# 9. HYDROLOGY AND HYDROGEOLOGY

## 9.1 INTRODUCTION

This chapter of the EIAR assesses and describes the likely effects of the proposed project on the Hydrological (surface water) and Hydrogeological (groundwater) environment.

The proposed project comprises the following three elements:

1. The proposed wind farm site, which will contain thirteen turbines and associated infrastructure,
2. The proposed GCR (including substation), and
3. Proposed temporary accommodation works (nodes) on the Turbine Delivery Route (TDR).

The proposed project comprises the construction of 13 no. wind turbines, the grid connection infrastructure, temporary accommodation work (nodes) on the proposed turbine delivery route (TDR) and all ancillary works.

The total land area of the planning application boundary is approximately 222 ha, of which approximately 29 ha (13 %) will be used for infrastructure, of which approximately 16 ha (c 7%) will be associated with the wind farm and approximately 13 ha (6%) will be associated with the grid connection and substation. Information on the existing hydrological and hydrogeological environment is presented as the baseline for the proposed project. Any likely significant effects of the proposed project are presented along with prescribed mitigation measures. Any residual and cumulative effects are also assessed.

### 9.1.1 Statement of Authority

John Dillon and Peter McSherry, of TOBIN have completed this chapter.

John Dillon (BSc., MSc., DIC, MCIWM, PGeo) is a hydrogeologist with 20 years geological/ hydrogeological experience in groundwater development, wind farm and major infrastructure developments. John has authored numerous Hydrology, Hydrogeology and Water Quality EIAR chapters for a range of renewable projects including wind farms. John is familiar with the proposed wind farm for the Rooaunalaghta Green Energy Project, and has worked on other wind farms including Castlebanny, Ballincor, Lissinagroagh and Derryadd set in various ground conditions and water environments. John has undertaken site surveys in terms of karst and is the technical reviewer for this chapter and assessment.

Peter Mc Sherry (BSc., PGCert) is a hydrogeologist with over 5 years hydrogeological experience in groundwater resources, contaminated land, ground investigation and various infrastructure developments. Peter also has over 5 years' experience in environmental management with a particular focus on wastewater treatment, energy management and regulatory compliance. Peter has a master's in Hydrogeology. Peter has authored several hydrogeology reports for various infrastructure and renewable projects, including Lissinagroagh wind farm and Ballincor wind farm. Peter was involved in the site supervision of drilling and trial pits, site walkovers and baseline assessment of the EIAR chapter.

### 9.1.2 Limitations Encountered in Compiling Information

No overarching assumptions or limitations have been identified that apply to the assessment for hydrology and hydrogeology. Where routine assumptions have been made while undertaking the assessment, these are noted in the following sections.

There were no limitations on access during the field survey and all areas of the site were available for inspection, enabling an assessment of karst features, drainage conditions and bedrock exposures.

Groundwater level data represent conditions observed during the monitoring period and vary seasonally in response to fluctuations in rainfall, recharge rates and catchment conditions. The blockage of the monitoring well occurred following drilling however sufficient data was available from the monitoring programme to characterise seasonal groundwater-level variation.

## 9.2 Scoping and Consultation

The EIA Scoping and consultation activities were carried out as set out in Chapter 1 and includes a summary of the consultees and responses received (or not received).

Consultation and scoping has included EIA scoping, consultation events and meetings with key stakeholders. The feedback received throughout the process has been considered in preparing this EIAR chapter.

Table 9-1 provides a summary of the key issues raised during the consultation process relevant to hydrology and hydrogeology, and details how these issues have been considered in the production of this EIAR chapter. The full list of consultee responses received can be found in Table 1-4 of Chapter 1.

*Table 9-1: Consultation responses relevant to hydrology and hydrogeology*

| Consultee | Comment | How Issues Have Been Addressed |
|---|---|---|
| Scoping Responses | | |
| An Coimisiún Pleanala | The first pre-application consultation meeting was held with An Coimisiún Pleanála on 26 May 2026, with subsequent meetings held on 27 July and 31 August 2026. Hydrology and hydrogeology was briefly discussed in the first and third meetings, but formed a more substantial part of the second meeting. The main issues raised in these meetings were:<br><br>1. The Commission advised that the applicant should review hydrological and hydrogeological issues raised for other wind farm developments in karst environments and demonstrate that appropriate mitigation has | The matters raised by An Coimisiún Pleanála during the pre-application consultation process have been addressed through the project design, site investigations and the Hydrology and Hydrogeology assessment.<br><br>1. In particular - Hydrological and hydrogeological issues identified on other wind farm developments in karst environments were reviewed and informed both the site investigation strategy and the mitigation measures incorporated into the design.<br>2. The SI data, groundwater level data and karst specific information is provided in Chapter 8 and supporting appendices and site specific |

| | | |
|---|---|---|
| | been incorporated into the project design.<br>2. The site investigations, bedrock and groundwater studies, groundwater contours, groundwater-dependent ecosystems/turloughs, and nearby drinking water supplies should be clearly addressed. A robust Surface Water Management Plan and Water Framework Directive Compliance Assessment will be required.<br>3. Discussion was held on the level of site investigations completed. The investigations will need to be clearly presented.<br>4. The assessment should address drinking water supplies including Glencorrib GWS which has a reservoir near the proposed wind farm.<br>5. Consideration should be given for the potential presence of karst features and ensure an appropriate protocol is followed and documented.<br>6. Baseline aquatic ecology surveys should be used to characterise existing river conditions and inform mitigation and ecological monitoring for bridge crossings and HDD crossings. | information utilised in the hydrological and hydrogeological assessment (Chapter 9). Consultation was undertaken with the Glencorrib GWS. A comprehensive Surface Water Management Plan has been prepared as part of the application documentation, demonstrating the effectiveness of the proposed drainage, attenuation and pollution control measures, included as Appendix 2-6. A Water Framework Directive (WFD) Compliance Assessment has been completed and demonstrates that the proposed development will not result in deterioration of waterbody status or hinder the achievement of Water Framework Directive objectives, included as Appendix 9-1.<br><br>3. Additional geophysics was undertaken to address the comments made. Potential karst features have been investigated and considered throughout the design process. A karst management protocol (see Appendix 2-2 CEMP) will be followed to guide construction activities and to ensure groundwater resources are protected in the event that karst features are encountered. Information about the site investigations has been clearly provided in Section 9.3.3 and 9.4.<br>4. Existing drinking water receptors, including the Glencorrib Group Water Scheme and private water supplies, have been identified and assessed. Appropriate protection measures have been incorporated into the project design and mitigation strategy. Consultation was undertaken with Glencorrib GWS to understand their existing network in relation to the proposed wind farm. No groundwater abstraction for Glencorrib occurs on site.<br>5. Conceptual model of groundwater and section is provided in Section 9.4.3. A karst assessment is included in Appendix 8-1 which identifies and assesses the key areas on site based on site information.<br>6. Baseline aquatic ecology surveys were used to characterise existing river conditions. Aquatic Baseline Survey Report available as Appendix 6-5. |

| | | |
|---|---|---|
| | | Consultation has been undertaken with the relevant statutory bodies, including the Office of Public Works, National Parks and Wildlife Service and Inland Fisheries Ireland and detailed further in Chapter 1, Section 1.9 and copies available as Appendix 1-3. |
| NPWS | No significant issues raised in relation to hydrology or hydrogeology. Focus primarily on ornithology issues. | See Chapter 6 and 7. |
| Geological Survey Ireland | Suggest utilising GSI data. Geological Survey Ireland would appreciate a copy of reports detailing any site investigations carried out. | GSI databases are utilised in the EIAR. Data on boreholes etc will be provided to the GSI. |
| Inland Fisheries Ireland | No response | While no response was received, TOBIN have followed best practice in terms of IFI guidelines (2016). |
| Uisce Éireann | UE commented that the development is located in surface water Drinking Water Area Catchment for:<br>• Tuam Regional Water Supply Scheme (RWSS) with the abstraction point located 15 km downstream on Lough Corrib.<br>• Galway City Council Public Water Supply, with the abstraction point located 26 km downstream on Lough Corrib. | Effects on water abstractions is included in Section 9.5. The proposed project is located in the Corrib catchment. |
| OPW | OPW commented that any new culverts or bridges (or modifications to any existing culverts or bridges) are required to cross watercourses as part of the development or on proposed or existing access roads to serve or access the development, you should be aware the required consent from the Commissioners of Public Works. They also recommend that a flood risk assessment be carried out with regard to the proposed project and its construction. | TOBIN has followed best practice in terms of Flood risk assessment (FRA). A FRA is included in Appendix 9-2. A section 50 will be prepared for the Shancloon stream crossing |
| Mayo County Council | No Comments on Hydrology or Hydrogeology | N/A |

## 9.3 Assessment Methodology

The baseline environment of the proposed wind farm site, proposed grid connection route (GCR) and nodes of the proposed turbine delivery route (TDR) was thoroughly investigated through extensive desk studies and field inspections. The methodology for this chapter involved a combination of desk-based research, walkovers and intrusive investigations, such as trial pits, boreholes and geophysical assessments.

The study area was defined on the basis of the potential hydrological/hydrogeological zone of influence of the proposed wind farm and GCR.

Works for the TDR include spreading of hardcore at one bend along with some demounting of signs or hedge trimming. As no significant works are required for the TDR, this is screened out from further assessment in this chapter.

The assessment considers all surface water bodies and groundwater bodies that are hydraulically connected to the proposed development and that could potentially experience direct or indirect effects during construction, operation or decommissioning.

The study area includes all WFD waterbodies intersected by, or immediately downstream of, the proposed wind farm site, Grid Connection Route (GCR) and substation. The extent of the study area was informed by the local hydrological regime, mapped surface water drainage network, identified groundwater flow pathways and the nature of the proposed works. Particular consideration was given to locations where there is potential for sediment mobilisation, accidental spills, dewatering activities, drainage discharges or watercourse crossing works.

A downstream assessment extent of approximately 2 km was adopted from project infrastructure where hydrological connectivity exists. This distance exceeds the likely extent of measurable impact associated with the proposed works and is considered sufficient to capture any waterbodies that could reasonably be affected by construction-related runoff or changes in water quality.

Waterbodies located outside the hydrological zone of influence, including those that are hydraulically disconnected from the proposed project, were excluded from detailed assessment on the basis that no mechanism exists through which the project could affect their WFD status or objectives.

The study area for the hydrology and hydrogeology assessment is presented as Figure 9-1. The study area for the proposed GCR uses a 200 m buffer, based on the limited works and excavations required.

The assessment draws on the best available hydrological and hydrogeological data, supported by site-specific information and online publicly available datasets in conjunction with professional judgment where quantitative site data gaps occur. Natural seasonal and interannual variability have been considered in interpreting baseline conditions.

Where analytical or modelling techniques have been applied, these have been developed and validated using available datasets, with conservative parameters adopted to address uncertainty.

The assessment in this chapter has considered the mitigation that has been embedded into the design to avoid or reduce adverse environmental effects. Embedded mitigation is integral to the

project design and therefore the assessment of effects assumes all embedded design measures are in place. Relevant embedded mitigation for this topic is detailed in Section 9.5.1.

## 9.3.1 Relevant Legislation and Guidance

### *9.3.1.1 Legislation*

The following legislation is applicable to the assessment of the hydrology and hydrogeology chapter of this EIAR and have been complied with in this assessment.

European Directives:

- Drinking Water Directive – European Union Directive (2020/2184) on the quality of water intended for human consumption;
- Environmental Impact Assessment (EIA) Directive - European Union Directive (2011/92/EU) on the assessment of the effects of certain public and private projects on the environment, as amended by Directive 2014/52/EU;
- Environmental Quality Standards Directive – European Parliament and of the Council (2008/105/EC) as amended 2013/39/EU requires the identification of priority substances to set Environmental Quality Standards (EQSs) for the concentrations of the priority substances in surface waterbodies and to review periodically the list of priority substances ;
- Groundwater Directive – European Union Directive (2006/118/EC) on the protection of groundwater against pollution and deterioration (as amended);
- Habitats Directive - European Union Directive (92/43/EEC) on the conservation of natural habitats and of wild fauna and flora (as amended);
- Water Framework Directive - European Union Directive (2000/60/EC) on establishing a framework for Community action in the field of water policy (as amended); and
- Waste Framework Directive - European Union Directive (2008/98/EC) on waste and repealing certain Directives (as amended).

National Legislation:

- Local Government (Water Pollution) Act 1977 and (Water Pollution) (Amendment) Act 1990;
- Planning and Development Act, 2000 (as amended);
- Planning and Development Regulations 2001 (as amended);
- S.I. No. 293 of 1988: European Communities (Quality of Salmonid Waters) Regulations 1988;
- S.I. No. 722 of 2003: European Communities (Water Policy) Regulations 2003 (as amended);
- S.I. No. 684 of 2007: Wastewater Discharge (Authorisation) Regulations 2007;

- S.I. No. 272 of 2009: European Communities Environmental Objectives (Surface Waters) Regulations 2009 (as amended);
- S.I. No. 296 of 2009: The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009 (as amended);
- S.I. No. 99 of 2023: European Union (Drinking Water) Regulations 2023; and
- S.I. No. 9 of 2010: European Communities Environmental Objectives (Groundwater) Regulations 2010 (as amended).

The EU Water Framework Directive (2000/60/EC) (WFD) established a framework for the protection of both surface water and groundwater. Transposing legislation (S.I. No. 272 of 2009, European Communities Environmental Objective (Surface Water) Regulations 2009 (as amended)) outlines the water protection and water management measures required in Ireland to maintain high or good status of waters. The third cycle of the RBMP: 2022 – 2027, was published by the Department of Housing, Planning and Local Government and Heritage in 2024.

The WFD establishes common principles and an overall framework for action in relation to water protection and developed the overall principles and the structure for protection and sustainable use of water in the European Union. A separate WFD compliance Assessment is included with this application – Appendix 9-1.

The European Communities Environmental Objectives (Surface Waters) Regulations, S.I. No. 272 of 2009 (as amended) give effect to the criteria and standards to be used for classifying surface waters in accordance with the ecological objectives approach of the WFD. In accordance with the regulations, waters classified as 'High' or 'Good' must not be allowed to deteriorate. Waters classified as less than good must be restored to at least good status within a prescribed timeframe. In addition, the regulations address certain shortcomings identified by the European Court of Justice in relation to Ireland's implementation of the Dangerous Substances Directive (76/464/EEC), as amended (repealed by the WFD, 2000/60/EC as amended). The regulations set standards for biological quality elements and physico-chemical conditions, supporting biological elements (e.g., temperature, oxygen balance, pH, salinity, nutrient concentrations and specific pollutants), which must be complied with. These parameters establish the 'ecological status' of a water body.

#### *9.3.1.2 Policy*

The overarching planning policy relevant to the proposed project is described in EIAR Chapter 4.

#### *9.3.1.3 Guidance*

The principal guidance and best practice documents complied with to inform the assessment of likely significant effects on hydrology and hydrogeology are summarised below. The documents represent current best practice in Ireland:

- CIRIA (2001). Control of Water Pollution from Construction Sites – Guidance for Consultants and Contractors, CIRIA C532;
- CIRIA (2016). Groundwater control – design and practice, 2nd Ed, CIRIA C750;

- National Roads Authority (NRA) (2008a). Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- National Roads Authority (NRA) (2008b). Environmental Impact Assessment of National Road Schemes – A Practical Guide;
- Office of Public Works (OPW) (2019). The Flood Risk Management Climate Change Sectoral Adaptation Plan;
- Office of Public Works (OPW) and Department of the Environment, Heritage and Local Government (DoEHLG) (2009). The Planning System and Flood Risk Management Guidelines; and
- The Institute of Geologists Ireland (IGI) (2013). Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements.

In addition to specific hydrology and hydrogeology guidance documents, the following guidelines were considered in the preparation of this chapter:

- Environmental Protection Agency (EPA) (2022). Guidelines on the Information to be Contained in Environmental Impact Assessment Reports;
- European Commission (2017). Environmental Impact Assessment of Projects – Guidance on the preparation of the Environmental Impact Assessment Report; and
- Department of Housing, Planning and Local Government (2018). Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (August 2018).

### 9.3.2 Desk Study

The baseline environment of the proposed project (the proposed wind farm site, GCR and temporary nodes on the TDR) were investigated through comprehensive desk studies, site visits and intrusive site investigation.

For the purposes of this Hydrology and Hydrogeology chapter, the study area, comprising the proposed project is illustrated in Figure 9-1. The study areas have been defined in accordance with best practice guidance and professional judgement to identify potential source-pathway-receptor linkages and likely significant effects associated with the construction, operation and decommissioning phase of the proposed project. The assessment of the potential significant effects of the proposed project on hydrology and hydrogeology is limited to within the study area as defined on Figure 9-1 and Figure 9-2. Hydrological / hydrogeological pathways in the downstream receiving waters are identified as part of the assessment.

A desk study of the study area i.e. the proposed project was undertaken to collate and review background information of the receiving environment during the assessment. The sources of information reviewed are listed below:

- Geological Survey Ireland (GSI) datasets, including hydrological, hydrogeological, and geological mapping[1];
- Environmental Protection Agency (EPA) datasets on hydrological and hydrogeological Water Framework Directive mapping, catchments, monitoring, protected areas and water environment pressures [2];
- Met Éireann Meteorological Databases[3];
- National Parks and Wildlife Service (NPWS) data on designated conservation sites[4];
- GeoHive platform for mapping, topographic, and base imagery data[5];
- Lidar data and other publicly available digital elevation models (DEMs) to support interpretation of topography and geomorphology;[6]
- Office of Public Works Flood Maps;[7]
- Drew, David. (2008). Hydrogeology of lowland karst in Ireland. Quarterly Journal of Engineering Geology and Hydrogeology;
- Planning Application Ref. 22970 – Carrowoughteragh Quarry[8];
- CFRAM Preliminary Flood Risk Assessment (PFRA) maps;[9]
- Department of Environment, Community and Local Government on-line mapping viewer;[10]

### 9.3.3 Field Surveys

As part of the assessment of the proposed project, a series of structured field investigations were undertaken to evaluate site conditions, both at the surface and subsurface level. These field activities were informed by desk study findings and designed to validate desktop assumptions, assess geomorphological features, and characterise underlying ground conditions.

Walkover surveys of the proposed wind farm site, were carried out in order to identify hydrological features e.g., karst features, wetlands, wet ground, areas prone to flooding, drainage patterns and distribution, exposures and drains etc. These surveys were undertaken by the hydrology and hydrogeology team in October 2025, November 2025, February 2026, April 2026 and July 2026. The karst walkover survey involves a systematic inspection of the wind farm site and in particular proposed infrastructure areas to identify evidence of karstification. The survey aimed to identify any features such as sinkholes (dolines), swallow holes, springs, limestone pavement, solution-widened fissures etc.

[1] Geological Survey Ireland (GSI). Available at: https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx [Accessed May 2026]
[2] Environmental Protection Agency (EPA) Maps and Data. Available at: https://gis.epa.ie/EPAMaps/ [Accessed May 2026]
[3] Met Éireann Meteorological Databases. Available at: https://www.met.ie/climate/available-data [Accessed May 2026]
[4] National Parks and Wildlife Service (NPWS) Map Viewer. Available at: https://www.npws.ie/maps-and-data [Accessed May 2026]
[5] GeoHive Public Mapping Platform. Ordnance Survey Ireland. Available at: https://www.geohive.ie/ [Accessed May 2026]
[6] Lidar and Digital Elevation Models from Bluesky, Geological Survey Ireland and Ordnance Survey Ireland via GeoHive. Available at: https://www.geohive.ie/ [Accessed May 2026]
[7] Office of Public Works Flood Maps. Available at: https://www.floodinfo.ie/map/floodmaps/ [Accessed May 2026]
[8] eplanning.ie/MayoCC/searchresults [Accessed September 2026]
[9] CFRAM Preliminary Flood Risk Assessment (PFRA) maps. Available at: https://www.floodinfo.ie [Accessed May 2026]
[10] Department of Environment, Community and Local Government on-line mapping viewer: https://www.myplan.ie/ [Accessed May 2026]

Following the field surveys, the results were reviewed using Geographic Information Software (GIS) in conjunction with publicly available hydrological and hydrogeological data from GSI, EPA and OPW.

A site investigation (SI) was carried out in November 2025 to determine the subsurface conditions at the proposed wind farm site. All works were completed using Irish Drilling Limited (IDL) and logging was conducted by an IDL engineering geologist – See Chapter 8.

The SI report and subsequent data for the proposed project can be located in Appendix 2-5. The SI work undertaken included:

- Nine rotary core boreholes to 10.5 mbgl (metres below ground level);
- Three monitoring well installations;
- Fifteen machine-dug trial pits;
- Completion of fifteen Geophysical Survey lines;
- GPS (Global Positioning System) coordinates survey of all completed SI locations;
- Groundwater monitoring; and
- Geotechnical & Environmental Laboratory testing.

A 50 mm groundwater monitoring standpipe was installed in three boreholes (BH-01, BH05 and BH-07). Borehole samples were collected for analysis, as discussed further in Section 9.4. The primary subsoil type encountered at the proposed wind farm site was a SILT dominant subsoil. No notable karst features (open voids, karst cavities) were recorded at any of the site investigation locations.

Surface water monitoring was completed at three locations, as illustrated in Figure 9-4, in April 2026 and also completed as part of Chapter 6 Biodiversity in May 2023 and in August 2026 . Long term EPA monitoring locations on the Black River and Lough Corrib is included in Section 9.4.1.







## Legend

- Proposed wind farm site boundary
- Wind farm site study area
- Substation 200m Buffer
- GCR 200m Buffer
- Proposed Grid Connection Route
- Turbine Locations
- 110kV Substation

0 500 1,000
Meters

**Spatial Reference**
Datum: IRENET95
EPSG: 2157

**Copyrights:**
Sources: Map data © OpenStreetMap contributors, Microsoft, Esri Community Maps contributors, Map layer by Esri, ©

| Rev | Date | Description | By | Chkd. |
|---|---|---|---|---|
| REV | 02/10/2026 | Draft issue | X.X | X.X |

Client: ROOAUNALAGHTA Green Energy

Project:

Rooaunalaghta Green Energy Project

Title:

Figure 9-1:
Hydrological and Hydrogeological Study Area for the proposed project

Scale @ A3: 1:40,000

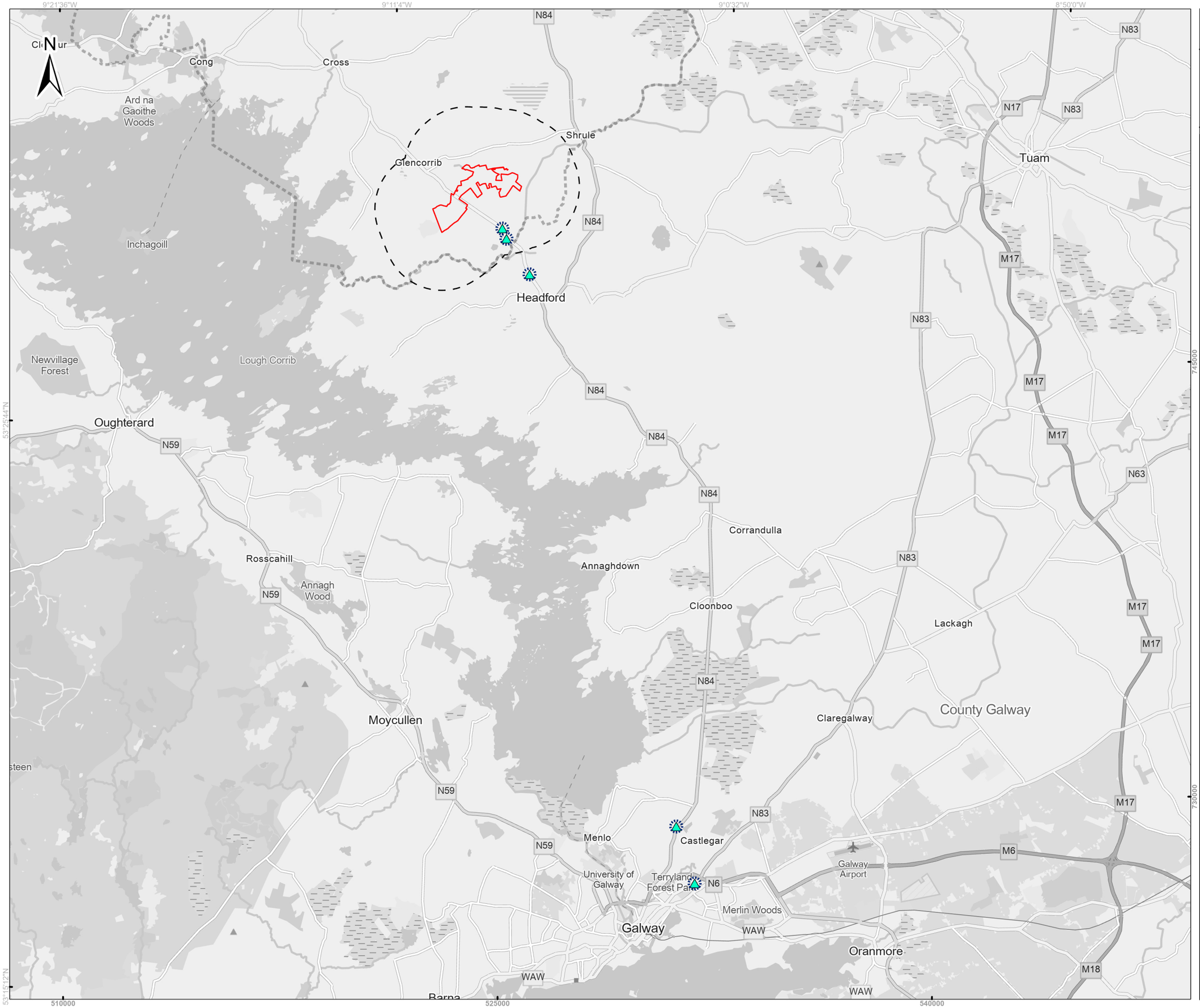
| Prepared by: | Checked by: | Date: |
|---|---|---|
| K.Kale | J.Staunton | October 2026 |

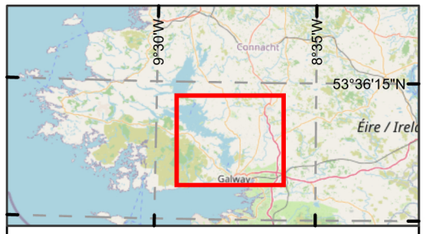
TOBIN
Tel: +353-(0)1-8030406
Email: info@tobin.ie
www.tobin.ie

TOBIN Consulting Engineers will not be liable for any use of this document for any purpose other than that for which it was originally prepared and provided. Except where specifically and explicitly agreed in writing by TOBIN Consulting Engineers,as copyright holder, no part of this document may be reproduced or transmitted in any form and this document shall not bereled upon by any third party for any purpose.

Map Ref: 11981-016-AE-GCR-TOB-A

Draft: A




**Legend**

- Proposed wind farm site Boundary
- Wind farm site study area
- TDR 200m Buffer

0 3 6
Kilometers

**Spatial Reference**
Datum: IRENET95
EPSG: 2157

**Copyrights:**
Sources: Map data © OpenStreetMap contributors, Microsoft, Esri Community Maps contributors, Map layer by Esri, ©

| Rev | Date | Description | By | Chkd. |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| A | 02/10/2026 | First issue | K.K | J.S |

Client:

ROOAUNALAGHTA Green Energy

Project:

Rooaunalaghta Green Energy Project

Title:

Figure 9-2:
Study area for the proposed works areas on the TDR

Scale @ A3: 1:120,000

| Prepared by: | Checked by: | Date: |
|---|---|---|
| K.Kale | J.Staunton | October 2026 |

TOBIN

Tel: +353-(0)1-8030406
Email: info@tobin.ie
www.tobin.ie

TOBIN Consulting Engineers will not be liable for any use of this document for any purpose other than that for which it was originally prepared and provided. Except where specifically and explicitly agreed in writing by TOBIN Consulting Engineers,as copyright holder, no part of this document may be reproduced or transmitted in any form and this document shall not bereled upon by any third party for any purpose.

Map Ref: 11981-017-AE-TDR-TOB-A

Draft: A

## 9.3.4 Methodology

The conventional source-pathway-receptor model for surface water and groundwater attributes is applied to assess potential effects on the hydrological and hydrogeological environment, specifically sensitive receptors downstream of the proposed wind farm site.

In order for a likely significant effect to be realised, three factors or the source-pathway-receptor model must be present. These are:

1. A source of a potential significant effect;
2. An environmental attribute, known as a receptor, which can be affected; and
3. A pathway or connection which allows the source to affect the receptor.

For the purposes of this Hydrology and Hydrogeology chapter, the study area was delineated based on site-specific characteristics and includes WFD derived river subbasins that are hydraulically connected to the proposed project. These river subbasins comprise Black (Shrule_020), Black (Shrule_030), Knocknageeha_010, and Mocorha__010. The extent of the study area is illustrated in Figure 9-1.

The Black River is located c. 180 m southeast of the proposed wind farm site. The Rooaunalaghta Stream (EPA Code: 30R03) forms a hydrological pathway between the proposed wind farm site and the Black River. The Knocknageeha_30 stream is mapped 2.8km to the north of the proposed wind farm site. Based on the site topography flow is towards the Black River.

In this chapter, any likely significant effects on the water environment resulting from the proposed project are evaluated and mitigation measures are proposed, to reduce any significant effects. Based on the mitigation measures proposed, the significance of the residual effects on the water environment is determined.

Throughout the development of the proposed project, measures have been adopted as part of the evolution of the project design and approach to construction, to avoid or otherwise reduce likely significant effects on the environment. These embedded measures are integral to the proposed project. The assessment of likely significant effects assumes all embedded measures are in place. Relevant embedded mitigation for this topic is detailed in Section 9.5.1.

### *9.3.4.1 Sensitivity of Receptor*

The importance or sensitivity rating criteria of the hydrological and hydrogeological attributes within the baseline environment are presented in Table 9-2 and Table 9-3 respectively. These tables are adapted from the National Roads Authority (NRA, 2008a) and presented in Appendix C2 of the IGI Guidance Document (IGI, 2013).

These criteria, in conjunction with the desk study, identified the environment type and the extent of site investigation required to gain a comprehensive understanding of the baseline environment and the conceptual site model. This will also contribute toward identifying likely significant effects and mitigation measures required.

*Table 9-2: Sensitivity of Hydrological Attribute*

| 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.<br>Regionally important potable water source supplying >2500 homes.<br>Quality Class (Biotic Index Q4-5).<br>Flood plain protecting more than 50 residential or commercial properties from flooding.<br>Nationally important amenity site for wide range of leisure activities. |
| High | Attribute has a high quality or value on a local scale. | Salmon fishery<br>Locally important potable water source supplying >1000 homes.<br>Quality Class (Biotic Index Q4).<br>Flood plain protecting between 5 and 50 residential or commercial properties from flooding.<br>Locally important amenity site for wide range of leisure activities |
| Medium | Attribute has a medium quality or value on a local scale. | Coarse fishery.<br>Local potable water source supplying >50 homes<br>Quality Class C (Biotic Index Q3, Q2-3).<br>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.<br>Local potable water source supplying <50 homes.<br>Quality Class D (Biotic Index Q2, Q1).<br>Flood plain protecting 1 residential or commercial property from flooding.<br>Amenity site used by small numbers of local people. |
| Negligible | Attribute has a low quality or value on a local scale. | Quality Class D (Biotic Index Q2, Q1)<br>Amenity site used by small numbers of local people. |

*Table 9-3: Sensitivity of Hydrogeology Attribute*

| 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. |

| Importance | Criteria | Typical Example |
|---|---|---|
| Very High | Attribute has a high quality or value on a regional or national scale. | Regionally Important Aquifer with multiple wellfields.<br>Groundwater supports river, wetland or surface water body ecosystem protected by national legislation - NHA status.<br>Regionally important potable water source supplying >2500 homes.<br>Inner source protection area for regionally important water source. |
| High | Attribute has a high quality or value on a local scale. | Regionally Important Aquifer.<br>Groundwater provides large proportion of baseflow to local rivers.<br>Locally important potable water source supplying >1000 homes.<br>Outer source protection area for regionally important water source.<br>Inner source protection area for locally important water source. |
| Medium | Attribute has a medium quality or value on a local scale. | Locally Important Aquifer.<br>Potable water source supplying >50 homes.<br>Outer source protection area for locally important water source. |
| Low | Attribute has a low quality or value on a local scale. | Poor Bedrock Aquifer (Pl).<br>Potable water source supplying <50 homes. |
| Negligible | Attribute has a low quality or value on a local scale. | Poor Bedrock Aquifer (Pu).<br>Potable water source supplying <10 homes.<br>No groundwater abstractions within 250 m. |

### *9.3.4.2 Magnitude of Impact*

The magnitude of any impact considers the likely scale of the predicted change to the baseline conditions, resulting from the predicted impact and considers the duration of the impact i.e. temporary or permanent. Definitions on the magnitude of an impact on individual hydrological and hydrogeological attributes are presented in Table 9-4 and Table 9-5 respectively. These tables are from the National Roads Authority (NRA, 2008a) and presented in Appendix C2 of the IGI Guidance Document (IGI, 2013).

The sensitivity of the receptor and the magnitude of impact on the receptor will determine the significance level of the likely effect and if mitigation measures are required.

*Table 9-4: Magnitude of Impacts on Hydrological Receptors*

| Importance | Criteria | Typical Example |
|---|---|---|
| Large adverse | Results in loss of attribute and/or quality and integrity of attribute | Loss or extensive change to a waterbody or water dependent habitat. |

| Importance | Criteria | Typical Example |
|---|---|---|
| | | Increase in predicted peak flood level >100 mm.<br>Extensive loss of fishery.<br>Calculated risk of serious pollution incident >2% annually.<br>Extensive reduction in amenity value. |
| Moderate adverse | Results in impact on integrity of attribute or loss of part of attribute | Increase in predicted peak flood level >50 mm.<br>Partial loss of fishery.<br>Calculated risk of serious pollution incident >1% annually.<br>Partial reduction in amenity value. |
| Small adverse | Results in minor impact on integrity of attribute or loss of small part of attribute | Increase in predicted peak flood level >10 mm.<br>Minor loss of fishery.<br>Calculated risk of serious pollution incident >0.5% annually.<br>Slight reduction in amenity value. |
| Negligible | Results in an impact on attribute but of insufficient magnitude to affect either use or integrity | Negligible change in predicted peak flood level.<br>Calculated risk of serious pollution incident <0.5% annually. |
| Minor beneficial | Results in minor improvement of attribute quality | Reduction in predicted peak flood level >10 mm.<br>Calculated reduction in pollution risk of 50% or more where existing risk is <1% annually. |
| Moderate beneficial | Results in moderate improvement of attribute quality | Reduction in predicted peak flood level >50 mm.<br>Calculated reduction in pollution risk of 50% or more where existing risk is >1% annually. |
| Major beneficial | Results in major improvement of attribute quality | Reduction in predicted peak flood level >100 mm. |

*Table 9-5: Magnitude of Impact on Hydrogeological Receptors*

| Importance | Criteria | Typical Example |
|---|---|---|
| Large adverse | Results in loss of attribute and/or quality and integrity of attribute | Removal of large proportion of aquifer.<br>Changes to aquifer or unsaturated zone resulting in extensive change to existing water supply springs and wells, river baseflow or ecosystems.<br>Potential high risk of pollution to groundwater from routine run-off.<br>Calculated risk of serious pollution incident >2% annually. |
| Moderate adverse | Results in impact on integrity of attribute or loss of part of attribute | Removal of moderate proportion of aquifer.<br>Changes to aquifer or unsaturated zone resulting in moderate change to existing water supply springs and wells, river baseflow or ecosystems. |

| Importance | Criteria | Typical Example |
|---|---|---|
| | | Potential medium risk of pollution to groundwater from routine run-off.<br>Calculated risk of serious pollution incident >1% annually. |
| Small adverse | Results in minor impact on integrity of attribute or loss of small part of attribute | Removal of small proportion of aquifer.<br>Changes to aquifer or unsaturated zone resulting in minor change to water supply springs and wells, river baseflow or ecosystems.<br>Potential low risk of pollution to groundwater from routine run-off.<br>Calculated risk of serious pollution incident >0.5% annually. |
| Negligible | Results in an impact on attribute but of insufficient magnitude to affect either use or integrity | Calculated risk of serious pollution incident <0.5% annually. |

#### *9.3.4.3 Significance of Effects*

The significance of an effect from the proposed project has been assessed in accordance with the 2022 EPA Guidelines. The significance is determined by comparing the magnitude of the impact, shown in Table 9-4 and Table 9-5 to the sensitivity of the environmental attribute, as per shown in Table 9-2 and Table 9-3. The significance of effects rating ranges from imperceptible to profound.

## 9.4 RECEIVING ENVIRONMENT

The receiving environment is discussed in terms of hydrological and hydrogeological conditions. The hydrological and hydrogeological features such as rivers, catchments, aquifers and waterbodies within the study area are shown on Figures 9-3 and 9-4.

### 9.4.1 Hydrology (Surface Water)

The purpose of this section is to describe the surface water (hydrological) setting of the study area, including the following:

- Catchment overview;
- Site surface water features and drainage;
- Surface water quality;
- Hydrometric data;
- Surface water abstractions; and
- Flood Risk Assessment (FRA).

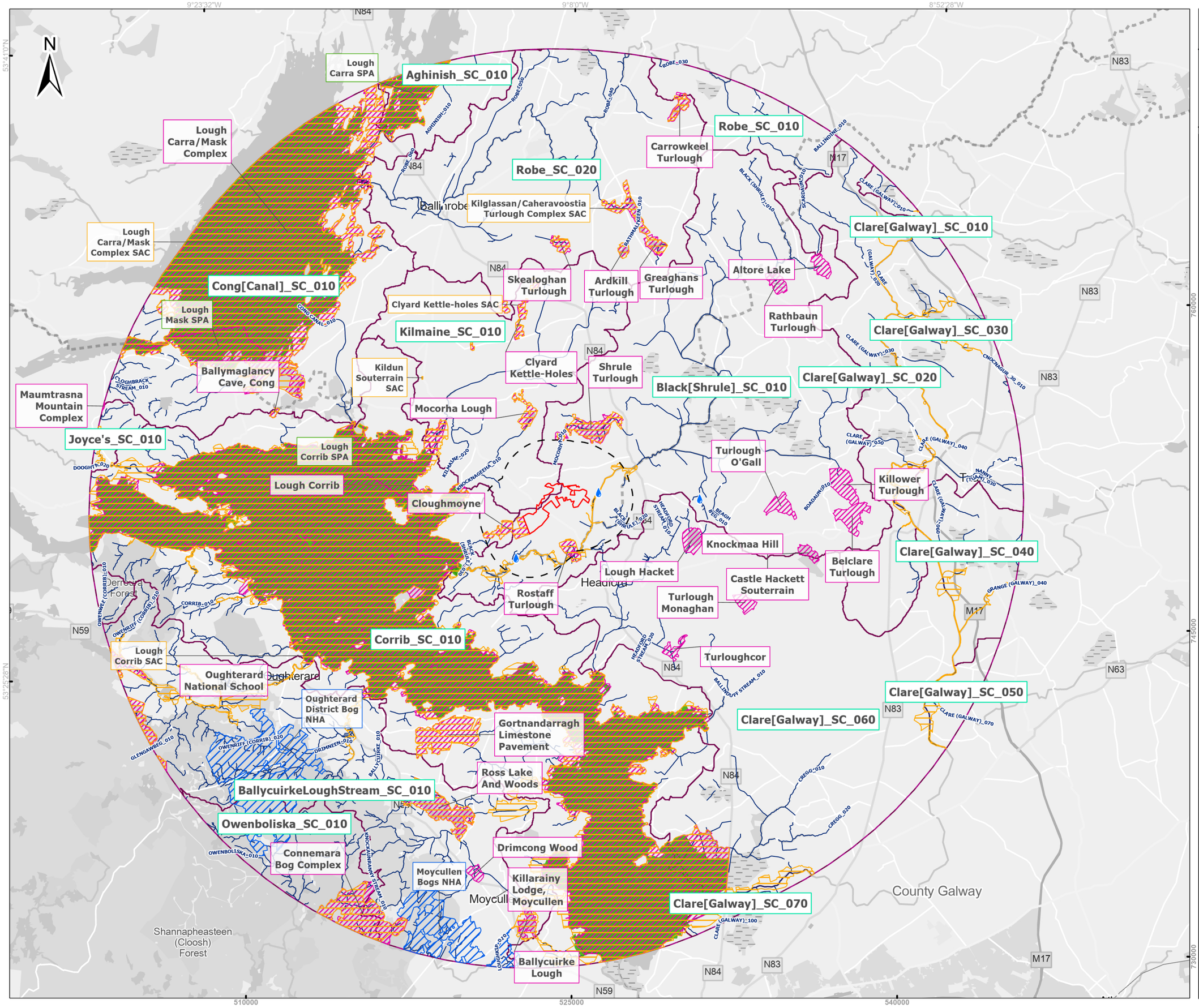
#### *9.4.1.1 Catchment Overview*

A catchment, also referred to as a drainage basin and watershed, is a topographic area that collects and discharges surface streamflow through one outlet or mouth. The catchment boundary is the dividing land where surface drainage flows toward a given stream from land where it drains into a separate stream. Surface water features, subcatchments and designated sites is outlined on Figure 9-3.

For river monitoring and water quality management under the WFD, each lake, stream and river is associated with a watershed area known as a river sub-basin. Clusters of these river sub-basins are grouped together to form sub-catchments, which are further grouped together to form catchments. The hydrological regime of the overall WFD catchment areas does not cross the catchment boundaries.

The proposed wind farm site lies within the Black (Shrule_020), Black (Shrule_030), Knocknageeha_010, and Mocorha_010 river sub basins. The proposed wind farm site lies within the Corrib (30) surface water catchment. The majority of the proposed wind farm site drains towards the Black (Shrule) river and Lough Corrib. The Black (Shrule) River flows along the northeast and southeast of the proposed wind farm site, before entering Lough Corrib, 4 km downstream.

The Corrib_010 watercourse is located approximately 1.4 km to the southwest of turbine T3 and is hydrologically connected to Lough Corrib. Lough Corrib is located approximately 3.1 km to the southwest of the proposed wind farm site.




**Legend**

- Proposed wind farm site boundary
- Wind farm site study area
- 20km Buffer
- WFD - Rivers
- WFD - Subcatchments
- Surface water sampling locations

Designated Sites

- Special Areas of Conservation (SACs)
- Protected Natural Heritage Areas (pNHAs)
- Special Protected Areas (SPAs)
- Natural Heritage Areas (NHAs)

0 3 6
Kilometers

**Spatial Reference**
Datum: IRENET95
EPSG: 2157

**Copyrights:**
Sources: Map data © OpenStreetMap contributors, Microsoft, Esri Community Maps contributors, Map layer by Esri, ©

| Rev | Date | Description | By | Chkd. |
|---|---|---|---|---|
| A | 02/10/2026 | First issue | K.K | J.S |

Client: ROOAUNALAGHTA Green Energy

Project:

Rooaunalaghta Green Energy Project

Title:

Figure 9-3:
Surface waterbodies, designated sites, sub catchments and surface water monitoring locations

Scale @ A3: 1:160,000

| Prepared by: | Checked by: | Date: |
|---|---|---|
| K.Kale | J.Staunton | October 2026 |

TOBIN
Tel: +353-(0)1-8030406
Email: info@tobin.ie
www.tobin.ie

TOBIN Consulting Engineers will not be liable for any use of this document for any purpose other than that for which it was originally prepared and provided. Except where specifically and explicitly agreed in writing by TOBIN Consulting Engineers,as copyright holder, no part of this document may be reproduced or transmitted in any form and this document shall not bereled upon by any third party for any purpose.

Map Ref: 11981-018-D.S-S.BO-TOB-A

Draft: A

9°8'0"W

N

Cross

RS30K010280

RS30K010300

RS30K220930

Glencorrib

Poll Beg Turlough

N84

Lough Lee

RS30L550750

RS30B020120

RS30M330920

Shrule

RS30B020200

RS30B020210

SW2

RS30B020280

SW3

RS30B040300

RS30B020300

SW1

RS30B020400

RS30B020500

RS30B020600

Lough Hacket

Caherlistr

Caherlist GAA

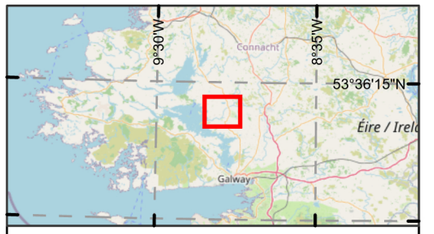
Headford

RS30H010100

RS30H010150

RS30H010160

525000




**Legend**

- Proposed wind farm site boundary
- Wind farm site study area
- GCR 200m Buffer

Infrastructure

- Proposed Grid Connection Route
- 110kV Substation

Water Quality Monitoring Stations (Q Value)

- Q4-5, Q5 - High Status
- Q4 - Good Status
- No Q Values
- Water Sampling Locations

0 1 2
Kilometers

**Spatial Reference**
Datum: IRENET95
EPSG: 2157

**Copyrights:**
Sources: Map data © OpenStreetMap contributors, Microsoft, Esri Community Maps contributors, Map layer by Esri, ©

| Rev | Date | Description | By | Chkd. |
|---|---|---|---|---|
| A | 02/10/2026 | First issue | K.K | J.S |

Client: ROOAUNALAGHTA Green Energy

Project:

Rooaunalaghta Green Energy Project

Title:

Figure 9-4:
Surface Water
Monitoring Locations

Scale @ A3: 1:40,000

| Prepared by: | Checked by: | Date: |
|---|---|---|
| K.Kale | J.Staunton | October 2026 |

TOBIN
Tel: +353-(0)1-8030406
Email: info@tobin.ie
www.tobin.ie

TOBIN Consulting Engineers will not be liable for any use of this document for any purpose other than that for which it was originally prepared and provided. Except where specifically and explicitly agreed in writing by TOBIN Consulting Engineers,as copyright holder, no part of this document may be reproduced or transmitted in any form and this document shall not bereliied upon by any third party for any purpose.

Map Ref: 11981-019-EPA.SWML-GCR-TOB-A

Draft: A

#### *9.4.1.2 Site Surface Water Features and Drainage*

There are mapped drains located in the proposed wind farm site which flow towards the Rooaunalaghta Stream (EPA Code 30R03) and the Black [Shrule] River (EPA Code 30B02). These are generally modified and used to assist in the drainage of agricultural land-use. The Black [Shrule] River flows along the northeast and southeast of the proposed wind farm site. The proposed GCR is illustrated in Figure 9-2.

The proposed GCR crosses two EPA mapped watercourses, namely the Black River (Black (Shrule_020) and the Shancloon stream (Black (Shrule) _010) and two drains. Two streams are mapped by the EPA (Raheen_030 and Killamanagh) near the substation however there is no stream present at these locations. The Shancloon stream is historically straightened, U-shaped channel with poor hydromorphology. The stream is approximately 1 to 1.5 m wide with banks around 1.5 m high at the location of the proposed instream works to cross the steam and upgrade the culvert. Due to the small catchment area and contributing flow the stream was semi-dry during the August 2026 survey, with only isolated pools of standing water and no flow present.

Hydrometric data includes measurements of surface water (hydrology) and groundwater (hydrogeology) levels and flows. The historical channelisation of the Black River altered the natural drainage and it is surface water, rather than groundwater, that is now the controlling factor in present day flooding – See Appendix 9-2. The Black River and many of the tributaries were additional drained under the Corrib-Headford arterial drainage scheme and the Shrule Drainage District. The Black River is a trapezoidal straightened channel to the south west of the site. Aquatic reports on the Black River are included in Chapter 6 Biodiversity.

Discharge, defined as the volumetric flow rate through a given cross-sectional area, is a key hydrometric parameter. In Ireland, such data are collected under the EPA's Hydrometric Programme, which maintains over 1,000 active stations nationwide.

A review of the EPA HydroNet website showed that nearby hydrometric gauge stations include the Shrule water level station (station no. 30030), the Ower Bridge water level station (station no. 30002) and the Lough Lee water level station (station no. 30071). The Shrule water level station is located approximately 2.7 km northeast of Turbine T13 and is for spot flow measurements only; no continuous water level or flow records are available. Similarly, the Lough Lee water level station is located on the Lough Lee waterbody approximately 3.5 km to the northeast of turbine T13 and is for spot flow measurements only; no continuous water level or flow records are available. The Ower Bridge water level station located approximately 1.4 km southeast of the T3 turbine and monitors water levels and flows continuously. Details of these hydrometric stations are presented in Table 9-6 below.

The EPA has produced a model of the naturalised flow estimates for Irish rivers[11]. Dots along the length of the mapped river channel are referred to as nodes and provide a range of modelled flow rates in the river. This data may be used in conjunction with the Hydro Catchments data to give an area catchment for each node which is contributing toward flow in the river waterbody.

There are no nodes located within the proposed wind farm site and hence the primary indication of flow in the stream and river waterbodies is the data available from the hydrometric stations.

[11] https://gis.epa.ie/EPAMaps/Water [Accessed September 2026].

*Table 9-6: Hydrometric station details*

| Station Name | Waterbody | Station No. | Station Status | Data Available |
|---|---|---|---|---|
| Shrule | Black (Shrule) | 30030 | Inactive | Spot flow measurements only – no continuous water level or flow records available. |
| Lough Lee | Lough Lee | 30071 | Inactive | Spot flow measurements only – no continuous water level or flow records available. |
| Ower Bridge | Black (Shrule) | 30002 | Active | Water Level and Flow Data available[12] |

#### *9.4.1.3 Surface Water Quality*

The EPA assesses the water quality of rivers, streams and lakes using a biological assessment, testing the chemical and physical parameters of the waterbody as well as assessing the hydromorphology of the waterbody i.e. the physical setting and habitat conditions of the waterbody. The biological assessment is carried out every three years and assigns a biological river quality (biotic index) rating from Q5-Q1 to watercourse sections. Q5 denotes a watercourse with high water quality WFD status and high community diversity within unpolluted water and of satisfactory condition, whereas Q1 denotes bad water quality WFD status and very low community diversity within seriously polluted water and of an unsatisfactory condition.

The chemical and physical characteristics of a waterbody are measured several times a year. The chemical parameters include specific nutrient and harmful chemical concentrations; and the physical parameters include temperature, pH (acidity), water flow and water level.

The results of these assessments and testing are collated to give a water quality classification for the waterbody which will be 'bad', 'poor', 'moderate', good' or 'high'. The aim of the WFD is for all waterbodies to achieve and maintain at least a 'good' classification by 2027. The EPA also assesses the risk of each waterbody failing to meet this WFD objectives and will classify the waterbody as 'at risk' or 'not at risk'.

There is both chemical and physical data available for the Black (Shrule)_030 Black (Shrule)_020, Black (Shrule)_010, and the Corrib_010 river waterbody (EPA, 2024b). The Black (Shrule)_010 waterbody is the only waterbody within the study area with 'Poor' overall ecological status with strong performance for most physical, chemical and supporting ecological indicators in the SW 2019-2024 monitoring period, with only biological status or potential, fish status or potential valued at poor status and dissolved oxygen indicating failed status. Table 9-7 lists the WFD waterbodies within the proposed wind farm study area, and GCR study areas and their corresponding water quality status (EPA, 2024a). One out of six river water bodies within Black River subcatchment is at risk (Black [Shrule]_020) due to less than Good biological status (driven

[12] Office of Public Works

by invertebrates). Significant pressures identified within this water body were a combination of channelisation, agriculture (notable a farmyard and cattle access) and septic tanks. The Knocknageeha _010 is at Moderate status.

*Table 9-7: WFD river waterbodies and corresponding water quality status*

| WFD Subbasin | WFD Code | Location | Water Quality Status | Water Quality Risk |
|---|---|---|---|---|
| Black (Shrule)_030 | IE_WE_30B020600 | Proposed Wind Farm Study Area | Good | Not at Risk |
| Black (Shrule)_020 | IE_WE_30B020300 | Proposed Wind Farm Study Area | Good | At Risk |
| Black (Shrule)_010 | IE_WE_30B020200 | Proposed Wind Farm Study Area & GCR Study Area | Poor | At Risk |
| Corrib_010 | IE_WE_30C020300 | Proposed Wind Farm Study Area | Good | Not at Risk |
| Knocknageeha _010 | IE_WE_30K220930 | Proposed Wind Farm Study Area | Moderate | Review |
| Mocorha_010 | IE_WE_30 m330920 | Proposed Wind Farm Study Area | Good | Not at Risk |
| Headford Stream_010 | IE_WE_30H010200 | Proposed GCR Study Area | Moderate | Review |

EPA monitoring is undertaken on the Black River at Shrule upstream of and at Moyne Bridge (on the R334) downstream of the proposed wind farm and GCR[13]. Based on the EPA monitoring data, total Ammonia (as N), Total oxidisable Nitrogen and Ortho-Phosphate (as P) indicate at least good quality. Average concentration for Total Ammonia (as N) is less than 0.035 mg/l since 2012 both upstream and downstream. Similarly Ortho-Phosphate (as P) is less than 0.02 mg/l since 2013 both upstream and downgradient.

*Table 9-8 Moyne Bridge - Annual average Orthophosphate concentrations*

| Year | Value mg/l P |
|---|---|
| 2007 | 0.027 |
| 2008 | 0.038 |
| 2009 | 0.03 |
| 2010 | 0.037 |
| 2011 | 0.041 |
| 2012 | 0.022 |
| 2013 | 0.012 |
| 2014 | 0.008 |

[13] https://www.catchments.ie/data/#/subcatchment/30/30_11?_k=lvtydm

| Year | Value mg/l P |
|---|---|
| 2015 | 0.013 |
| 2016 | 0.015 |
| 2017 | 0.011 |
| 2018 | 0.014 |
| 2019 | 0.014 |
| 2020 | 0.014 |
| 2021 | 0.013 |
| 2022 | 0.012 |
| 2023 | 0.017 |

Surface water sampling was carried out on watercourses which are hydrologically connected to the proposed wind farm site in April 2026. This involved testing samples from three different surface water sampling points. The locations of the sampling points are shown in Figure 9-4.

Following the collection of the samples on site, they were sent to Complete Laboratory Solutions (CLS) for testing against a suite of parameters. The results of the analysis are summarised in Table 9-9.

*Table 9-9: Surface Water Sampling Results (April 2026)*

| Parameter | Units | Surface Water Regs 2007 (as amended) | SW-1 | SW-2 | SW-3 |
|---|---|---|---|---|---|
| | | | 23/04/2026 | 23/04/2026 | 23/04/2026 |
| **pH** | **pH** | 6.0< pH < 9.0 | 7.6 | 7.6 | 7.0 |
| **Electrical Conductivity** | **µS/cm** | NA | 543 | 548 | 625 |
| **Suspended Solids @105°C** | **mg/l** | NA | 5.0 | 6.0 | 5.0 |
| **Ammonium as NH4** | **mg/l** | Good status ≤ 0.065 (mean) ≤ 0.140 (95%ile) | 0.033 | 0.029 | 0.043 |
| **Nitrate** | **mg/l** | NA[14] | 3.55 | 3.27 | 4.05 |
| **Phosphate as $PO_4$** | **mg/l** | Good status ≤ 0.065 (mean) and ≤ 0.140 (95%ile) | <0.03 | <0.03 | <0.03 |
| **Mineral Oil in Water (By calculation)** | **µg/l** | NA | 30 | 23 | 52 |

Overall, both the long-term EPA dataset and the site-specific monitoring results (Table 9-9) demonstrate that surface waters hydrologically connected to the proposed wind farm are currently of good chemical quality, in particularly low ammonium and phosphorus concentrations. Ammonium concentrations recorded during the April 2026 survey (0.029-0.043 mg/l $NH_4$) are comparable to the ammonia concentrations historically recorded by the EPA, while ortho-phosphate concentrations remained below the laboratory detection limit at all sampling locations. Nitrate concentrations of 3.27-4.05 mg/l are within the range typically

[14] Nitrate MAC of 50mg/l (Drinking Water regulations)

observed in rural agricultural catchments and do not indicate any elevated nutrient loading. Mineral oil concentrations ranged from 23 to 52 µg/l across the three sampling locations. These concentrations are considered low and are not indicative of significant hydrocarbon contamination within the catchment but do reflect the presence of anthropogenic influences in the river catchments.

#### *9.4.1.4 Surface Water Abstractions*

The EPA Map Viewer (accessed in April 2026) provides information on the locations of surface water protection areas. These are in the form of:

- Drinking Water – Rivers;
- Drinking Water – Lakes;
- Geological Survey Ireland (GSI) Public Supply Source Protection Areas; and
- National Federation of Group Water Schemes (NFGWS) Group Scheme Source Protection Areas.

The proposed wind farm site and GCR study area, does not fall within any surface water protection areas and there are no known surface water abstractions within the study area. Surface water abstractions occur on Lough Corrib >3km from the proposed wind farm. In terms of the private supplies there are no streams on the proposed wind farm site. All of the study area is served by public mains or group water schemes as detailed in section 9.4.2.

#### *9.4.1.5 Flood Risk Assessment*

The Office of Public Works (OPW) provides information on flood risk throughout Ireland. This includes historical events as well as modelled flood extents for:

- Low probability events i.e., 1-in-1000 chance of occurring or being exceeded in any given year, also known as an Annual Exceedance Probability (AEP) of 0.1%;
- Medium probability events i.e., 1-in-a-100 chance of occurring or being exceeded in any given year, or an AEP of 1%; and
- High probability events i.e., 1-in-a-10 chance of occurring or being exceeded in any given year, or an AEP of 10%.

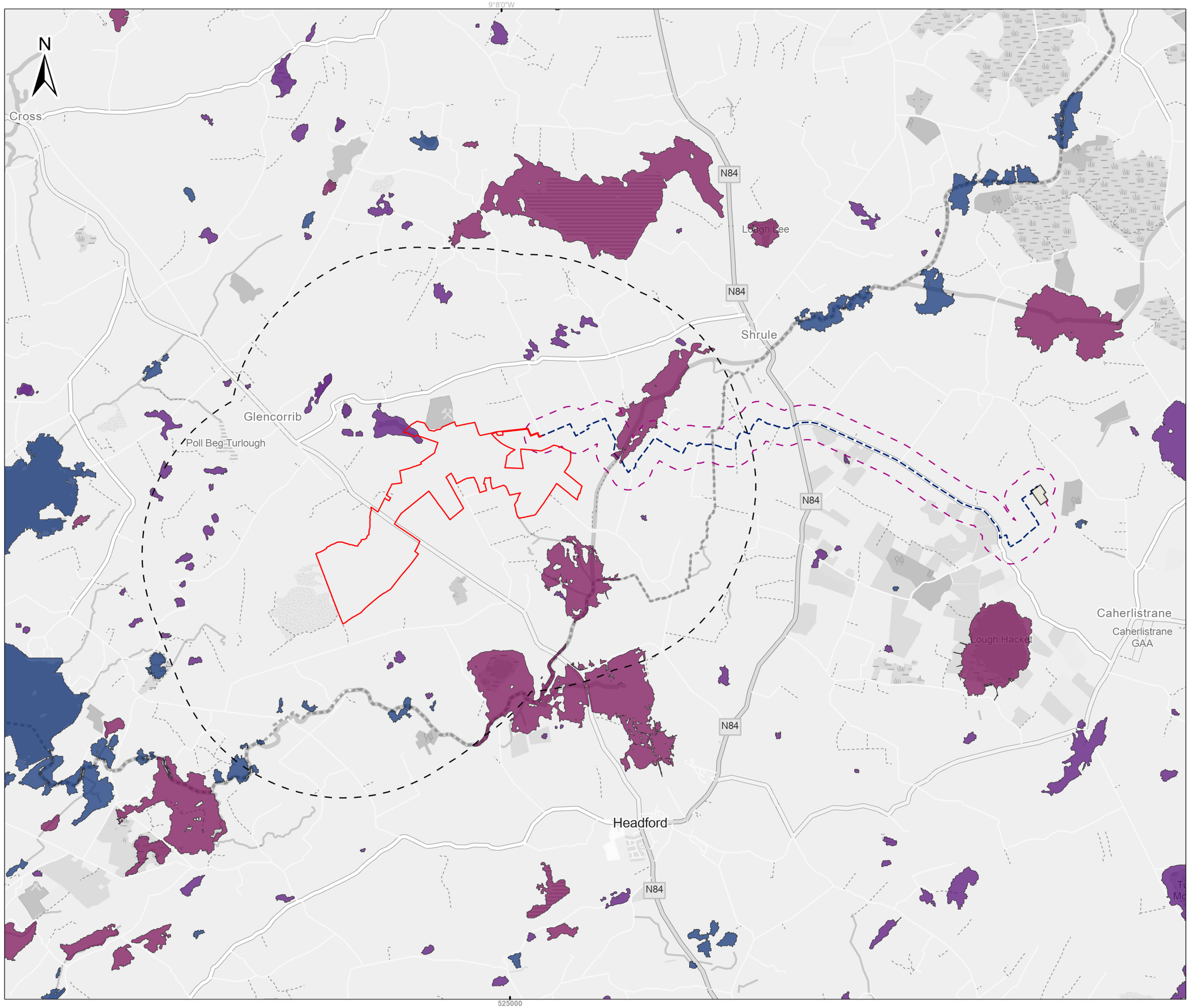
The OPW also produce 'Flood Maps' (surface water) for the purposes of establishing a framework for the assessment and management of flood risks. These aim to reduce the adverse consequences for human health, the environment, cultural heritage and economic activity associated with floods.

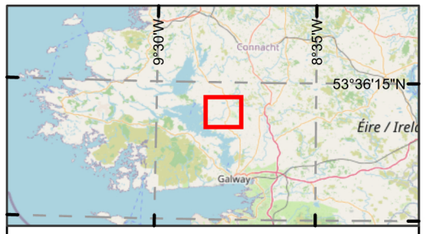
GSI has also developed Groundwater Flood Maps as part of the 2016-2019 Groundwater Flood Project. These maps aid in understanding the deficit of groundwater flood data in Ireland and help to assist stakeholders making informed decisions regarding groundwater risk.

A Stage 2 Flood Risk Assessment (FRA) is included as Appendix 9-2 to this EIAR. This FRA concluded that no area within the proposed wind farm site is likely to be liable to flooding. GSI maps indicate the potential (Medium Confidence) for surface water flooding to the south of the proposed wind farm site, along the Black (Shrule)_030, as illustrated in Figure 9-5. GSI mapping further indicates an area along the proposed GCR, approximately 600 m to the northeast of

turbine T12, which has the potential for groundwater/surface water flooding. A small portion of the northwest boundary site (300 m north of turbine T6) intersects an area mapped by GSI as having groundwater flood potential.

The Stage 2 FRA recommended no further assessment of flooding. The assessment took account of climate change by incorporating 20% allowances for increased rainfall intensity and runoff, consistent with OPW climate change guidance. Based on the results of this flood risk assessment and project design i.e. drainage sized for climate change, no increase in downstream flood risk, infrastructure outside flood zone, the risk of flooding to the proposed wind farm site is minimal, and the proposed project will not increase the flood risk elsewhere.




**Legend**

- Proposed wind farm site boundary
- Wind farm site study area
- GCR 200m Buffer

Infrastructure

- Proposed Grid Connection Route
- 110kV Substation

Surface Water Flood Areas

- Winter 2015/2016 Surface Water Flooding

Historic Groundwater Flood

- Groundwater
- Groundwater/Surface water

0 1 2
Kilometers

**Spatial Reference**
Datum: IRENET95
EPSG: 2157

**Copyrights:**
Sources: Map data © OpenStreetMap contributors, Microsoft, Esri Community Maps contributors, Map layer by Esri, ©

| Rev | Date | Description | By | Chkd. |
|---|---|---|---|---|
| A | 02/10/2026 | First issue | K.K | J.S |

Client: ROOAUNALAGHTA Green Energy

Project:
Rooaunalaghta Green Energy Project

Title:
Figure 9-5:
Site Flood Assessment Map for the Proposed Windfarm site and the proposed GCR

Scale @ A3: 1:40,000

| Prepared by: | Checked by: | Date: |
|---|---|---|
| K.Kale | J.Staunton | October 2026 |

TOBIN
Tel: +353-(0)1-8030406
Email: info@tobin.ie
www.tobin.ie

TOBIN Consulting Engineers will not be liable for any use of this document for any purpose other than that for which it was originally prepared and provided. Except where specifically and explicitly agreed in writing by TOBIN Consulting Engineers,as copyright holder, no part of this document may be reproduced or transmitted in any form and this document shall not bereled upon by any third party for any purpose.

Map Ref: 11981-020-FLO-S.BO-TOB-A

Draft: A

## 9.4.2 Groundwater

The purpose of this section is to describe the groundwater (hydrogeological) setting of the proposed project. It is provided to give context to the groundwater characteristics and flow patterns within and adjacent to the proposed project. Groundwater is water that has infiltrated into the ground to fill the pore spaces within sediment deposits and the pore space and fractures within the bedrock. An aquifer is an underground body of water bearing rock or unconsolidated materials (gravel or sand) that can yield a usable quantity of water.

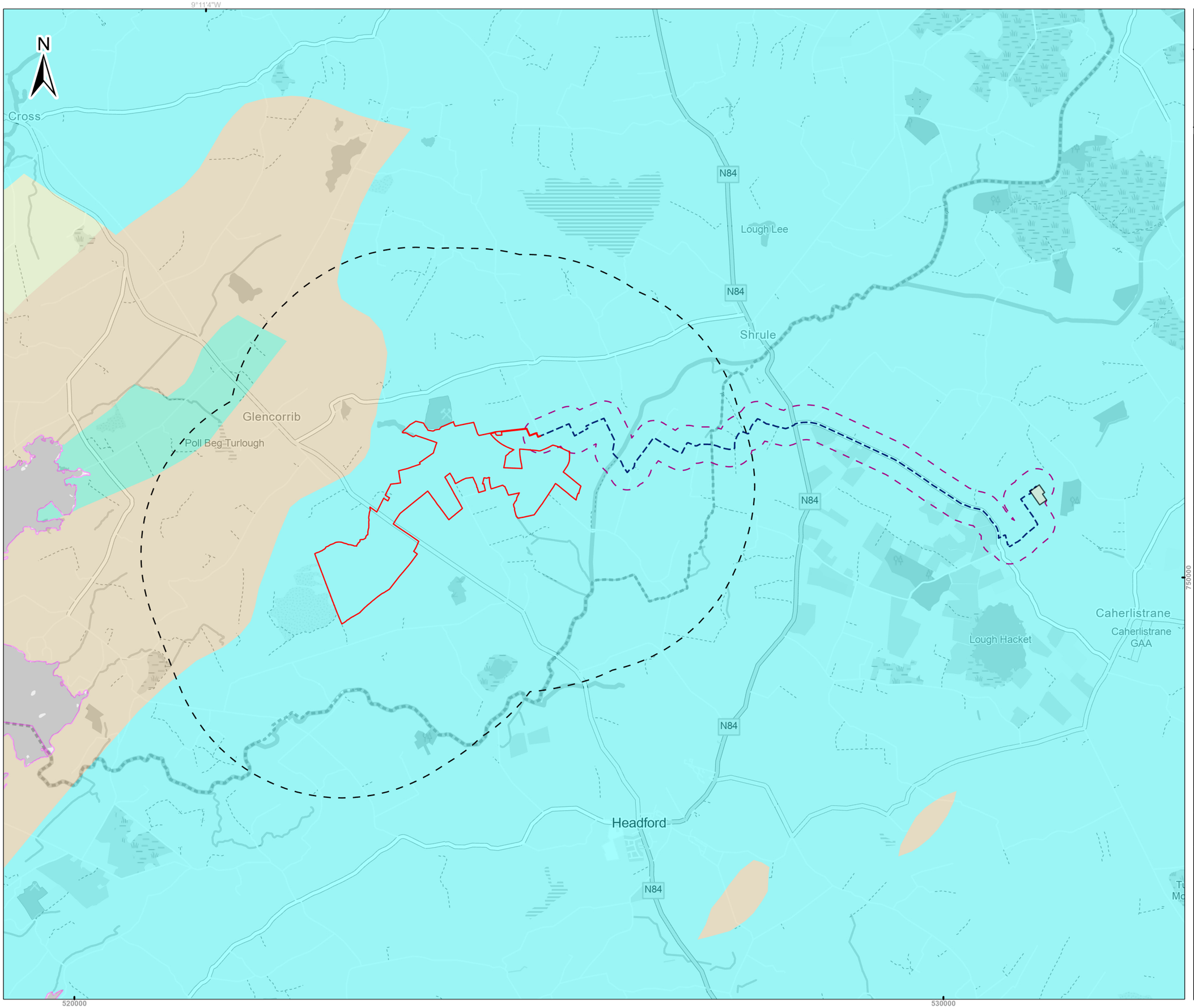
### *9.4.2.1 Aquifer Potential and Characteristics*

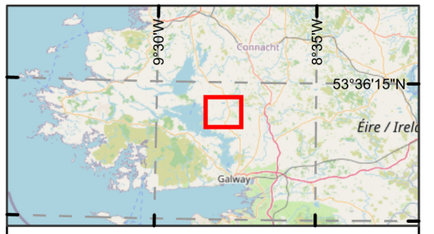
#### Proposed wind farm site

The aquifer potential of a bedrock unit is determined by the groundwater productivity, which in turn is determined based on hydraulic characteristics compiled from borehole data throughout the country.

The proposed wind farm site is underlain by Pure Bedded Limestone of the Oakport Limestone Formation, Illaunagappul Formation and the Oldchapel Limestone Formation, all of which are classified as Regionally Important Aquifers – Karstified (conduit) (Rkc), as illustrated in Figure 9-6. To enable and assist the aquifer classification, bedrock formations and members were grouped into one of 27 rock unit groups which have similar properties and geological age. The bedrock underneath the study area is part of the Dinantian Pure Bedded Limestone rock unit group.

There are no sand and gravel aquifers mapped within the study area, as illustrated in Figure 9-6. One bedrock fault is mapped within the study area, approximately 1.2 km to the north turbine T13.




**Legend**

- Proposed wind farm site boundary
- Wind farm site study area
- GCR 200m Buffer

Infrastructure

- 110kV Substation
- Proposed Grid Connection Route

Bedrock Aquifer

- Rkc - Regionally Important Aquifer - Karstified (conduit)
- Rkd - Regionally Important Aquifer - Karstified (diffuse)
- RK - Regionally Important Aquifer - Karstified
- Rf - Regionally Important Aquifer - Fissured bedrock
- Lm - Locally Important Aquifer - Bedrock which is Generally Moderately Productive
- Lk - Locally Important Aquifer - Karstified
- Ll - Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
- Pl - Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones
- Pu - Poor Aquifer - Bedrock which is Generally Unproductive
- Lake

0 1 2
Kilometers

**Spatial Reference**
Datum: IRENET95
EPSG: 2157

**Copyrights:**
Sources: Map data © OpenStreetMap contributors, Microsoft, Esri Community Maps contributors, Map layer by Esri, ©

| Rev | Date | Description | By | Chkd. |
|---|---|---|---|---|
| A | 02/10/2026 | First issue | K.K | J.S |

Client: ROOAUNALAGHTA Green Energy

Project:

Rooaunalaghta Green Energy Project

Title:

Figure 9-6:
Bedrock Aquifers mapped at the Proposed Windfarm site and GCR

| Scale @ A3: | 1:40,000 | |
|---|---|---|
| Prepared by: | Checked by: | Date: |
| K.Kale | J.Staunton | October 2026 |

TOBIN
Tel: +353-(0)1-8030406
Email: info@tobin.ie
www.tobin.ie

TOBIN Consulting Engineers will not be liable for any use of this document for any purpose other than that for which it was originally prepared and provided. Except where specifically and explicitly agreed in writing by TOBIN Consulting Engineers,as copyright holder, no part of this document may be reproduced or transmitted in any form and this document shall not bereled upon by any third party for any purpose.

Map Ref: 11981-021-Aq.B-S.BO-TOB-A

Draft: A

Groundwater bodies (GWB) are the groundwater management units under the WFD. GWB are subdivisions of large geographical areas of aquifers so that they can be effectively managed in order to protect the groundwater and linked surface waters.

The majority of the study area and all of the proposed wind farm site is underlain by the Clare-Corrib GWB, as illustrated in Figure 9-7. Towards the northwest and west, the study area is underlain by the Cong-Robe GWB and to the north lies the GWDTE – Shule Turlough (SAC000525) (GSI, 2026). A number of possible turloughs are identified in the surrounding area. Ballisnahyny Lake East, Ballisnahyny Lake West and Poolbeg lakes are located to the 0.4 to 1km north west and Rostaff Lake pNHA is located 1.5 km to the south of the proposed wind farm site. The Ballisnahyny Lake East is mapped in a location of deep poorly drained soils. Site information indicates the present of deep deposits of glacial tills and lacustrine sediments, locations in a localised depression. No springs or seepages were noted to the east of the lake. Rostaff lake is a permanent lake and does not dry out. Rostaff lake is therefore not a true turlough. The importance of Rostaff Turlough is primarily ornithological with nationally important numbers of Greenland white-fronted geese and shoveler (See Chapter 6). Ballisnahyny A and B to the west of the R334 were not classified as turloughs based on the O'Neill, F.H. & Martin, J.R. (2015)[15].

Part of Ballisnahyny Lake east is located within the wind farm site boundary with the nearest Turbine T6 located 400 m to the south. The species assemblage was not diverse within the waterbody it did include species such as creeping bent grass (*Agrostis stolonifera*), carnation sedge (*Carex panicea*), pondweed (*Potamogeton* sp.) and common spike-rush (*Eleocharis palustris*).

To the north of the proposed wind farm site is Carrowoughteragh quarry, operated by P&D Lydon. A proposed temporary access track will connect to the Carrowoughteragh quarry during the construction stage of the proposed project. Water levels in the quarry are <25mOD and blasting is regularly carried out there as part of the stone extraction method.

The GSI Clare-Corrib and Cong-Robe GWB descriptions indicate that groundwater flows through fissures, faults, joints and bedding planes. In pure bedded limestones these openings are enlarged by karstification which significantly enhances the permeability of the rock. Karstification can be accentuated along structural features such as fold axes and faults. Flow pathways are often determined by discrete conduits. Overall groundwater flow will be towards the rivers and lakes, but the highly karstified nature of the bedrock means that locally, groundwater flow directions can be highly variable. Most of the groundwater flow occurs in the upper epikarstic layer and in a zone of interconnected solutionally enlarged bedding planes and fissures, generally extending to a depth of 30 to 50 m below ground level (bgl). Transmissivity and well yields are variable. Storage in the GWB is generally low (GSI, 2004). Within the site poorly connected groundwater areas results in locally high groundwater levels however the regional groundwater level is between 20 – 30 mOD.

[15] O'Neill, F.H. & Martin, J.R. (2015). Summary of findings from the Survey of Potential Turloughs 2015. Unpublished Report for National Parks & Wildlife Service. Volume I: Main Report.

Overall, groundwater flow direction within the Clare-Corrib GWB is generally to the southwest, with all groundwater flowing towards and discharging to Lough Corrib (GSI, 2004). Both point recharge and diffuse recharge occurs in this GWB. Diffuse recharge occurs over the GWB via rainfall percolating through the permeable subsoil. In areas of deep peat and low permeability glacial till, recharge to the underlying aquifer is limited to point recharge such as swallow holes, collapse features/dolines, and losing streams (GSI, 2004). A losing stream or drain is located 100 m south of T10. The stream is dry during the summer period however based on site observations contains water during the winter or during flood events. The drainage channel is a permanent channel 0.38 km to the south at ITM 525087,750697. Water from this drain flows to the Rooaunalaghta Stream a further 0.7km to the south east.

### Groundwater levels

Groundwater levels were identified during the site investigation works within 3 no. groundwater monitoring wells, with groundwater levels ranging from 3.2 m to 6.2 m below ground level (bgl), consistent with a hydraulic gradient directed towards Rooaunalaghta Stream and Black River to the south of the wind farm site. Water levels to the north of the site at Carrowoughteragh quarry are <25mOD (c.15 mbgl). The losing stream to the south of T10 is at 21-22 mOD with permanent water levels at the permanent stream at 17.5 to 17.8 mOD.

Standpipes (50 mm uPVC) were installed in selected boreholes at the infrastructure sites, to allow for monitoring of groundwater levels (manual and dataloggers) and taking of water samples. Dataloggers were installed in groundwater monitoring wells on-site to allow for continuous water level measurement since November 2025. Groundwater levels in BH07 varied between 3.3 and 4.3 m bgl during the winter period (Nov 2025 to March 2026) and between 4.3 to 4.6 m bgl during the summer period. Groundwater levels in BH01 varied between 5 and 5.3 m bgl during the winter period (Nov 2025 to March 2026) and between 5.3 to 5.6 m bgl during the summer period. This low level of seasonal variation in the water table may indicate a low permeability in the local area, and therefore a low level of karstification.

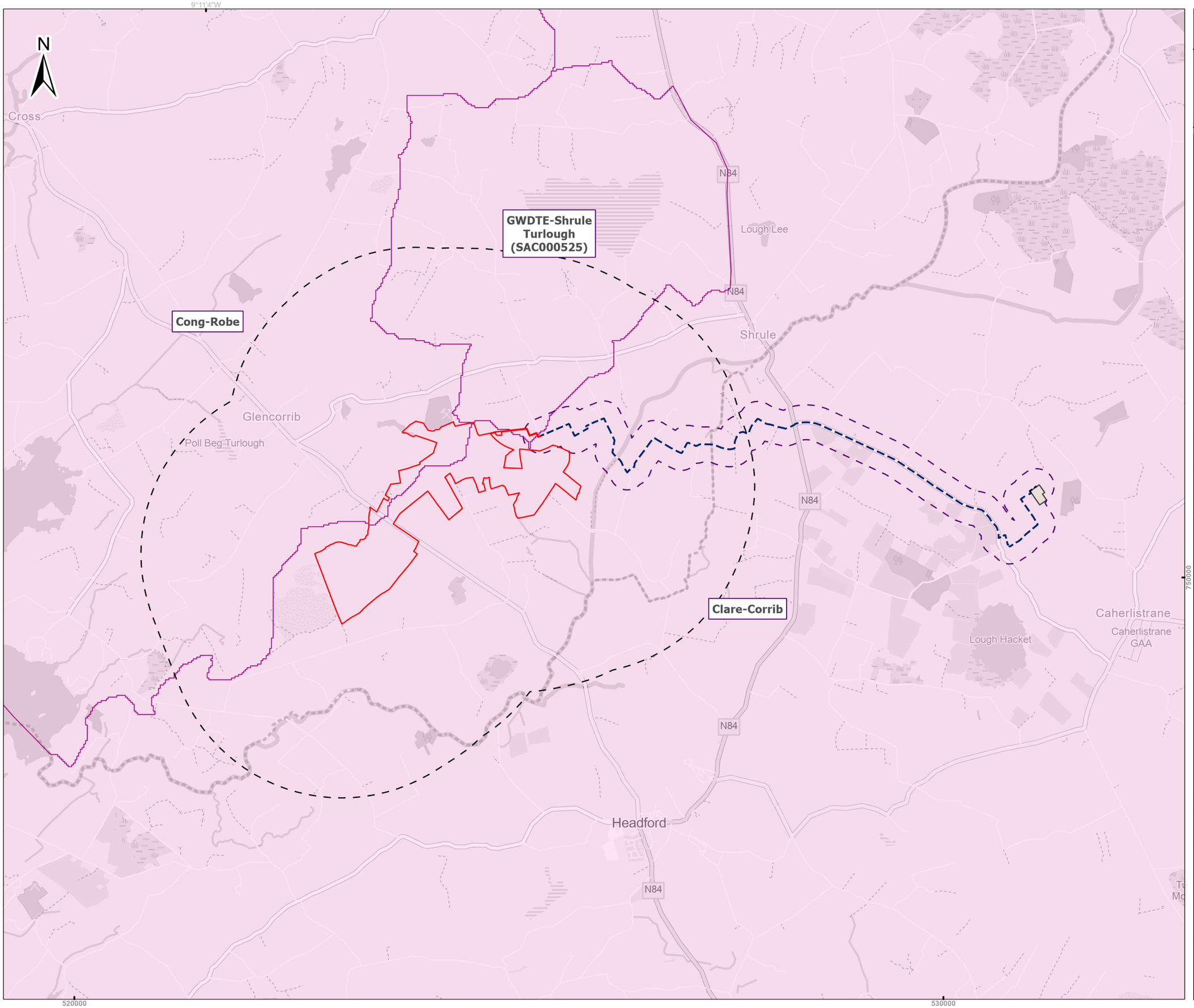
Groundwater levels are provided in Appendix 2-5. Groundwater levels in the disused onsite borehole is 6.7mbgl in July 2026.

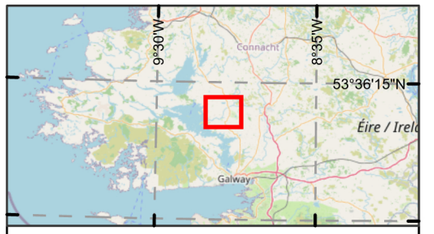
| Borehole | Ground Level (mOD) | Water Level (m bgl) | Water Level (mOD) | Principal Lithology |
|---|---|---|---|---|
| **BH-1** | 33.89 | 4.69 | 29.2 | Topsoil and gravelly silt over limestone gravel/cobbles, underlain by very strong grey slightly bioclastic fine to coarse grained limestone. |
| **BH-3** | 29.04 | 5 | 25.04 | Topsoil and limestone gravel over weathered limestone, underlain by very strong grey bioclastic fine to coarse grained limestone. |
| **BH-7** | 43.91 | 3.06 | 40.85 | Topsoil and silty overburden over weathered limestone, underlain by very strong grey slightly bioclastic fine to coarse grained limestone with calcite veins. |

Some perched water levels occur on site in area such as at a former pit near the site entrance. While the area exposes rock at 50 mOD. As the site is located in a localised topographical low, surface water periodically collects in this area.

### Proposed GCR and nodes on the TDR

The proposed GCR lies entirely within the Clare-Corrib GWB as previously described. The proposed TDR work areas fall within the Clare-Corrib GWB, GWDTE-Lough Corrib Fens 3 & 4 (SAC000297), Waste Facility (W0013-01) and the Clarinbridge GWB. All are described as regionally important aquifer – Karstified (conduit) (Rkc).




**Legend**

- Proposed wind farm site boundary
- Wind farm site boundary
- GCR 200m Buffer
- WFD - Groundwater bodies

Infrastructure

- 110kV Substation
- Proposed Grid Connection Route

0 1 2
Kilometers

**Spatial Reference**
Datum: IRENET95
EPSG: 2157

**Copyrights:**
Sources: Map data © OpenStreetMap contributors, Microsoft, Esri Community Maps contributors, Map layer by Esri, ©

| Rev | Date | Description | By | Chkd. |
|---|---|---|---|---|
| A | 02/10/2026 | First issue | K.K | J.S |

Client: ROOAUNALAGHTA Green Energy

Project:
Rooaunalaghta Green Energy Project

Title:
Figure 9-7:
Groundwater bodies mapped at the proposed wind farm site and proposed GCR

Scale @ A3: 1:40,000

| Prepared by: | Checked by: | Date: |
|---|---|---|
| K.Kale | J.Staunton | October 2026 |

TOBIN
Tel: +353-(0)1-8030406
Email: info@tobin.ie
www.tobin.ie

TOBIN Consulting Engineers will not be liable for any use of this document for any purpose other than that for which it was originally prepared and provided. Except where specifically and explicitly agreed in writing by TOBIN Consulting Engineers,as copyright holder, no part of this document may be reproduced or transmitted in any form and this document shall not bereled upon by any third party for any purpose.

Map Ref: 11981-022-WFD-S.BO-TOB-A

Draft: A

9°9'48"W

53°36'15"N

53°29'52"N

525000

N

Q2
T7
T8
T13
BH5
T6
T9
T12
T10
T5
BH7
Q1
T11
MW1
S1
R334
BH2
T4
T2
T1
T3
Kilroe




## Legend

- Proposed wind farm site boundary
- Turbine Locations
- Boreholes

0 250 500
Meters

**Spatial Reference**
Datum: IRENET95
EPSG: 2157

**Copyrights:**
Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community,

| Rev | Date | Description | By | Chkd. |
|---|---|---|---|---|
| A | 02/10/2026 | First issue | S.P | J.S |

Client: ROOAUNALAGHTA Green Energy

Project:

Rooaunalaghta Green Energy Project

Title:

Figure 9-8:
Groundwater level - Monitoring locations

Scale @ A3: 1:10,000

| Prepared by: | Checked by: | Date: |
|---|---|---|
| S.Pezzetta | J.Staunton | October 2026 |

TOBIN
Tel: +353-(0)1-8030406
Email: info@tobin.ie
www.tobin.ie

TOBIN Consulting Engineers will not be liable for any use of this document for any purpose other than that for which it was originally prepared and provided. Except where specifically and explicitly agreed in writing by TOBIN Consulting Engineers,as copyright holder, no part of this document may be reproduced or transmitted in any form and this document shall not bereled upon by any third party for any purpose.

Map Ref: 11981-038-GW..SW-Lvls-TOB-A

Draft: A

#### 9.4.2.2 Karst Features

The karst assessment has reviewed relevant GSI data and supplemented by aerial photography, LiDAR-derived terrain analysis, detailed site walkovers, geophysical investigations, borehole and trial pit records, groundwater monitoring data and the conceptual hydrogeological model developed for the site. Karst assessment is included in Appendix 8-1. This approach was adopted as not all karst features are expressed at the ground surface. Overall, while local karstification is anticipated within the limestone bedrock, no significant karst features, swallow holes, open conduits, caves or point-recharge features were identified within the proposed infrastructure footprints.

No karst features such as turloughs, springs, swallow holes, enclosed depressions, caves etc, are mapped by GSI within the proposed wind farm site (GSI, 2026). According to the GSI karst database[16] ,the nearest mapped karst feature (sinking stream) to the proposed project is located approximately 325 m southeast of T12. While the feature is mapped as a swallow hole on the GSI viewer the note refers to a losing section of the Black River. The Black River was still in flow during the 2026 drought period and no swallow hole was evident. Four unmapped karst features (dolines) were mapped using aerial photography, LiDAR data and site walkovers in the study area. These karst features are dolines (enclosed depressions), with two identified c.80 m southeast and c120 m north west of T1 hardstand area, one 700 m south of T3 and another approximately 200 m to the west of the offsite substation.

A number of permanent lakes/ turloughs are identified in the study area. Ballisnahyny Lake East, Ballisnahyny Lake West and Poolbeg lakes are located to the north west and Rostaff Lake pNHA is located to the south of the site. Rostaff lake appears to be a permanent lake and is not known to dry out and therefore not a true turlough. Part of Ballisnahyny Lake east is located within the wind farm site boundary with the nearest turbine T6 located 400 m to the south.

No potential enclosed depressions are located within the proposed footprint of any of the turbine bases or hardstand areas. The potential enclosed depressions/dolines present within the proposed wind farm site are typically very shallow, nearly flat depressions and are present within glacial deposits. The base of the depressions are underlain by several metres of glacial till.

There is no evidence of a swallow hole/sink hole or any channelling/funnelling of surface water runoff to ground at the doline. The larger of the depressions were actually noted to hold surface water during wet periods and therefore they appear to not have a significant surface water drainage function at the site. A losing stream/drain is located 100 m to the southwest of T10. This stream extends to the Rooaunalaghta stream however is only a permanent stream from SW1. A karst risk assessment is completed as part of this assessment and included in Appendix 8-1 and the CEMP (Appendix 2-2).

#### 9.4.2.3 Groundwater Vulnerability

Groundwater vulnerability represents the intrinsic geological and hydrogeological characteristics that determine how easily groundwater may be contaminated by activities at the surface. Vulnerability depends on the quantity of contaminants that can reach the groundwater and the time taken by water to infiltrate to the water table. These factors are controlled by the type of subsoils that overlie the groundwater, the way in which the contaminants reach the

[16] https://gsi.geodata.gov.ie/portal/apps/webappviewer/

geological deposits (whether point or diffuse) and the unsaturated thickness of geological deposits from the point of contaminant discharge.

The Groundwater Vulnerability Map is based on the type and thicknesses of subsoils (sands, gravels, glacial tills (or boulder clays), peat, lake and alluvial silts and clays) and the presence of karst features. Groundwater that readily and quickly receives water and contaminants from the land surface is more vulnerable than groundwater that receives water and contaminants more slowly and consequently in lower quantities. Groundwater vulnerability is classified as follows:

- Rock at or near surface or karst (X);
- Extreme (E);
- High (H);
- Moderate (M); and
- Low (L).

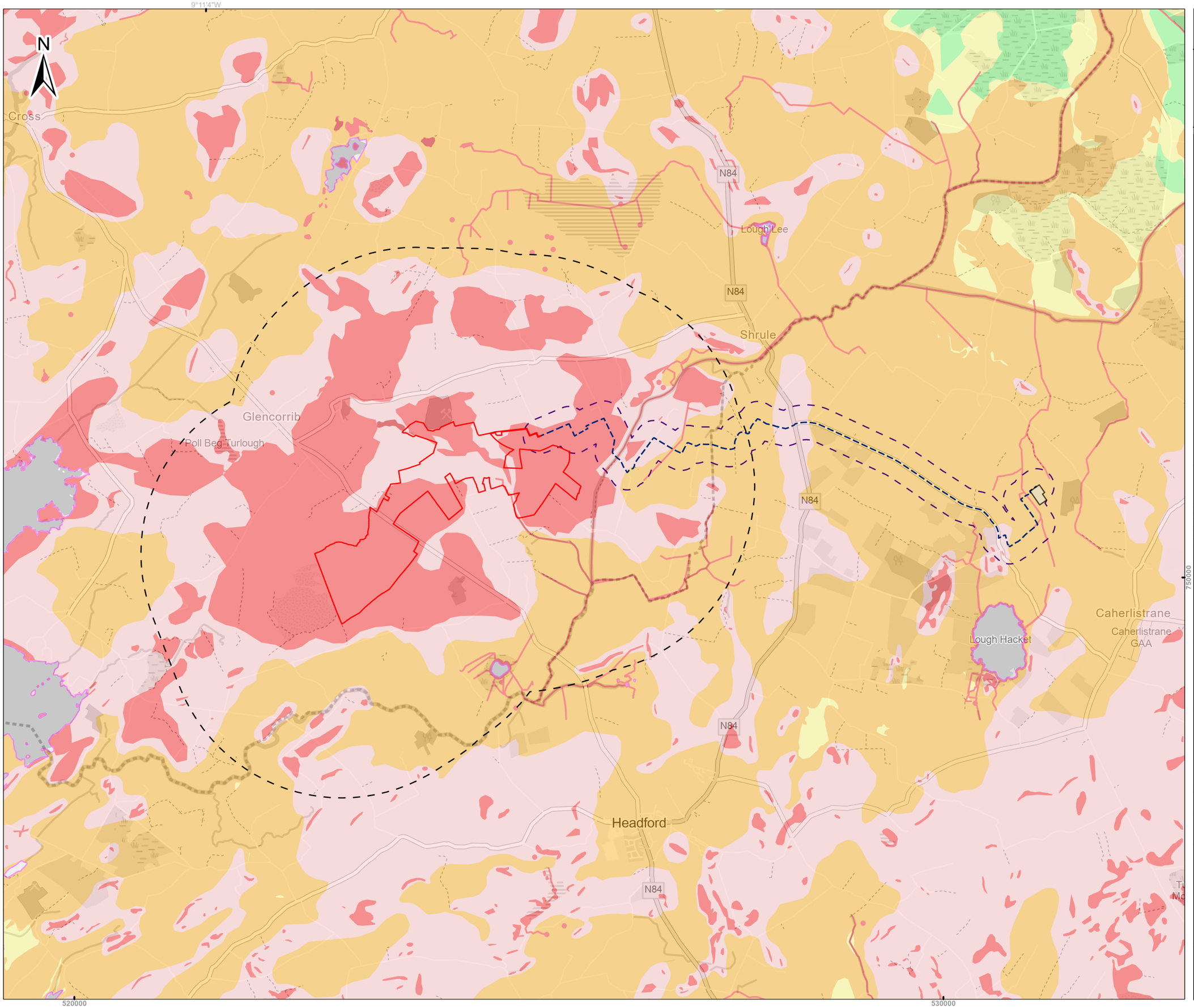
A detailed description of the vulnerability categories can be found in the Groundwater Protection Schemes document (DELG/EPA/GSI, 1997) and in the draft GSI Guidelines for Assessment and Mapping of Groundwater Vulnerability to Contamination (GSI, 2003).

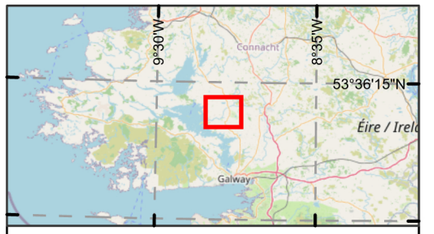
Groundwater is most at risk where the subsoils are absent or thin and in areas of karstic limestone. Consequently, any contamination of surface water would be rapidly transported into the groundwater system, and vice versa due to the close interaction between surface water and groundwater in karstified aquifers.

Areas surrounding karst features such as turloughs, swallow holes and sinking streams are classified as extremely vulnerable to groundwater pollution. Groundwater is classed as extremely (X) vulnerable within 30 m of certain karst features.

The groundwater vulnerability throughout the proposed wind farm site is generally classified as Rock at or near surface or karst (X) and extreme (E) groundwater vulnerability. The extreme vulnerability classifications are predominantly due to the presence of thinner soils, overlying the bedrock. Depth to Bedrock is detailed in Chapter 8. Trial pits encountered refusal during excavation interpreted as rock or possible rock at depths between 0.6 m and 2.9 m bgl, further confirming the presence of shallow bedrock conditions. Intact rockhead /strong bedrock ranges from 1.1 m to 4.9 m bgl (BH03) based on the borehole data. Evidence of bedrock exposures occur on the proposed wind farm site including a former quarry 20 m to the north of the reservoir.

The groundwater vulnerability throughout the GCR is generally moderate (M) to extreme (E) with a portion of section of the route of the proposed GCR nearest to the proposed wind farm site, located over an area mapped as being rock at or near surface (X) groundwater vulnerability (Figure 9-9).




**Legend**

- Proposed wind farm site boundary
- Wind farm site study area
- GCR 200m Buffer

Infrastructure

- 110kV Substation
- Proposed Grid Connection Route

Groundwater Vulnerability

- Rock at or near Surface or Karst
- Extreme
- High
- Moderate
- Low
- Water

0 1 2
Kilometers

**Spatial Reference**
Datum: IRENET95
EPSG: 2157

**Copyrights:**
Sources: Map data © OpenStreetMap contributors, Microsoft, Esri Community Maps contributors, Map layer by Esri, ©

| Rev | Date | Description | By | Chkd. |
|---|---|---|---|---|
| A | 02/10/2026 | First issue | K.K | J.S |

Client: ROOAUNALAGHTA Green Energy

Project:

Rooaunalaghta Green Energy Project

Title:

Figure 9-9:
Groundwater Vulnerability mapped at the proposed wind farm site and proposed GCR

Scale @ A3: 1:40,000

| Prepared by: | Checked by: | Date: |
|---|---|---|
| K.Kale | J.Staunton | October 2026 |

TOBIN
Tel: +353-(0)1-8030406
Email: info@tobin.ie
www.tobin.ie

TOBIN Consulting Engineers will not be liable for any use of this document for any purpose other than that for which it was originally prepared and provided. Except where specifically and explicitly agreed in writing by TOBIN Consulting Engineers,as copyright holder, no part of this document may be reproduced or transmitted in any form and this document shall not bereled upon by any third party for any purpose.

Map Ref: 11981-023-GRD.V-S.BO-TOB-A

Draft: A

#### *9.4.2.4 Groundwater Recharge*

Groundwater recharge is a measure of the amount of effective rainfall (i.e. rainfall minus evapotranspiration), that falls on an area and can infiltrate to ground to replenish groundwater. Figure 9-10 illustrates the groundwater recharge ratings at the proposed wind farm site and GCR.

Groundwater recharge has been calculated by GSI nationally by multiplying the effective rainfall by a set of recharge coefficients which are displayed on the GSI's groundwater recharge map of Ireland and are based upon hydrogeological settings. Broadly, these hydrogeological settings are governed by subsoil permeability and thickness, the presence of saturated soils, and the ability of the underlying aquifer to accept percolating waters. In areas where the majority of effective rainfall runs off the land surface, surface water is dominant, and equally where the majority of the effective rainfall is recharging the aquifers, groundwater is dominant.

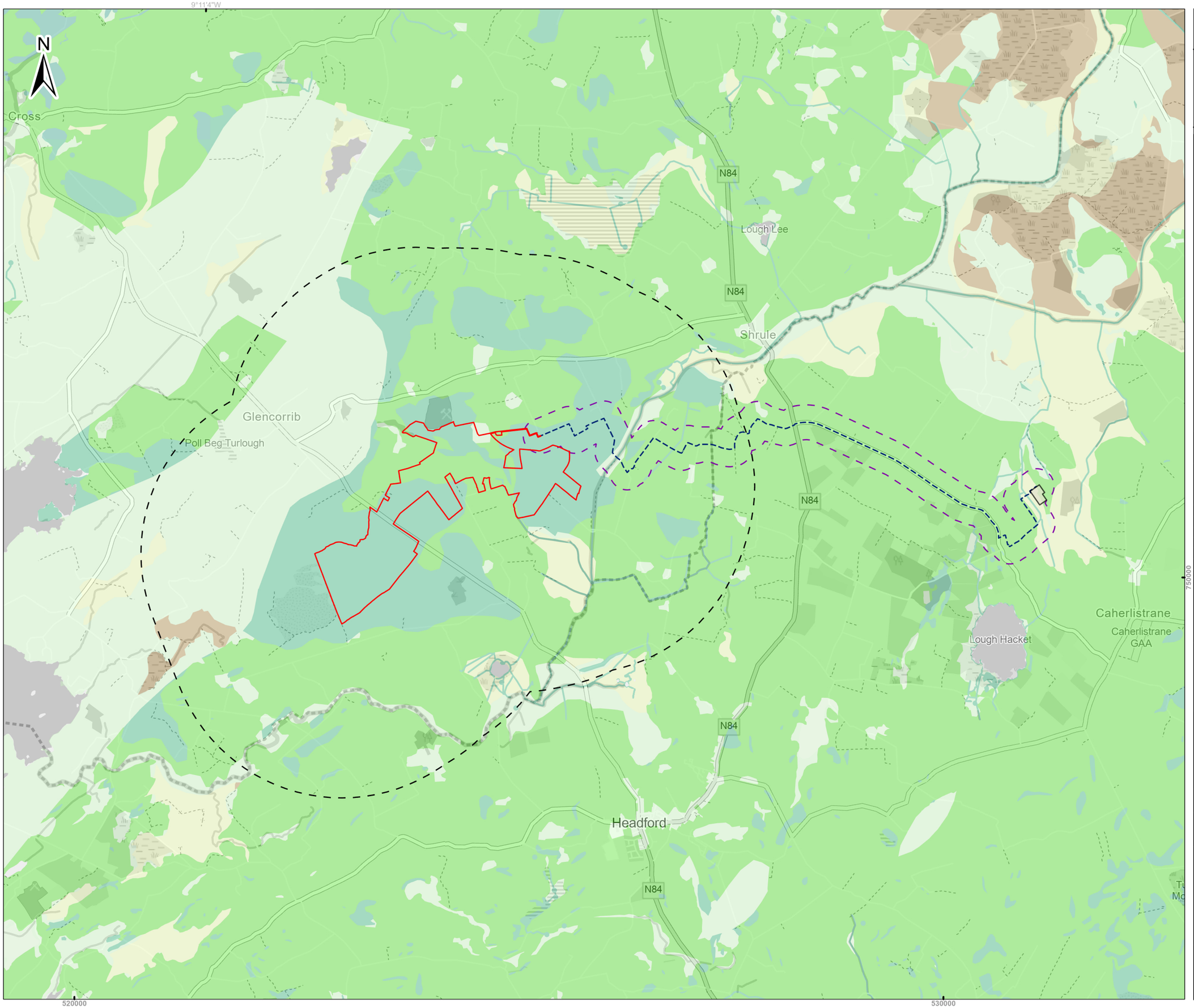
Surface water runoff or overland flow is the flow of water occurring on the ground surface when excess rainwater, stormwater, meltwater, or other sources, can no longer sufficiently infiltrate the soil. HR Wallingford developed a number of UK Sustainable Drainage System tools including the Greenfield Runoff Rate Estimation Tool which was used to provide a calculation of runoff for the proposed wind farm site[17] and included in Appendix 2-6. When assessing runoff characteristics of the proposed wind farm site, it can be best described as an area with high infiltration, gentle slopes and moderate rainfall.

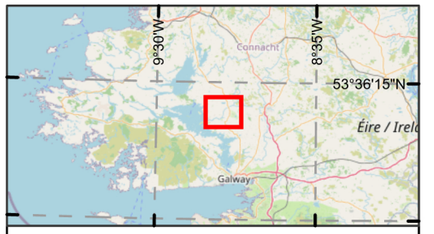
The Headford rainfall monitoring station actively operated by Met Éireann collects daily rainfall levels and is located approximately 5 km to the southeast of the proposed wind farm site. Data from this station indicates that there is an average annual rainfall of approximately 1,229 mm/year.

### Proposed wind farm site and GCR

Both point and diffuse recharge occurs in both the Shrule and Clare-Corrib GWBs. Diffuse recharge occurs over the GWB's via rainfall percolating through the permeable subsoil. Point recharge occurs via many small sinks that are present in the low permeability till areas where the subsoil is breached. Recharge also occurs along 'losing' sections of streams. Karst features such as swallow holes and enclosed depressions generally also provide the means for point recharge. Recharge in the catchment is classified by GSI and is predominantly 600-800 mm/year in bedrock outcrop and subcrop. Effective rainfall for the study area is approximately 751.3 mm/year to 798.7 mm/year (GSI, 2026).

[17] www.uksuds.com [Accessed September 2026].




**Legend**

- Proposed wind farm site boundary
- Wind farm site study area
- GCR 200m Buffer

Infrastructure

- 110kV Substation
- Proposed Grid Connection Route

Groundwater Recharge

- >2000 mm
- 1401-2000 mm
- 1001-1400 mm
- 901-1000 mm
- 801-900 mm
- 701-800 mm
- 601-700 mm
- 551-600 mm
- 501-550 mm
- 451-500 mm
- 401-450 mm
- 351-400 mm
- 301-350 mm
- 251-300 mm
- 201-250 mm
- 151-200 mm
- 101-150 mm
- 51-100 mm
- 1-50 mm
- 0 mm

0 1 2
Kilometers

**Spatial Reference**
Datum: IRENET95
EPSG: 2157

**Copyrights:**
Sources: Map data © OpenStreetMap contributors, Microsoft, Esri Community Maps contributors, Map layer by Esri, ©

| Rev | Date | Description | By | Chkd. |
|---|---|---|---|---|
| A | 02/10/2026 | First issue | K.K | J.S |

Client: ROOAUNALAGHTA Green Energy

Project:

Rooaunalaghta Green Energy Project

Title:

Figure 9-10:
Groundwater Recharge mapped at the proposed wind farm site and proposed GCR

| Scale @ A3: | 1:40,000 | |
|---|---|---|
| Prepared by: | Checked by: | Date: |
| K.Kale | J.Staunton | October 2026 |

TOBIN
Tel: +353-(0)1-8030406
Email: info@tobin.ie
www.tobin.ie

TOBIN Consulting Engineers will not be liable for any use of this document for any purpose other than that for which it was originally prepared and provided. Except where specifically and explicitly agreed in writing by TOBIN Consulting Engineers,as copyright holder, no part of this document may be reproduced or transmitted in any form and this document shall not bereled upon by any third party for any purpose.

Map Ref: 11981-024-GRD.R-S.BO-TOB-A

Draft: A

#### *9.4.2.5 Groundwater Abstractions, Groundwater Source Protection Zones and Group Water Schemes*

### Proposed wind farm site and GCR

As reported by the EPA and GSI, groundwater sources, particularly public, group scheme and industrial supplies, are of critical importance in many regions. Consequently, the objective of a Source Protection Zone (SPZ) is to provide protection by placing tighter controls on activities within all or part of the source protection area of the supply. Groundwater Source Protection Zones (SPZs) and Zones of Contribution (ZOCs) are delineated areas which have been proven to contribute groundwater to a borehole or spring.

The proposed wind farm site is not within a Zone of Contribution or Source Protection Zone for any mapped public or private water supplies, and there are no group water schemes mapped close to the area. The nearest mapped group water scheme is the Cluide-Cahermorris group water scheme (IE_GSI_ZOC_193) located 5.1 km to the southeast of the proposed off-site substation.

GSI maintains a wells and springs database which shows the approximate location of dug wells, springs and boreholes across Ireland. The database is not exhaustive and was created by collating data collected by GSI or submitted to GSI from local authorities and other state bodies, private well grants, drillers, consultants, group water schemes and academia. The location of individual dug wells, springs and boreholes is presented as circles ranging in diameter, with smaller diameters indicating greater location certainty and larger diameters indicating greater location uncertainty. Based on the mapped GWS and PWS network, and planning applications, water mains is present on all local roads and supply >90% of dwellings in the surrounding area. The Glencorrib Reservoir is located 0.2 km to the north of the site entrance from the R334 and is at an elevation area above the proposed project infrastructure. Bedrock exposures to the west of the reservoir confirm the presence of very strong, dark grey limestones at this location. One abstraction borehole was identified on the wind farm site however this is no longer in use according to the landowner.

The database shows there are no other boreholes within the proposed wind farm site and GCR.

#### *9.4.2.6 Groundwater Quality and Risk*

### Proposed wind farm site

The hydrochemistry of the Dinantian Pure Bedded Limestones rock unit group is typically characterised as having a calcium-bicarbonate hydrochemical signature, with groundwater described as hard to very hard and generally having a high alkalinity and conductivity. The groundwater conductivities are generally of the order 300 to >450 µS/cm, but lower values suggest short groundwater residence times.

The WFD groundwater quality status classifications are based on an assessment of the point and diffuse sources in the area that may affect groundwater quality. The study area is located within the respective GWBs. According to the WFD water quality status 2019 – 2024 for the Clare-Corrib, Cong-Robe and GWDTE-Shrule Turlough (SAC000525) GWBs are all classified as being of 'Good' quality.

The WFD also classifies each GWB in terms of its risk of failing to meet the WFD objectives by 2027. The risk of not meeting WFD objectives was determined by assessment of monitoring data, data on the pressures and data on the measures that have been implemented. Waterbodies that are 'At Risk' are prioritised for implementation of measures. This assessment was completed in 2020 by the EPA Catchments Unit in conjunction with other public bodies and was primarily based on monitoring data up the end of 2018. The Clare-Corrib and GWDTE-Shrule Turlough (SAC000525) GWBs are classified as 'Not at risk'. The Cong-Robe GWB is classified as 'At risk'.

### 9.4.3 Conceptual Site Model

The Conceptual Site Model (CSM) pertaining to hydrology and hydrogeology, for the proposed wind farm site, where the majority of construction works will occur, is outlined below. Construction represents the highest-risk phase due to earthworks, dewatering, and heavy machinery. The model has been informed by geological, hydrogeological and hydrological evidence gathered through the desk-based assessment (aerial images, LiDAR datasets, karst database, mapped water features, etc.), hydrological analysis, and intrusive ground investigations (i.e. boreholes, trial pits, geotechnical surveys, groundwater data from standpipes, nearby quarries, available online databases, site walkover, etc.). Groundwater monitoring carried out has provided data on the temporal variation in the water table, and this has also been considered in preparing this CSM. The model is intended to identify plausible migration pathways, relevant to the construction, operational and decommissioning phases of the project.

Diagram 9-1 below presents the overall conceptual source-pathway-receptor model for the proposed wind farm. The diagram illustrates the relationship between potential construction sources, including earthworks, excavations, fuel storage, concrete works and the potential surface water and groundwater pathways, and the sensitive receptors identified within the assessment including local streams, the Black (Shrule) River, and downstream receptors. This diagram provides the framework for the assessment of effects presented in Section 9.5. Diagram 9-2 illustrates a conceptual section through the northern part of the site extending from the offsite quarry area towards the Rooaunalaghta Stream. Diagram 9-3 presents an alternative conceptual section west-east through the same catchment. Diagram 9-5 presents a conceptual section extending from T2 through the central wind farm lands towards the Black River.

The purpose of the CSM is to present a visual understanding of the proposed wind farm site and the source-pathway-receptor model between the site and any activities with potential to generate pollution or sediment . The proposed wind farm site is predominantly underlain by the Oakport Limestone Formation. The northeast of the proposed wind farm site is underlain by the Illaunagappul and Old chapel Limestone Formation, all of which are classified as Regionally Important Aquifers – Karstified (conduit) (Rkc).

The proposed wind farm site lies within the Mocorha_010, Black (Shrule)_030, Black (Shrule)_020, Knocknageeha_010 river sub-basins, and the Corrib (Hydrometric area 30) surface water catchment. The proposed wind farm site is underlain by the Clare-Corrib and the





Cong-Robe GWBs, with a small portion to the north mapped within the GWDTE-Shrule Turlough (SAC000525) GWB.

Although no watercourses intercept the proposed wind farm site boundary, it lies within the Black [Shrule]_SC_010 sub-catchment and is therefore anticipated to be hydrologically connected to the Black (Shrule) waterbody via subsurface/ diffuse drainage pathways.

There are several GSI mapped karst features within the study area, however none are mapped within the proposed wind farm footprint. The nearest feature is a doline located 80 m to south of T1. Due to the thickness of permeable subsoils and presence of karst features, the proposed wind farm site is anticipated to be hydraulically connected to the groundwater.

There are no known surface water or groundwater abstractions of concern located on the proposed wind farm site.

A flood risk assessment determined there is no risk of fluvial and groundwater flooding in the proposed wind farm site.

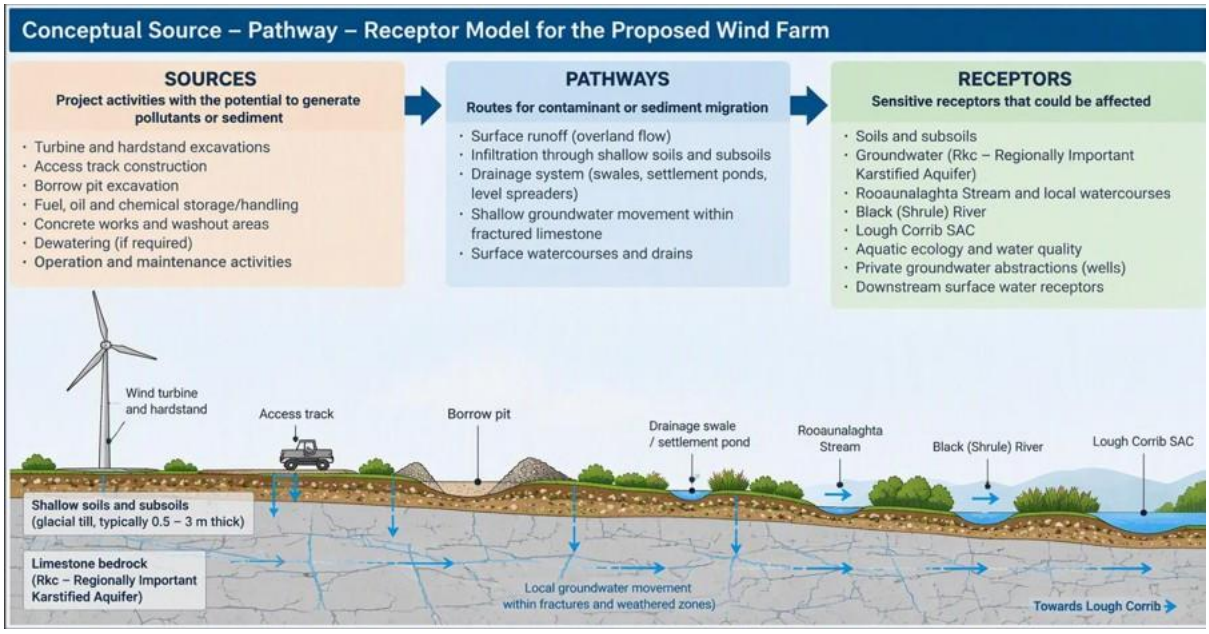



*Diagram 9-1 Conceptual Source Pathway Receptor*

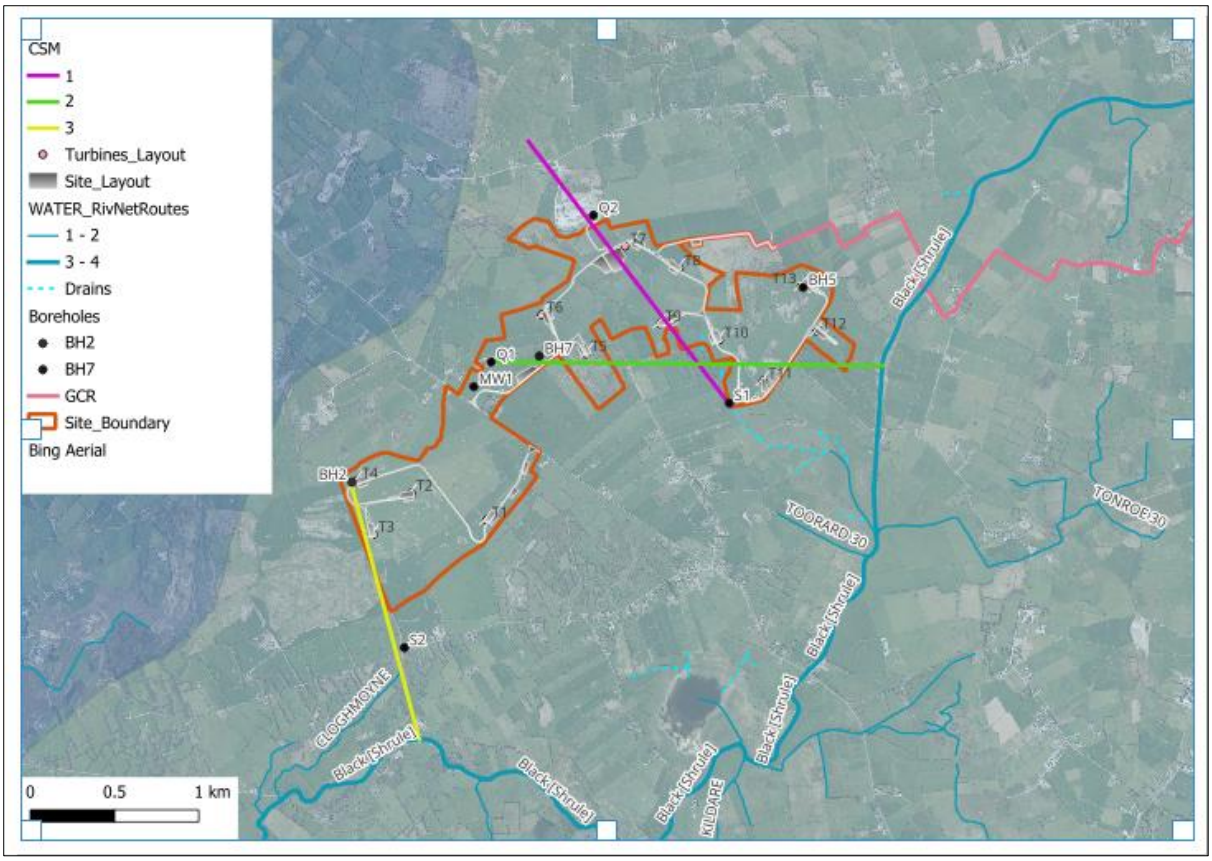



*Diagram 9-2 CSM 1 through quarry, borrow pit and Rooaunalaghta stream*

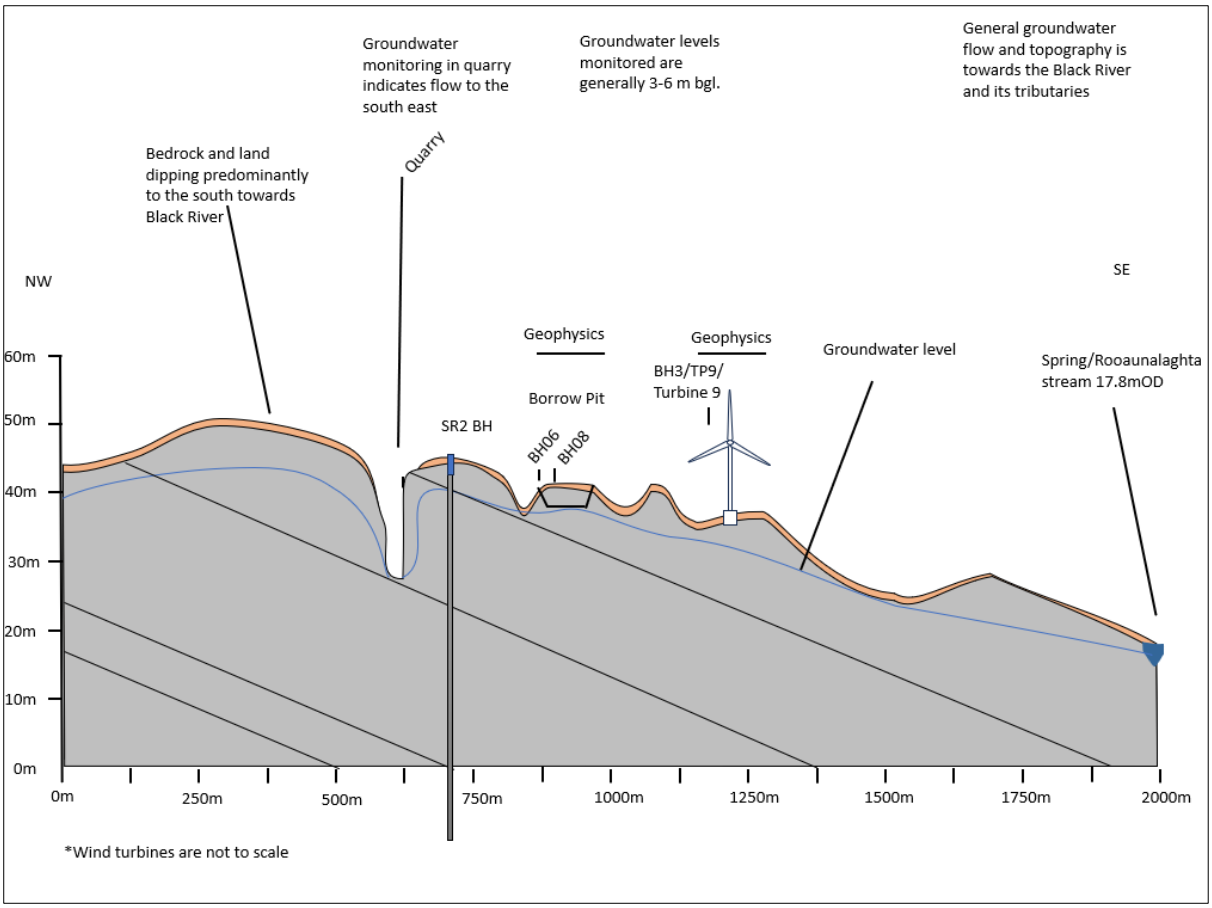



*Diagram 9-3 CSM 1 through quarry, borrow pit and Rooaunalaghta stream*[18]

[18] Note vertical exaggeration is 20/1

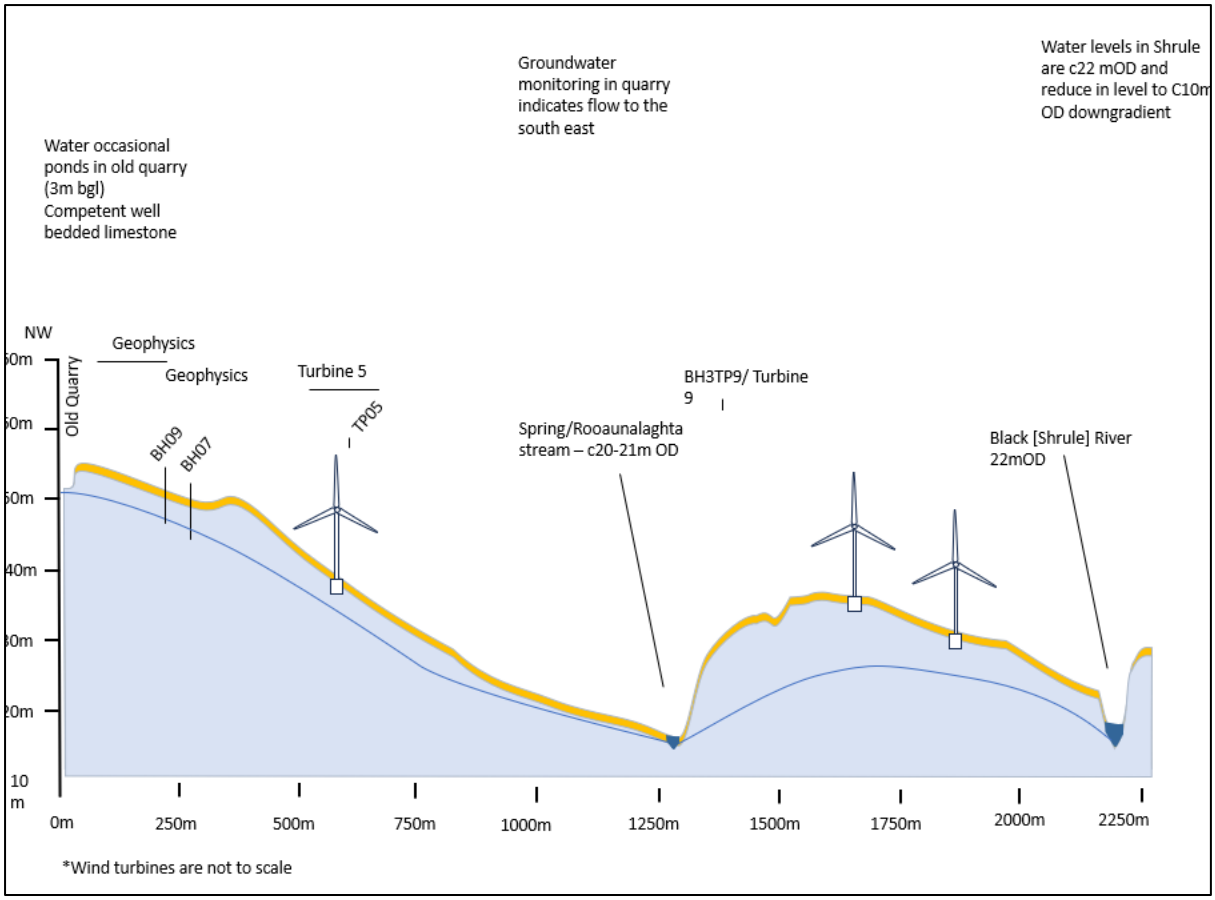



*Diagram 9-4 CSM 2 Through old Quarry, T5 and Black River*

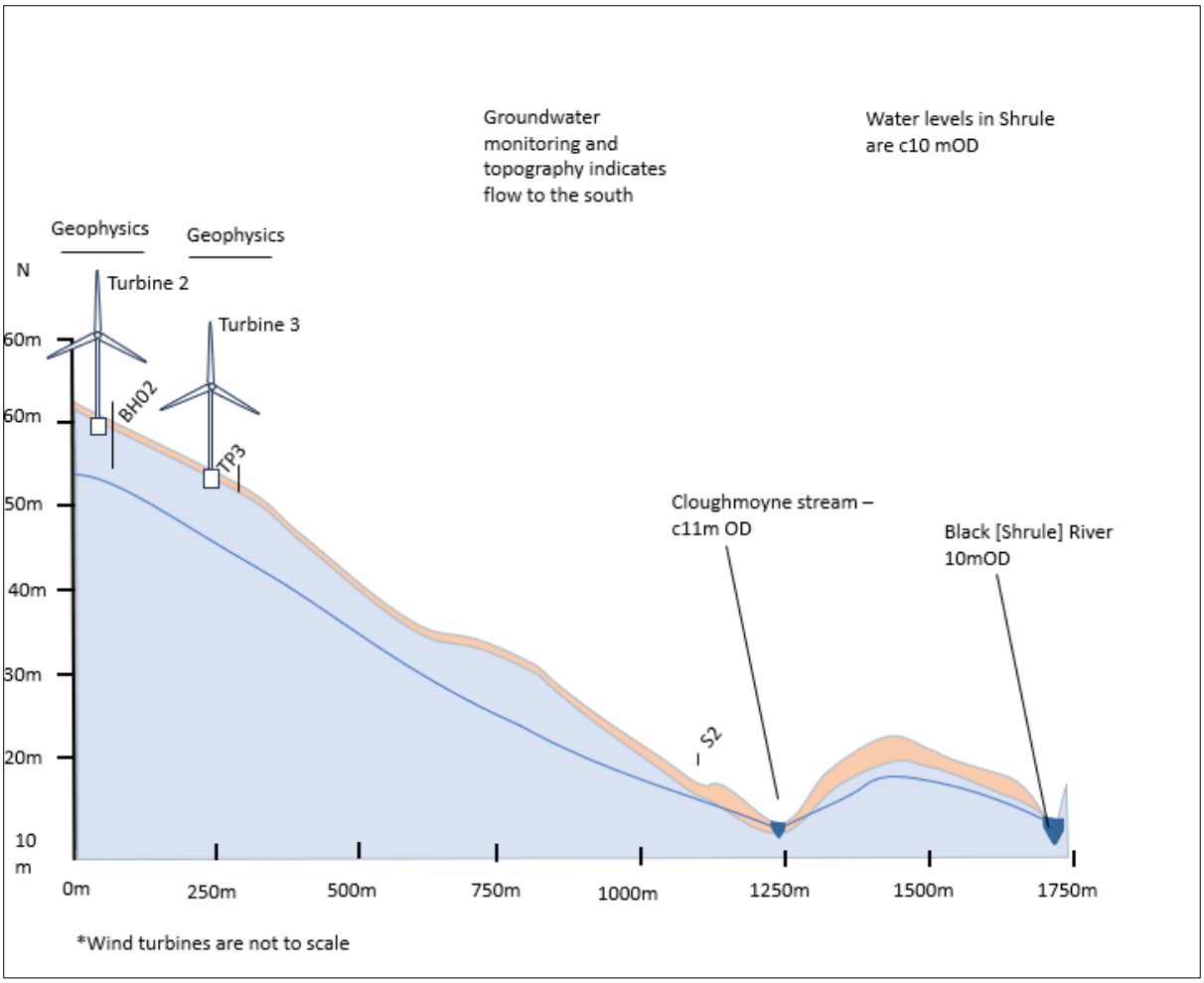



*Diagram 9-5 CSM3 Through T2 and Black river*

### *9.4.3.1 Surface water and groundwater interaction*

The conceptual model recognises that surface water and groundwater are interconnected within the underlying limestone aquifer. Rainfall may either generate overland runoff to field drains and local watercourses or infiltrate through the shallow soils and subsoils to the limestone bedrock. Groundwater movement within the limestone will subsequently contribute to local surface watercourses as discharge further downgradient. Conversely, where sinking streams occur, surface water may enter the underlying groundwater system.

The assessment therefore does not treat the surface water and groundwater environments as independent systems. Potential source-pathway-receptor linkages have been considered for both overland and subsurface pathways, including runoff through the proposed drainage network, infiltration through shallow soils and weathered limestone, groundwater movement through fractures and locally karstified bedrock, and potential interaction with downstream surface water receptors.

The conceptual site model presented above provides the basis for the assessment of hydrological and hydrogeological effects in Section 9.5. The model integrates the site-specific geological, hydrogeological and hydrological information obtained from desk studies, site

investigations, geophysical surveys, groundwater monitoring, surface water observations and karst assessment. It identifies the potential relationships between proposed infrastructure, surface water runoff, field drainage, infiltration to the underlying limestone aquifer, groundwater movement and downstream surface water receptors.

The assessment in Section 9.5 therefore considers potential effects using a source-pathway-receptor approach. An effect can arise only where a credible source, pathway and receptor linkage is present. Where such a linkage is identified, its potential effects are assessed, together with the measures incorporated into the Proposed Project to avoid or interrupt the pathway

### 9.4.4 Designated sites

No National Heritage Areas were identified within the proposed wind farm site. The designated sites that are hydrologically connected to the proposed wind farm site are summarised in Table 9-10. Locations of the designated sites are shown on Figure 9-2 and Figure 9-3.

The proposed project is located within the wider hydrological and hydrogeological catchment of Lough Corrib SAC (Site Code 000297). Surface water drainage from the site is directed via local drainage channels and tributaries towards the Black River, which ultimately discharges to Lough Corrib. The site is also situated within the Clare-Corrib Groundwater Body, where regional groundwater flow is towards the Black River and Lough Corrib. Consequently, a potential pathway exists between the proposed development and the SAC. The development does not involve direct works within any designated waterbody, or alteration of surface water channels in the SAC. The Black River is also connected to the Rostaff turlough. Rostaff turlough is not a true turlough but rather a permanent lake. During winter flood events the low-lying areas around Lough Rostaff flood.

Shrule Turlough SAC (Site Code 000525) is located 2 km north of the proposed wind farm site. The hydrogeological information, including groundwater level monitoring, local topography, mapped drainage patterns and the conceptual hydrogeological model, indicates that groundwater flow from the site is predominantly directed towards the Black River and Lough Corrib catchment. No direct hydrogeological connection between the proposed development area and Shrule Turlough has been identified. Groundwater flow to the north of the site is towards the southeast (River Black) and there is a strong topographical gradient towards the Black River. However, given the presence of a regionally important karstified limestone aquifer, the Shrule Turlough was screened in on a precautionary basis due to the presence of a shared karstified aquifer and the potential for groundwater-mediated pathways affecting the groundwater-dependent QI habitat , however connectivity is unlikely based on the outcomes of the extensive survey effort. Notwithstanding this, the proposed project incorporates design measures, pollution prevention controls and SuDS infrastructure such that no significant effects on groundwater quality, groundwater levels or groundwater-dependent ecosystems, including Shrule Turlough SAC, are predicted.

Approximately 1 km of the GCR is located within the Lough Hacket catchment and will be installed within the existing public road corridor. The works will comprise narrow trench excavations for cable installation together with associated reinstatement works. Given that the cables will be located within an existing road environment, the works are not expected to result

in significant alterations to existing drainage patterns, groundwater flow regimes or hydrogeological conditions. The excavations will be temporary and localised, and following cable installation all trenches will be backfilled and reinstated to pre-construction levels.

*Table 9-10: Designated sites hydrologically connected to the proposed study area*

| Site ID | Site Classification | Site Code | Proximity to the proposed wind farm site | Connection to the proposed wind farm site |
|---|---|---|---|---|
| Cloughmoyne | SAC & pNHA | 000479 | c. 50 m west of turbine T3 | No – No relevant qualifying interests. |
| Lough Hacket | pNHA | 001294 | c. 1.1 km south of the proposed substation | Yes - 1km of GCR located within road in L. Hacket catchment. The Substation is located in a separate subcatchment to L. Hacket. |
| Shrule Turlough | SAC & pNHA | 000525 | c. 2.0 km north of turbine T7 | Based on Groundwater monitoring on site and catchment boundary delineation – no significant connection has been identified with Shrule Turlough SAC/pNHA. Given the presence of a regionally important karstified limestone aquifer, there is potential hydraulic connection, however connectivity is unlikely based on the outcomes of the extensive survey effort. On this basis, and given the potential for hydrogeological connectivity, this is brought forward for assessment. |
| Lough Corrib | SAC & pNHA | 000297 | c. 350 m east of turbine T12 i.e. section of the Black {Shrule] River | Yes - via hydrological and hydrogeological connection to Black (Shrule) river. |
| Rostaff Turlough | pNHA | 000385 | c. 1.2 km southeast of turbine T1 | Yes - via connection to Black Shrule river. |

The proposed wind farm site and GCR are located in the Corrib catchment which is hydrologically connected to Lough Corrib. The GCR crosses the Black (Shrule) river which is also hydrologically connected to Lough Corrib.

### 9.4.5 Activities Associated with the Proposed wind farm

The construction activities associated with the proposed project at the proposed wind farm site, GCR and nodes along the TDR include:

- Earthworks - Including storage and re-deposition of significant volumes of material in both temporary and long term spoil storage, excavation of rock (likely blasting, rock breaking and crushing);
- Storage/ transmission of concrete and/or hazardous materials; and
- Excavation of materials above the water table.

Earthworks include the stripping and/or removal of soil, subsoil and rock using equipment as detailed in Chapter 2. This will be carried out to create access routes to each turbine location; installation of the turbine foundations and land levelling for the proposed substation site.

Using the average borrow pit depth of 5 m bgl, the available volume of potential useable material is approximately 30,000 $m^3$ (accounting for overburden, an entrance and based on the area of the proposed borrow pit being approximately 1.1 ha).

Storage and transmission of leachable and/or hazardous materials will include the transportation of concrete in constructing the turbine foundations and movement of fuels for machine refuelling around the proposed works areas (this also applies to fuels and oils that are in machines moving around).

### 9.4.6 Sensitivity of Receptors

The hydrological quality in the study area is considered to be of high sensitivity. EPA water quality monitoring in the receiving waters of the study area are classified as good (Q4). Further information on the sensitivity rating for aquatic macroinvertebrates species can be found in Section 6.2 of Chapter 6 (Biodiversity). In terms of hydrological and hydrogeological flows, the study area is of high sensitivity due to shallow soils and underlying regionally important bedrock aquifer.

Works for the TDR include hardcore at one roundabout along with some demounting of signs or hedge trimming. As no significant works are required for the TDR, this is screened out from further assessment in this chapter.

The hydrogeological quality is of medium - high sensitivity due to the possible connection to karst features. There are no groundwater abstractions mapped on the proposed wind farm site or GCR. The infrastructure has avoided karst features. The proposed project is not located in a source protection zone (SPZ). There are no public water supply sources within the study area boundary.

The hydrogeological flow is considered to be of medium sensitivity due to the limited and temporary groundwater abstraction on the proposed wind farm site and GCR and the absence of groundwater dependant terrestrial ecosystems at the infrastructure locations. There is no significant alteration to the groundwater recharge with all runoff control on site and allow to infiltrate to ground post treatment. The proposed construction footprint is limited in extent and largely located on relatively elevated areas of the site. Site investigations, groundwater monitoring and karst surveys did not identify significant groundwater abstractions, active karst

features or point recharge features within the proposed infrastructure areas. Groundwater inflows are anticipated to be localised, with only limited dewatering likely during construction. The relatively small construction footprint in the context of the overall groundwater body, together with the absence of highly sensitive groundwater flow receptors within the immediate zone of influence, supports a medium sensitivity rating for groundwater flow.

In addition, the proposed project is not located in a source protection zone (SPZ), with no public water supplies within the study area boundary and no private well within 0.55 km from any turbine location. One former abstraction borehole is located 0.6 km to the west of T6 within the wind farm site however this is not currently in use. There are 2 reservoirs operated by Glencorrib GWS located adjacent to wind farm site however abstraction occurs from Lough Corrib, 3.2 km to the north east of the wind farm infrastructure. Other abstractions on Lough Corrib over 15km to the south. Tuam Regional Water Supply Scheme (RWSS) with the abstraction point located 15 km downstream on Lough Corrib. Galway City Council Public Water Supply, with the abstraction point located 26 km downstream on Lough Corrib.

## 9.5 Assessment of Effects

This section addresses the likely significant effects of the proposed project. The description of the likely significant effects covers direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and adverse effects of the proposed project. The criteria (2022 EPA Guidelines) for the assessment of effects requires that likely significant effects are described with respect to their magnitude, frequency, extent, complexity, probability, duration, reversibility etc.

The construction, operational and decommissioning activities were reviewed to identify those likely to cause an effect on identified water bodies including water courses within the study area for the proposed project. Following the identification of sensitive waterbodies, the extent and severity of potential construction, operational and decommissioning effects were evaluated considering all proposed control measures included in the proposed project design.

This section presents an assessment in the absence of any mitigation measures, with the exception of measures that have been incorporated into the design (e.g. avoiding sensitive features through the siting of the proposed project). Measures have been proposed in Section 9.6 to reduce or mitigate the effects, and the residual effects after the application of mitigation measures are reported in Section 9.7. No significant works are required for the TDR and it is therefore screened out from Likely significant effects.

The below assessment has been informed by the CSM presented in Section 9.4.3. For each potential effect, consideration has been given to the source of the potential change or contaminant, the available surface water and/or groundwater pathway, and the relevant receptor. In the limestone setting at the proposed wind farm site, the assessment conservatively recognises the potential for interaction between surface water and groundwater through infiltration, weathered and fractured bedrock and locally karstified limestone, notwithstanding that no significant cavities or conduits were identified beneath the investigated infrastructure locations.

### 9.5.1 Embedded Mitigation

The design team has integrated measures into the project's design and construction methodology (referred to as embedded mitigation). These measures are inherent to the project and are outlined in Chapters 2 of the EIAR, and Grid Construction Methodology (see Appendix 2-3). Embedded mitigation forms part of the project design and is therefore included in the assessment. Additional mitigation measures are assessed separately in Section 9.6.

#### *9.5.1.1 Mitigation by avoidance*

The fundamental mitigation measure to be implemented during each phase of the proposed project will be avoidance of sensitive hydrological or hydrogeological receptors wherever possible through project design. This key principle is referred to as "mitigation by avoidance". This principle has been adopted during the design of the turbine and associated infrastructure layout. The final site layout plan has been identified as the optimal layout design available for protecting existing habitats and the existing hydrological regime of the site, while at the same time incorporating engineering and other environmental constraints. As part of mitigation by avoidance during the design phase, surface water, karst features, sensitive habitats and drainage buffer zones were applied.

Buffer zones are intended to drive the design process by minimising or avoiding the risk to surface water features by restricting construction disturbance to outside these zones, in turn protecting riparian vegetation and providing potential for filtering of runoff from the site and maintaining the baseline hydrological and drainage regime at the site. In terms of surface waters, a 50 m buffer was selected based on established Irish wind farm practice and precautionary application of hydrological protection measures. Given the karstic setting, a 30 m buffer is applied to doline or karst features with additional controls including SuDS, interceptor drains and sediment management have been incorporated. Based on the site observations the doline near T1 appears to represent an area of lower permeability and surface water ponds in this area where the infiltration rate is lower than the rainfall.

Where distances are less than 50 m relocation of turbines is undertaken or additional mitigation is required. The buffer applied to all EPA mapped surface water features i.e., mapped streams, rivers, lakes. There are no streams within 50 m of the proposed turbines.

Groundwater buffer zones are dependent on the characteristics of the receptor e.g., public supply source protection zone, and the characteristics of the underlying geology and associated aquifer e.g., poor unproductive aquifer, or regionally important aquifer. For the purpose of this assessment the following conservative approach on the buffer distances has been applied:

- 300 m Groundwater Buffer Zone. No groundwater abstraction points, GWDTE are mapped within 300 m of the proposed wind farm or GCR infrastructure. A 300 m screening buffer was adopted as a precautionary study area for the identification of potential GWDTEs. The buffer is intended to ensure that habitats with a potential hydrogeological connection to the proposed works are considered during the assessment. The presence of a habitat within this buffer does not imply likely impact; potential effects are subsequently assessed based on hydrogeological connectivity, groundwater dependence, pathway characteristics and the magnitude of the proposed ground disturbance. No influence has been detected from the existing quarry, 175 m to the east of Ballisnahyny Lake East.

In this buffer zone area, additional mitigation measures will be applied to ensure the maximum reduction in potential risks to waterbodies.

#### *9.5.1.2 Mitigation by design*

The descriptive mitigation measures outlined in this Chapter will be applied to the development design and construction methodologies with a view to avoiding any likely significant adverse effects to water quality in the receiving surface water network. The aims in relation to embedded mitigation measures by design described in the EIAR are further clarified here.

### Nature-based Solutions.

Nature based solutions will be adopted at the proposed project and have been incorporated into the design. Nature based solutions include Sustainable Drainage Systems (SuDS), which will be employed to attenuate runoff and reduce the hydrological response to rainfall at the site. Extending or maximising this approach sufficiently has the potential to attain net beneficial effects i.e., a net reduction in runoff rates at the site, beneficial effects on water quality and reducing flood risk to downstream flood risk areas. One of the main objectives of nature-based solutions and SuDS is to create an array of runoff stilling areas / standing water and promote diffuse discharge and recharge of runoff at the proposed site.

### Constructed Drainage

The proposed wind farm site drainage will be integrated into the existing surface water network. The drainage incorporated into the design will facilitate the collection of surface water runoff from upstream of the proposed wind farm infrastructure and provide a buffered redistribution of cleaner runoff downstream following passage through the constructed treatment train, as described further in the Surface Water Management Plan (SWMP), in Appendix 2-6.

The principle behind SuDS devices is to reduce the quantity of discharge from developments such as the proposed wind farm to predevelopment flows and to improve the quality of run-off. The SuDS devices, as part of the proposed wind farm design, mimic existing greenfield runoff in terms of volume, rate of runoff and quality of runoff. For the proposed wind farm the quantity of run-off will be decreased to greenfield rates by providing SuDs methods such as surface water settlement ponds.

Interceptor drains will be installed up-gradient of all proposed wind farm infrastructure, at strategic locations to collect clean surface runoff, in order to minimise the amount of runoff reaching areas where suspended sediment could become entrained.

Swales will be implemented to control run-off from the surface running to lower water levels in the subgrade, to control surface water and to carry this flow to outlet points. Swales along access tracks will be installed in advance of the main construction phase.

Swales will provide additional storage of storm water, located on an at-gradient basis. Given the steep longitudinal gradients on some sections of the access track, regular check dams will be employed within the trackside swale on these sections to reduce the flow velocity and provide settlement opportunity.

Swales will be re-vegetated following excavation. Vegetation will reduce the flow velocity, treat potential pollutants, increase filtration and silt retention.

Settlement ponds will be located downstream of road swale sections and at hardstand locations, as illustrated on Drawing 11981-2040, to manage/buffer volumes of runoff discharging from the drainage system during periods of high rainfall, thereby reducing the hydraulic loading to watercourses. Settlement ponds are designed in consideration of the greenfield runoff rates.

Any settlement pond design is based on primary settling out of suspended solids from aqueous suspension. Settlement ponds will be installed alongside the formation of the road and will be fenced off for safety.

Further embedded design measures include the following:

- Hazardous substances (fuel, oils, chemicals) will be stored in bunded areas (110% capacity) with impermeable bases; and
- All concrete will be mixed off-site and imported into the site. All concrete bowsers (trucks) will be washed down at a dedicated concrete washout off-site at least 50 m from a drainage ditch or watercourse. Concrete washings will not be disposed of on-site to any surface or ground water feature. All washings will be removed off-site and treated at a licensed facility.

### 9.5.2 Future Baseline Scenario

As outlined in the EPA 2022 EIAR Guidelines, the description of future baseline relates to the environment as it would be in the future should the proposed project not be constructed and in operation. If the proposed project is not constructed there would be no major changes in hydrology and hydrogeology to the proposed wind farm site. Farming and related activities would continue on the wind farm site and off-road sections of the GCR. There is no likely significant change to the proposed nodes for the TDR. In a future baseline scenario, there would be no significant effect to the hydrology and hydrogeology environment.

Agricultural practices would continue as they currently are with some potential intensification. The localised increasing pressures on the local water quality will continue without separate intervention.

The streams surrounding the wind farm site do not generally indicate a reduction in water quality since 2008. Considering the established agricultural land use practices in the study area, the WFD 'Good' status objective for groundwater and surface water will likely be maintained with the implementation of the WFD programme of measures.

### 9.5.3 Likely Significant Effects - Construction

Potential impacts leading to likely significant effects during construction include increased runoff, release of suspended solids, release of nutrients, release of hydrocarbons, release of horizontal directional drilling material, release of wastewater sanitation contaminants, release of construction or cementitious material, excavation dewatering and construction water discharge, and diversion and/or enhancement of drainage crossings. A total of 14.9 hectares will be developed for the construction phase within an overall wind farm site area of 222 hectares.

#### *9.5.3.1 Alteration of Surface Water Flow*

A flood risk assessment (FRA) was undertaken to determine whether the proposed project is at risk from extreme fluvial flooding events with allowances for climate change. The FRA report is discussed in Section 9.4 and concluded that the key infrastructure including the substation site is not at risk from flooding. Therefore, the effects of flood risk on the proposed project are adverse direct, long term, and not significant.

**Wind Farm Site**

Construction activities at the proposed project could potentially reduce the infiltration capacity of the soils in areas where earthworks are undertaken thus increasing the rate and volume of direct surface runoff.

Concrete/ structural fill will be used to upfill to the required finished floor level. The proposed borrow pit location has been identified as a source of site-wide general fill for construction activities. Material from local quarries will be utilised as capping material as required. The option for direct access to Carrowoughteragh quarry, located to the north of the proposed borrow pit is incorporated into the design. The location was selected as potential source of general fill and chosen due to proximity to access tracks and proposed infrastructure. Surface water from the proposed substation, access tracks and the borrow pit will be treated to remove sediment and discharged to the SuDS network which will recharge to ground.

The PFRA indicative pluvial flood mapping identifies parts of the proposed development area as potentially susceptible to surface water flooding during extreme rainfall events, including the locations of Turbines T1, T6 and T10, sections of access tracks and the borrow pit area (See Appendix 9-2). However, it should be noted that the PFRA mapping is a strategic national-scale dataset prepared to identify areas that may be susceptible to flooding and is intended for high-level screening purposes. Based on a review of Geological Survey Ireland (GSI) predicted groundwater flooding in the area and historical flood data mapping, there is no evidence to suggest liability to groundwater flooding for the proposed project. The mapped groundwater flood extents within the wider area are limited in extent, locally constrained, and situated at lower elevations than the proposed infrastructure.

Review of the site topography indicates that the areas identified by the PFRA mapping are generally associated with localised low points where surface water may temporarily accumulate following intense rainfall. No critical electrical infrastructure, such as the proposed substation, is located within an area identified as being at significant risk from pluvial flooding.

The receiving watercourses are considered to be of medium (site drains) to high sensitivity; however, given the negligible to low magnitude of impact, the resulting effect is assessed as adverse, short term, slight and not significant.

**GCR**

A total of two EPA watercourse crossings are required for the GCR (Black (Shrule) and Shancloon streams). Two further crossings of drains are required along the proposed GCR. A combination of measures are proposed to cross the various streams and drainage channels.

To facilitate the crossing of the Shancloon stream, instream works will be required. To do this, a temporary dam and flume diversion will be established to maintain downstream flow while the

excavation with duct installation and culvert replacement works are undertaken – See Appendix 2-3 Grid Construction methodology.

Temporary pump sump(s) will be created to convey the water downstream of the open excavation crossing point. Pumps will be suitably sized to convey the water from the stream/ river either side of the excavation. A direct impact on hydrological flows will occur because of the damming and diversion or over pumping that will be required, albeit temporarily. Dewatering activities have potential to result in silty water runoff and spillages are at a greater risk of occurrence in these locations because the pathway is shorter and more direct; in addition, the damming and over-pumping [19], has the potential to increase sediment loads, in the absence of control measures

Potential effects on the within the vicinity of the stream will also include:

- Removal of the existing culvert and natural bed and banks and placement of an upgraded culvert leading to changes in the channel;
- Changes to overland runoff due to cleared working areas leading to changes in the flows within the channel;
- Changes to morphological features and sediment processes resulting in erosion and deposition due to the temporary damming of the watercourses to create a dry working area; and
- Changes to the extent of modification within a channel.

The construction of infrastructure including the substation will require the removal of topsoil and subsoil to a competent founding layer and diversion of a dry agricultural drainage ditch.

The magnitude of impact is considered low to negligible due to the limited scale and extent of the proposed works relative to the receiving surface water catchments. Any potential effects would be localised to the infrastructure footprint and works area. Excavations are localised, with any blasting restricted to 1-3m and isolated near-surface bedrock excavations where required. Site investigations, geophysical surveys, groundwater monitoring and the karst assessment did not identify significant karst features or flow pathways that could facilitate wider impacts.

The receiving watercourses are considered to be of medium to high sensitivity; however, given the negligible to low magnitude of impact, the resulting effect is assessed as adverse, short term, slight and not significant.

#### *9.5.3.2 Alteration of Surface Water Quality*

**Wind Farm Site**

Initial activities during construction that could potentially result in alteration to surface water quality within and downstream of the proposed project, include soil stripping to construct the infrastructure including access tracks, passing bays, borrow pit, temporary construction compound, turbine foundations and substation. Exposed and disturbed ground may increase the

[19] A barrier is constructed across the full width of the watercourse upstream of the works area and water is transfer from upstream of this barrier to downstream of the works area via pumps. This maintains 'normal' flow in the watercourse either side of the isolated reach.

risk of erosion and subsequent sediment laden surface water runoff. The release of suspended solids is primarily a consequence of the physical disturbance of the ground during the construction phase, if not correctly compacted.

Incorrect site management of earthworks and excavations during the main construction phase could, therefore, lead to loss of suspended solids to surface waters and lowering of water quality as a consequence of the following activities:

- Run-off and erosion from soil stockpiles (prior to reinstatement/profiling); and
- Dewatering of excavations for turbine foundations and the borrow pit.

The Black (Shrule)_020, Black (Shrule)_030 and Corrib_010 watercourses are currently at good status. In light of the hydrological connectivity, there are potential short term adverse effects on water quality resulting from construction in the absence of additional mitigation.

There will be a risk of pollution from site traffic through the accidental release of oils, fuels, and other contaminants from vehicles. Concrete (specifically, the cement component) is highly alkaline and any spillage to a local watercourse would be detrimental to water quality as well as flora and fauna.

There are no surface water streams within 50 m of any construction area.

Interceptor drains will be installed up-gradient of all proposed wind farm infrastructure including the construction stage borrow pit, to collect clean surface runoff, in order to minimise the amount of runoff reaching areas where suspended sediment could become entrained. A silt buster will be used at the borrow pit in addition to the proposed SuDS network.

Swales will be implemented to control run-off from the surface running to lower water levels in the subgrade, to control surface water and to carry this flow to outlet points. Swales along access tracks will be installed in advance of the main construction phase.

The potential for a significant spillage of hydrocarbons or cement is limited on site due to the project design (bunding, hydrocarbon interceptors at construction compound) – see section 9.5.1. The risk of a serious spillage occurring on site is negligible due to the embedded containment measures; however, a credible spill pathway has been conservatively assessed through the CSM. Concrete and other cement-based products are alkaline and direct release to surface waters can have significant adverse effects on water quality. The effects associated with concreting are associated with gravity and or piled foundations. The site preparation works will contain the concrete in an enclosed, excavated area on the hardstands. The presence of construction workers at the proposed wind farm site will lead to the generation of foul sewage from toilets and washing facilities. The foul wastewater will be contained onsite and tankered off site periodically to licensed facilities for treatment. The embedded measures taken to protect surface water and groundwater within the site will also protect the downstream and downgradient water quality. As such there are no likely significant effects on the water quality in the Black River, Lough Corrib or any surface water abstraction on Lough Corrib.

The receiving catchments are considered of medium to high sensitivity, but the predicted change in runoff characteristics is of negligible magnitude; therefore, the effect is assessed as adverse direct/indirect, short term and unlikely, slight and not significant.

**GCR**

A dry agricultural drainage ditch around the offsite substation will require minor alteration. This will be fenced off and drainage diverted around the proposed offsite substation. The overall effect is considered to have negligible to slight, adverse short-term effect (construction related).

The potential for a spillage of hydrocarbons and horizontal directional drilling material is limited on GCR and substation. The potential for a significant spillage of hydrocarbons or cement is limited on site due to the project design (bunding, hydrocarbon interceptors at substation) – see section 9.5.1. The risk of a serious spillage occurring on site is negligible due to the embedded containment measures; however, a credible spill pathway has been conservatively assessed through the CSM.

The receiving catchments are considered of medium to high sensitivity, but the predicted change in runoff characteristics is of negligible magnitude; therefore, the residual effect is assessed as adverse direct/indirect, short term and unlikely, slight and not significant.

#### *9.5.3.3 Alteration of Groundwater Flow*

**Wind Farm Site**

As detailed in Section 9.4.3, the proposed wind farm site is underlain by a 'regionally important aquifer. There are no private wells within the proposed wind farm site and no registered wells located within the 0.6 km of the wind turbine locations. Based on Census return data[20] and a review of planning applications in the surrounding area, over 95% of dwellings utilise public or group water scheme supplies. While unregistered domestic groundwater abstractions may exist within the study area, given the localised nature of excavations, absence of significant dewatering, implementation of groundwater protection measures and separation distances from dwellings, significant effects on any such abstractions are not predicted.

The proposed project will locally alter recharge (i.e. tracks and hardstand areas) however groundwater will continue to recharge to ground across the proposed wind farm site. The total overall recharge will remain unchanged.

The Conceptual Site Model identifies a potential hydraulic linkage between groundwater and surface water, particularly during the construction phase when excavation and placement activities will temporarily alter surface runoff patterns and shallow groundwater flow on a small part of the wind farm site. The site is underlain by permeable soils and bedrock which may allow infiltration of rainfall and groundwater movement towards adjacent drainage features. Potential contaminants associated with the construction phase comprise suspended solids and, in the event of an accidental spill, hydrocarbons from plant and machinery. To prevent effects on both groundwater and surface water receptors, all runoff generated within the active works area will be directed to the proposed SuDS treatment train or system. The settlement lagoons have been designed to remove suspended solids prior to discharge while a Class 1 bypass oil interceptor will provide protection against accidental hydrocarbon contamination at key locations.

Groundwater encountered during construction is anticipated to be shallow, localised and of limited volume due to existing topography and location of turbines and borrow pit on the elevated areas of the site. Any groundwater ingress to excavations will be directed to the site

[20] Interactive Data Visualisations | CSO Ireland https://visual.cso.ie/?body=entity/ima/cop/2022&boundary=C04172V04943&guid=4c07d11d-fdf4-851d-e053-ca3ca8c0ca7f&theme=5

drainage system and settlement lagoons prior to discharge. Consequently, groundwater-derived flows have been incorporated into the assessment of the surface water management system.

Groundwater levels recorded within boreholes were locally shallower than the maximum proposed excavation depths. However, these observations are considered to primarily reflect shallow, transient groundwater conditions within the weathered bedrock zone, together with perched water associated with recharge events, rather than the deeper regional groundwater system. The uppermost weathered zone of the limestone bedrock and commonly contains temporary or seasonally variable groundwater storage, resulting in locally elevated water levels following periods of rainfall. Consequently, groundwater encountered during excavation of turbine foundations and the borrow pit is expected to comprise predominantly shallow recharge and perched groundwater within the epikarst system.

The borrow pit will be excavated up to 5.5 m below grade level (bgl) or 30 mOD and therefore will locally affect groundwater levels. The borrow pit is located on a small hill with the surrounding ground level reducing to less than 30 mOD surrounding the borrow pit. Groundwater inflows are therefore limited. .

The regional groundwater table is interpreted to occur at greater depth and to be controlled by more persistent groundwater flow within the underlying bedrock aquifer. Groundwater levels in the adjacent Carrowoughteragh quarry are at 24.7-29 mOD and between 10 and 17 m OD to the south of the proposed wind farm site.

All groundwater and surface water treated will be allowed to percolate back to ground. Turbine foundations will typically be excavated to 4 m bgl, the final depth will be confirmed at detailed design stage. Till like soils and bedrock occur at the proposed wind farm site. Dewatering will likely be required to construct the turbine foundations and borrow pit and could potentially result in a temporary localised decrease in water levels.

The site and surrounding areas are served by public and group water mains which run along the local and regional roads including the R224, L1615 and N84. As with any construction site, the main risk to groundwater at the site is from hydrocarbon and cement spillage and leakages at excavations locations.

The proposed SuDS drainage works as detailed in section 9.5.1 will mimic the existing hydrological/hydrogeological regime thereby avoiding significant changes to groundwater flow volumes.

The magnitude of impact is considered low to negligible due to the limited scale and extent of the proposed works relative to the receiving groundwater body and surface water catchments. Any potential effects would be confined to the immediate vicinity of the infrastructure footprint and would not extend beyond the localised works area. Excavations are generally shallow and localised, with any blasting restricted to isolated near-surface bedrock excavations where required. Site investigations, geophysical surveys, groundwater monitoring and the karst assessment did not identify significant karst features or groundwater flow pathways that could facilitate widespread impacts.

While the underlying aquifer is considered to be of medium to high sensitivity; with the implementation of embedded measures, the impact magnitude is negligible, resulting in a slight, not significant effect.

**GCR**

The GCR cables will be installed in private lands and the existing road network with HDD crossing under the Black River crossing and a proposed undercrossing with culvert upgrade at the Shancloon stream crossing. Due to the shallow trenching (1.2m) nature of the proposed crossing works, no significant effects on the water supply zones (Ower Headford, Claren/Knocklehard, Glencorrib GWS, Mochara GWS and Ramolin / Brodella North) are likely. Details of the proposed GCR and crossing details is included in Appendix 2-3.

The groundwater is considered to be of medium to high sensitivity; however, with the implementation of embedded measures, the impact magnitude is negligible, resulting in an adverse direct/indirect, short term slight, not significant effect.

#### *9.5.3.4 Alteration of Groundwater Quality*

**Wind Farm Site**

No registered abstraction wells exist within the proposed wind farm site study area. The underlying limestone bedrock exhibits varying degrees of karstification. Karst aquifers can facilitate variable groundwater flow through enlarged fractures, conduits and solutionally enlarged features, reducing the natural attenuation capacity typically provided by subsoils. Consequently, accidental releases of sediment-laden water, hydrocarbons or other contaminants could have a more direct pathway to groundwater and downgradient receptors than in non-karst environments. However, through the application of avoidance/design measures, buffer zones and construction controls, the impact magnitude is negligible, resulting in a slight and not significant effect. No point recharge locations were identified within the proposed footprint and dolines on site demonstrate low permeability characteristics. No direct discharge will occur on the site, with all water controlled and treated within the SuDS network.

Any blasting required during construction would be restricted to localised shallow excavations (<5m) where competent bedrock cannot be removed by conventional excavation techniques. Based on borehole data, blasting is not likely to be required at the borrow pit but is not ruled out. Blasting, if required, would be temporary, controlled and limited to near-surface bedrock excavation. Given the shallow nature of the works, the absence of deep blasting below the water table and the limited volume of rock to be excavated, no significant effects on groundwater levels, groundwater flow regimes or surface water drainage are predicted.

The use of micropiles is not expected to result in significant effects on groundwater or surface water receptors due to their small diameter, limited footprint and the low volumes of excavation required. Installation involves drilling narrow boreholes (typically 100-200 mm diameter) and grouting within the cased borehole, resulting in only minor and highly localised disturbance to the underlying bedrock and any groundwater.

The proposed wind farm footprint comprises 16 ha distributed within the overall proposed wind farm site area of 222 ha (c.7%) or <0.001% of the overall groundwater body. SuDS measures identified in section 9.5.1 will be implemented in advance of the main construction phase.

The magnitude of impact is low from the construction of the proposed wind farm infrastructure. The proposed SuDS drainage works will control and treat runoff and mimic the existing hydrological/hydrogeological regime thereby avoiding significant changes to groundwater quality.

The underlying aquifer is considered to be of medium to high sensitivity; however, with the implementation of embedded measures, the impact magnitude is negligible, direct/indirect and temporary, resulting in a slight**,** not significant adverse effect.

**GCR**

No registered abstraction wells exist within the proposed GCR study area. Similarly, the underlying aquifer is considered to be of medium to high sensitivity; however, with the implementation of embedded measures, the impact magnitude is negligible, direct/indirect and temporary, resulting in a slight**, not significant** adverse effect.

## 9.5.4 Likely Significant Effects - Operational

Due to the nature of the proposed project, there will be a potential loss of area for rainfall to infiltrate to ground and replenish groundwater stores. However, this will be on a local scale and is considered to be an imperceptible effect due to the embedded mitigation and related nature-based solutions. The proposed wind farm footprint comprises 16 ha distributed within the overall proposed wind farm site area of 222 ha (c.7%) (see Chapter 2). The potential to increase surface water runoff is low.

The principles of the embedded mitigation measures described under section 9.5.1 are based on the control and management of runoff discharge rates, which regulate the speed of runoff within the drainage network, buffering the discharge from the drainage network, and maintaining the natural hydrological regime. The same measures ensure potential pollutants are also attenuated and these measures will likely provide beneficial effects in terms of both runoff and water quality.

### *9.5.4.1 Alteration of Surface Water Quality*

The proposed permanent wind farm footprint comprises 16 ha within the overall wind farm site of 222 ha. An off-site substation will be constructed as part of the proposed project and will occupy a hard-standing area of 0.6 ha. Elements of the electrical plant at the substation site (primarily transformers) may contain oil for insulation purposes which are a potential source of contamination. As part of the substation design all fuel is stored in bunded areas.

The presence of hardstand areas may increase the risk of erosion and subsequent sediment-laden surface water runoff. The release of suspended solids is primarily a consequence of the runoff from hardstand areas, if not correctly compacted.

Due to the design measures and limited activity during the operational phase, the predicted change in runoff characteristics is of negligible magnitude; therefore, the residual effect is assessed as adverse direct/indirect, short term and unlikely, slight and not significant.

Surface water arising from roof drainage within the substation will be managed using SuDS. As detailed in section 9.5.1, a hydrocarbon interceptor will be installed on the substation site. The receiving catchments are considered of medium to high sensitivity.

Due to the design measures and limited activity during the operational phase, the predicted change in runoff characteristics is of negligible magnitude; therefore, the residual effect is assessed as adverse direct/indirect, long term and unlikely, slight and not significant.

#### *9.5.4.2 Alteration of Surface Water Flow*

The installation of permanent infrastructure would not result in a significant increase in surface water runoff during the operational phase of the proposed project. As detailed in Section 9.4, existing surface water runoff is low and the proposed project will not result in a significant alteration in runoff rates. There are no potential significant effects on the watercourse crossing locations during the operational phase.

Due to the design measures and limited activity during the operational phase, the predicted change in runoff characteristics is of negligible magnitude; therefore, the residual effect is assessed as adverse direct/indirect, long term and unlikely, slight and not significant.

#### *9.5.4.3 Alteration of Groundwater Quality*

During the operational phase of the proposed project, no direct discharges to the groundwater environment are anticipated. Water from the access tracks and hardstands will infiltrate to ground in a controlled manner through swales and infiltration areas.

Periodic vehicle access to the proposed project for routine and unscheduled maintenance introduces a limited potential for accidental emissions. These could include minor fuel or oil leaks from vehicles, such as four-wheel drives or vans, which may result in slight, localised, and temporary contamination of groundwater. As traffic volumes on the site will be negligible (<4 per day on average) the risk of a spill is very low. The risk is constrained by the small fuel tank capacities of the maintenance vehicles and the infrequent nature of their presence on site.

At the proposed substation, the occasional presence of maintenance personnel will generate foul sewage from toilet and washing facilities. This wastewater will be collected in a sealed and alarmed tank and removed off-site by a permitted collector for disposal at a licensed wastewater treatment facility, ensuring no discharge to ground or surface water. The hydrocarbon intercept and bunds will operate and be maintained as set out in section 9.5.1.

Due to the design measures and limited activity during the operational phase, the predicted change in runoff characteristics is of negligible magnitude; therefore, the residual effect is assessed as adverse direct/indirect, long term and unlikely, slight and not significant.

#### *9.5.4.4 Alteration of Groundwater Flow*

The installation of permanent infrastructure could result in a decrease in groundwater infiltration during the operational phase of the proposed project, as a result of the proposed permanent wind farm and GCR infrastructure. However, due to the small proportional change in land-use within the proposed project, the change to infiltration rates is low. SuDS design measures such as swales and ponds will encourage infiltration back to ground.

Due to the design measures and limited activity during the operational phase, the predicted change in runoff characteristics is of negligible magnitude; therefore, the residual effect is assessed as adverse direct/indirect, long term and unlikely, slight and not significant.

### 9.5.5 Likely Significant Effects - Decommissioning

Decommissioning of the proposed project would result in the cessation of renewable energy generation and the removal of certain infrastructural elements, including all above ground turbine components. Turbine foundations will remain in place underground and hardstands will be covered in topsoil and reseeded, the plinth will be removed and the foundation will be reinstated to grassland. The site access tracks, off-site substation and the GCR will remain in place.

The effects of decommissioning the above-ground components have been assessed as less significant than the construction phase. Mitigation measures for the construction phase will also be implemented during decommissioning so that there will be no likely significant effects. Potential effects on the alteration of groundwater quality at the proposed project are therefore considered to be adverse direct, short-term, unlikely and not significant.

### 9.5.6 Summary of Potential Significant Effects

Tables 9-11 to 9-12 summarise the significance of potential hydrological and hydrogeological effects prior to the implementation of mitigation measures.

*Table 9-11: Significance of Hydrological and Hydrogeological Effects – Construction Phase (Pre-Mitigation)*

| Hydrological Component | Description | Sensitivity | Magnitude | Significance (Pre-Mitigation) |
|---|---|---|---|---|
| Surface Water Flow incl flood risk | Temporary alteration of runoff patterns arising from vegetation clearance, earthworks, access track construction and foundation excavations. | Medium (flood) to high | Low to negligible | Short-term, localised and reversible. Slight Adverse (Not Significant) |
| Surface Water Quality | Risk of sediment-laden runoff from exposed soils and excavation areas. Potential accidental spillages of fuels, lubricants, concrete and other construction materials. | High (watercourses and downstream receptors) | Low to negligible | Unlikely due to separation distances, flow directions and limited interaction pathways. Not Significant Adverse. Short-term and unlikely. |
| Groundwater Flow | Localised interception of shallow groundwater during excavations and borrow pit works. Potential alteration of recharge characteristics at foundation locations. | Medium | Low to negligible | Temporary and localised. Slight Adverse (Not Significant) |

| Hydrological Component | Description | Sensitivity | Magnitude | Significance (Pre-Mitigation) |
|---|---|---|---|---|
| Groundwater Quality | Potential contamination from accidental spillages, concrete pours and construction plant operation. | Medium to High (locally vulnerability bedrock areas) | Low to negligible | Short-term and unlikely. Slight Adverse (Not Significant) |

*Table 9-12: Significance of Hydrological and Hydrogeological Effects – Operational Phase (Pre-Mitigation)*

| Hydrological Component | Description | Sensitivity | Magnitude | Significance (Pre-Mitigation) |
|---|---|---|---|---|
| Surface Water Flow incl flood risk | Permanent hardstanding and infrastructure may marginally increase runoff rates compared to baseline conditions. Drainage systems designed to accommodate design storm events and climate change allowance | Medium (flood) to high | Low to negligible | No significant increase in flood risk. Long-term but localised. Not Significant Adverse |
| Surface Water Quality | Routine operation presents limited pollution risk. Surface water drainage infrastructure and SuDS features remain operational throughout the project lifetime. | High (watercourses and downstream receptors) | Low to negligible | Long-term and unlikely. Not Significant |
| Groundwater Flow | Presence of turbine foundations, substation and buried infrastructure. | Medium | Negligible | No measurable effect on regional groundwater regime. Not Significant |
| Groundwater Quality | Small residual risk associated with transformer oils and maintenance activities. | Medium to High (locally vulnerability bedrock areas) | Low to negligible | Long-term and unlikely. Not Significant |

## 9.6 Mitigation Measures

As with the embedded mitigation measures outlined in Section 9.5.1, the following standard practice pollution control measures will be incorporated into the CEMP ( Appendix 2-2) for the project, which the contractor will be obliged to follow to remove any risk of a pollution incident:

- Near-stream construction work will only be carried out during the period permitted by IFI (2016)[21] guidance document *"Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites"*, that is, May to September inclusive. The excavation, installation and reinstatement process for the general GCR works will take on average of two days to complete a 100-metre section similar to minor road works. The proposed HDD will be undertaken over a 2-3 day period with additional time to install the launch and reception pits. The proposed HDD is designed to avoid direct effects on streams in accordance with the IFI guidance (2016)[22] guidance document *"Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites"*. A HDD crossing is proposed for the Black River.
- On completion of the works, all apparatus, plant, tools, offices, sheds, surplus materials, rubbish and temporary erections or works of any kind will be removed from the site;
- All works must follow the guidance set out in the Guidance document entitled: CIRIA guidance note Control of Water Pollution from Construction Sites (CIRIA, 2001);
- A 24-hour, seven-day week Emergency Response protocol will be drawn up and implemented. This will be implementable in the unlikely event of an accidental spillage of chemicals, hydrocarbons or release of sediment to the surface or ground water system;
- All excavated material will be removed to suitable stockpile areas;
- Stockpiling will be limited to areas where the ground is stable and well drained;
- Spoil disposal areas will be located where the risk of soil erosion and water quality deterioration is minimal and must also have an adequate buffer from aquatic zones;
- Where spoil disposal areas are bunded, the bunds will extend to a level above the top of the spoil;
- Any water discharge from the stockpiles will be monitored (see Section 9.6.4.1). Runoff water will be prevented from flowing directly into the site adjacent drainage channels;
- All machinery will be regularly maintained and checked for leaks. Services will not be undertaken within 50 m of aquatic features. Servicing will be undertaken on level, hard surfaced designated areas;
- An adequate supply of spill kits and hydrocarbon adsorbent packs will be available at labelled stations throughout the sites with all vehicles on-site carrying spill kits. All

[21] IFI (2016) *Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites* https://www.fisheriesireland.ie/media/guidelines-on-protection-of-fisheries-during-construction-works-in-and-adjacent-to-waters *[Accessed February 2026].*

[22] IFI (2016) *Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites, available at* https://www.fisheriesireland.ie/media/guidelines-on-protection-of-fisheries-during-construction-works-in-and-adjacent-to-waters *[Accessed February 2026].*

relevant personnel will be fully trained in the use of the equipment. Any used spill kits will be disposed of appropriately off-site;

- All equipment and machinery will be cleaned prior to entry as a bio security measure. This is to avoid transfer of invasive species on equipment and machinery which may have been used elsewhere to the receiving catchment.

Reference will be made to the IFI biosecurity protocols found at http://www.fisheriesireland.ie/Biosecurity/biosecurity.html.

## 9.6.1 Mitigation Measure - Construction Phase

Mitigation measures to be taken during the construction phase of the proposed project are detailed below. Early engagement between Uisce Eireann/Group Water Schemes and the Applicant will be carried out on the project regarding any infrastructure located near their assets.

### *9.6.1.1 Alteration of Surface Water Flow*

The proposed project is characterised by infiltration rather than surface water flow. Settlement of runoff from hardstand areas will be provided as detailed in section 9.5.1.

Prior to the construction of infiltration features, the underlying ground conditions will be verified. Should preferential groundwater pathways be encountered during excavation works, the Karst Management Protocol (See Appendix 8-1 and Appendix 2-2 CEMP) will be implemented. A suitably qualified hydrogeologist will inspect the feature and recommend appropriate measures.

**Proposed GCR**

The proposed watercourse crossings will be completed in the summer months to avoid periods of potential flooding. This time period coincides with the period of lowest expected rainfall and, therefore, minimum runoff rates. This will minimise the risk of entrainment of suspended sediment in surface water runoff, and transport via this pathway to surface watercourses.

Mitigation measures in relation to the proposed GCR are outlined in the CEMP in Appendix 2-2 of the EIAR. The mitigation measures include

- Near-stream construction work will only be carried out during the period permitted by IFI (2016)[23]
- All works must follow the guidance set out in the Guidance document entitled: CIRIA guidance note Control of Water Pollution from Construction Sites (CIRIA, 2001);
- A 24-hour, seven-day week Emergency Response protocol will be drawn up and implemented. This will be implementable in the unlikely event of an accidental spillage of chemicals, hydrocarbons or release of sediment to the surface or ground water system;
- All excavated material will be removed to suitable stockpile areas;

[23] IFI (2016) *Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites* *https://www.fisheriesireland.ie/media/guidelines-on-protection-of-fisheries-during-construction-works-in-and-adjacent-to-waters* *[Accessed February 2026].*

- Stockpiling will be limited to areas where the ground is stable and well drained;
- Spoil disposal areas will be located where the risk of soil erosion and water quality deterioration is minimal and must also have an adequate buffer from aquatic zones;
- Where spoil disposal areas are bunded, the bunds will extend to a level above the top of the spoil;
- Any water discharge from the stockpiles will be monitored (See Section 9.6.4.1). Runoff water will be prevented from flowing directly into the site adjacent drainage channels;
- All machinery will be regularly maintained and checked for leaks. Services will not be undertaken within 50 m of aquatic features. Servicing will be undertaken on level, hard surfaced designated areas;
- An adequate supply of spill kits and hydrocarbon adsorbent packs will be available at labelled stations throughout the sites with all vehicles on-site carrying spill kits. All relevant personnel will be fully trained in the use of the equipment. Any used spill kits will be disposed of appropriately off-site;
- All equipment and machinery will be cleaned prior to entry as a bio security measure. This is to avoid transfer of invasive species on equipment and machinery which may have been used elsewhere to the receiving catchment. Imported stone material will be checked to ensure no invasive species.

One HDD crossing is proposed on the GCR. HDD is a trenchless method to remove direct impact to watercourses/drains however a number of control measures are proposed to ensure there are no significant effects from the HDD. Mitigation measures applicable to HDD include:

- A competent and experienced Contractor will be appointed to undertake the HDD works;
- The Contractor will prepare a HDD Method Statement using industry best practice and relevant guidance to inform the optimal methodology for the works. The Method Statement will include ***biosecurity*** controls and an incident response plan for any potential frac-out;
- The Contractor will undertake the directional drilling in accordance with industry best practice including British Standard EN 16191:2014 Tunnelling machinery, safety requirements and CIRIA C648 '*Control of water pollution from linear construction projects Technical Guidance*' (CIRIA, 2006a);
- The contractor will ensure that all personnel working on site are trained in pollution incident control response. A regular review of weather forecasts of heavy rainfall is required to avoid works in very wet conditions. The Contractor will be required to prepare a response plan in advance of the works commencing;
- Weather conditions will be considered when planning construction activities to minimise the risk of runoff from site, no works will be scheduled when an orange or red weather warning is in place;
- There will be no storage of fuels/drilling fluid within 30 m of a watercourse;
- Provision of exclusion zones and barriers (sand bags and silt fences) between any excavated material and any surface water features will be installed to prevent sediment

washing into the receiving water environment. Silt fences will be installed and the contractor will ensure that silt fences are regularly inspected and maintained during the construction phase;

- Clay (Bentonite) based drilling fluids will not be used; instead, inert food-grade, biodegradable drilling fluids will only be used for these works. The drill profile will achieve a minimum 1.5 m depth beneath the riverbed.
- To prevent loss of drilling fluids or 'frac-out' from occurring, a series of actions and controls will be implemented; the drill fluids operator will monitor drill fluid density, viscosity and solids content on an ongoing basis, to ensure that the fluid does not increase in viscosity, requiring additional pressure to maintain mobility;
- Viscometers will be used to measure drill fluid gel strength and shear strength. Filtrate can also be measured to calculate the amount of filter cake building up on the internal wall of the bore. Any increases in pump pressure experienced by the drill operator will be investigated immediately to prevent the risk of pressure build up within the annulus. In some circumstances, depending on the drilling equipment used, the pilot drill borehole assembly will be fitted with a down hole pressure monitor to measure pressure in the annulus between the drill and the bore wall. This will give an early indication of pressure build up in the hole and allow the drill operator to prevent a 'frac-out'. If there is a risk of a 'frac-out' a number of measures will be implemented including:
    - pumping a high viscous drilling fluid with a higher density to the risk zone; and
    - circulate and pump loss circulation material (typically cork or manufactured inert polymers) to the risk zone to seal the risk zone, grouting of the risk zone, and, or launch a packer before the risk zone.
- Reception pits will be situated outside of the riparian zone. A buffer zone width of 30 m or greater will be maintained from the drainage channel;
- The contractor will implement procedures to maximise the recirculation or reuse of drilling fluid to minimise waste disposal;
- Disposal of drilling fluids will be the responsibility of the contractor to an approved and licenced waste facility;
- Monitoring of the drilling operations will be undertaken at all times by the contractor under the supervision of an Ecological Clerk of Works (ECoW) with stop works authority. The monitoring will include visual inspection of the pits and monitoring of the volume of returns flowing back to the entry pit. The monitoring personnel will be in constant communication with the drilling rig operator and thus will be able to immediately cease drilling if necessary; and
- As part of the SWMP, pre-Construction and construction phase baseline water quality monitoring will be undertaken.

With regard to the Shancloon stream crossing, instream works will be scheduled during periods of low flow and undertaken within the appropriate fisheries working window, as set out in IFI

(2016)[24] guidance document *"Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites"*,

Prior to commencement of the Shancloon stream crossing works, appropriate sediment and erosion control measures, including geotextile silt curtains, straw bales, silt fences or equivalent filtration measures, will be installed downstream of the works area, to minimise the release of suspended solids and to protect downstream water quality.

The Shancloon Stream is a historically straightened, heavily modified watercourse characterised by a U-shaped channel. Owing to its small catchment area and limited contributing flows, the watercourse exhibited semi-dry conditions in summer period including the August 2026 aquatic survey, with only isolated standing pools present and no observable flow.

To facilitate the crossing works, temporary upstream and downstream dams will be installed using sandbags and water-filled dams, and flume pipe(s) will be placed to convey all stream flows around the work area. Once the diversion system is operational, the existing culvert will be removed and the crossing works undertaken within the isolated section of channel.

Any residual water within the work area will be directed to a temporary sump and removed by pumping. Where ground conditions are suitable, water will be discharged to a vegetated infiltration area. Where infiltration is not feasible due to saturated ground conditions, water will first be directed through an appropriately sized settlement tank prior to discharge. This will ensure that suspended sediments are removed before any water leaves the work area.

Installation of the cable ducting will then be undertaken within the isolated and dewatered section of channel. On completion of the works, the stream bed, banks and culvert crossing will be reinstated to their original profile and condition, the temporary diversion structures will be removed, and natural surface water flows will be restored. All disturbed areas will be stabilised as soon as practicable to minimise the potential for erosion and sediment mobilisation.

#### *9.6.1.2 Alteration of Surface Water Quality*

No additional measures are required for the surface water quality. Design measures outlined in Section 9.5.1 will be protective of surface water quality.

#### *9.6.1.3 Alteration of Groundwater Flow*

Prior to the construction of infiltration features, the underlying ground conditions will be verified. Should preferential groundwater pathways be encountered during excavation works, the Karst Management Protocol (See Appendix 8-1 and Appendix 2-2 CEMP) will be implemented. A suitably qualified hydrogeologist will inspect the feature and recommend appropriate measures.

Based on the site investigation data, no significant dewatering would be required at the borrow pit or turbine locations; however, minor inflows may occur in the proposed excavations. Groundwater encountered will be managed and treated in accordance with CIRIA C750, 'Groundwater control: design and practice' (CIRIA, 2016). Groundwater from the borrow pit will

[24] IFI (2016) *Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites* https://www.fisheriesireland.ie/media/guidelines-on-protection-of-fisheries-during-construction-works-in-and-adjacent-to-waters *[Accessed February 2026].*

be treated initially in a proprietary settlement tank and in the settlement ponds with overland flow towards the surface water network, see Drawing 11981-2040 to 11981-2042.

An infiltration basin following the settlement ponds will be utilised to manage storm water runoff from hardstanding. The construction of soakaway chambers and filter drains to disperse surface water in a controlled manner. In addition, the proposed site layout would include an infiltration basin which would be used for control of any surface water runoff. In accordance with NRA 2015 guidance (Road Drainage and the Environment)[25], where rock is shallow (<2m), the soakaway design would include a minimum of 1m of engineered material (1 x 10-7 permeability) across the base of the basin. While the guidance is for higher risk road construction scheme, the guidance will be applied to the proposed wind farm. The base of an infiltration basin will have a slope of <1% to allow infiltration throughout the entire basin. Side slopes will be <1/3 to prevent erosion of the sides of the basin. The outfall from the settlement will discharge to a filter strip to provide additional water quality treatment.

No additional mitigation measures are required for the proposed GCR.

#### *9.6.1.4 Alteration of Groundwater Quality*

If groundwater is encountered during excavation works, water pumped from excavations will be treated to remove sediment by the use of silt bags. Silt bags will be managed and monitored to ensure no breakthrough or bypass. Water will discharge from the silt bags into settlement ponds and the SuDS network.

During the construction phase, all works associated with the construction of the GCR will be undertaken in accordance with the guidance contained within CIRIA Document C811 'Environmental Good Practice on Site' (CIRIA, 2023). Groundwater pumped from excavations will be treated to remove silt by the use of silt bags. When undertaking HDD works, turbidity monitoring will be undertaken.

### 9.6.2 Mitigation Measures – Operational Phase

The following mitigation measures will be implemented during the operational stage. As no substantial works are proposed for the construction phase the potential for sediment runoff or contamination is low. SuDS measures will remain in place during the operational period.

#### *9.6.2.1 Alteration of Surface Water Flow*

Design measures outlined in Section 9.5.1 will be protective of surface water flow. No additional measures are required.

#### *9.6.2.2 Alteration of Surface Water Quality*

No additional mitigation over and above what is stated in Chapter 2 is required during operational phase. Regular bund testing will be undertaken along with inspections of the SuDS infrastructure. Monitoring of swales (visually) will be undertaken to ensure check dams and silt entrapment measures are effective and operating to specification.

[25] NRA (2015) DN-DNG-03065 - Road Drainage and the Environment

#### *9.6.2.3 Alteration of Groundwater Quality*

Design measures outlined in Section 9.5.1 will be protective of ground water flow. No additional measures are required.

#### *9.6.2.4 Alteration of Groundwater Flow*

Design measures outlined in Section 9.5.1 will be protective of ground water flow. No additional measures are required.

### 9.6.3 Mitigation Measures - Decommissioning

Decommissioning of the proposed project will involve the disassembly and removal of the turbines offsite. The potential effects have been assessed as similar to the construction phase and, therefore, the mitigation measures for the construction phase will also be implemented during decommissioning. Turbine foundations will remain in place underground and hardstands will be covered in topsoil and reseeded, the plinth will be removed and the foundation will be reinstated to grassland. The risks associated with leaving tracks and infrastructural components in situ are low. Therefore, no likely significant effects will occur based on the proposed decommissioning.

#### *9.6.3.1 Alteration of Surface Water Flow*

Design measures outlined in Section 9.5.1 will be protective of surface water flow. No additional measures are required. SuDS measures will remain in place during the decommissioning period. There are no likely significant effects on surface water flow during the decommissioning phase.

#### *9.6.3.2 Alteration of Surface Water Quality*

Mitigation measures applied during decommissioning activities will be similar to those applied during construction where relevant. Some of the effects will be avoided by leaving elements of the proposed wind farm site and GCR in place.

The decommissioning phase will not require any significant works that will potentially affect the drainage network. There are no likely significant effects on surface water quality during the decommissioning phase.

#### *9.6.3.3 Alteration of Groundwater Flow*

Design measures outlined in Section 9.5.1 will be protective of ground water flow. No additional measures are required. There are no likely significant effects on groundwater during the decommissioning phase.

#### *9.6.3.4 Alteration of Groundwater Quality*

Design measures outlined in Section 9.5.1 will be protective of ground water flow. No additional measures are required. There are no likely significant effects on groundwater during the decommissioning phase.

### 9.6.4 Monitoring

A comprehensive water quality monitoring programme will be implemented preconstruction, during and post construction of the proposed project. The programme will include monitoring of both surface water and groundwater at monitoring locations across the site, with continuous

water level and turbidity monitoring supplemented by daily inspections, weekly field measurements and routine laboratory analysis of key parameters, including pH, electrical conductivity, suspended solids, nutrients and hydrocarbons. Monitoring results will be assessed against predefined trigger values and baseline conditions established during the pre-construction monitoring period. An Environmental Manager will oversee the programme and will have authority to require corrective actions, including cessation of works where trigger values are exceeded. Inspection records, monitoring data and incident investigations will be documented and reported throughout the construction period to ensure the effectiveness of mitigation measures and the protection of surface water and groundwater resources.

#### *9.6.4.1 Surface water quality monitoring*

Local surface water features at the proposed project will be monitored pre-construction and during construction to take account of any variations in the quality of the local surface water environment as a result of activities related to the proposed project.

The locations and main water parameters are outlined in the proposed surface water monitoring schedule in the Surface Water Management Plan, Appendix 2-6.

Inspections of silt traps are critical after prolonged or intense rainfall while maintenance will ensure maximum effectiveness of the proposed measures. Stockpiles and the borrow pit will be evaluated and monitored and kept stable for safety and to minimise erosion.

Turbidity monitors/alarms will be strategically placed upstream and downstream of works to assess the main construction period i.e. turbine base construction. Where elevated turbidity is noted, visual checks will be undertaken. All monitoring equipment will be calibrated regularly to ensure that results are accurately measured as detailed in the SWMP[26].

Corrective Actions will include:

- Investigate whether channels used to convey water are protected with vegetation, erosion control blankets, or a similar erosion control measure. If not, implement appropriate erosion control measures.
- Check all outlets and location of turbidity monitors
- Stop dewatering if the downstream area shows elevated turbidity or erosion.
- Check outlet protection or a velocity dissipation device.
- Ensure a stable, erosion-resistant surface (e.g., well-vegetated grassy areas, clean filter stone, geotextile underlayment) in place at outlets.
- Check for leaking pumps, hoses, and pipe connections and fix if identified.

A programme of inspection and maintenance will be designed, and dedicated construction personnel assigned to manage this programme. A checklist of the inspection and maintenance control measures will be developed, and records kept in accordance with the SWMP.

During the construction phase, field testing and laboratory analysis of a range of parameters will be undertaken at adjacent watercourses, specifically following heavy rainfall events (i.e., weekly, monthly and event based as appropriate).

[26] Note – SWMP includes for groundwater level and water quality monitoring

#### *9.6.4.2 Groundwater monitoring*

The dewatering operations will be inspected each day when dewatering water is ongoing to ensure that dewatering treatment controls are working correctly; to evaluate whether there are observable indicators of sediment discharges; Where any issues are encountered, action will be undertaken to correct any problems at the proposed project or with the dewatering controls that may have contributed to the discharges. Regular inspections of the infiltration basins will be undertaken to ensure no direct discharge to groundwater.

Regular monitoring of groundwater (levels and quality) will take place using the monitoring boreholes installed onsite and any available well data immediately downstream of turbines during the construction phase.

## 9.7 RESIDUAL EFFECTS

The greatest potential for hydrological or hydrogeological effects occurs during the construction phase. Embedded mitigation measures, including mitigation by design (such as nature-based solutions and constructed drainage design) and mitigation by avoidance, have been incorporated from the outset to minimise hydrological and hydrogeological impacts. A range of mitigation measures, including erosion and sediment controls, will be implemented and fully functioning before construction commences. The assessment proposes a range of additional mitigation measures as part of the CEMP (Appendix 2-2). The existing natural on-site drainage system will remain active during construction, operational and decommissioning of the proposed project and will be enhanced by a proposed sustainable drainage plan that has been designed for this proposed project, as per Chapter 2, Section 2.8.4. Following implementation of the embedded and additional mitigation measures, no uncontrolled significant pollutant linkage or significant alteration of groundwater or surface water flow is predicted.

### 9.7.1 Construction Phase

The majority of the proposed project drains towards the Black (Shrule) river. No river flows within the site boundary of the proposed wind farm site. The proposed wind farm footprint comprises 16 ha within the overall proposed wind farm site area of 222 ha (c.7%) (see Chapter 2). The substation comprises a footprint of 0.6 ha. The potential to increase surface water runoff is low.

The potential for the release of suspended solids to watercourse receptors is a risk to water quality of the downstream rivers. Proven and effective measures to mitigate the risk of releases of sediment have been proposed in Section 9.6 above. Pre-mitigation, there is potential for water pollution as a result of the excavations, with potential slight short term, adverse effects.

It is predicted that the (pre mitigation) effects are not significant on groundwater flow or quality. The effects on hydrogeology are limited to issues associated with the storage and use of potential contaminants at the proposed and localised dewatering at infrastructure locations i.e. borrow pit and turbine footprints. Chemicals and fuel would be stored and used in accordance with manufacturer's instructions and EPA 2022 EIAR Guidelines. Accordingly, it is concluded that residual effects on groundwater quality or flow would be short term and imperceptible.

Based on the proposed best practice mitigation outlined within the CEMP, hydrological or hydrogeological conditions would not be altered to a degree that would significantly affect the

study area. The residual effects on the hydrology and hydrogeology environment as a result of the construction of the proposed project are considered to be imperceptible/not significant and short term in nature.

The construction timescale of activities within the proposed project will be phased and short-term in duration and, thereafter, there are no significant long-term effects.

### 9.7.2 Operational Phase

There are no likely significant residual hydrological or hydrogeological effects associated with the proposed project during the operational phase based on the location of infrastructure outside of the flood zones, maintenance of the proposed SuDS, use of bunding and interceptor at the substation, no direct discharges, no wastewater discharges and low maintenance traffic requirement.

### 9.7.3 Decommissioning Phase

There are no likely significant residual hydrological or hydrogeological effects associated with the proposed project during the decommissioning phase.

## 9.8 Cumulative Effects

The potential for cumulative effects of the proposed project with other existing and proposed developments in the region has been undertaken. A list of proposed developments reviewed as part of this section are listed in Chapter 4 of this EIAR. The main likelihood of cumulative effects is assessed to be hydrological (surface water quality) rather than hydrogeological (groundwater). Due to the hydrogeological setting of the proposed wind farm site and GCR and the near surface nature of construction activities, cumulative effects with regard groundwater quality or quantity arising from the proposed project with other existing and proposed developments are assessed .

The river subcatchment was selected for the cumulative assessment of hydrology and hydrogeology effects as it represents a conservative zone of Influence beyond which cumulative interactions are not credible for this topic. As listed in Chapter 4, there are a number of relevant applications for renewable energy projects in the region of the proposed wind farm site, as illustrated in Figure 9-10. The footprint of the proposed wind farm site does not overlap with other wind farms and therefore the potential for significant cumulative effects is limited. If construction for these projects overlap or run concurrently with the proposed project, construction related effects would occur (either significant or not significant).

The primary potential for cumulative effects will occur during the construction phase of the proposed project, as this is when earthworks and excavations will be completed. The potential for cumulative effects during the operational phase of the proposed project will be significantly reduced as there will be no exposed excavations, there will be no sources of sediment to reach watercourses, no use of cementitious materials and fuels/oil will be kept to a minimum and bunded at the site. During the decommissioning phase, the potential cumulative effects are similar to the construction phase, but to a lesser degree with less ground disturbance.

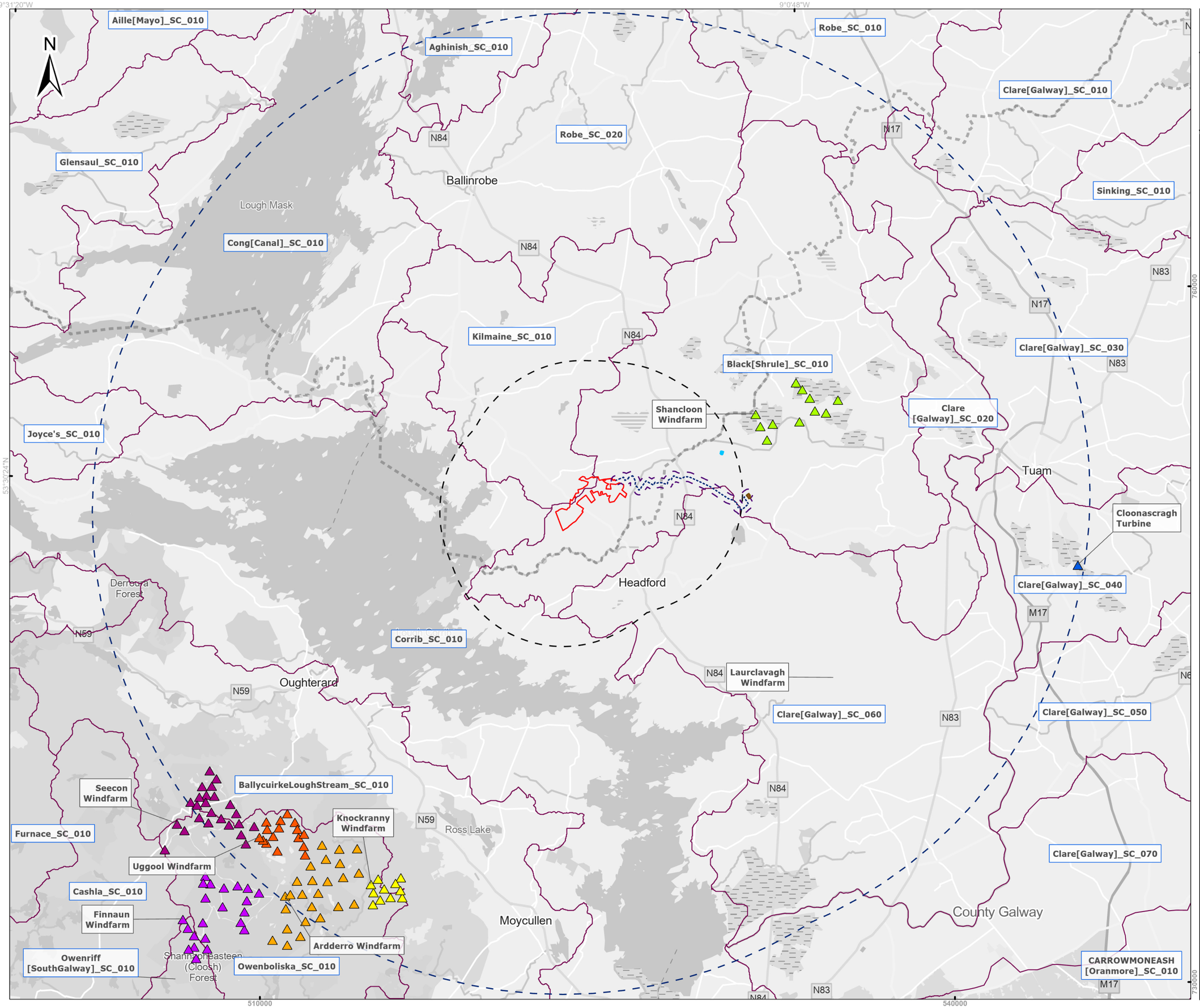
### 9.8.1 Existing Projects

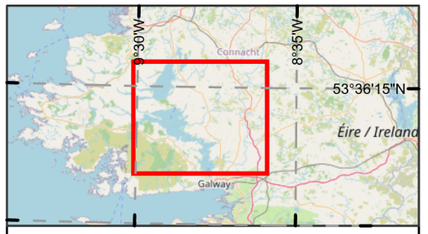
The footprint of the proposed wind farm site does not overlap with other wind farms and no other existing or proposed renewable energy projects, are located within 5 km of the proposed windfarm site and no wind farms within the Black [Shrule] Subcatchment, as illustrated in Figure 9-11.

Carrowoughteragh quarry is located to the north of the proposed windfarm site and has the potential to interact through the local groundwater and surface water environment. However, the potential for significant cumulative effects is considered low. Ground disturbance associated with the quarry is long established and no significant effects have occurred based on planning permission information and ongoing monitoring.

The construction of the wind farm, and access tracks to the quarry, will be temporary and spatially limited, while groundwater encountered during excavations is expected to be confined primarily to shallow groundwater. The quarry represents an established activity within the receiving environment and there is no evidence that the combined groundwater abstraction, dewatering or excavation activities would result in significant changes to regional groundwater levels, groundwater flow patterns or groundwater-dependent receptors. Furthermore, implementation of standard construction-phase control measures, including management of dewatering discharges, sediment controls and pollution prevention measures, will minimise the potential for cumulative impacts on groundwater quality and receiving surface waters. Consequently, any cumulative hydrogeological or hydrological effects arising from the combined operation of the proposed development and the quarry are predicted to be negligible to minor and not significant.

Based on a review of Table 1-5, Chapter 1, there are no existing projects with subcatchments that could result in likely significant cumulative effects.




**Legend**

- Proposed wind farm site boundary
- Wind farm site study area
- 20km Buffer
- GCR 200m Buffer
- WFD - Subcatchments

Infrastructure

- Proposed Grid Connection Route
- Proposed 110kV substation
- 110kV Shancloon Substation

Windfarms within 30km

- Ardderro Windfarm
- Ballykinava/Cuilmore Windfarm
- Cloonascragh Turbine
- Finnaun Windfarm
- Knockranny Windfarm
- Mace Upper Windfarm
- Magheramore/Cregganbrack Windfarm
- Seecon Windfarm
- Shancloon Windfarm
- Uggool Windfarm
- Cunlaghfadda Windfarm

0 2 4
Kilometers

**Spatial Reference**
Datum: IRENET95
EPSG: 2157

**Copyrights:**
Sources: Map data © OpenStreetMap contributors, Microsoft, Esri Community Maps contributors, Map layer by Esri, ©

| Rev | Date | Description | By | Chkd. |
|---|---|---|---|---|
| A | 02/10/2026 | First issue | K.K | J.S |

Client: ROOAUNALAGHTA Green Energy

Project:

Rooaunalaghta Green Energy Project

Title:

# Figure 9-11: Existing and Proposed Energy Developments within 5 km & 20 km of Proposed Wind Farm Site and GCR

Scale @ A3: 1:150,000

| Prepared by: | Checked by: | Date: |
|---|---|---|
| K.Kale | J.Staunton | October 2026 |

TOBIN

Tel: +353-(0)1-8030406
Email: info@tobin.ie
www.tobin.ie

TOBIN Consulting Engineers will not be liable for any use of this document for any purpose other than that for which it was originally prepared and provided. Except where specifically and explicitly agreed in writing by TOBIN Consulting Engineers,as copyright holder, no part of this document may be reproduced or transmitted in any form and this document shall not bereled upon by any third party for any purpose.

Map Ref: 11981-025-WTG-WF..30km-TOB-A

Draft: A

#### *9.8.1.1 Proposed/Granted Projects*

The footprint of the proposed project does not overlap with other wind farms and no other existing or granted renewable energy projects, are located within 5 km of the proposed wind farm site or within the Black river subbasin, as illustrated in Figure 9-11. While the potential for cumulative effects review was undertaken of renewable energy projects within the relevant subcatchment. Only one proposed wind farm is located in the Black [Shrule] River catchment.

**Shancloon Wind Farm Ref. 323699** – This application has been recently refused by ACP (September 2026) however has the potential to be subject to Judicial Review and therefore has still been considered cumulatively. (The development is located ~6.5 km to the northeast of the proposed wind farm site. Shancloon Wind Farm is located 6.5 km upgradient in the Black [Shrule] River catchment. The construction stage in particular is assessing the potential for cumulative effects. The proposed construction is within the same catchment of a water receptor and could result in combined runoff impacts to water quality. All of the wind turbine foundations are located a minimum of 50 m away from any all watercourses and as such it is unlikely that surface water runoff from these installations would enter watercourses based on the proposed surface water management.

The surface hydrological environment of the Proposed Development and its downstream catchments are considered to be of high sensitivity given that the site is hydrologically connected with the Lough Corrib SAC via the Black River. None of turbines are located within 50 m of any watercourse and as such, and given their small-scale nature and detailed mitigation measures, there is no potential for them to act cumulatively with the Proposed Development to cause a significant effect on hydrogeology or hydrology.

**Other Developments**

A number of small scale residential and rural developments are proposed in areas within the 5 km area. The remaining applications relate principally to residential, commercial and agricultural use types. Remaining applications present no likely cumulative hydrology and hydrogeology impacts as they generally involve shallow excavations distant from the wind farm and GCR. A full list of planning applications within the wider area of the proposed project is provided in Appendix 1-5 of this EIAR. No likely significant cumulative effects arise, based on the spatial separation between the projects.

## 9.9 CONCLUSION

The nature of the proposed project dictates that the greatest potential effect on the water environment will be during the construction phase. The construction of the proposed project could result in contamination of groundwater via infiltration to ground, or contamination of surface water via contaminated runoff or spills into the adjacent drainage channels. However, the area which could be potentially impacted by the proposed project will be localised and with the implementation of the mitigation measures during the construction, operational and decommissioning phases, any effects on the water environment will be not significant.

The operational phase of the proposed project will have a not significant adverse long-term effect on the hydrology and hydrogeology environment through the application of identified

mitigation measures and appropriate management throughout the operation phase of the proposed wind farm site.

Taking into consideration the likely effects of the proposed wind farm and GCR/substation on, it is concluded that, following the implementation of design and mitigation measures, it will not compromise progress towards achieving Good Ecological Status/Good Ecological Potential or cause a deterioration of the overall status of the waterbodies and will not compromise the qualifying features of protected areas and is compliant with other relevant Directives. It can therefore be concluded that the proposed wind farm and GCR/substation is fully compliant with the requirements of the Water Framework Directive (2000/60/EC) as amended.

The decommissioning phase of the proposed project will have a not significant adverse long-term effect on the hydrology and hydrogeology environment through the application of identified mitigation measures and appropriate management throughout the decommissioning phase of the proposed wind farm site.

## 9.10 REFERENCES

Construction Industry Research and Information Association (CIRIA), 2001. Control of Water Pollution from Construction Sites – Guidance for Consultants and Contractors, CIRIA C532. ISBN: 978-0-86017-532-2, London.

Construction Industry Research and Information Association (CIRIA), 2016. Groundwater control – design and practice, 2nd Ed, CIRIA C750. ISBN: 978-0-86017-755-5, London.

Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora. Official Journal L206. Available at: https://eur-lex.europa.eu/eli/dir/1992/43/oj, Accessed: 15/04/2026

Department of Housing, Planning and Local Government, 2018. Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment. Available at: https://www.gov.ie/en/publication/53aee9-guidelines-for-planning-authorities-and-an-bord-pleanala-on-carrying/, Accessed 15/04/2026.

Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy. Official Journal L 327. Available at: https://eur-lex.europa.eu/eli/dir/2000/60/oj, Accessed: 15/04/2026

Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration. Official Journal of the European Union L372/19. Available at: https://eur-lex.europa.eu/eli/dir/2006/118/oj, Accessed: 15/04/2026

Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (Text with EEA relevance). Official Journal of the European Union L312/3. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32008L0098, Accessed: 15/04/2026

Directive 2008/105/EC of the European Parliament and of the Council of 16 December 2008 on environmental quality standards in the field of water policy, amending and subsequently repealing Council Directives 82/176/EEC, 83/513/EEC, 84/156/EEC, 84/491/EEC, 86/280/EEC and amending Directive 2000/60/EC of the European Parliament and of the Council. Official Journal of the European Union L348/84. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32008L0105, Accessed: 16/04/2026

Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment (codification) (Text with EEA relevance), 2011. Official Journal of the European Union L26/1. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32011L0092, Accessed: 16/04/2026

Directive (EU) 2020/2184 of the European Parliament and of the Council of 16 December 2020 on the quality of water intended for human consumption (recast) (Text with EEA relevance). Official Journal of the European Union L435/1. Available at: https://eur-lex.europa.eu/eli/dir/2020/2184/oj, Accessed: 16/04/2026

Environmental Protection Agency (EPA), 2022. Guidelines on the Information to be Contained in Environmental Impact Assessment Reports. ISBN 978-1-80009-005-7.

Environmental Protection Agency (EPA), 2003. Advice Notes on Current Practice in the Preparation of Environmental Impact Statements. ISBN 1-84095-117-6.

Environmental Protection Agency (EPA), 2024a. EPA Maps. Available at: https://gis.epa.ie/EPAMaps/Water, Accessed: 16/04/2026

Environmental Protection Agency (EPA), 2024b. Catchments.ie, a collaboration between the Department of Housing, Planning and Local Government, the Environmental Protection Agency, and the Local Authority Waters Programme. Available at: https://www.catchments.ie/, Accessed: 16/04/2026

Environmental Protection Agency (EPA), 2024c. EPA HydroNet. Available at: https://epawebapp.epa.ie/hydronet/#Water%20Levels, Accessed 16/04/2026

European Commission, 2017. Environmental Impact Assessment of Projects, Guidance on the preparation of the Environmental Impact Assessment Report (Directive 2011/92/EU as amended by 2014/52/EU). ISBN 978-92-7974373-3.

The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009. S.I. No. 296/2009. Available at: https://www.irishstatutebook.ie/eli/2009/si/296/made/en/print?q=pearl, Accessed: 15/08/2024. Amended by:

- European Union Environmental Objectives (Freshwater Pearl Mussel) (Amendment) Regulations 2018. S.I. No. 355/2018. Available at: https://www.irishstatutebook.ie/eli/2018/si/355/made/en/print?q=pearl, Accessed: 16/04/2026

European Communities Environmental Objectives (Groundwater) Regulations 2010. S.I. No. 9 of 2010: Available at: https://www.irishstatutebook.ie/eli/2010/si/9/made/en/print?q=9&years=2010, Accessed: 15/08/2024. Amended by:

- European Communities Environmental Objectives (Groundwater) (Amendment) Regulations 2011. S.I. No. 389/2011. Available at: https://www.irishstatutebook.ie/eli/2011/si/389/made/en/print?q=389&years=2011, Accessed: 16/04/2026;
- European Communities Environmental Objectives (Groundwater) (Amendment) Regulations 2012. S.I. No. 149/2012. Available at: https://www.irishstatutebook.ie/eli/2012/si/149/made/en/print?q=149&years=2012, Accessed: 16/04/2026;
- European Union Environmental Objectives (Groundwater) (Amendment) Regulations 2016. S.I. No. 366/2016. Available at: https://www.irishstatutebook.ie/eli/2016/si/366/made/en/print?q=366&years=2016, Accessed: 16/04/2026; and
- European Communities Environmental Objectives (Groundwater) (Amendment) Regulations 2022. S.I. No. 287/2022. Available at: https://www.irishstatutebook.ie/eli/2022/si/287/made/en/print?q=287&years=2022, Accessed: 16/04/2026.

European Communities Environmental Objectives (Surface Waters) Regulations 2009. S.I. No. 272 of 2009. Available at: https://www.irishstatutebook.ie/eli/2009/si/272/made/en/print?q=272&years=2009, Accessed: 16/04/2026.

- European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2012. S.I. No. 327/2012. Available at: https://www.irishstatutebook.ie/eli/2012/si/327/made/en/print?q=327&years=2012, Accessed: 16/04/2026;
- European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2015. S.I. No. 386/2015. Available at: https://www.irishstatutebook.ie/eli/2015/si/386/made/en/print?q=386&years=2015, Accessed: 16/04/2026;
- European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019. S.I. No. 77/2019. Available at: https://www.irishstatutebook.ie/eli/2019/si/77/made/en/print?q=77&years=2019, Accessed: 16/04/2026;
- European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2021. S.I. No. 659/2021. Available at: https://www.irishstatutebook.ie/eli/2021/si/659/made/en/print?q=659&years=2021, Accessed: 16/04/2026;
- European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2022. S.I. No. 288/2022. Available at: https://www.irishstatutebook.ie/eli/2022/si/288/made/en/print?q=288&years=2022, Accessed: 16/04/2026; and
- European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2023, S.I. No. 410/2023. Available at: https://www.irishstatutebook.ie/eli/2023/si/410/made/en/print?q=410&years=2023, Accessed: 16/04/2026.

European Communities (Quality of Salmonid Waters) Regulations, 1988. S.I. No. 293/1988. Available at: https://www.irishstatutebook.ie/eli/1988/si/293/made/en/print?q=293&years=1988, Accessed: 11/09/2026.

European Communities (Water Policy) Regulations 2003. S.I. No. 722/2003. Available at: https://www.irishstatutebook.ie/eli/2003/si/722/made/en/print?q=722&years=2003, Accessed: 11/09/2026. Amended by:

- European Communities (Water Policy) (Amendment) Regulations 2005. S.I. No. 413/2005. Available at: https://www.irishstatutebook.ie/eli/2005/si/413/made/en/print?q=413&years=2005, Accessed: 11/09/2026;
- European Communities (Water Policy) (Amendment) Regulations 2008. S.I. No. 219/2008. Available at: https://www.irishstatutebook.ie/eli/2008/si/219/made/en/print?q=219&years=2008, Accessed: 11/09/2026;
- European Communities (Water Policy) (Amendment) Regulations, 2010. S.I. No. 93/2010. Available at: https://www.irishstatutebook.ie/eli/2010/si/93/made/en/print?q=93&years=2010, Accessed: 11/09/2026;
- European Communities (Water Policy) (Amendment) (No. 2) Regulations, 2010. S.I. No. 326/2010. Available at: https://www.irishstatutebook.ie/eli/2010/si/326/made/en/print?q=326&years=2010, Accessed: 11/09/2026;

- European Union (Water Policy) Regulations 2014. S.I. No. 350/2014. Available at: https://www.irishstatutebook.ie/eli/2014/si/350/made/en/print?q=350&years=2014, Accessed: 11/09/2026; and
- European Union (Water Policy) (Amendment) Regulations 2022. S.I. No. 166/2022. Available at: https://www.irishstatutebook.ie/eli/2022/si/166/made/en/print?q=166&years=2022, Accessed: 11/09/2026.

European Union (Drinking Water) Regulations 2023. S.I. No. 99 of 2023. Available at: https://www.irishstatutebook.ie/eli/2023/si/99/made/en/print?q=99&years=2023, Accessed: 11/09/2026.

Local Government (Water Pollution) Act 1977. Act No. 1/1977. Available at: https://www.irishstatutebook.ie/eli/1977/act/1/enacted/en/html?q=water+pollution, Accessed: 11/09/2026. Amended by:

- Local Government (Water Pollution)(Amendment) Act, 1990. Act No. 21/1990. Available at: https://www.irishstatutebook.ie/eli/1990/act/21/enacted/en/html?q=water+pollution, Accessed: 11/09/2026.

Geological Survey Ireland (GSI), 2024. Geological Survey Ireland Spatial Resources, Department of the Environment, Climate and Communications. Available at: https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228, Accessed: 11/09/2026

Geological Survey Ireland (GSI), 2012. The Geological Heritage of County Galway, An Audit of County Geological Sites in County Galway. GSI Publications. Available at: https://www.gsi.ie/en-ie/Pages/default.aspx, Accessed: 11/09/2026

Geological Survey Ireland (GSI), 2012. The Geological Heritage of County Mayo, An Audit of County Geological Sites in County Mayo. GSI Publications. Available at: https://www.gsi.ie/en-ie/Pages/default.aspx, Accessed: 11/09/2026

Geological Survey Ireland (GSI), 2004. Clare-Corrib GWB: Summary of Initial Characterisation, Draft 1. Groundwater Bodies. Available at: https://www.gsi.ie/en-ie/Pages/default.aspx, Accessed: 11/09/2026.

Government of Ireland, 2018. River Basin Management Plan for Ireland, 2018 – 2021. Prepared by the Department of Housing, Planning and Local Government. Available at: https://www.gov.ie/en/publication/429a79-river-basin-management-plan-2018-2021/, Accessed: 11/09/2026

Government of Ireland, 2024. Water Action Plan 2024, A River Basin Management Plan for Ireland. Prepared by the Department of Housing, Local Government and Heritage. Available at: https://www.gov.ie/en/policy-information/8da54-river-basin-management-plan-2022-2027/, Accessed: 11/09/2026

Met Eireann, 2024. Irish Meteorological Service. Available at: https://www.met.ie/, Accessed: 11/09/2026

National Parks and Wildlife Service (NPWS), 2013. Site Synopsis, Site Name: Cloughmoyne SAC, Side Code: 000479. Available at: https://www.npws.ie/protected-sites/sac/000479, Accessed: 11/09/2026

National Parks and Wildlife Service (NPWS), 2022. Site Synopsis, Site Name: Lough Corrib SAC, Side Code: 000297. Available at: https://www.npws.ie/protected-sites/sac/000297, Accessed: 11/09/2026

National Parks and Wildlife Service (NPWS), 2013. Site Synopsis, Site Name: Shrule Turlough SAC, Side Code: 000525. Available at: https://www.npws.ie/protected-sites/sac/000525, Accessed: 11/09/2026

National Roads Authority (NRA) (2008a). Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes. Available at: https://www.tii.ie/en/technical-services/environment/planning/, Accessed: 11/09/2026.

National Roads Authority (NRA) (2008b). Environmental Impact Assessment of National Road Schemes – A Practical Guide. Available at: https://www.tii.ie/en/technical-services/environment/planning/, Accessed: 11/09/2026

Office of Public Works (OPW), 2024. Floodinfo.ie, Flood Maps. Available at: https://www.floodinfo.ie/, 11/09/2026

Office of Public Works (OPW), 2019. The Flood Risk Management Climate Change Sectoral Adaptation Plan, Prepared under the National Adaption Framework. Available at: https://www.gov.ie/en/publication/97984b-climate-change-and-sectoral-adaptation-plan/#climate-change-and-flooding, Accessed: 11/09/2026.

Office of Public Works (OPW) and Department of the Environment, Heritage and Local Government (DoEHLG) (2009). The Planning System and Flood Risk Management, Guidelines for Local Authorities. Available at: https://www.gov.ie/en/publication/7db50-the-planning-system-and-flood-risk-management-guidelines-for-planning-authorities-nov-09/, Accessed: 11/09/2026

Ordnance Survey Ireland (OSI), 2024. GeoHive Map Viewer. Available at: https://geohive.ie/, Accessed: 11/09/2026

Planning and Development Act, 2000. Act No. 30/2000. Available at: https://www.irishstatutebook.ie/eli/2000/act/30/enacted/en/html?q=planning+and+development, Accessed: 11/09/2026. Amended by:

- Planning and Development (Amendment) Act, 2002. Act No. 32/2002. Available at: https://www.irishstatutebook.ie/eli/2002/act/32/enacted/en/html?q=planning+and+development, Accessed: 11/09/2026;
- Planning and Development (Amendment) Act 2010. Act No. 30/2010. Available at: https://www.irishstatutebook.ie/eli/2010/act/30/enacted/en/html?q=planning+and+development, Accessed: 11/09/2026;
- Planning and Development (Amendment) Act 2015. Act No. 63/2015. Available at: https://www.irishstatutebook.ie/eli/2015/act/63/enacted/en/html?q=planning+and+development, Accessed: 11/09/2026;

- Planning and Development (Amendment) Act 2017. Act No. 20/2017. Available at: https://www.irishstatutebook.ie/eli/2017/act/20/enacted/en/html?q=planning+and+development, Accessed: 11/09/2026;
- Planning and Development (Amendment) Act 2018. Act No. 16/2018. Available at: https://www.irishstatutebook.ie/eli/2018/act/16/enacted/en/html?q=planning+and+development, Accessed: 11/09/2026; and
- Planning and Development (Amendment) Act 2021. Act No. 18/2021. Available at: https://www.irishstatutebook.ie/eli/2021/act/18/enacted/en/html?q=planning+and+development, Accessed: 11/09/2026.

Planning and Development Regulations, 2001. S.I. No. 600/2001. Available at: https://www.irishstatutebook.ie/eli/2001/si/600/made/en/print, Accessed: 11/09/2026.

The Institute of Geologists Ireland (IGI), 2013. Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements. Available at: https://igi.ie/publications/guidelines/, Accessed: 11/09/2026.

Waste Water Discharge (Authorisation) Regulations 2007. S.I. No. 684/2007. Available at: https://www.irishstatutebook.ie/eli/2007/si/684/made/en/print, Accessed: 11/09/2026. Amended by:

- Waste Water Discharge (Authorisation) (Amendment) Regulations 2010. S.I. No. 231/2010. Available at: https://www.irishstatutebook.ie/eli/2010/si/231/made/en/print?q=231&years=2010, Accessed: 11/09/2026;
- Waste Water Discharge (Authorisation) (Environmental Impact Assessment) Regulations 2016. S.I. No. 652/2016. Available at: https://www.irishstatutebook.ie/eli/2016/si/652/made/en/print?q=652&years=2016, Accessed: 11/09/2026;
- European Union (Wastewater Discharge) Regulations 2020. S.I. No. 214/2020. Available at: https://www.irishstatutebook.ie/eli/2020/si/214/made/en/print?q=214&years=2020, Accessed: 11/09/2026