAR Figure 8-7 (Volume 4)).

The WFD status of the streams and rivers nearest to the proposed Project are of 'Poor' status, excluding Ballymartin Stream, which has a 'Good' status. However, all waterbodies flow into rivers of 'Good' status or Kilglass Lake, which has a 'Moderate' status. In accordance with the requirements of the WFD, it is necessary to mitigate and monitor any likely adverse effects arising from the proposed Project. These measures are necessary to maintain the quality of all waters, prevent deterioration of any waterbody, and ensure that the attainment of good status for any surface or groundwater body is not jeopardised.

River & Lake Waterbodies Risk

The risk for each waterbody of failing to meet their WFD objectives by 2027 is outlined by this section. Waterbodies that are 'At Risk' are prioritised for implementation of measures. This

assessment was completed in 2024 by the EPA and was based on monitoring data up to 2021¹. The three risk categories are:

- Waterbodies classified as 'At Risk' are those that are currently failing to meet their environmental objectives, or where monitoring data indicates a trend that may prevent them from achieving these objectives by the end of the current WFD cycle. The pressures and impacts affecting these waterbodies are generally well understood, and as a result, targeted actions are required to restore water quality and support progress toward meeting WFD goals.
- Waterbodies classified under the 'Review' category may lack sufficient monitoring data, making it difficult to determine their risk status with confidence. In cases where monitoring has been conducted, there may be early signs of improvement or recent implementation of measures, but additional time is needed to evaluate their effectiveness. To support accurate assessment and protection of water quality, further monitoring and analysis are required. In the meantime, precautionary actions should be taken to safeguard these waterbodies and prevent potential deterioration.
- Waterbodies classified as 'Not at Risk' are currently meeting their environmental objectives under the Water Framework Directive. While no immediate restoration actions are required, continued efforts to protect and maintain water quality are essential to ensure these waterbodies remain in good status throughout the current and future management cycles.

¹ Environmental Protection Agency (2024) *Update on pressures impacting on water quality – May 2024*. Available at: <https://www.epa.ie/publications/monitoring--assessment/freshwater--marine/Update-on-pressures-impacting-on-water-quality-%E2%80%93-May-2024.pdf>

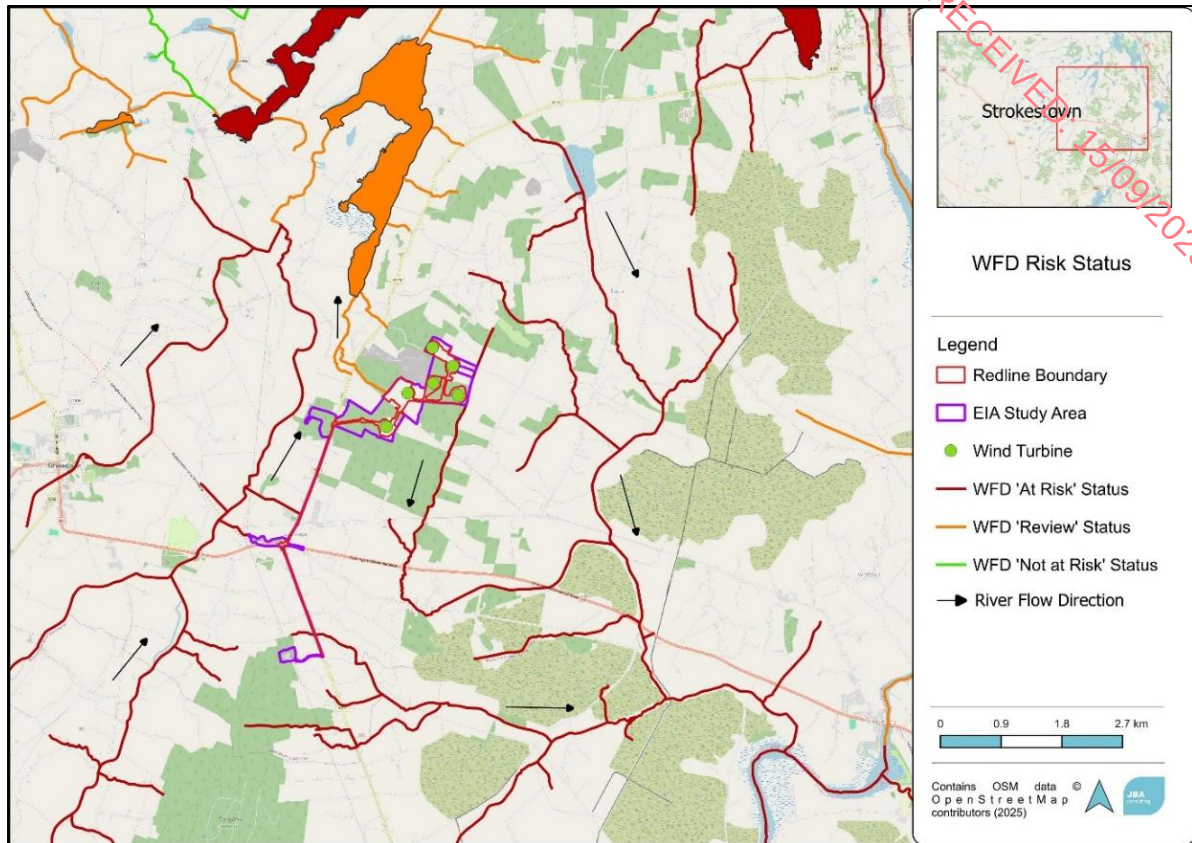


Figure 8-8: WFD Waterbodies risk status surrounding proposed Project (Ref: EIAR Figure 8-8 (Volume 4)).

It is noted that the rivers closest to the proposed Project are 'At Risk' (red) and/or under 'Review' (orange). This again highlights the need for any likely adverse effects of the proposed Project to be assessed and mitigated against.

River Q Values

National surveys of Irish rivers have taken place on a continuous basis since 1971, when 2,900km of river channel was surveyed. The National Rivers Monitoring Programme was replaced by the WFD Monitoring Programme from 22 December 2006. As part of the WFD Monitoring Programme, approximately one third of our major rivers and their more important tributaries are surveyed and assessed each year by EPA ecologists. A complete survey cycle is completed every three years. The sites are scored on a five-point system developed by the EPA called the Biological Q rating system. The EPA assesses macroinvertebrate communities to categorise the biological quality (Q value) of a river into five classes: high, good, moderate, poor or bad. Macroinvertebrates are the main biological element used to determine our river water quality. Therefore, changes in Q value are generally indicative of changes in overall ecological status. The classes and Q values relate as shown below in **Table 8-8**.

Table 8-8: Q value ratings and interpretation

Q Rating	WFD Status	Pollution
Q5 or Q4-5	High	Unpolluted
Q4	Good	Unpolluted
Q3-4	Moderate	Slightly Polluted
Q3 or Q2-3	Poor	Moderately Polluted
Q2, Q1-2 or Q1	Bad	Seriously Polluted

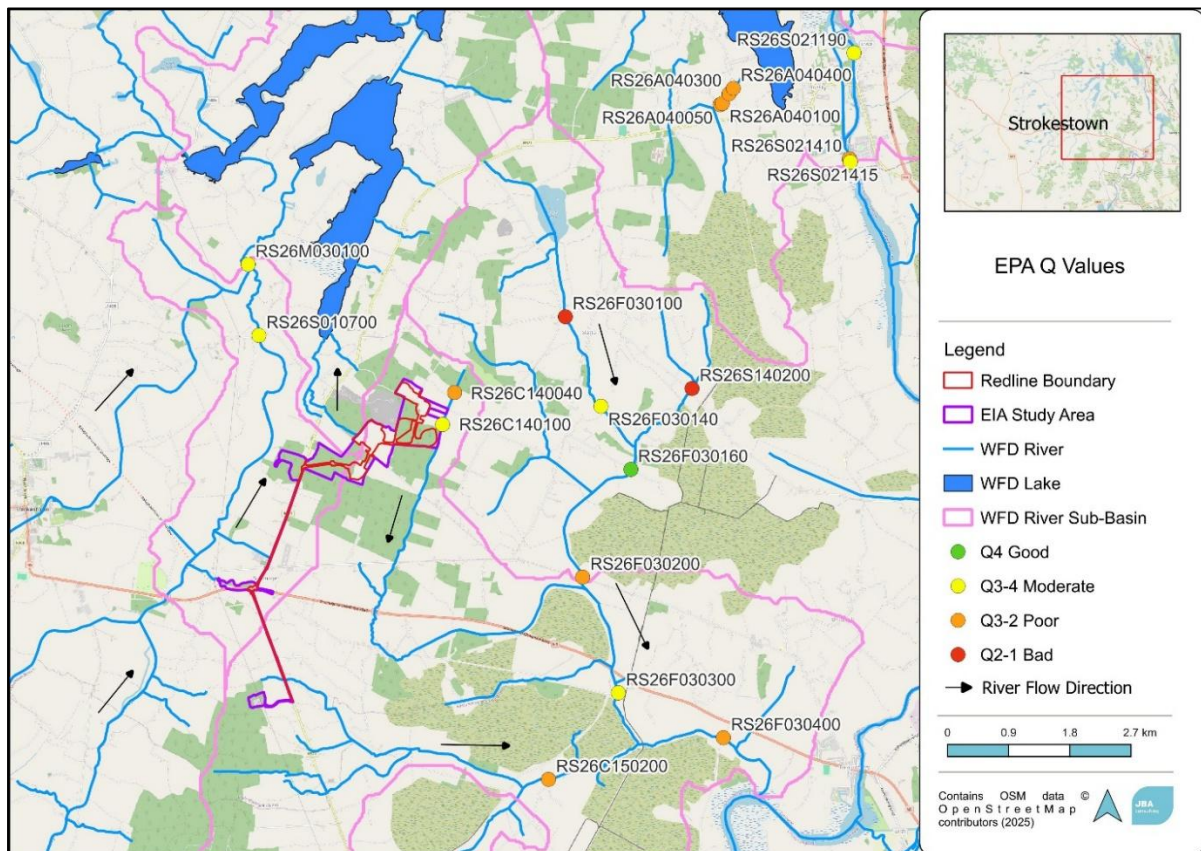


Figure 8-9: Q values of rivers surrounding wind farm Site (Ref: EIAR Figure 8-9 (Volume 4)).

There are nineteen EPA water monitoring stations which have Q ratings from 1988 to 2023, downstream of the proposed Project. The water quality status at the stations varies from 'Good' to 'Bad'. These values are detailed in **Table 8-9** and shown in **Figure 8-9**. Baseline water quality data was also collected as part of the proposed Project which is detailed further within **Section 8.5**.

Table 8-9: Q values recorded at nearby stations

Station code	Location and hydrological distance	Year measured	Q rating	Status
MOUNTAIN (ROSCOMMON)_010 River Sub-Basin				
RS26S010700	Bridge u/s Kilglass Lough	2023	3-4	Moderate
RS26M030100	1 km u/s Kilglass Lough	2020	3-4	Moderate
FEORISH (TARMONBARRY)_010 River Sub-Basin				
RS26F030100	FEORISH (TARMONBARRY) - Bridge N.E. of Ballymoylin	1999	2	Bad
RS26S140200	SLATTAGH MORE STREAM - Br SW Derrymoylin	1996	2	Bad
RS26F030140	Br W Dooslattagh	2023	3-4	Moderate
RS26F030160	FEORISH (TARMONBARRY) - Bridge E. of Caul / W of Caul on Discovery	1992	4	Good
RS26F030200	Bridge E.S.E. of Northyard	2023	3	Poor
FEORISH (TARMONBARRY)_020 River Sub-Basin				
RS26C140040	CULLIAGH STREAM - Bridge W. of Northyard	1992	3	Poor
RS26C140100	CULLIAGH STREAM - Bridge S. of Gortoose	1992	3-4	Moderate
RS26F030300	FEORISH (TARMONBARRY) - Cloonmore Bridge	1992	3-4	Moderate
RS26F030400	Br d/s Cloonmore Br	2023	3	Poor
RS26C150200	CURRAGHROE STREAM - Bridge N. of Drinagh	1999	3	Poor
SHANNON (Upper)_070 River Sub-Basin				
RS26A040050	AGHOO STREAM - Bridge 1 km S. of Knockhall	1988	2-3	Poor
RS26A040100	AGHOO STREAM - Bridge 1 km E. of Knockhall	1992	2-3	Poor
RS26A040300	AGHOO STREAM - Second Bridge u/s Lough Bofin	1989	2-3	Poor
RS26A040400	AGHOO STREAM - First Bridge u/s Lough Bofin	1992	3	Poor
RS26S021190	SHANNON (Upper) - 0.5 km u/s Roosky Bridge	1990	3-4	Moderate
RS26S021410	Roosky: d/s Lock (LHS)	2023	3	Poor
RS26S021415	Roosky: d/s Old Canal (RHS)	2002	3-4	Moderate

8.4.3 Groundwater Vulnerability

The GSI have prepared a groundwater vulnerability classification for the Republic of Ireland, whereby vulnerability at a particular point can be established around the natural geological and hydrogeological characteristics at that point.

Groundwater vulnerability is contingent on the nature of subsoils (permeability), recharge type (point or diffuse) and the thickness of the unsaturated zone (depth to groundwater).

Figure 8-10 shows groundwater vulnerability within 3km of the proposed Project, which defines the hydrogeological study area of karst regions in accordance with IGI Guidelines (2013), which recommend a 2km study area, or an extended buffer in areas where karst is present. Given the presence of karst features along parts of the TDR, a 3km buffer for the project was considered appropriate. The western portion of the Site (turbines T01, T02, T04, T06, associated Access Tracks and GCR) falls within an area of 'Extreme' groundwater vulnerability. Turbine T05 is located within an area of 'High' groundwater vulnerability and the most easterly turbine, T03 falls within an area of 'Moderate' groundwater vulnerability.

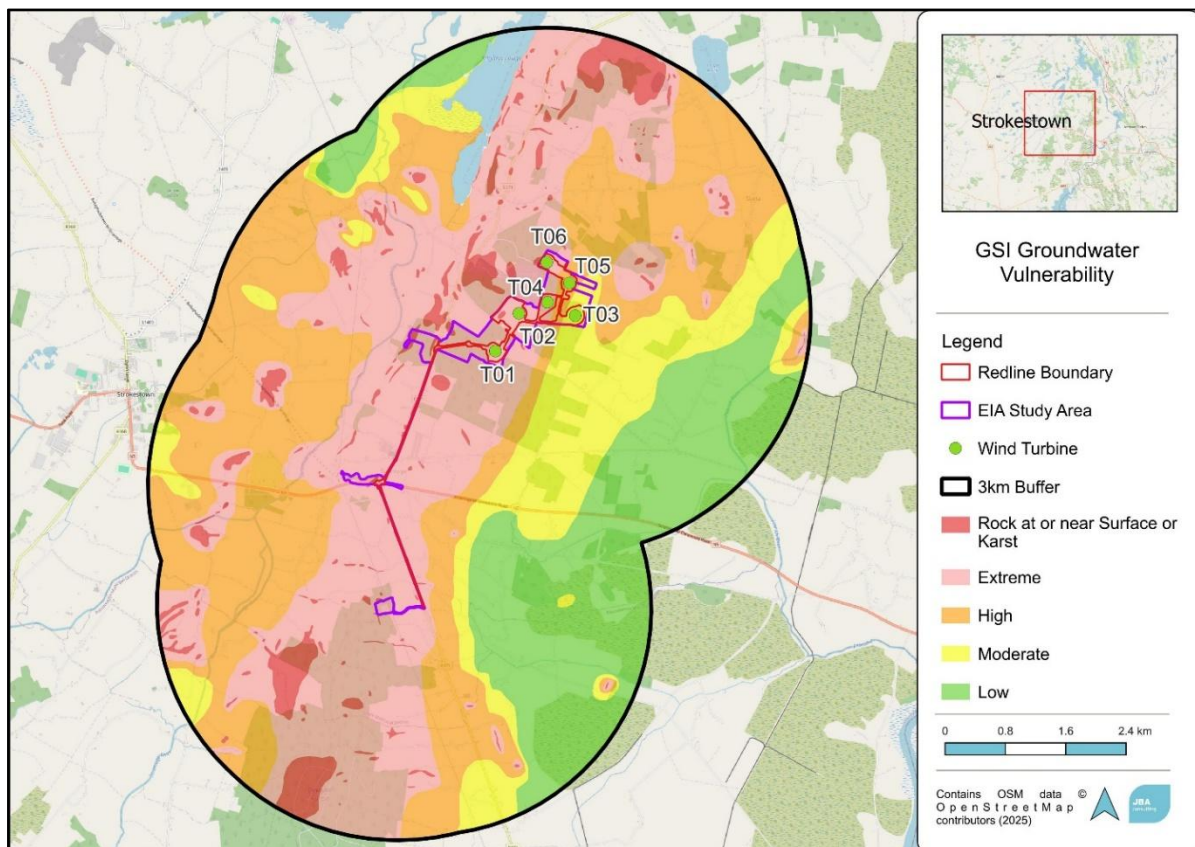


Figure 8-10: Groundwater vulnerability within 3km of the proposed Project (Ref: EIAR Figure 8-10 (Volume 4)).

Figure 8-11 to **Figure 8-14** show groundwater vulnerability within 3km of the TDR. Groundwater vulnerability varies from 'Low' to 'Extreme' along the TDR, with some sections of exposed rock.

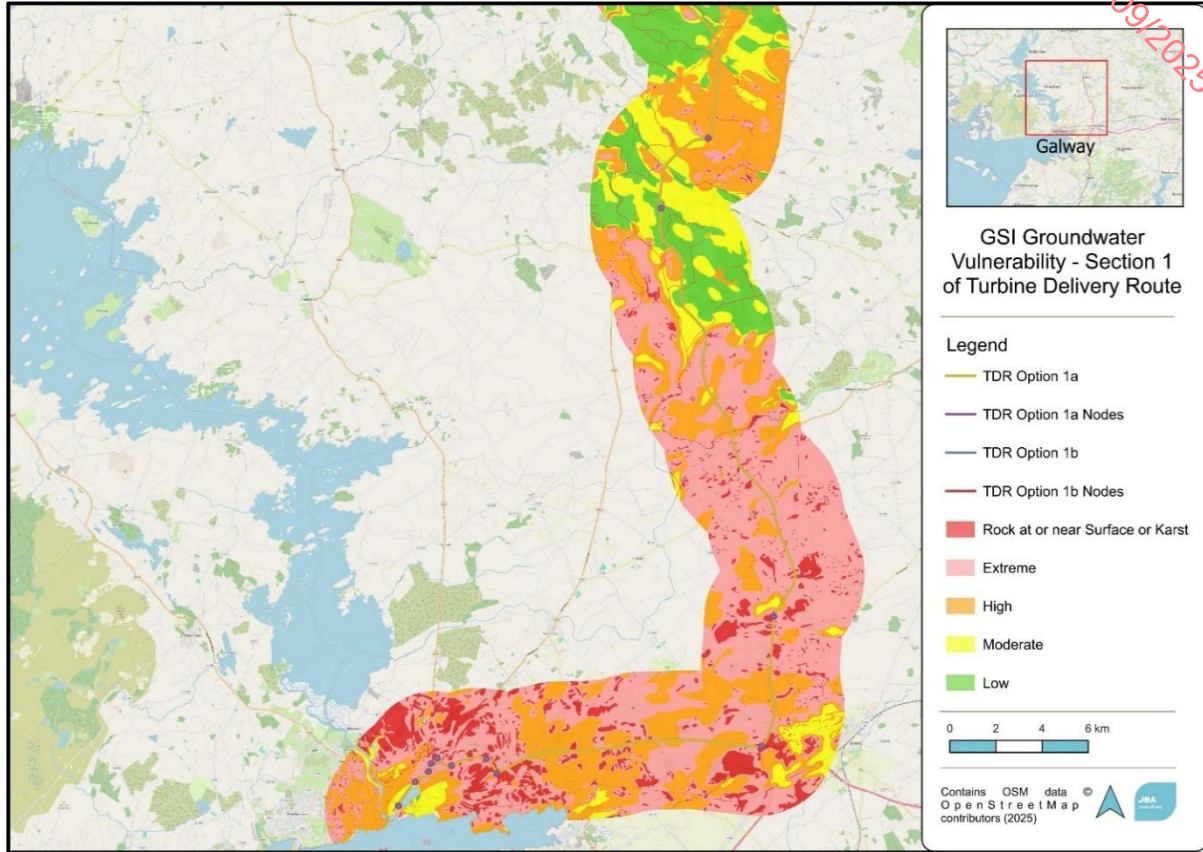


Figure 8-11: Groundwater vulnerability within 3km of section 1 of the TDR (Ref: EIAR Figure 8-11 (Volume 4)).

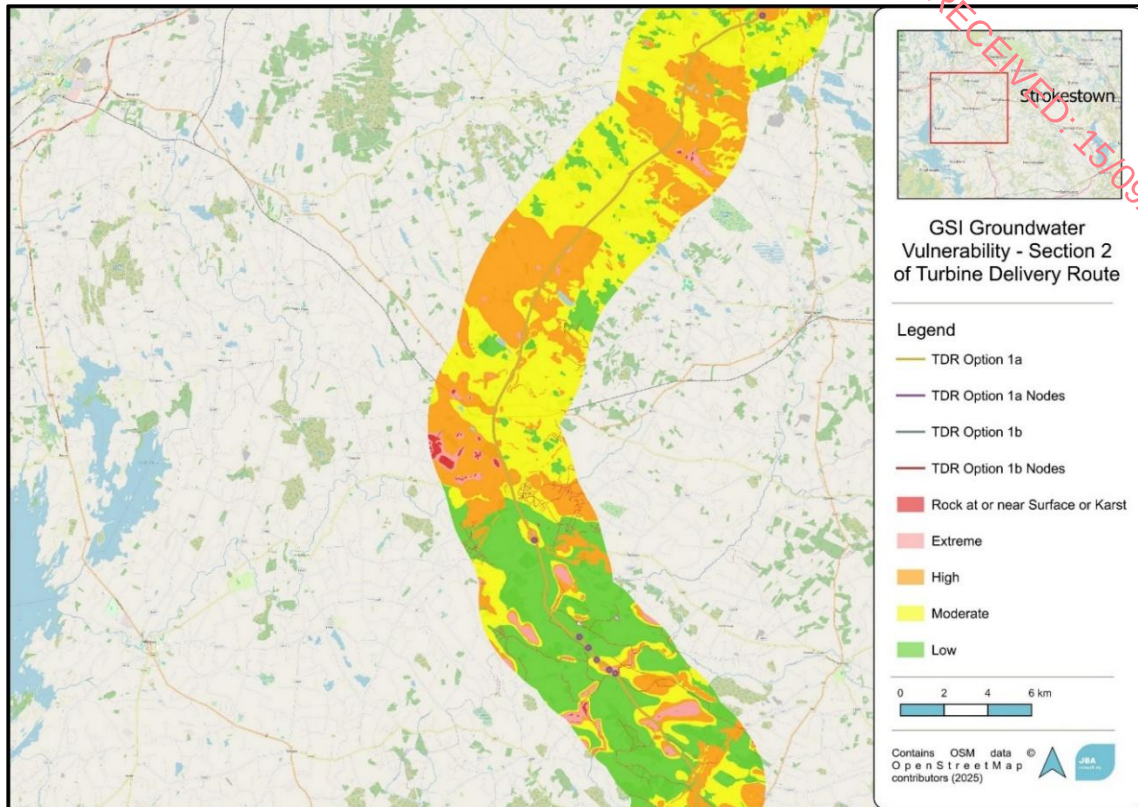


Figure 8-12: Groundwater vulnerability within 3km of section 2 of the TDR

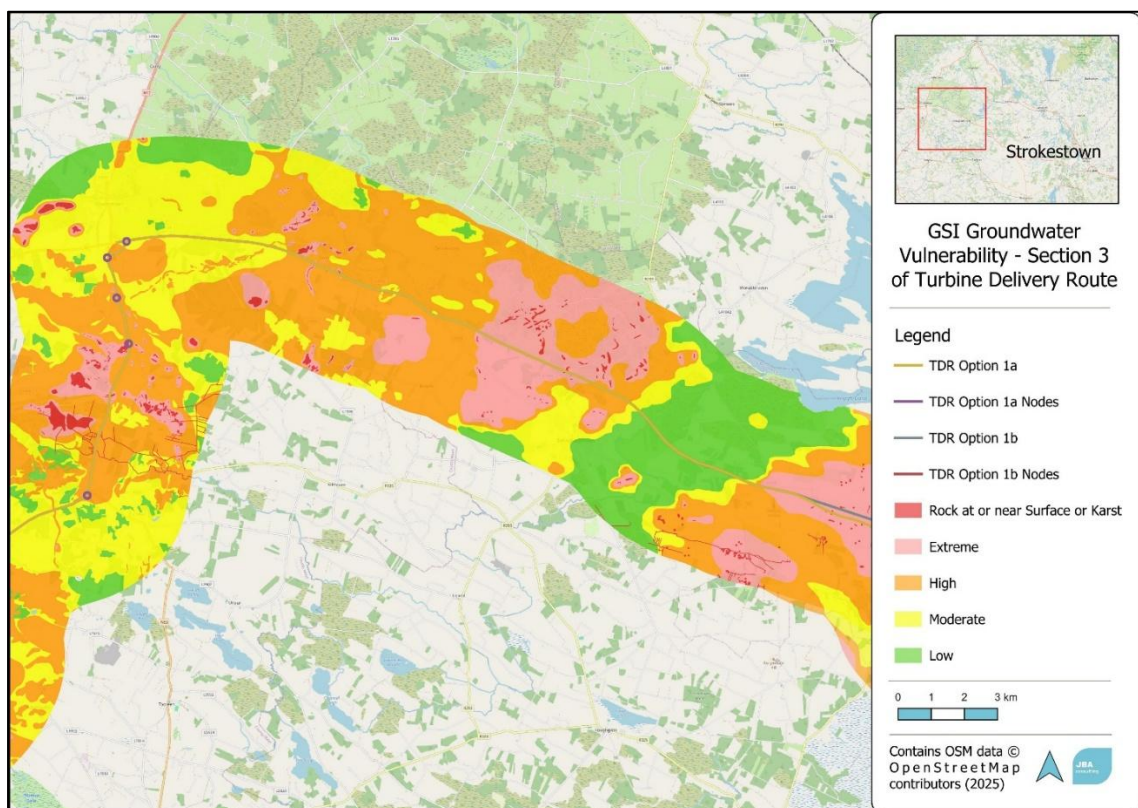


Figure 8-13: Groundwater vulnerability within 3km of section 3 of the TDR

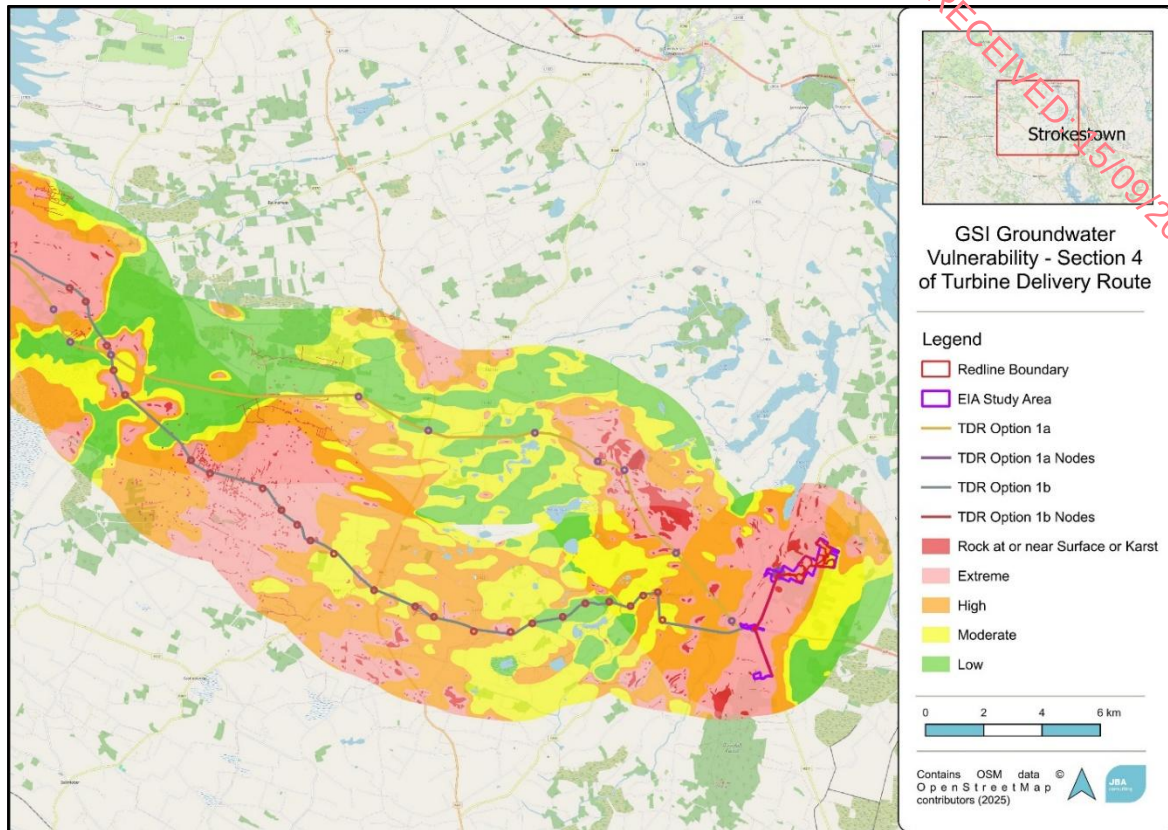


Figure 8-14: Groundwater vulnerability within 3km of section 4 of the TDR

8.4.4 Groundwater Bodies

The proposed Project is situated across several groundwater bodies, seen in **Figure 8-15**.

The north-west section of the wind farm Site (T01, T02, T04, T05 and T06) is within the Lough Acrick groundwater body. A small eastern section of the wind farm Site, beneath T03, and the southern portion of the GCR is within the Scramoge South groundwater body. The northern portion of the GCR is located in the Kilglass Dromod groundwater body, and the mid-portion of the GCR is within the Scramoge North groundwater body. All groundwater bodies within the project Site have a 'Good' WFD status. Additionally, all groundwater bodies within the wind farm Site are classified as having 'Good' status across multiple quality assessments, including quantitative status, chemical status and drinking water protected area tests.

The bedrock underlying the wind farm Site is a mixture of blue-grey greywacke and black argillite, with pale conglomerate and red sandstone under the GCR. The subsoils are composed mainly of sandstone till (Lower Palaeozoic/Devonian) and sandstone and shale till (Lower Palaeozoic), with smaller sections of undifferentiated alluvium and bedrock at surface.

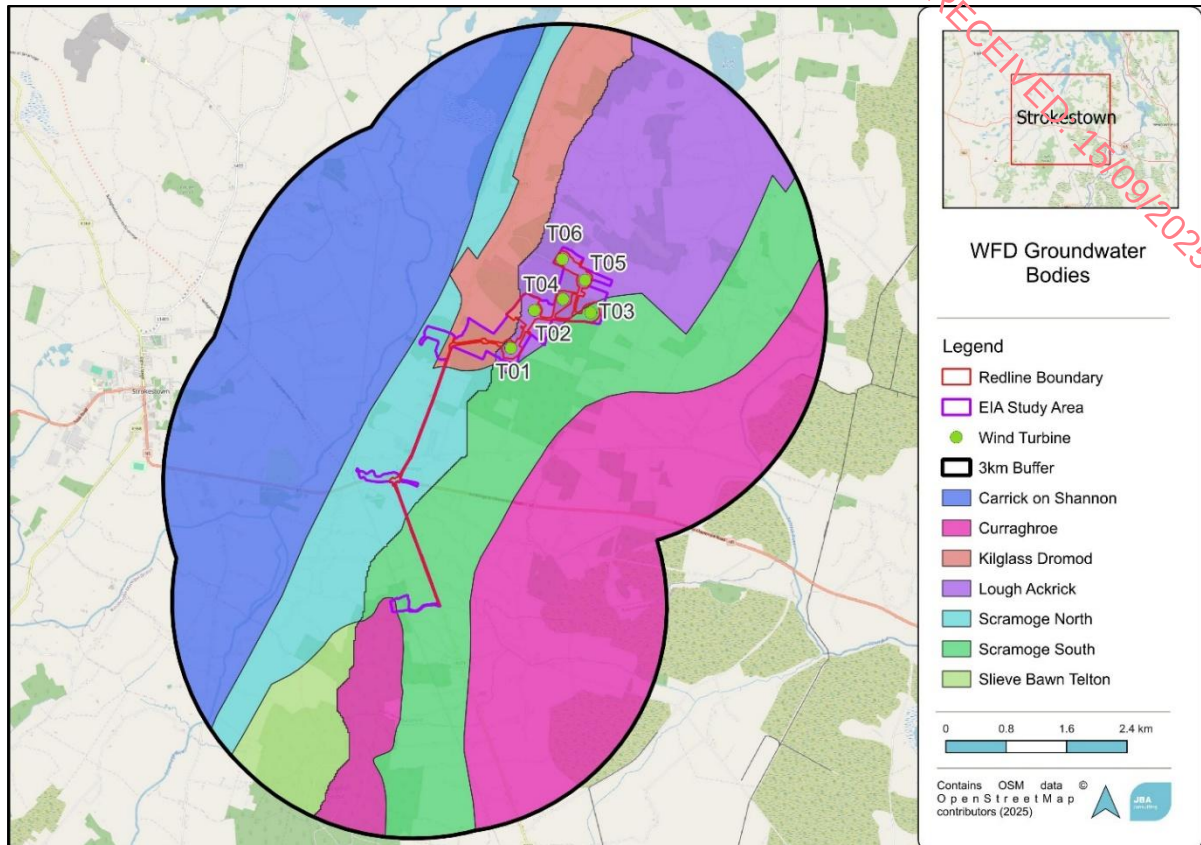


Figure 8-15: WFD groundwater bodies within 3km of proposed Project (Ref: EIAR Figure 8-15 (Volume 4)).

8.4.5 GSI Aquifer Classification

The western portion of the wind farm Site (turbines T01, T02, T04, T05 and T06) and northern portion of the GCR is underlain by a 'Poor Aquifer', bedrock which is generally unproductive except for local zones.

A small portion of the eastern side of the wind farm Site beneath turbine T03 and the majority of the GCR is underlain by a 'Locally Important Aquifer', bedrock which is generally moderately productive.

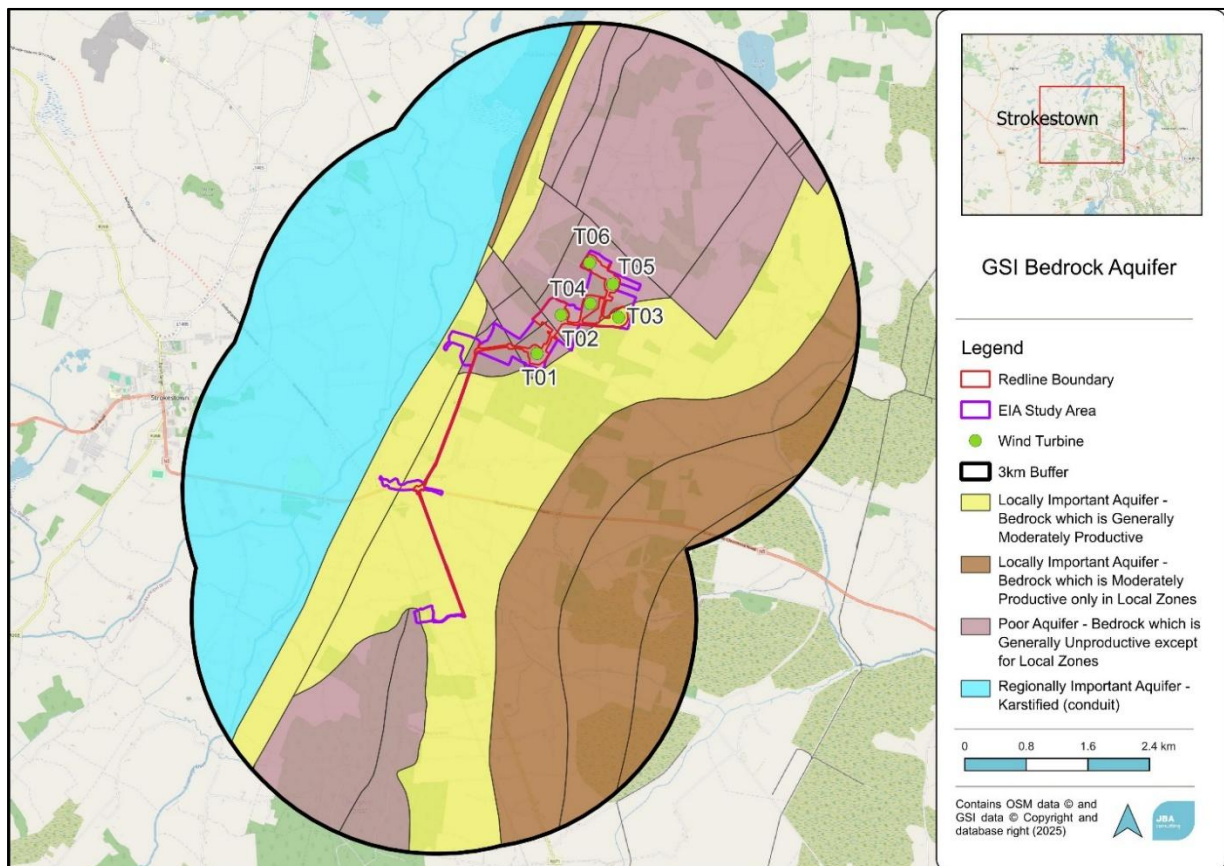


Figure 8-16: GSI groundwater aquifer classification within 3km of proposed Project (Ref: EIAR Figure 8-16 (Volume 4)).

8.4.6 Groundwater Body Risk Status

All groundwater bodies beneath the proposed Project are classified as 'Not at Risk'. It is therefore important to maintain this status through assessing and preventing or mitigating any likely significant adverse effects of the proposed Project.

8.4.7 Karst

The GSI map viewer² was consulted to identify groundwater karst features in the vicinity of the proposed wind farm Site. Within a 3km buffer zone of the EIA study area for the proposed wind farm Site, six karst landforms were identified (**Figure 8-17**). These include two springs located along TDR Option 1b and northwest of the site, and four enclosed depressions, two situated 3km southwest of the GCR and two 3km northwest of the site.

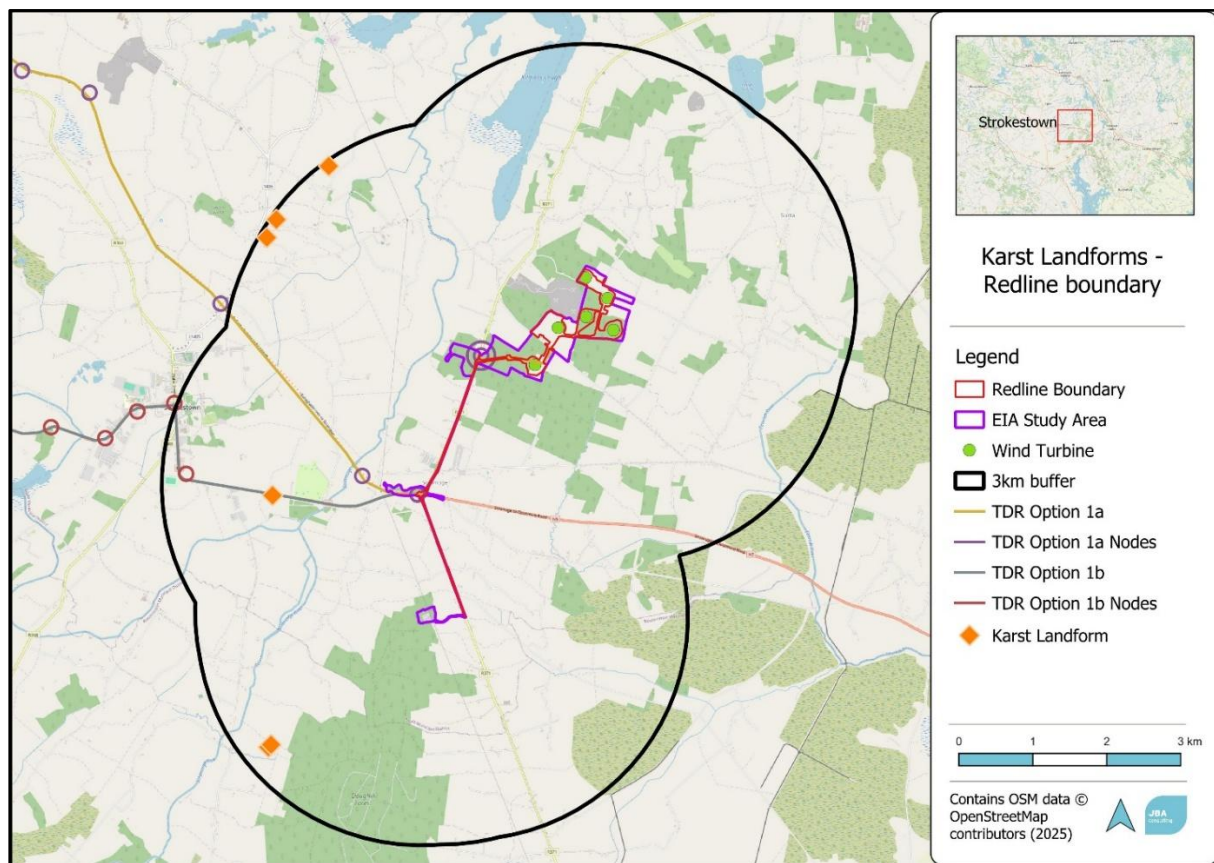


Figure 8-17: Karst landforms within 3km of the wind farm Site

² GSI (2025) 'Data and Maps'. Available at: <https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx>

Figure 8-18 - Figure 8-21 and Table 8-10 show karst landforms within 3km of the TDR.

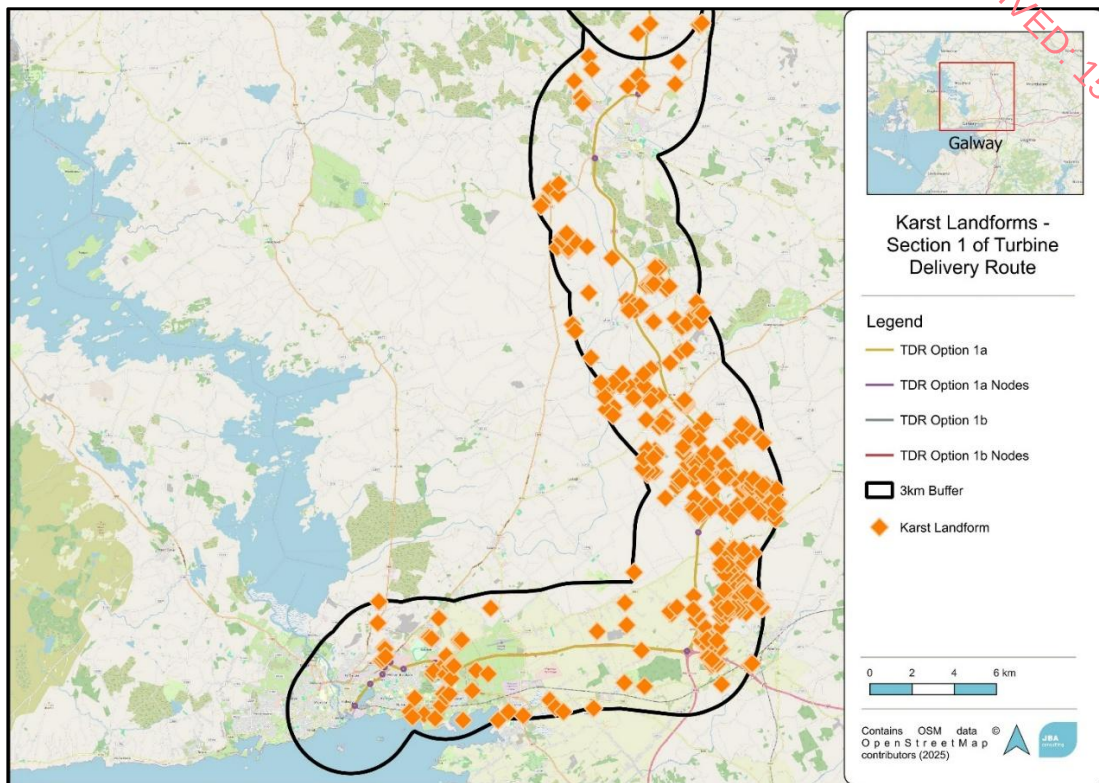


Figure 8-18: Karst landforms within 3km of section 1 of the TDR

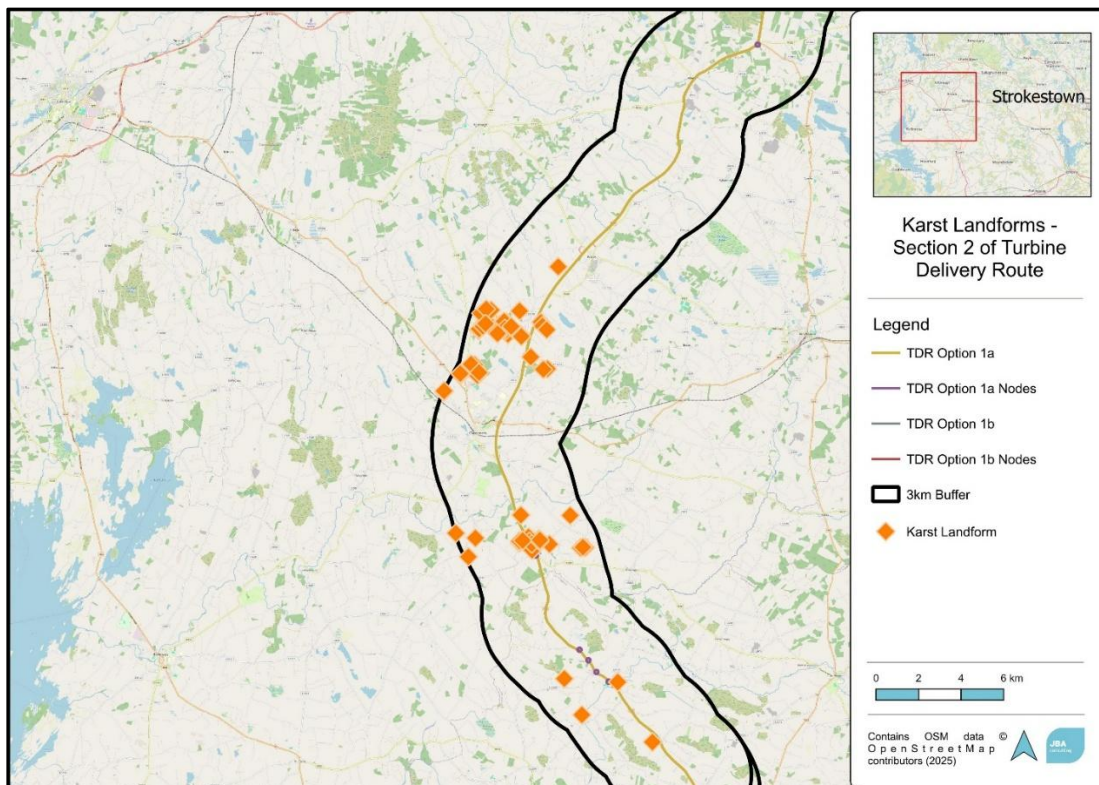


Figure 8-19: Karst landforms within 3km of section 2 of the TDR

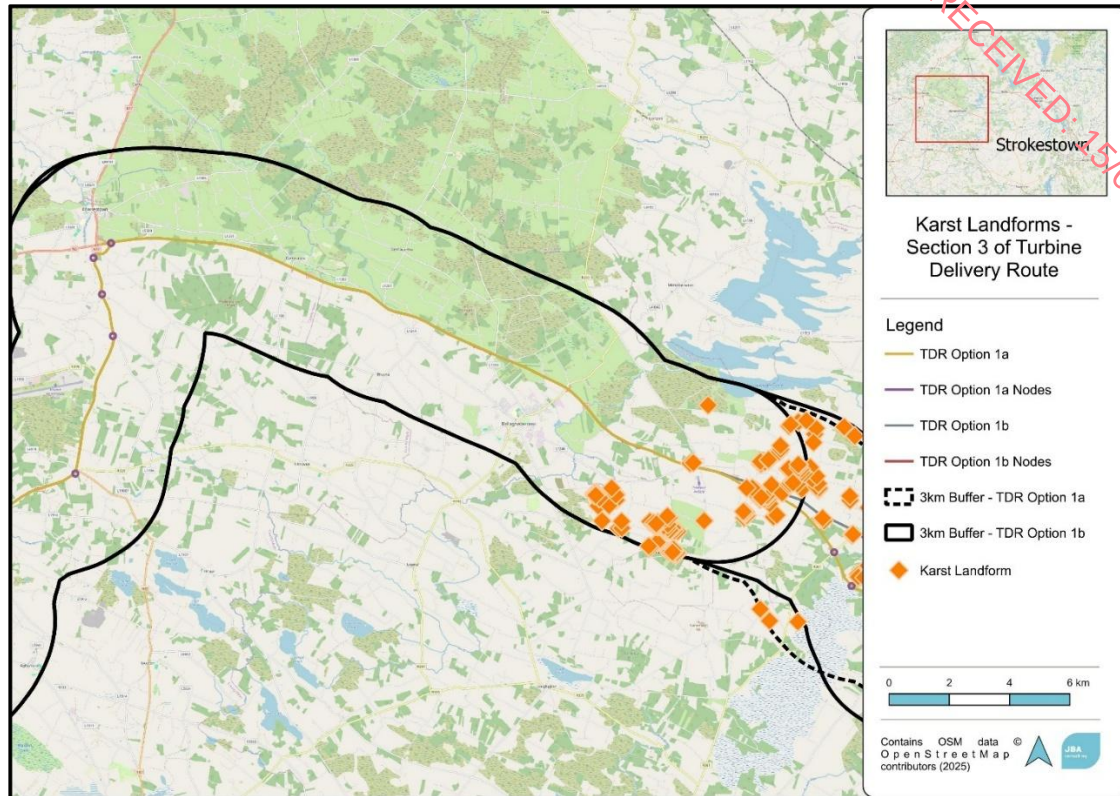


Figure 8-20: Karst landforms within 3km of section 3 of the TDR

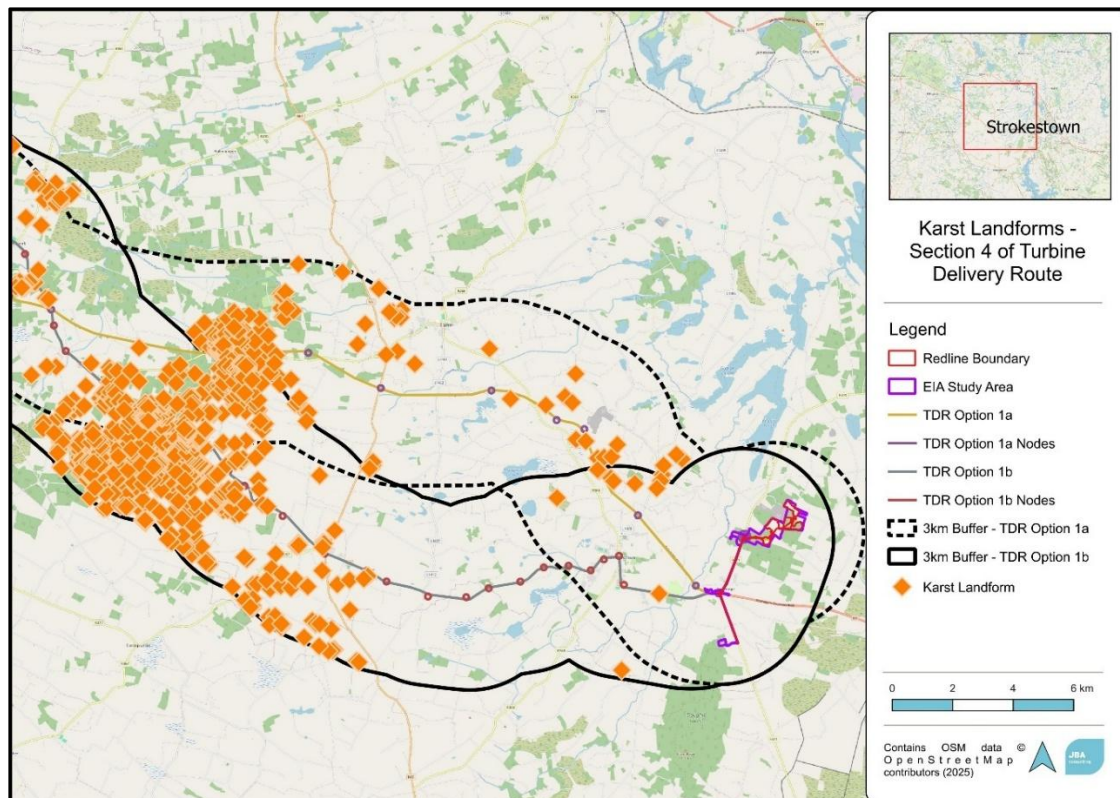


Figure 8-21: Karst landforms within 3km of section 4 of the TDR

Table 8-10: Summary of karst landform types within 3km of the TDR

Karst landform type	Number of features in TDR study area
Borehole	6
Cave	20
Dry Valley	4
Enclosed Depression	1,352
Estavelle	1
Spring	115
Superficial Solution Feature	4
Swallow Hole	157
Turlough	26
Total	1,685

Of these features, 1,221 are within 3km of a node on the TDR. The vast majority of these features are not in close proximity to an area of proposed works. Following a Geographic Information System (GIS) analysis of the TDR nodes and the karst features dataset from GSI, the following are the most immediately relevant to the project:

- Turlough 1727NWK019, approximately 90m south of Node No. 4100;
- Spring 1727NWK010, approximately 125m northwest of Node No. 4095;
- Spring 1727NWK114, approximately 65m southeast of Node No. 4080;
- Enclosed Depression, approximately 95m northwest of Node No. 4070;
- Enclosed Depression, approximately 55m west of Node No. 4065;
- Enclosed Depression, approximately 60m southwest of Node No. 4060;
- Swallow Hole 1727NWK046, within Node No. 4055;
- Swallow Hole 1727NWK044, approximately 20m northwest of Node No. 4055;
- Enclosed Depression 1727NWK045, approximately 50m northwest of Node No. 4055;
- Enclosed Depression, approximately 70m southwest of Node No. 4055;
- Swallow Hole, approximately 70m northwest of Node No. 4055;
- Two Enclosed Depressions, located within Node No. 4040;

- Cave 1729SWK050, approximately 65m south of Node No. 4030;
- Swallow Hole 1729SWK051, approximately 70m southeast of Node No. 4030;
- Enclosed Depression 1729SWK004, approximately 80m southeast of Node No. 4030;
- Swallow Hole 1425NWK003, approximately 120m northeast of Node No. 2065; and
- Enclosed Depression, immediately adjacent to Node No. 2040.

8.4.8 Groundwater Wells and Springs

The GSI groundwater wells and springs database contains records of boreholes, dug wells, springs, and ground site investigations. Data is derived from GSI activities, Local Authorities, state bodies, private well grants, drillers, consultants, group water schemes and academia. The accuracy of location data varies by source and is indicated on the GSI web map by circle size. It is noted that this is not a comprehensive database.

A review of the database identifies the nearest mapped groundwater wells, located within or adjacent to the proposed Project. The wells located within the 3km study area are classified as having a poor yield for groundwater abstraction.

The radii of three groundwater wells are shown overlapping the Redline Boundary nearest turbine T06, however their exact location is not disclosed for privacy reasons. Additionally, the radii of a fourth and fifth groundwater well intersect with the GCR, with location accuracy limited to within 1km for privacy reasons. **Figure 8-22** and **Table 8-11** present the details of wells nearby the proposed Site.

Public consultation highlighted concerns regarding private wells supplying drinking water to nearby homes and farms. While not all wells are mapped in the GSI database, a precautionary approach has been adopted in this assessment by assuming the presence of private wells at residential properties surrounding the site. All such dwellings are located at a minimum setback distance of 640m from the proposed wind turbines, with the exception of sensitive receptor 35 that is located 599m from the closest wind turbine.

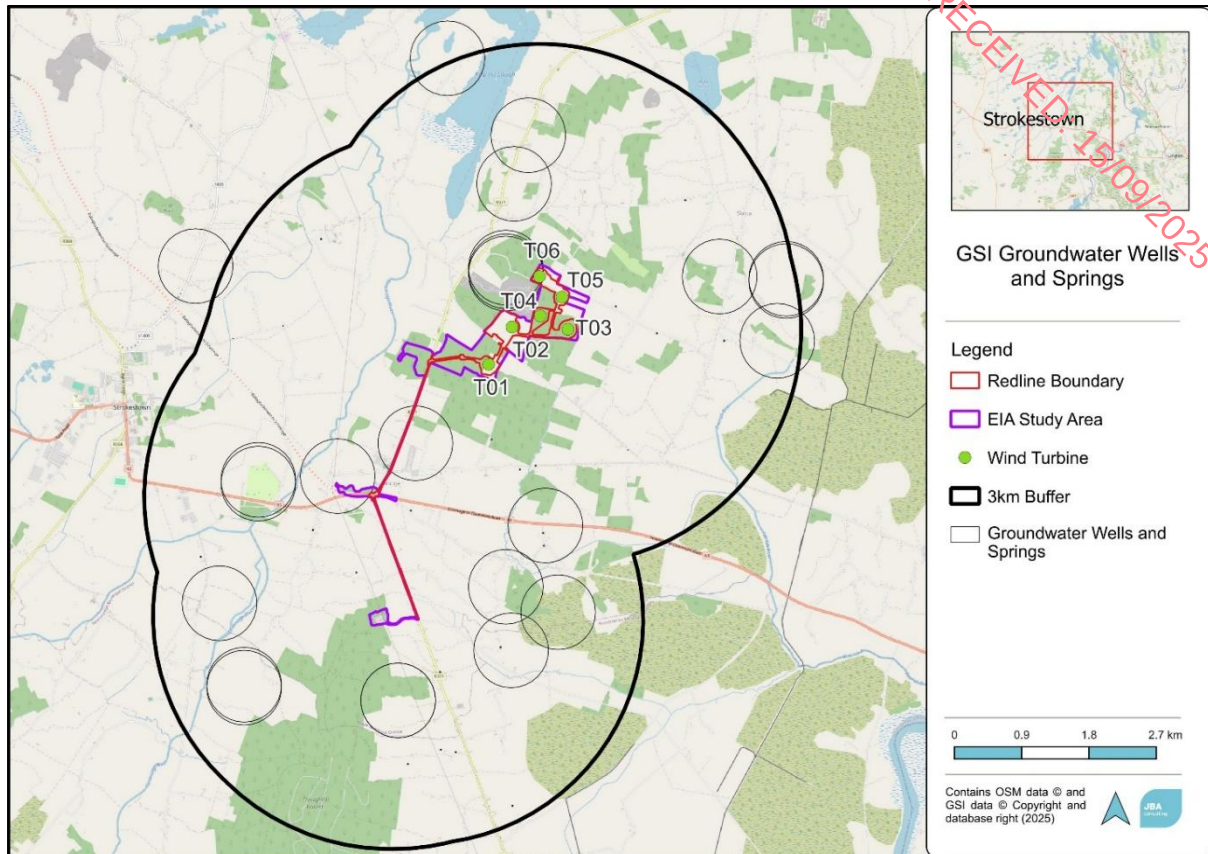


Figure 8-22: Mapped groundwater wells and springs within 3km of study area (Ref: EIAR Figure 8-22 (Volume 4)).

Table 8-11: Summary of mapped groundwater wells and springs adjacent to proposed wind farm Site

Groundwater Wells Description					
Well Reference	1727NEW054	1727NEW053	1727NEW055	1727NEW033	1727SEW090
Distance from Site	Located within 1km of T06	Located within 1km of T06	Located within 1km T06	Located within 1km of the grid connection route.	Located within 1km of the grid connection route.
Well Type	Dug well	Dug well	Dug well	Public supply (Co. Council)	Unknown
Source Use	Domestic use only	Domestic use only	Unknown	Public supply (Co. Council)	Unknown
Depth	1.5m	3.1m	1.5m	73.2m	0m
Drill Date	15/03/1972	17/10/1972	15/04/1972	19/04/1958	19/01/1998

8.4.9 Drinking Water Sources

There are no Group Water Schemes Source Protection Areas or Public Supply Source Protection Areas proximal to the proposed Project. The nearest is the Polecats Group Water Scheme (GWS), located approx. 9.6km northwest of the wind farm Site and through which

TDR Option 1a travels through, with Nodes No. 3045 and 3050 located within the Source Protection Area. This zone is in a different groundwater body to the wind farm Site and is therefore not likely to be connected via hydrogeology. Additionally, TDR Option 1b crosses the Source Protection Areas for the Peake & Corracreigh (Cloonyquin) GWS and the Corracreigh (Cloonyquin) GWS, along with Nodes No. 4055, 4060, 4065, 4070, 4075 and 4080. The above GWS are shown in **Figure 8-23**. The Carheenlea GWS Source Protection Area is traversed by TDR Option 1a, with Node No. 2050 located approx. 520m to the southwest.

Lough Forbes is a surface water abstraction site, managed by the EPA, which is located approx. 22.6km downstream of a small portion of the proposed Project. Between Lough Forbes and the proposed Project is a succession of waterbodies: the Scramoge and Upper Shannon Rivers, and Kilglass Lough, Lough Boderg, and Lough Bofin. Lough Forbes is also situated in a different groundwater body and is a long hydrogeological distance from the site, with hydrogeological pathways not likely to lead groundwater from the proposed Project to the Lough. Considering the long hydrological and hydrogeological distances between the proposed Project and Lough Forbes, no likely pathway for surface water or groundwater between the two exists. No significant effects are likely on Lough Forbes due to the proposed Project.

As noted in Section 8.4.8 above, for the purposes of this assessment the presence of drinking water wells at residences surrounding the proposed development has been assumed.

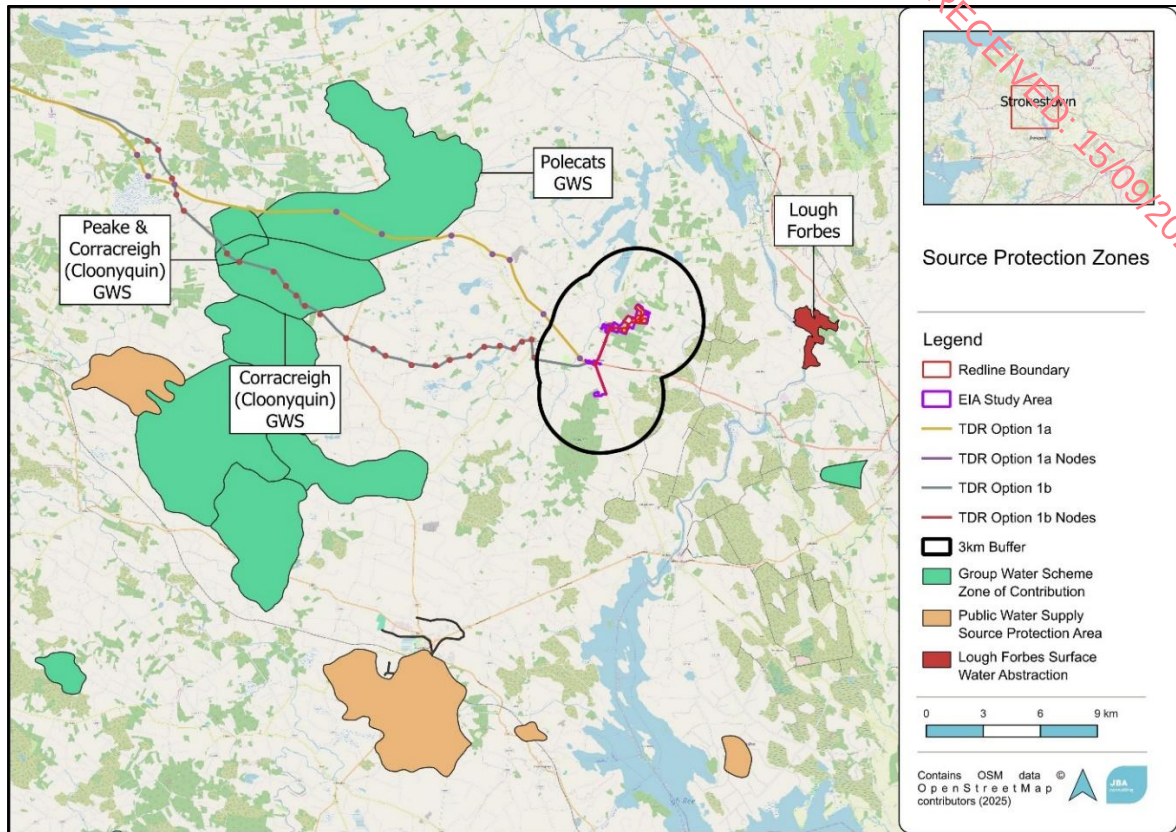


Figure 8-23: Group scheme and public supply source protection areas (Ref: EIAR Figure 8-23 (Volume 4)).

8.4.10 Groundwater Abstraction Sites

The EPA groundwater abstractions register³ was consulted to identify any abstraction sites within the vicinity of the proposed Project. This register provides information on all registered groundwater abstractions that exceed 25m³ per day. For privacy reasons, the grid locations of these abstractions are rounded to the nearest kilometre. There are no registered groundwater abstraction sites within a 4km radius of the wind farm Site. This assessment includes an additional 1km buffer to account for the rounding of grid locations. Therefore, there are no significant groundwater abstraction activities in close proximity to the proposed Project, as shown in **Figure 8-24**.

The closest registered groundwater abstractions are approx. 5.6km to the southwest and are used for land drainage purposes.

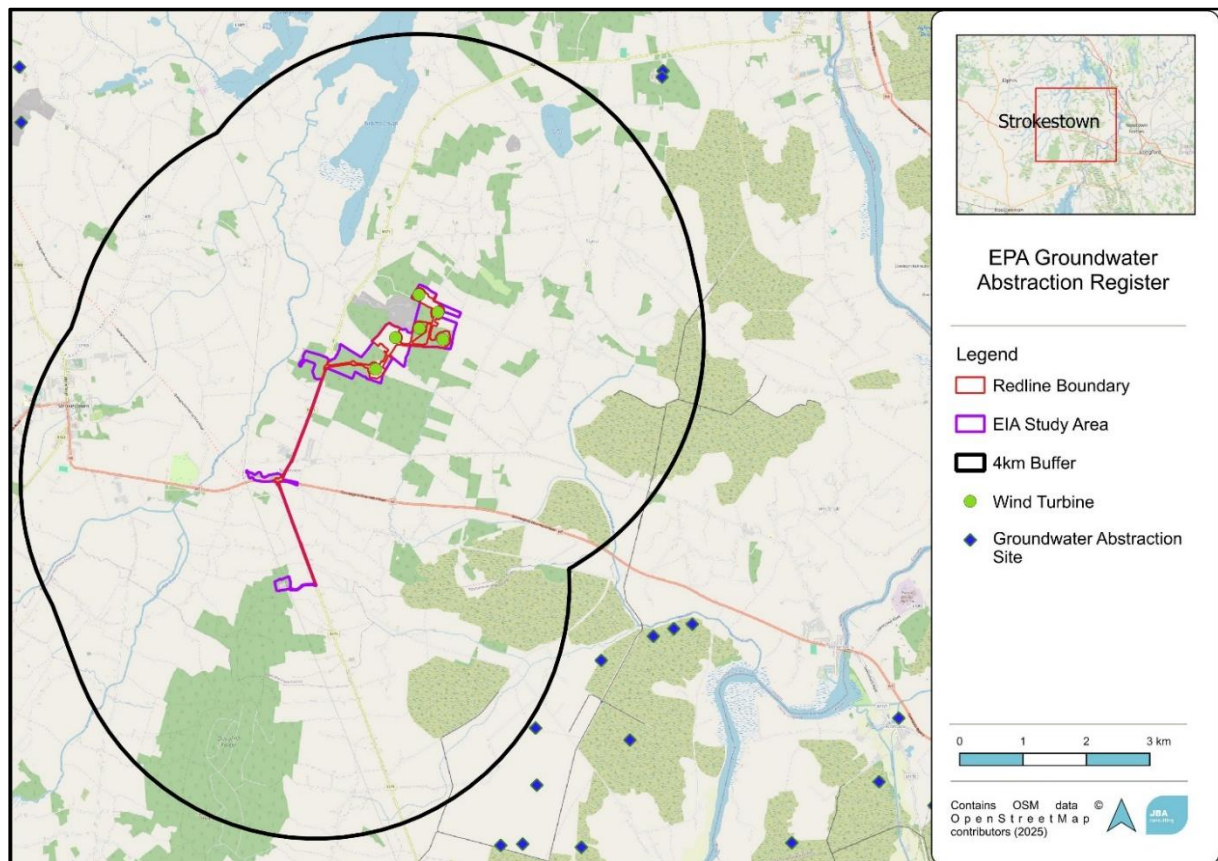


Figure 8-24: EPA Groundwater Abstraction Sites

³ EPA (2025) 'Water abstraction'. Available at: <https://www.epa.ie/our-services/licensing/freshwater--marine/water-abstraction/>

8.4.11 Surface Water Discharge

There is a Section 4 Discharge License (WP-06-05A) approximately 1.2km southwest from the proposed wind farm Site and approximately west of the GCR at, which discharges into the Scramoge River.

8.4.12 Flood Risk Assessment

A Site-Specific Flood Risk Assessment (SSFRA) has been completed by Hydrec Environmental Consulting in support of this planning application (see **Appendix 8.1 – FRA**).

In summary, the following conclusions were made within the FRA:

- The 2011 Preliminary Flood Risk Assessment (PFRA) mapping indicates that a small part of the wind farm Site (i.e. along the eastern boundary) is potentially susceptible to fluvial flooding;
- However, these maps are based on preliminary, non-definitive data and the OPW advises that these maps should not be used to assess risk to individual properties;
- Consequently, a hydraulic assessment of the Culliagh Stream was completed in order to predict the 1 in 100-year and 1 in 1000-year (+ climate change allowance) flood scenarios;
- Some channel overspill was modelled to occur under the 1% AEP and 0.1% AEP flood events. However, the associated flood extents were marginal in nature. This is in agreement with the marginal quantity of flooding mapped as part of the PFRA study;
- Furthermore, these flood extents are not predicted to encroach onto the confines of the proposed Project areas. Therefore, the wind farm Site can be described as being located outside of 'Flood Zone A' or 'Flood Zone B' and thus deemed acceptable from a flood risk perspective;
- A minimum freeboard of 1.2m currently exists between the 1 in 1000-year (+C.C) flood level and proposed Project locations;
- No flooding at the proposed Site Entrance 1 off the R371 – Regional Road is mapped or modelled to occur hence, emergency service access to the Site will not be restricted from a flood risk perspective (i.e. ground levels at site entrance at c. 104m AOD);
- In addition, no flooding from the PFRA, CFRAM, National Indicative Fluvial Mapping (NIFM), GSI or OPW flood record datasets are mapped/recorded at any location along the offsite GCR or at any location where temporary accommodating works associated with the TDR are proposed;

- Consequently, the proposed Project is deemed to have passed the criteria of the Justification Test; and
- To conclude, the proposed Project will not be at risk from flooding under the previously discussed scenarios nor will it exacerbate flooding in the immediate vicinity or wider area.

8.4.13 Protected Ecological Environment

There are no European designated sites within or bordering the proposed Project. The nearest site of significance is Kilglass and Grange Loughs proposed Natural Heritage Area (pNHA), c.1km north of the wind farm Site.

This section provides an assessment of the ecological baseline information based on a study area that incorporates the land within the site boundaries and wider Area of Influence (AoI). The Source-Pathway-Receptor model is used to establish ecological receptors that the Project could have significant effects on. A potential hydrological impact has been identified between the proposed Project and Lough Ree SAC, based on its downstream location and the presence of mobile QIs that may be sensitive to changes in water quality or flow. Lough Ree is located approx. 11.8km south of the proposed Project, and approx. 18.7km downstream.

Table 8-12 outlines the potential impact pathways that establish connectivity between the Project and internationally designated ecological sites.

Chapter 6 – Biodiversity and the **EIAR Volume 6 - Appropriate Assessment Screening Report** discuss the designated sites and connectivity to the proposed Project in detail.

Table 8-12: Proximity of European and National designated sites to the Project

Designated site	Straight line Distance from Project	Hydrological connectivity
000440 Lough Ree SAC	11.7km south	18.6km via Bellmount (Cloggernagh) (GCR crossing); 22.1km via the Culliagh stream (wind farm Surface Run-off point)
004064 Lough Ree SPA	11.8km south	This site is connected downstream (18.4km)
000608 Kilglass And Grange Loughs pNHA	1km north	This site is connected downstream (1.8km)
001642 Lough Boderg And Lough Bofin pNHA	6.2km northeast	This site is connected downstream (11.1km).
000608 Lough Ree pNHA	8.6km south	18.6km via Bellmount (Cloggernagh) (GCR crossing); 22.1km via the Culliagh stream (wind farm Surface Run-off point) Within foraging range of Otter

A qualifying interest of Lough Ree SAC is Otter (*Lutra lutra*), with the proposed Project located within its foraging range. A potential surface water pathway to Lough Ree SAC exists via the FEORISH (TARMONBARRY)_020 waterbody, which flows into the River Shannon approx. 8.8km downstream of the project site, which from that point flows approx. another 9.5km to Lough Ree SAC. Due to the distance between the wind farm Site and the sites listed in **Table 8-12**, along with mitigation measures outlined in **Chapter 6 – Biodiversity**, significant effects to these sites via water or groundwater are not anticipated.

8.5 Fieldworks

Hydrological walkover surveys were completed in May 2024, encompassing surface water sampling. An Aquatic Baseline Report was prepared by Triturus Environmental Ltd in August 2023 on behalf of the Applicant, (see **Appendix 6.8 – Aquatic Ecology**). **Table 8-13** below displays the numbered sampling points and their locations in the vicinity of the proposed Project.

Table 8-13: Location of surface water sampling points adapted from Aquatic Baseline Report

Site No.	Watercourse	EPA Code	Location	X (ITM)	Y (ITM)
C1	Gortlustia Stream	26G29	R371 Road crossing	596764	596764
C2	Bellmount Stream	26B99	R371 Road crossing	596977	778274
A1	Culliagh Stream	26C14	Culleenaghmore	599315	782096
A2	Culliagh Stream	26C14	Northyard	598969	598969
A3	Culliagh Stream	26C14	Cloonshannagh	601882	778105
B1	Ballymartin Stream	26B82	Ballyfeeny	597532	782282
B2	Ballymartin Stream	26B82	Tully	597437	782729
B3	Glen Stream	26G38	Tully	597847	783004

A discussion of the sampling points as outlined by the Aquatic Baseline Report (**Appendix 6.8 – Aquatic Ecology**) is detailed in **Table 8-14**.

Table 8-14: Q status and ecological evaluation of sampling points adapted from Aquatic Baseline Report

Site No.	Watercourse	Q Status	Location	Aquatic evaluation	ecological
A1	Culliagh Stream	Q2-3 (poor)	Culleenaghmore	Local importance (lower value)	
A2	Culliagh Stream	Q3 (poor)	Northyard	Local importance	
A3	Culliagh Stream	Q3 (poor)	Cloonmore	Local importance (lower value)	

Site No.	Watercourse	Q Status	Location	Aquatic evaluation	ecological
B1	Ballymartin Stream	Q3 (poor)	Ballyfeeny	Local importance (lower value)	
B2	Ballymartin Stream	Q3 (poor)	Tully	Local importance (lower value)	
B3	Glen Stream	Q3 (poor)	Tully	Local importance (lower value)	
C1	Gortlustia Stream	n/a	R371 crossing road	Local importance (lower value)	
C2	Bellmount Stream	Q3-4 (moderate status)	R371 crossing road	Local importance (lower value)	

8.5.1 Surface Water Sampling Results

The following water quality parameters were collected in the field using an YSI water quality meter: pH, Temperature(°C), Conductivity (mS/cm), Dissolved Oxygen (mg/l), Redox Potential (units) and a visual and olfactory observation of each sample. **Table 8-15** presents the water quality readings collected during sampling and **Figure 8-25** shows the location of each sample site. A photolog of each sample collected is also presented within **Appendix 8.3 – Photolog**.

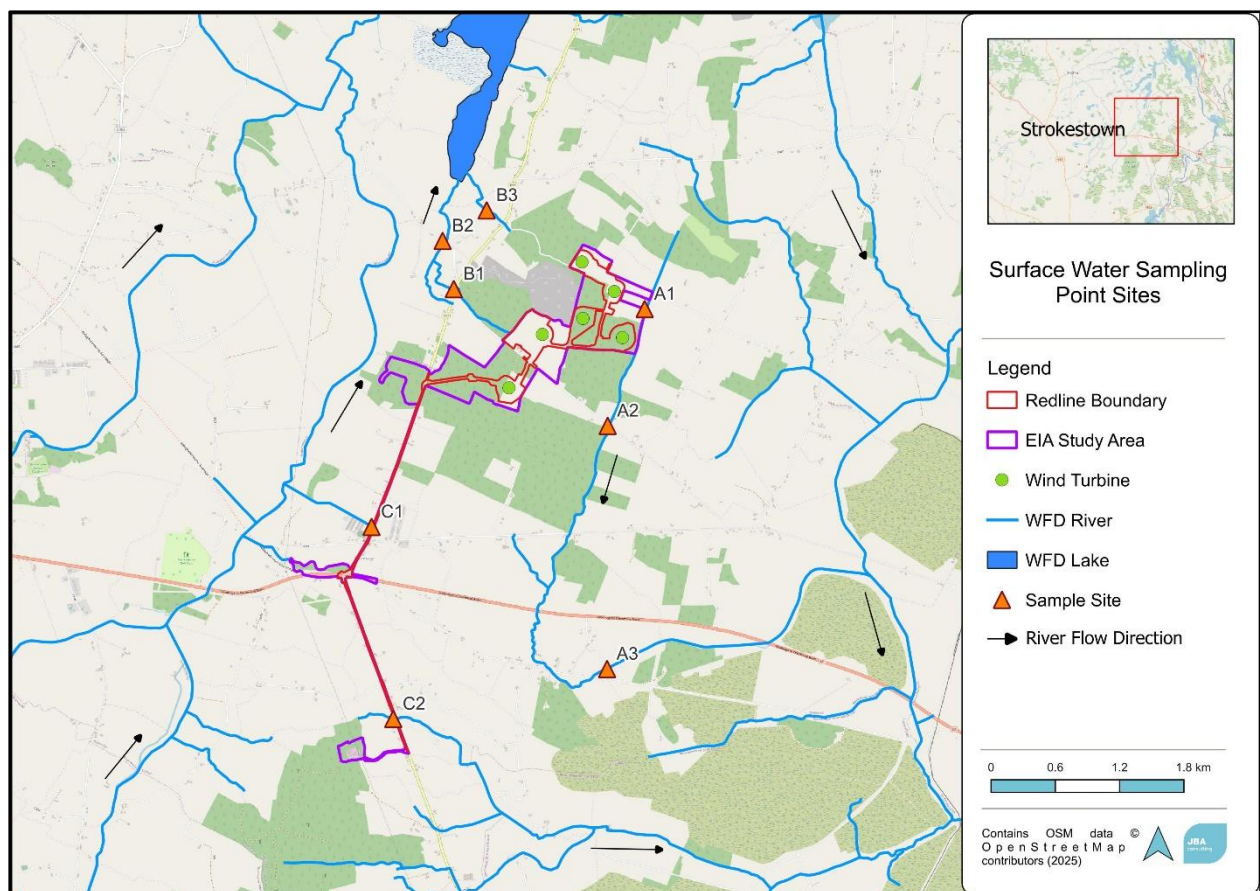


Figure 8-25: Locations of surface water sampling points (Ref: EIAR Figure 8-25 (Volume 4))

Table 8-15: Water quality results of surface water sampling

Sample Name	pH	Temperature (°C)	Time	Conductivity (mS/cm)	Dissolved Oxygen (mg/l)	Redox Potential	Visual	Odour
A1	8.00	14.5	14:40	365.9	7.82	365.3	Clear	N/A
A2	8.08	13.5	12:40	377.6	7.90	390.9	Clear/yellow hue	N/A
A3	8.22	14.5	12:11	443.7	7.69	363.9	Clear	N/A
B1	8.11	13.2	12:55	260.8	9.03	395.2	Clear	N/A
B2	7.66	17.7	14:00	402.2	6.30	366.0	Clear	N/A
B3	8.16	13.0	14:20	414.9	7.67	383.9	Clear	N/A
C1	7.41	12.4	10:54	1052	4.00	305.6	Clear/yellow hue	N/A
C2	8.23	13.4	11:50	362.1	7.45	440.9	Clear	N/A

Weather conditions during sampling on May 16th, 2024, were warm and sunny.

The pH of stream water is an imperative factor in determining its quality and the health of the aquatic life it supports. Stream water characteristically has a neutral (pH of 7) to slightly alkaline pH. Across the 8 sampling points, pH ranged from 7.41 to 8.23, giving an average of 8.00 pH. All recorded pH values were within the ideal pH range of 6-9, indicating that the water conditions were neither acidic nor extremely alkaline.

Conductivity measures within the samples collected ranged from 260.8 – 1,052 mS/cm, with an average recorded at 474 mS/cm. Conductivity was notably higher at C1, standing at 1,052 mS/cm. This sampling point also presented exceedances in Total Suspended Solids, as shown in **Table 8-15**. Salinity within river waterbodies increases with the rising concentration of suspended solids.

One of the primary causes of high conductivity in river bodies is salinity, which refers to the total concentration of all dissolved salts. When electrolytes dissolve in water, they form ionic particles that carry either a positive or negative charge, leading to higher conductivity levels associated with increased salinity. Conductivity was highest at sampling location C1, which was located adjacent to agricultural lands (refer to **Appendix 8.3 – Photolog**).

Dissolved oxygen levels ranged from 4.00 – 9.03 mg/l across the eight sampling sites, with an average of 7.20 mg/l. The lowest dissolved oxygen concentration was observed at sampling

point C1, which could potentially be resultant from agricultural runoff, as this point is immediately adjacent to agricultural farmland (refer to **Appendix 8.3 – Photolog**).

Collected samples were also dispatched to Fitz Scientific laboratories in cool boxes under chain of custody and analysed for the following parameters:

- Ammonia (Surface Water);
- Arsenic (Dissolved);
- BOD (Surface Water);
- Cadmium (Dissolved);
- Chromium (Dissolved);
- Chemical Oxygen Demand (Surface Water);
- Copper (Dissolved);
- Lead (Dissolved);
- Mercury (Dissolved);
- Nickel (Dissolved);
- Nitrate (Surface Water);
- Phosphate (Ortho) Surface Water;
- Selenium (Dissolved);
- Solids (Total Suspended);
- TPH (>C10-40);
- Turbidity (Surface Water); and
- Zinc (Dissolved).

Table 8-16 displays a summary of water quality results within the hydrological context of the proposed Project and its environs (refer to **Appendix 8.2 – Surface Water Sampling**).

Table 8-16: Analysis of results of surface water sampling

Parameter	LOD	Units	SOP	Surface Water Regs	Location Point							
					C1	C2	A3	A2	B1	B2	B3	A1
Ammonia (Surface Water)	0.01	mg/L as N	114	0.15*	0.26	0.03	0.02	0.05	0.02	0.04	0.02	0.01
Arsenic (Dissolved)	0.4	ug/L	177	2.5	1.1	0.7	1.1	1	1.1	1.1	0.7	0.9
BOD (Surface Water)	2	mg/L	113	High status ≤ 2.2 (95%ile)	<10	0.3	0.9	1.4	0.5	1	0.4	1.3
Cadmium (Dissolved)	0.5	ug/L	177	Water hardness **	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium (Dissolved)	0.7	ug/L	177	4.7	0.8	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7
Chemical Oxygen Demand (Surface Water)	5	mg/L	107	40	99	19	26	13	33	31	40	18
Copper (Dissolved)	0.1	ug/L	177	30*	4	1.9	1.3	1.3	2.3	1.5	1.1	1.1
Lead (Dissolved)	0.2	ug/L	177	14	0.2	<0.2	<0.2	<0.2	<0.2	0.2	0.3	<0.2
Mercury (Dissolved)	0.1	ug/L	178	0.07	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel (Dissolved)	0.4	ug/L	177	34	3	1.7	1.5	2.1	4	2.3	0.7	2.1
Nitrate (Surface Water)	0.51	mg/L as N	103	25	<0.51	<0.51	<0.51	<0.51	<0.51	<0.51	<0.51	<0.51
Phosphate (Ortho) Surface Water	0.01	mg/L as P	117	0.3*	0.13	0.02	0.03	0.02	0.05	0.02	0.02	0.01
Selenium (Dissolved)	3	ug/L	177	10	<3	<3	<3	<3	<3	<3	<3	<3
Solids (Total Suspended)	5	mg/L	106	50	208	24	<5	<5	20	<5	91	<5
TPH (>C10-40)	1	ug/L	188	10	<1	<1	<1	<1	<1	<1	<1	<1

Parameter	LOD	Units	SOP	Surface Water Regs	Location Point							
					C1	C2	A3	A2	B1	B2	B3	A1
Turbidity (Surface Water)	0.1	NTU	109	4	57.3	1.1	3.2	1.8	50.9	4.6	17.3	1.7
Zinc (Dissolved)	0.9	ug/L	177	100	10.9	9.9	7.6	8.5	2	3.9	2.3	3

The analysis results indicate that the water quality at location C1 does not meet 'Good' status criteria for Chemical Oxygen Demand (COD), Total Suspended Solids and Turbidity, with values of 99 mg/L, 208 mg/L and 57.3 NTU, respectively. All other parameters tested at remaining sampling points were compliant with Surface Water Regulations, as outlined in **Table 8-16**.

Agricultural activity has been shown to contribute to the pollution of waterbodies due to the excessive use of pesticides and chemical fertiliser, which eventually leach into groundwater and drain into surface waterbodies. Eutrophication is a primary concern for aquatic environments near farmland. Nutrients from agricultural runoff, used for increased productivity, lead to algal blooms. These, in turn, cause low dissolved oxygen levels, creating issues for aquatic animals (Kumar et. Al., 2021).

Algal blooms were not noted during the sampling at C1, however, dissolved oxygen is notably lower at this point in comparison to other sampling points, standing at 4.00 mg/l (**Table 8-15**).

Furthermore, COD indicates the degree of organic pollution in waterbodies. The increased COD levels at sampling point C1 could be attributed to vegetative dieback depositing into the stream.

8.5.2 Land Drains

A number of land drains were noted during the Site walkover as presented in **Figure 8-26**.

Although none are mapped as EPA surface water features, several flow into EPA-designated surface water features. Therefore, any likely impacts on these features will need to be assessed and mitigated against.

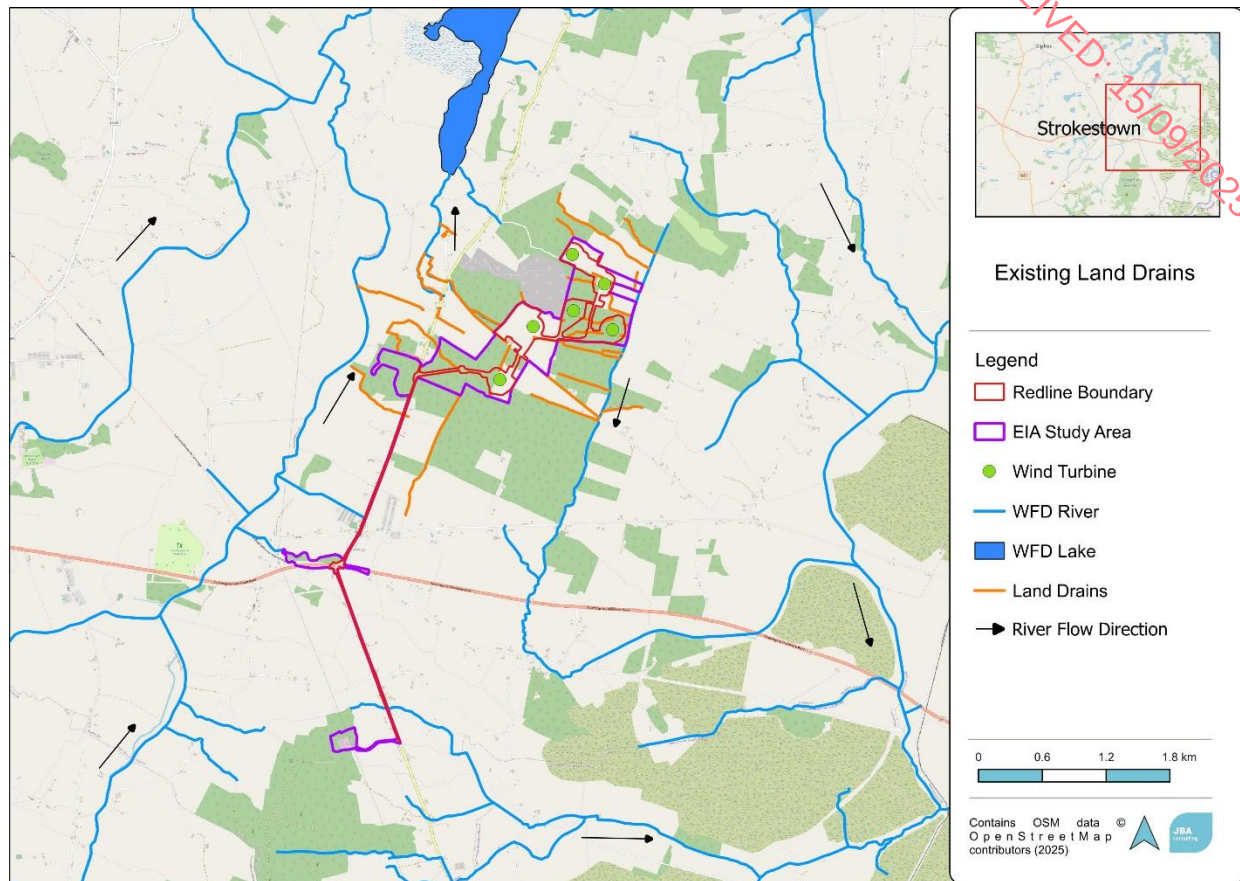


Figure 8-26: Existing land drains within vicinity of the proposed Project (Ref: EIAR Figure 8-26 (Volume 4)).

8.6 Assessment of Importance of Attributes

The attributes discussed above have been assessed using the criteria outlined in **Table 8-1** and

Table 8-2, and given the following importance ratings seen in **Table 8-17**.

Table 8-17: Importance ratings for hydrological and hydrogeological attributes

Attribute	WFD name	Importance	Rationale
Scramoge River (includes Gortlustia Stream)	MOUNTAIN (ROSCOMMON)_010	High	River of local importance with a Q rating of 3-4 'Poor' WFD status and 'At Risk'
Ballymartin Stream	OWENUR_030	High	Stream of local importance which flows into Kilglass Lough 'Good' WFD status and is under 'Review'
Feorish River	FEORISH (TARMONBARRY)_010	Medium	River of local importance with a Q rating of 3/3-4 'Poor' WFD status and 'At Risk'
Culliagh Stream/Bellmount Stream	FEORISH (TARMONBARRY)_020	Medium	River of local importance with a Q rating of 3/3-4 C2 sampling point 'Poor' WFD status and 'At Risk'
Kilglass Lough	n/a	High	Lake used locally for fishing Designated as a pNHA 'Moderate' WFD status and is under 'Review'
Groundwater Bodies	Kilglass Dromod Lough Ackrick Scramoge North Scramoge South	Medium	Locally important aquifer 'Good' WFD status and 'Not At Risk'
Karst Landforms	n/a	High	Sensitive environment
Drinking Water Sources	n/a	High	Lough Forbes used for surface water abstraction Wells used for public and domestic supply Source protection zones
Industrial Water Uses	n/a	Low	Neighbouring quarry wells used for industrial use

8.7 Embedded Mitigation

Through the development of the proposed Project, measures have been adopted as part of the evolution of the design to avoid or reduce adverse impacts on the environment. These measures are referred to as 'embedded mitigation' and are effectively built into the impact assessment. Embedded mitigation relevant to the water environment is set out below. Where additional mitigation measures are proposed, these are detailed after the impact assessment (**Section 8.9**).

Refer to **Chapter 3 – Consideration of Reasonable Alternatives** for a detailed account of primary mitigation relating to water, hydrology, hydrogeology and drainage.

A 50m buffer, with the exception of water crossings and some other minor works, was applied to watercourses shown on the 1:50,000 OSI maps at the design phase in accordance with the Irish Wind Energy Industry Best Practice Guidelines (IWEA, 2012). The guidelines state construction works should be kept 50m from watercourses where reasonably possible, with the exception of crossings which should be minimised. Additionally, 10m design buffers were applied to land drains and other hydrologically and hydrogeologically sensitive features. These constraints informed the micro-siting of Turbines, Access Tracks, spoil storage areas, and the Relay Tower to avoid where possible direct interaction with groundwater and surface water features. This approach reduces the risk of hydrological and hydrogeological impacts, including flow alteration and contamination.

8.8 Assessment of Effects

Predicted effects during construction, operational and decommissioning phases of the proposed Project are detailed in this Section. The 'Do Nothing' scenario, which presents an outline of the evolution of the baseline in the absence of the Project, is also discussed.

This assessment has focused on likely significant effects. All effects outlined in the following sections are presented before the incorporation of any additional mitigation. As per EPA Guidelines, receptors discussed in the following sections refer to "*any element in the environment which is subject to impacts*".

8.8.1 'Do Nothing' Scenario

If the proposed Project does not go ahead, the existing land use would remain unchanged and there would be no immediate impacts to the Site's hydrology and hydrogeology, allowing natural succession to continue. Existing drainage pathways on site would remain in use and would potentially change over time. As vegetation grows, overland flow pathways could naturally alter, with increased water retention due to the expanding vegetation and trees.

With climate change, the frequency and intensity of rainfall are expected to increase. This could exceed the capacity of existing drainage pathways, leading to a higher risk of pluvial flooding. Additionally, the existing activities on the Site (farming and forestry), could likely cause adverse impacts on the water, hydrology and hydrogeology environments.

The 'Do Nothing' scenario is considered to be **Not Significant, Long-Term, Neutral**, regarding water, hydrology and hydrogeology. In EIA terms, this is noted as **Not Significant**. However, it is

important to note that the aging infrastructure, changing climate conditions and ongoing Site activities could pose future challenges.

8.8.2 Construction Phase

Construction activities of the proposed Project which have the potential to impact on the water, hydrology and hydrogeology environment are listed below.

- Turbine construction including the Turbine Foundations and Turbine Hardstands;
- Construction of the Onsite Substation;
- Provision of 2 no. Temporary Construction Compounds;
- Installation of Wind Farm Internal Cabling;
- Installation of GCR cabling;
- Installation of Relay Tower;
- Construction of the Site Access Tracks; and
- Localised temporary accommodation works (such as widening and stoning of public road verges, relocation of utilities, hedge/tree trimming) for the TDR;

Construction activities are expected to last approximately 18 months.

Fine Sediment Pollution

During the construction phase, the water, hydrology and hydrogeology environments are at risk from fine sediment pollution from the following sources:

- Excavation, or storage of fill material near or adjacent to watercourses;
- Exposed ground following vegetation clearance near or adjacent to watercourses;
- Tree felling within wind farm Site and hedge and tree cutting along TDR;
- Installation of cable, trenching works, HDD crossing of the N5 and watercourse crossing on the Bellmount (or Cloggernagh) along the GCR;
- Interaction between machinery and the stream environment, such as for excavations required for Site Access Tracks, Turbine Foundations, the Onsite Substation and the Relay Tower; and

- Temporary accommodating works including hardcore areas at nodes along the TDR.

There are several likely pathways for fine sediment to be mobilised from these sources to water receptors. Surface water runoff during a precipitation event could wash fine sediment from Temporary Soil Storage Areas (refer to **Part 1 - Planning Drawings 23604-201 to 23604-208**) or exposed ground into the Ballymartin or Culliagh streams, either directly via surface runoff pathways or indirectly via the construction phase drainage network (refer to **Part 1 - Planning Drawings 23604-400-P1 to 23604-405**). Approximately 62,731m³ of material is estimated to be excavated during construction, with 56,458m³ to be stored or reused onsite, and 6,273m³ designated for removal off-site (refer to **Chapter 2 – Project Description**). This volume of exposed and stored material increases the potential for fine sediment mobilisation, particularly during heavy rainfall events.

GCR works including machinery operating adjacent to Bellmount (or Cloggernagh) Stream and Gortlusia Stream could knock exposed sediment directly into the water channel or move material to a position where, should it rain, the sediment would be more vulnerable to mobilisation by surface water runoff (either as sheet flow or slumping of sediment piles into the channel).

The GCR will cross one watercourse the Bellmount (or Cloggernagh) Stream located in the Scramoge South groundwater body, which flows to the Curraghroe stream, the Feorish (Tammonbarry) and the Shannon [Upper], which has downstream pathways to the Lough Ree SAC. The GCR will pass over the existing stream within the existing carriageway (see **Part-1 Planning Drawing 23604-306 and 564**).

It is proposed to utilise HDD at one location along the GCR – the N5/R371 road junction; to cross the N5 without open excavation of the road, (see **Planning Drawing 23604-304 and 562**). The HDD at this location will be approximately 50m in length.

This intersects the Scramoge North groundwater body which is shared by small streams that flow into the Scramoge. As such, these works have potential for groundwater contaminant sources to the Scramoge, which flows into the Kilglass stream. Given the separation distance, the likelihood for significant contamination event to impact streams within the Scramoge North ground waterbody being extremely low and the nature of HDD works is not considered likely to interact directly with groundwater.

Additionally, temporary accommodating works along the TDR could further contribute to fine sediment pollution through the cutting of hedges and trees, or the reinforcing of concrete areas adjacent to watercourses.

No Third Schedule invasive species were recorded within the wind farm Site (see **Appendix 6.4 – Habitats Technical Appendix**). Therefore, the spread of invasive species from within the Site is considered unlikely. However, invasive species could potentially be introduced during activities such as soil import or through the movement of machinery and materials.

Tree felling activities within the wind farm Site may temporarily damage soils and consequently, adversely impact water quality through increased erosion, sedimentation and nutrient runoff. During tree felling, nutrient loss is higher as there are no living tree roots to absorb nutrients. Organic matter that is left to decay releases phosphorus and nitrogen, potentially contaminating small streams through overland flow pathways. These small streams may eventually converge with the Ballymartin or Culliagh streams, or the Scramoge River, thereby extending the impact to water quality downstream.

Fine sediment pollution refers to both the fine sediment itself and urban pollutants, such as fuel emissions, that can be adsorbed onto the fine particles and transported along with them. Once fine sediment enters the water, it can disperse through the water column as suspended sediment. Suspended sediment affects physio-chemical water quality parameters by increasing turbidity and reducing dissolved oxygen. Changes in these conditions, along with toxicity effects associated with adsorbed urban pollutants, can pose a risk to the life of aquatic species. Settlement of fine sediment over instream geomorphic features such as coarse sediment deposits (e.g., riffles and bars) can smother these important physical habitat environments, rendering them unsuitable for aquatic species.

A fine sediment pollution event would be expected to immediately impact the local environment, and to subsequently affect downstream environments as the fine sediment is flushed through the system during flushing flow conditions (e.g., winter high flow events). Given flushing is expected, the effect on water quality and instream features is expected to be reversible. Taken together, the magnitude of likely impacts on the water and hydrology receptors without mitigation measures in place is medium, which combined with the high sensitivity of receptors leads to a **Short-Term, Adverse, Moderate** effect. In EIA terms, this is **Not Significant**.

Hydromorphology

Changes to the hydromorphology of the water and hydrology environments are likely to be limited in extent and magnitude due to the proposed Project layout. No direct hydromorphological effects are likely to occur, with no direct interactions with the surface water network proposed. Natural sediment dynamics will flush fine sediments through the network gradually. The magnitude of likely impacts on water will be low to negligible, which combined with the high to medium sensitivity of receptors leads to a **Short-Term, Adverse, Slight** impact on water and hydrology due to hydromorphology. In EIA terms, this is **Not Significant**.

Accidental Spills and Leaks

During the construction phase, there is a risk of localised accidental pollution incidences from the following sources:

- Spillages or leakage of temporary oils and fuels stored on Site;
- Spillages or leakage of oils and fuels from construction machinery or Site vehicles;
- Spillage of oil or fuel from refuelling machinery on Site; and
- Run-off from concrete and cement during the construction of Turbine Foundations or Turbine Hardstands.

There are several potential pathways for these pollutants from their sources to receptors. A direct hydrological link to surface water exists should an accidental spill or leak occur directly into Culliagh, Gortlustia, Ballymartin 26, or Bellmount streams during construction, or on land, and be allowed to flow overland to these watercourses. A spill or leak could also discharge to the existing surface water drainage network and subsequently discharge to the watercourses mentioned above, in addition to the Scramoge and Feorish rivers, or Kilglass Lough. During the construction phase, compaction of the soil or subsoil could occur due to the use of heavy machinery in green areas. This could reduce infiltration rates and increase surface water runoff, further acting as a pathway for potential pollutants.

The potential pollutants described above could negatively impact surface water or groundwater quality if allowed to reach them. Concrete (specifically the cement component) is highly alkaline, and any potential spillages can be detrimental to surface water and groundwater quality. Changes in pH of the affected waterbody resulting from spills of concrete material would have a consequent effect on aquatic species recorded in surrounding waterbodies, including Brown Trout and

Lamprey. Spillage of oil or other similar contaminants which are likely to be in use during construction would similarly negatively impact the water, hydrology and hydrogeology environment.

An accidental spill or leak is likely to be an isolated event if it occurs in a specific geographical area. The entire water, hydrology and hydrogeology environment as described above is therefore not likely to be affected, with effects likely only within one river sub-basin and the immediate area downstream. Taken together, the magnitude of likely impacts on water, hydrology and hydrogeology without mitigation measures in places is high, which combined with the high sensitivity of receptors leads to a **Short-Term, Adverse, Significant** effect on water, hydrology and hydrogeology due to accidental spills and leaks. In EIA terms, this is noted as **Significant**.

Groundwater Impacts

During the construction phase, the hydrogeology environment is at risk from fine sediment pollution in addition to accidental pollution from the following sources:

- Excavation of, or import of, fill material on Site;
- Run-off and erosion from soil stockpiles;
- Spillages or leakage of temporary oils and fuels stored on Site;
- Spillages or leakage of oils and fuels from construction machinery or Site vehicles;
- Spillage of oil or fuel from refuelling machinery on Site; and
- Run-off from concrete and cement during the construction of Turbine Foundations or Turbine Hardstands.
- Construction of the GCR including trenching works and HDD crossing of the N5.

There are several potential pathways for fine sediment and pollutants to be mobilised from these sources to groundwater and drinking water receptors, which are discussed in the sections below.

Dewatering groundwater from Turbine Foundations

Excavation for Turbine Foundation areas may encounter groundwater, necessitating the pumping of groundwater inflows. This process will result in a temporary localised drawdown of the water table and subsequent discharges to nearby surface water channels. Such excavation activities can alter the natural groundwater flow, potentially affecting neighbouring wells, springs and other water sources. The disturbance of soil and rock layers may introduce fine sediment and pollutants into the groundwater, impacting its quality. These activities can generate suspended solids in

drainage water, increasing the risk that sediment-laden recharge water could enter the underlying aquifer.

Additionally, temporary dewatering of turbine base excavations during construction has the potential to impact local groundwater levels, potentially causing further disruptions to the natural groundwater system. Any dewatering as a result of construction is expected to be limited in extent, i.e., limited to the immediate area surrounding the excavations, and temporary, with natural recharge expected to occur. Dewatering impacts on nearby groundwater wells as outlined in **Table 8-11** are not expected, as any dewatering at site will be temporary and localised.

The magnitude of likely dewatering impacts without mitigation measures in place is low, which combined with the high to medium sensitivity of receptors leads to a **Temporary, Adverse, Slight** effect due to fine sediment pollution or accidental spills and leaks. In EIA terms, this is noted as **Not Significant**.

Accidental pollution of existing water sources and public water supplies

The release of water from construction Site areas has the potential to impact groundwater if Site conditions are not suitable. There are two Temporary Construction Compounds proposed, which will need to be carefully managed to mitigate this risk. Concrete and other cement-based products are highly alkaline and corrosive, and their release into the Site drainage system can significantly negatively impact water quality as they percolate into the ground. There is also a risk of poor quality or contaminated water entering the groundwater system below the wind farm Site and flowing towards groundwater wells and public water supplies.

A fine sediment pollution event or an accidental spill or leak in the groundwater environment is likely to affect the immediate local area by direct downward pathways to underlying groundwater, as well as any surface waterbodies or water sources that are hydrologically connected or within the same groundwater system. Trenching works along the GCR including the HDD crossing of the N5 has the potential to impacts groundwater however, due to the shallow depth of the trenching works within the existing road carriageway for the GCR (between 0 - ~2m for the HDD crossing), works along the GCR is not considered likely to interact directly with groundwater.

The GSI groundwater wells and springs located adjacent to the proposed Project may be directly affected as they are in the same groundwater bodies. These wells and springs are sources of water for both public supply, managed by the Local Authority, and for domestic use. As outlined

in **Section 8.4.8** above, private household wells are also present in the area and as a precautionary approach, this assessment assumes that residences around the site have these wells, and so these could also be directly affected. Mitigation measures will be required to reduce the impact to these water sources and to safeguard their quality and availability. The magnitude of likely impacts on these groundwater features without mitigation measures in place is high, which combined with the high sensitivity of receptors leads to a **Short-Term, Adverse, Significant** effect due to fine sediment pollution or accidental spills and leaks. In EIA terms, this is noted as **Significant**.

The source protection zones identified in **Section 8.4.9**, e.g. Polecats Group Water Scheme, are located in a different groundwater body and therefore will not be affected by these activities. Similarly, the Lough Forbes surface water abstraction site is situated in a separate groundwater body from the proposed Project, and there is no likelihood of a direct surface water pathway due to the long distances and large intervening waterbodies (Kilglass Lough, Lough Bofin, Lough Boderg). The magnitude of likely impacts on these features without mitigation measures in place is low, which combined with the high sensitivity of receptors leads to a **Slight, Short-Term, Adverse** effect on drinking water sources. In EIA terms, this is **Not Significant**.

Karst landforms have the potential to be impacted by enabling works along the TDR, which include the widening and stoning of public road verges and roundabouts, hedge cutting, and the relocation or removal of street furniture. Of the TDR nodes which are in the immediate vicinity of karst landforms, identified in **Section 8.4.7**, only one, Node No. 2040, has been designated for advanced works. This Node is located directly adjacent to an enclosed karst depression. However, the nature of the works at this Node, limited to the relocation or removal of street furniture, reduces the risk of fine sediment pollution or accidental spills and leaks impacting the karst environment. The magnitude of likely impacts on these features without mitigation measures in place is medium, which combined with the high sensitivity of receptors leads to a **Slight, Short-Term, Adverse** effect on the enclosed depression. In EIA terms, this is **Not Significant**. Other karst landforms will not be impacted by construction activities.

8.8.3 Operational Phase

The likely impacts on the water, hydrology and hydrogeology environments during the operational phase refer to both the static ongoing operation of the proposed wind farm and to any specified maintenance requirements. There are no anticipated impacts to the water, hydrology and hydrogeology environments as a result of the GCR or TDR during the operational phase.

Operational Drainage

Upon completion, the newly constructed permanent drainage systems will be integrated into the existing network. This approach will minimise significant changes to current drainage patterns. The magnitude of likely impacts on the water, hydrology and hydrogeology environments without mitigation measures in place is low, which combined with the high sensitivity of receptors results in a **Long-Term, Adverse, Slight** effect due to operational drainage. In EIA terms, this is **Not Significant**.

Maintenance

During the operational phase, activities associated with the maintenance of the proposed Project have the potential to impact the water, hydrology and hydrogeology environments. This includes the ongoing use of the Onsite Substation, Site Access Tracks, vehicular use, and the maintenance of Turbines which utilises oil and lubricants. As discussed above, likely impacts of these activities on water, hydrology and hydrogeology include fine sediment pollution and accidental spills and leaks, such as fuel leakage from vehicles used to maintain the proposed wind farm. Additionally, the Turbine Hardstand areas and the Site Access Tracks will have the potential to contribute to an increase in surface water runoff, release of sediments, hydrocarbons and pollutants into adjacent watercourses. Together, the magnitude of likely impacts on water, hydrology and hydrogeology will be medium, which combined with the high sensitivity of receptors leads to a **Moderate, Long-Term, Adverse** effect due to ongoing maintenance works. In EIA terms, this is **Not Significant**.

8.8.4 Decommissioning Phase

Following the end of the operational phase the Applicant may wish to replace the turbines with a new set of turbines, subject to fulfilling the planning requirements at the time or the proposed Project may be decommissioned fully. The Onsite Substation and grid connection will remain in place as it will be in the ownership of ESB Networks and will form part of the National Grid. The

Relay Tower will remain in place as it will form part of the telecommunication network in the area. Other activities will include:

- Removal of the turbines and above-ground concrete (the 'plinth');
- Removal of underground cabling associated with the Wind Farm Internal Cabling, with ducting left in situ;
- Reinstatement of the Turbine Hardstands and Turbine Foundations, by covering with earth and reseeded/replanted as appropriate.

Most of the Site Access Tracks; and associated drainage will serve the ongoing forestry and farming practices in the area. Refer to **Chapter 2 – Project Description and Planning Drawings 270 – 278**) for a full outline of the decommissioning phase. A **Decommissioning Management Plan** has been prepared as part of this EIAR (**Appendix 2.1.4**).

The likely impacts associated with the decommissioning phase are anticipated to be similar in nature to those experienced during the construction phase of the proposed Project, but to a lesser degree. Removing the infrastructure could cause disruption to the local environment, particularly through an increased risk of sediment release.

The magnitude of likely impacts on the water, hydrology and hydrogeology environments without mitigation measures in place is medium, which combined with the high sensitivity of receptors results in a **Temporary, Adverse, Moderate** effect due to the decommissioning phase. In EIA terms, this is **Not Significant**.

8.9 Mitigation Measures

In the impact assessment discussed above, a range of likely effects on water, hydrology and hydrogeology were identified. Mitigation measures in the construction, operational and decommissioning phases of the proposed Project will be implemented to reduce any likely significant adverse effects.

Most measures are required during the construction phase as it will pose the greatest level of risks due to the construction activity on Site, plant construction and use of construction materials and the soil on Site.

In the sections below the mitigation measures for the 'Do Nothing' scenario, construction phase, operation phase and decommissioning phase are discussed.

8.9.1 'Do Nothing' Scenario

In the 'Do Nothing' scenario, no mitigation measures are proposed as no development will take place.

8.9.2 Construction Phase

Mitigation measures during the construction phase are discussed below. These mitigation measures have been developed with the source-pathway-receptor links above in mind and are designed to break this link either by removing the source or disrupting the pathway for pollution.

Best Practice Construction Methods

A **CEMP (Appendix 2.1)** and **SWMP (Appendix 2.1.1)** have been prepared for the proposed Project and will be implemented by the Appointed Contractor for the construction phase.

The **CEMP** sets out a framework associated, to ensure that appropriate controls are in place, to manage environmental effects associated with the construction phase.

The **CEMP** is a live document will be updated prior to the construction phase commencing, by the Appointed Contractor, to address the requirements of any relevant planning conditions, including any additional mitigation measures that are conditioned.

A copy of the **CEMP** shall be submitted to the Local Authority prior to the commencement of the construction phase.

All mitigation measures outlined hereunder have been incorporated into the **CEMP** and **SWMP**.

Site-Specific Surface Water Management

The Site Access Tracks will be built by excavating to a stable layer and filling with selected materials. Since these tracks often create a flow path for surface water and are usually lower than adjacent existing ground levels, specific drainage designs will be used (refer to **Planning Drawings 23604-400-P1 to 236604-404) – Part 1**. These designs include:

- An upslope cut-off drain will be installed before the main earthworks to reduce overland runoff onto the track and working strip, except on gently sloping land or where there is limited upslope catchment;

- Track edge drainage swales will be placed on one or both sides of the track hardstanding, with permanent downslope edge drainage omitted where water can shed onto undisturbed vegetated ground;
- All new Access Tracks will be constructed with a fall to aid drainage of surface water; Access Tracks will be graded to ensure that all runoff is channelled towards the dirty water drains;
- Temporary drainage swales and settlement/filtration features will be added downslope if higher silt loading is observed or additional water control near watercourses is needed;
- Drainage swales and track shoulders will be topsoiled and re-vegetated promptly to establish vegetation;
- Outlets from track edge drainage will flow through temporary mini-settlement ponds and/or silt fences to remove silt during construction;
- Under-track culverts will be installed to allow clean surface runoff to the downgradient side, with culverts/pipes regularly dispersing clean runoff onto natural vegetated surfaces;
- In-line erosion and velocity control measures, such as check dams, silt fences, and other control measures, will be implemented;
- Temporary settlement ponds will be placed on the downgradient side of the excavated track section to collect dirty excavation runoff and keep it separate from clean surface water runoff; and
- Temporary sumps, settlement ponds, sediment traps, and proprietary settlement systems like Siltbusters will be used to treat dirty construction water runoff before its controlled release onto natural vegetation surfaces.

Any existing site drains over which new Site Access Tracks are to be constructed will be culverted or piped, ensuring a cross-sectional area that does not impede water flow, with a minimum diameter of 225mm for cleaning and maintenance. Additionally, the drainage design for both new and upgraded access tracks will incorporate a cambered surface with a 2% cross fall, directing runoff into a 1.5-meter-wide drain to effectively manage surface water. Existing drainage paths will not be unnecessarily re-routed or altered to minimise impacts on local hydrology. Works adjacent to watercourses will be avoided during heavy rain to reduce pollution risks. Regular inspections of the surface water management systems and public road cleaning near drains will be undertaken by the Appointed Contractor. To ensure crane stability, the maximum crossfall on the crane hardstands will not exceed 1/100. The Appointed Contractor will provide perimeter

drainage channels to collect surface runoff and direct it to a suitably sized settlement pond before discharging to existing vegetated ground.

Tree felling operations will be conducted during suitable weather conditions and whenever possible, operations will be halted if rainfall occurs, to minimise the risk of sediment mobilisation and runoff. Tree felling operations will be planned to minimise surface water flow rates and volumes during heavy rains, preventing sediment and silt from entering watercourses. Silt traps will be installed along felling routes as needed, to capture sediment or tree material and prevent it from entering watercourses.

As per the **SWMP (Appendix 2.1.1)**, surface water drainage measures to be implemented include:

- Clean Water Cut-off Drains will be installed upgradient of works areas to collect surface runoff and prevent it from reaching excavations and construction areas of the Site, where it could pick up silt and sediment. These drains will divert upslope runoff around the work area, redistributing it as sheet flow to minimise the volume of potentially silty runoff within the construction area.
- Dirty Water Cut-off Drains will be installed downgradient of works areas to collect surface flow runoff and to prevent it from entering existing watercourses. These drains will direct runoff from the work area to locations where it can be treated via settlement ponds or other sediment removal measures.
- Buffered Outfalls will be constructed at the end of Cut-off Drains, Silt Ponds and other control measures to convert concentrated flows into diffused sheet flow on areas of vegetated ground. Buffered Outfalls will be located downgradient of any proposed works areas in locations where they are not likely to contribute further to water ingress to construction areas of the Site.
- Level Spreaders will be used at permanent surface water drainage outfall points to convert concentrated flows into diffuse sheet flow over vegetated ground. This will ensure clean drainage water is distributed without re-concentrating into flow channels immediately below the discharge point.

Excavations will be designed to minimise the volume of retained water requiring disposal. The following drainage management measures will apply:

- Cut-off drains will be installed around working areas to intercept uncontaminated surface runoff and divert it away from construction or excavation sites. Surface water runoff may also be diverted around the excavation using heavy timbers or similar materials laid on the ground;
- Stockpiling of materials will be minimised, and essential stockpiles will be located as far from watercourses as possible;
- The base of the excavation will be at the constructed level, with water gathered in a sump and pumped at a low flow rate into either the mini-settlement pond or track swale;
- If pumping to a SuDS feature is not feasible or the flow rate is too high, flows will be collected and pumped to the downhill side of the excavation over flat vegetated land, well away from watercourses;
- If the downhill slope is steep, a shallow trench will be dug parallel to contour lines to ensure water filters into the soil layers. This trench will be backfilled with excavated material after the Turbine base is completed; and
- Foundation working areas will be re-vegetated as soon as possible after construction.

Monitoring of surface water on quantitative and qualitative parameters during the construction phase will be carried out. As a minimum, the following parameters will be recorded in surface waters: pH, conductivity, chemical oxygen demand, suspended solids and total dissolved solids.

If monitored levels exceed the threshold levels outlined in European Union Environmental Objectives (Surface Waters) Regulations 2009 to 2019, mitigation measures to protect surface water will be reviewed by the Environmental Manager acting on behalf of the Appointed Contractor.

Site-Specific Fine Sediment Pollution Management

Mitigation for the protection of surface water quality from runoff carrying fine sediments, hazardous substances and urban pollutants, such as fuel emissions, involves silt control measures. These include proper planning of works, Temporary Construction Compound, storage management and excavation plans, as follows:

- Silt fencing and runoff control measures will be implemented to prevent contaminant entering the Temporary Surface Water Drainage network. This will be aided through proper storage of hazardous materials and waste management practice;

- Planning of works will be conscious of available weather forecasts and avoid working during heavy rain/storm events to minimise the risk of runoff that may be in excess of the capacity of the runoff control measures outlined in this EIAR. If working during precipitation events cannot be avoided, then runoff control measures will be actively monitored during the works to ensure their capacity is not compromised;
- Appropriate silt control measures, including silt traps, silt fences, check dams, swales, and sedimentation ponds, shall be implemented, along with temporary settlement tanks in areas requiring water pumping;
- Trackside swales will be trapezoidal in section, at least 300 mm wide at the bottom and 450 mm deep, with check dams provided at prescribed intervals on all drainage channels to decrease erosion potential and trap silts;
- Importation of materials from off-site, such as aggregates and other construction materials, will be closely monitored to ensure that no contamination or invasive species, is brought onto the Site from external sources. Importation of materials such as aggregates and other forms of construction materials will be monitored, documented, certified, sampled and tested as per the requirements of the **Appendix 2.1.2 – Waste Management Plan**.
- Vegetation will not be stripped from existing drains unless absolutely necessary, as existing vegetation can act as a final filter during runoff conveyance to the watercourse, provided sufficient pre-treatment is in place.
- An Emergency Response Plan (ERP) will be in place for the construction phase and includes a spill response and control procedure that will be followed in the event of a spill/leakage occurring during construction. All site operatives will be trained in the requirements of the ERP and all site vehicles will also contain emergency spill kits.

The ERP will be updated prior to the construction phase commencing, by the Appointed Contractor. The ERP is detailed in **Appendix 2.1 – CEMP**. In the event of a spill/leak, the following steps will be followed:

- Stop the source of the spill and raise the alarm to alert people working in the vicinity of any potential dangers;
- If applicable, eliminate any sources of ignition in the immediate vicinity of the incident;

- Contain the spill using the spill control materials, track mats or other material as required;
- Do not spread or flush away the spill. If possible, cover or bund off any vulnerable areas where appropriate such as drains, watercourses or sensitive habitats;
- If possible, clean up as much as possible using the spill control materials;
- Contain any used spill control material and dispose of used materials appropriately using a fully licensed waste contractor with the appropriate permits so that further contamination is limited;
- Notify the ECoW immediately giving information on the location, type and extent of the spill so that they can take appropriate action;
- The ECoW will inspect the site and ensure the necessary measures are in place to contain and clean up the spill and prevent further spillage from occurring;
- The ECoW will notify the appropriate regulatory body such as Roscommon County Council and the EPA, if deemed necessary; and
- A record of all environmental incidents will be kept on file by the ECoW and the Main Contractor.

Site-Specific Hydromorphology Mitigation

To reduce the likely impacts from drilling works, the following mitigation measures are proposed:

- Bentonite, an inert drilling fluid, will be used in the works;
- The drilling rig and fluid handling units will be located on one side of the crossing and will be stored on double bunded 0.5mm PVC bunds which will contain any fluid spills and storm water run-off; and
- The drilling process should be continuously monitored to detect any possible leaking of drilling fluid. This can be gauged by monitoring pumping rates and pressures as well as observing for a bentonite plume.

In the event that drilling fluid does escape from the HDD through hydraulic fracturing the ECoW should be informed immediately, and corrective measures should be implemented (refer to **Chapter 6 – Biodiversity** and **CEMP (Appendix 2.1)**);

Site-Specific Accidental Spills and Leaks Mitigation

To avoid and manage accidental spills and leaks, a series of measures listed below will be implemented. The Appointed Contractor will be responsible for ensuring their implementation. To prevent contamination from fuel, oil, chemical and cementitious materials, the following measures will be adopted:

During concrete pours:

- Concrete pours shall not occur during forecasted heavy rainfall, and the pour area must be drained of any water. In case of spills, temporarily block dirty water drains in the immediate area, monitor and adjust the pH levels of water in settlement ponds using CO₂ entrainment if necessary, and clear any spillage immediately, depositing it in the chute wash down area; and
- Delivery trucks, tools, and equipment will be cleaned at designated areas within a controlled site area, with the concrete truck chute cleaning area lined with impermeable material to protect groundwater from pollution (refer to **Planning Drawing 23604-405) – Part 1**.

For fuel, oils and chemicals

- Ensure all fuels, oils, and chemicals are stored in bunded areas at least 50 meters from watercourses or drainage areas, with a capacity of 110% of the total volume.
- Construct bunded areas in accordance with AS 1940:2004 standards;
- The refuelling of construction machinery and vehicles will be carried out in designated refuelling areas using a prescribed re-fuelling procedure;
- Refuelling and maintenance activities will be prohibited near watercourses or drainage areas to minimise contamination risks;
- Refuelling and maintenance activities will be undertaken on impervious surfaces or bunded trays to prevent spills from seeping into the ground
- Appropriate spill kits will be readily available and stocked. Spill kits will be maintained on the mobile fuel truck and at numerous locations on the Site.
- Only mechanically sound vehicles, equipment and machinery on Site will be used on site
- Wastewater and greywater from the temporary construction compound will be transferred offsite by a licensed facility for treatment and disposal.

All monitoring records shall be maintained by the Appointed Contractor and submitted to the Applicant at agreed intervals. The monitoring details will include:

- Records of regular inspection, on bunds, vehicles, oil storage on Site according to the **CEMP (Appendix 2.1)**;
- Records of silt fencing conditions and placement; and
- Records of any water ingress during excavation.

Site-Specific Groundwater Mitigation

To prevent and manage fine sediment pollution and accidental spills from impacting the hydrogeology environment, occasional dewatering of surface water from excavated Turbine Foundations will be directed to a settlement pond for infiltration slightly downgradient. This ensures that recharge rates remain unchanged.

- Designate specific areas for refuelling and maintenance in a controlled manner, located on impervious surfaces/bunded trays to prevent spills from seeping into the ground;
- Avoid use of herbicides for vegetation control around Turbines and Site Access Tracks. Where herbicides are necessary, use environmentally friendly alternatives and apply them following strict guidelines to prevent infiltration into groundwater;
- Conduct baseline groundwater quality testing before the wind farm becomes operational to establish existing conditions; and
- Implement a regular groundwater monitoring program to detect any potential contamination early and take immediate corrective action.

During the construction of turbine foundations, temporary drainage measures will be implemented to facilitate groundwater dewatering. Water entering the excavation may have a relatively high concentration of suspended solids, therefore, the settlement ponds receiving this water will be designed to accommodate this flow. Pumping water from Turbine Foundation excavations can lead to substantial flow rates into settlement ponds. Where possible drainage channels will be installed to de-water excavations via gravity flow. Where pumping is required to de-water deeper excavations, temporary storage will be provided within the excavations and dewatering will be carried out at a flow rate that matches the capacity of the settlement ponds.

Additionally, the mitigation measures outlined in the above sections are to be implemented to prevent any likely significant adverse effects to groundwater.

8.9.3 Operational Phase

During the operational phase, the operator of the wind farm will put the mitigation measures outlined in **Section 8.9.2 – Accidental Spills and Leaks** in place during maintenance works.

The revegetation of drainage works and other exposed surfaces, combined with the non-intrusive nature of operations, minimises the risk of sediment release into watercourses during the operational stage. To ensure controlled, inspected, and managed drainage discharges throughout the operational phase, attenuation/settlement ponds will be installed at discharge points.

As per **Appendix 2.1.1 – SWMP**, following construction, the amount of on-site traffic will be negligible and there will be no particular risk of sediment runoff. Runoff from Site Access Tracks, Turbine Hardstands, and other works areas will continue to be directed to settlement ponds, which will be left in place. Check dams within the drainage channels will remain in place. The retention of this part of the drainage infrastructure will ensure that runoff continues to be attenuated and dispersed across existing vegetation before discharge into the ground. Details of settlement ponds and check dams are contained in **Planning Drawings 23604-400** and **23604-401**, respectively. In the operational phase of the wind farm, the reliance on the drainage system discussed above will be reduced as areas naturally revegetate. Once areas revegetate, this will result in a resumption of the natural drainage management that will have existed prior to any construction.

8.9.4 Decommissioning Phase

During decommissioning phase, silt protection controls similar to those used during the construction phase will be implemented. The drainage system will remain operational to treat any sediment-laden surface water runoff caused by soil disturbance.

Turbine Foundations, Turbine Hardstands and other below ground works and will be left in place. Leaving below ground structures in place is seen as a more ecologically responsible choice since removing may cause environmental disturbances including noise, dust, and vibration. These will be reinstated with stored topsoil and re-vegetated, see **Chapter 6 – Biodiversity** and **Appendix 2.1.4 – Decommissioning Management Plan** for details on re-vegetation and planting.

The revegetation process following the backfilling of Turbine Hardstanding areas will be monitored, and if necessary, erosion control matting will be used to aid in the re-establishment of vegetation.

8.10 Residual Effects

Following the implementation of the recommended mitigation measures and the final design and layout of the proposed Project, the likely significance of residual effects is discussed in the following sections.

8.10.1 Construction Phase

Fine Sediment Pollution

With the implementation of the mitigation measures outlined in **Section 8.9.2** for fine sediment pollution during the construction phase, the residual effects to water, hydrology and hydrogeology will be **Slight, Short-Term, Adverse**. In EIA terms, this is **Not Significant**.

Hydromorphology

With the implementation of the mitigation measures outlined in **Section 8.9.2** for hydromorphology during the construction phase, the residual effects to water, hydrology and hydrogeology will be **Slight, Short-Term, Adverse**. In EIA terms, this is **Not Significant**.

Accidental Spills and Leaks

With the implementation of the mitigation measures outlined in **Section 8.9.2** for accidental spills and leaks during the construction phase, the residual effects to water, hydrology and hydrogeology will be **Slight, Short-Term, Adverse**. In EIA terms, this is **Not Significant**.

Groundwater Impacts

With the implementation of the mitigation measures outlined in **Section 8.9.2** for groundwater impacts during the construction phase, and with the minimum residential setback from the proposed turbines being 640m (or 599m to receptor 35), the residual effects to groundwater bodies and nearby groundwater wells will be **Slight, Short-Term, Adverse**. In EIA terms, this is **Not Significant**.

With the implementation of the mitigation measures outlined in **Section 8.9.2**, the residual effects to source protection zones, and karst landforms are expected to be **Imperceptible, Short-Term, Adverse**. In EIA terms, this is **Not Significant**.

8.10.2 Operational Phase

Operational Drainage

With the implementation of the mitigation measures outlined in **Section 8.9.3** for operational drainage, the residual effects will be **Slight, Long-Term, Adverse**. In EIA terms, this is **Not Significant**.

Maintenance

With the implementation of mitigation measures outlined in **Section 8.9.2** and **Section 8.9.3** for maintenance during the operational phase, the residual effects will be **Slight, Long-Term, Adverse**. In EIA terms, this is **Not Significant**.

8.10.3 Decommissioning Phase

With the implementation of the mitigation measures outlined in **Section 8.9.4** during the decommissioning phase, the residual effects to water, hydrology and hydrogeology will be **Slight, Temporary, Adverse**. In EIA terms, this is **Not Significant**.

8.11 Risk of Major Accidents and/or Disasters

This section considers the vulnerability of the proposed Project to major accidents and/or disasters, the risk of those major accidents and/or disasters occurring and the potential for any significant adverse effects on water, hydrology and hydrogeology.

According to EPA Guidelines, these unplanned events can include ‘spill from traffic accidents, floods or landslides affecting the site, fire, collapse or equipment failure on site’. Additionally, the EIA Directive requires “major accidents, and/or natural disasters (such as flooding, sea level rise or earthquakes)” be addressed.

The *Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report* (European Commission, 2017) requires the consideration of major hazards in the context of the SEVESO III Directive. It is noted that the

proposed Project will not come under the Control of Major Accident Hazards (COMAH) Regulations and the closest COMAH establishment is c. 37km west of the development. Extreme weather, such as a Flooding event could potentially impact the hydrological context of the Site together with the proposed Development. However, a Site-Specific **Flood Risk Assessment** have been prepared for the proposed Development and is presented in **Appendix 8.1**. The report concluded that the development will not be at risk from flooding, nor will it exacerbate flooding in the immediate vicinity or wider area.

8.12 Cumulative Effects Assessment

Chapter 16 – Cumulative Effects details the approach to the assessment of cumulative effects. **Appendix 16.1 – Long list of other projects for the cumulative effects assessment** presents the list of other projects that have the potential to cause cumulative effects together with the proposed Project.

Several energy sector developments are situated approx. 8km to 16km from the proposed Project. These include Ballykenny Solar Farm (12km southeast), Cleggill Solar Farm (c.13km southeast), Derrane Wind Farm (c.16km southwest), Kinbrace Battery Energy Storage System (BESS) (c.14km northwest), Polecate Group Water Scheme (c.11.5km northwest), Derryadd Wind Farm (c.11.2km southeast) and the Cloon to Lanesborough 110kV Overhead line (c.12.5km south). Of these developments, only Derryadd Wind Farm and the Cloon to Lanesborough 110kV Overhead line are located downstream of the proposed Project. However, both are located within separate river sub-basins to the proposed Project. The distance between these developments and the proposed Project is considered sufficient to prevent any cumulative effects on the receiving environment, as all are located outside the defined study area, which encompasses the relevant river sub-basins and 3km groundwater zone of influence.

8.12.1 The Lanesboro – Sliabh Bawn 100kV & Sliabh Bawn Wind Farm

The Lanesboro – Sliabh Bawn 100kV overhead line and Sliabh Bawn Wind Farm are located c.4.2km south of the wind farm Site, with the GCR extending to connect to the Sliabh Bawn Substation. Given the proximity and similar nature of these projects, there is potential for adverse cumulative impacts to water, hydrology, and hydrogeology if no mitigation measures are implemented.

The Planning and Environmental Considerations Report for the Lanesboro – Sliabh Bawn 100kV overhead line states within Section 9 – Water (table 9-2) that “works are proposed within 50m of surface waters on the unnamed tributary of the Bellmount Stream (IE_SH_26FO30400)”

The Planning and Environmental Considerations Report for the Lanesboro – Sliabh Bawn 100kV overhead line concludes as follows:

“Taking account of the proposed mitigation measures outlined in Section 9.4 and detailed within the supporting CEMP (Atkins, 2023) the proposed development will not have a significant adverse effect on hydrology or hydrogeology or human health within the receiving environment. The proposed development will not cause a deterioration of the status of any surface or groundwater under the WFD and will not undermine the attainment by any such body of good status”

Therefore, any likely impacts to water quality in the receiving Bellmount (or Cloggernagh) Stream as a result of the 110kV overhead line have been appropriately mitigated.

Both developments have undergone full environmental assessment in the form of an EIAR. Any likely impacts to water, hydrology or hydrogeology as a result of the wind farm or overhead line will have appropriate mitigation measures in place, as does the proposed Project. , it is considered that there will be a **Slight, Short-Term, Adverse** cumulative effect, during the construction, operation and decommissioning phases of the proposed Project. In EIA terms, the cumulative effect with the operational Sliabh Bawn wind farm and the proposed Project is considered to be **Not Significant**.

8.12.2 Ballyfeeny Rock Quarry

The closest active sand and gravel quarrying operation to the Project, is Ballyfeeny Rock Quarry that lies adjacent to the proposed Project. The nearest receiving surface water body to both the Project and the Ballyfeeny Rock Quarry is the Ballymartin Stream (EPA Code 26B82). The Ballymartin Stream is a first order stream which rises directly adjacent to the western boundary of the wind farm Site, approximately 60m from the proposed Onsite Substation and Communications Relay Tower. However, the Environmental Impact Statement (EIS) for the Ballyfeeny Rock Quarry reported no significant adverse residual effects and noted that the quarry operates under planning conditions that include environmental management controls. While both projects individually conclude no likely significant effects, this assessment recognises that, in line with the EPA Guidelines (2022), the combination of multiple not significant effects has

the potential to result in more significant cumulative impacts. Therefore, a precautionary approach has been taken, considering the location and scheduling of activities that may interact across both sites. With the implementation of the mitigation measures outlined in this chapter, and taking into account the environmental controls in place at the quarry, any cumulative effects are expected to be limited in scale and duration and are not anticipated to result in significant adverse effects on hydrological or hydrogeological conditions as demonstrated by the continued “Good” water quality status. It is considered that there will be a **Negligible, Short-Term, Adverse** cumulative effect, during the construction, operation and decommissioning phases of the proposed Project. In EIA terms, the cumulative effect in combination with the active Ballyfeeney Rock Quarry and the proposed Project is considered to be **Not Significant**.

8.12.3 N5 Ballaghaderreen to Scramoge Realignment Scheme

The N5 Ballaghaderreen to Scramoge Realignment Scheme, scheduled for completion by late 2027, intersects with the GCR and shares hydrological links with the proposed Project. Given the scale and nature of both developments, there is potential for cumulative impacts on local water bodies, particularly the Gortlustia Stream and Scramoge River, if mitigation measures are not properly implemented. However, the N5 Scheme which is likely to be completed in advance of the construction phase of the proposed Project and has undergone an EIAR, which includes integrated hydrological protection measures throughout its design and construction. In line with EPA Guidelines (2022), this assessment recognises that minor effects from multiple projects can combine to create more significant cumulative impacts. To address this, the evaluation considers both the physical proximity of the two developments and the timing of their respective activities. With the environmental controls already in place for the N5 Scheme, the likelihood that the development will be completed well in advance of the construction phase of the proposed Project and the mitigation measures proposed for the current Project, any combined effects are expected to be limited in scale and duration and are not anticipated to result in significant adverse impacts on the surrounding water environment. It is considered that there will be a **Negligible, Short-Term, Adverse** cumulative effect, during the construction, operation and decommissioning phases of the proposed Project. In EIA terms, the cumulative effect in combination with the N5 Ballaghaderreen to Scramoge Realignment Scheme and the proposed Project is considered in EIA terms to be **Not Significant**.

Other projects outlined in **Chapter 16 - Cumulative Effects** are not expected to have a significant cumulative effect with the proposed Project. This is due to their small size and the absence of complex likely effects. This includes projects situated along the TDR, where the localised and temporary nature of the work at the proposed accommodating works indicates that no likely significant cumulative effects are anticipated.

As such, it is considered that there will be a **Slight, Short-Term, Adverse** cumulative effect, during the construction and decommissioning phases of the proposed Project, and a **Slight, Long-Term, Adverse** cumulative effect during the operational phase. In EIA terms cumulative effects between the proposed Project and other plans and projects are considered to be **Not Significant**.

8.13 Inter-related Effects

Impacts to water, hydrology and hydrogeology have the potential to interact with the following environmental factors:

Chapter 6 – Biodiversity: Watercourses serve as valuable ecological corridors, providing habitats for a number of significant and protected species. Impacts on waterbodies within such networks can affect aquatic habitats and the species they support. Key likely impacts include accidental sediment release, pollution from spills or leaks, and disruption to habitats caused by instream or bank-side activities. Through implementation of mitigation measures outlined in the Biodiversity and Water, Hydrology and Hydrogeology Chapters of the EIAR, the likely impact through interaction is reduced to **Slight, Short-Term, Adverse**. In EIA terms, this is **Not Significant**.

Chapter 7 – Land, Soils and Geology: Hydrogeology is linked with surface water networks. surface water run-off can directly affect soil quality and condition through deposition or withdrawal of chemicals, suspended solids, and nutrients. During construction eroded material can enter surface water causing an influx of sediments. This has the potential to increase suspended sediments. Through implementation of mitigation measures outlined in the Land, Soils and Geology and Water, Hydrology and Hydrogeology chapters of the EIAR, the likely impact through interaction is reduced to **Short-Term, Slight, Adverse**. In EIA terms, this is **Not Significant**.

8.14 Monitoring Requirements

No operational phase monitoring is required in relation to Hydrology and Hydrogeology.

8.15 Summary of Effects

This chapter has assessed the likely effects on water, hydrology and hydrogeology during the construction, operation and decommissioning phases of the proposed Project. **Table 8-18** below displays the impact assessment for all phases of the Project and confirms the residual effects following the application of mitigation measures.

Table 8-18: Summary of effects

Likely Impact	Receptor	Significance of effect	Additional Mitigation	Residual significance of effect
Construction Phase				
Fine sediment pollution	<u>Water and Hydrology:</u> Ballymartin Stream Culliagh Stream Scramoge River Bellmount Stream Watercourses adjacent to TDR	Moderate (Not Significant in EIA terms)	Construction phase mitigation measures are detailed in Section 8.9.2 – Fine Sediment Pollution	Slight (Not Significant in EIA terms)
Hydromorphology	<u>Water and Hydrology:</u> Bellmount Stream	Slight (Not Significant in EIA terms)	Construction phase mitigation measures are detailed in Section 8.9.2 – Hydromorphology	Slight (Not Significant in EIA terms)
Accidental spills and leaks	<u>Water and Hydrology:</u> Culliagh Stream Gortlustia Stream Ballymartin Stream Bellmount Stream Scramoge River Feorish River Kilglass Lough <u>Hydrogeology:</u> Groundwater bodies Drinking water sources	Significant (Significant in EIA terms)	Construction phase mitigation measures are detailed in Section 8.9.2 – Accidental Spills and Leaks	Slight (Not Significant in EIA terms)
Dewatering groundwater from turbine foundations	<u>Hydrogeology:</u> Groundwater bodies Groundwater wells	Slight (Not Significant in EIA terms)	Construction phase mitigation measures are detailed in Section 8.9.2 – Groundwater Mitigation	Slight (Not Significant in EIA terms)
Accidental pollution of existing water sources and public water supplies	<u>Hydrogeology:</u> Groundwater bodies Groundwater wells Source protection zones Karst landforms	Groundwater bodies, groundwater wells -Significant (Significant in EIA terms) Source protection zones, karst landforms - Slight (Not Significant in EIA terms)	Construction phase mitigation measures are detailed in Section 8.9.2 – Groundwater Mitigation	Groundwater bodies, groundwater wells - Slight (Not Significant in EIA terms) Source protection zones, karst landforms –

				Imperceptible (Not Significant in EIA terms)
Operational Phase				
Operational drainage	<u>Water and Hydrology:</u> Watercourses <u>Hydrogeology:</u> Groundwater bodies Drinking water sources	Slight (Not Significant in EIA terms)	Operational phase mitigation measures are detailed in Section 8.9.3	Slight (Not Significant in EIA terms)
Maintenance	<u>Water and Hydrology:</u> Culliagh Stream Gortlustia Stream Ballymartin Stream Bellmount Stream Scramoge River Feorish River Kilglass Lough <u>Hydrogeology:</u> Groundwater bodies Drinking water sources Industrial water uses	Moderate (Not Significant in EIA terms)	Operational phase mitigation measures are detailed in Section 8.9.3	Slight (Not Significant in EIA terms)

Decommissioning Phase				
Decommissioning activities	<u>Water and Hydrology:</u> Culliagh Stream Gortlustia Stream Ballymartin Stream Bellmount Stream Scramoge River Feorish River Kilglass Lough <u>Hydrogeology:</u> Groundwater bodies Drinking water sources Industrial water uses	Moderate (Not Significant in EIA terms)	Decommissioning phase mitigation measures are detailed in Section 8.9.4	Slight (Not Significant in EIA terms)

8.16 References

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