11 HYDROLOGY & HYDROGEOLOGY

11.1 INTRODUCTION

This chapter considers the likely significant effects on the receiving hydrological and hydrogeological environments associated with the construction, operation and decommissioning of the proposed Carrigeen Renewable Energy Development, Co. Roscommon, hereafter referred to as the 'Project' (as described in **Chapter 2: Project Description**).

The impacts caused by the construction, operation and decommissioning phases of the Project are assessed, and mitigation measures are provided where required. The assessment also identifies where hydrological features may constrain the layout of the Project.

11.1.1 Project Description

Permission is being sought by the Applicant for the construction of 11 No. Wind Turbines, Turbine Foundations, Turbine Hardstands, Site Access Roads, a Permanent Met Mast, Onsite Substation, Internal Cabling, Temporary Construction Compounds, Borrow Pit, Permanent Spoil Storage, Grid Connection and all ancillary and associated works.

The Onsite Substation and Grid Connection will connect to the national electricity grid via the existing Flagford 220kV substation. The Grid Connection cabling will be primarily located within the public road corridor. The total length of the proposed 110kV underground cabling route is c.17.5km.

Temporary works will be required to accommodate the delivery of the Wind Turbine components. These temporary works are included as part of this Application and details can be viewed in **Appendix 16.3**.

11.1.2 Key Defined Terms

Table 1.1 in **Section 1.2** of **Chapter 1: Introduction** lists the common Key Defined Terms used through this Environmental Impact Assessment Report (EIAR).

11.1.3 Supplementary Assessments

This chapter of the EIAR is supported by Figures provided in Volume III and the following Appendices provided in Volume IV of this EIAR:

- **Figures: 11.1 to 11.13**

- **Appendix 11.1: Flood Risk & Drainage Assessment**
- **Appendix 11.2: Surface Water Management Plan** (also included as **Management Plan 3** of the Construction Environmental Management Plan (**CEMP**))
- **Appendix 11.3: Water Framework Directive (WFD) Assessment**
- **Appendix 11.4: Consultation Records**

Reference should be made to **Chapter 1: Introduction** for information regarding detailed construction proposals.

Changes to the hydrological / hydrogeological regime may create resultant effects on ecology within hydrological dependent ecosystems. Therefore, this chapter is further supported by:

- **Chapter 6: Biodiversity**
- **Chapter 9: Aquatic Ecology**
- **Chapter 10: Soils and Geology**.

A CEMP is appended to the EIAR in **Appendix 2.1**. This CEMP will be a key construction contract document, which will ensure that all mitigation measures, which are considered necessary to protect the environment, are implemented.

11.1.4 Statement of Authority

This chapter of the EIAR was prepared by McCloy Consulting Ltd.; an independent environmental consultancy specialising in the water environment, with specialist knowledge of hydrological and hydrogeological assessments.

The staff members involved in the preparation of this assessment are as follows:

- Iain Muir MSc (Catchment Hydrology and Management) CEnv MIEnvSc – Associate (Environment) and Chartered Environmentalist experienced in Environmental Impact Assessment (EIA) specialising in the water environment for major infrastructure projects in the UK and Ireland across a 10-year career to date. Latter experience across the last 5 years includes developing expertise in undertaking hydrology and water quality assessments specifically for onshore wind renewable energy development in Northern Ireland and Ireland. Iain is responsible in this project for establishing the Baseline assessment and constraints, undertaking impacts assessments, and preparing the EIA chapter and associated maps and figures; and
- Kyle Somerville BEng (Hons) (Civil Engineering) CEng MIEI – Director and Chartered Engineer with 20 years' experience in the fields of hydrology, surface water management,

and groundwater screening assessments for onshore wind farm developments and other renewable energy and grid infrastructure projects in the UK and Ireland. With a background in surface water management design and on-site supervision, Kyle has overseen environmental assessments and design of surface water management for in excess of thirty onshore wind farm developments in the UK and Ireland, and his knowledge of the scale and nature of the Projects in their implementation allows insight and robust environmental assessment. Kyle is responsible in this project for technical oversight of the assessment.

11.1.5 Scope of Assessment

This report will assess the effects of the Project on hydrology and surface water quality, hydrogeology and groundwater quality. The assessment covers the construction, operational, and decommissioning phases of the Project.

This assessment identifies the hydrological and hydrogeological constraints within lands that fall within the main section of the Project, hereafter referred to as 'the Wind Farm Site', the proposed Grid Connection, and the proposed Turbine Delivery Route (TDR) (**Appendix 16.3**), and assesses the potential effects of the following:

- Existing natural and artificial drainage patterns;
- Water quality of surface water and groundwater;
- Surface and groundwater dependent ecosystems;
- Usage of surface water and groundwater including abstractions;
- Groundwater - surface water interactions; and
- Aquifer systems and their vulnerability.

In order to quantifiably assess the preceding, this report:

- Outlines relevant legislation, policy, and guidance relating to the water environment;
- Summarises consultations provided in response to informal scoping requests;
- Provides baseline information and identifies sensitive receptors;
- Identifies potential likely effects to sensitive receptors;
- Assesses the significance of any adverse effects and resulting impacts based on the magnitude of the impact and the sensitivity of the receptors;
- Discusses management of design evolution and details mitigation measures;
- Provides a residual impact assessment; and
- Discusses the cumulative effects of the Project in conjunction with other proposed and existing developments in the vicinity.

11.2 RELEVANT LEGISLATION AND GUIDANCE

11.2.1 Legislation

This study complies with the EIA Directive (as amended) (as defined in **Chapter 1: Introduction**) which requires Environmental Impact Assessment for certain types of major development before development consent is granted. The EIA Directive as amended is transposed inter alia by the Planning and Development Act 2000 (as amended) and by the Planning and Development Regulations 2001 (as amended).

In addition to this planning legislation, other environmental legislation relevant to hydrological and hydrogeological aspects of the environment were adhered to:

- Planning and Development Acts, 2000 (as amended);
- S.I. No. 477 of 2011 European Communities (Birds and Natural Habitats) 2011 (as amended);
- S.I. No. 99 of 2023 European Union (Drinking Water) Regulations 2023;
- S.I. No. 722 of 2003 European Communities (Water Policy) Regulations 2003 (as amended);
- S.I. No. 272 of 2009: European Communities Environmental Objectives (Surface Waters) Regulations 2009 (as amended);
- S.I. No. 296 of 2009: European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009 (as amended);
- S.I. No. 9 of 2010: European Communities Environmental Objectives (Groundwater) Regulations 2010 (as amended);
- S.I. No. 495 of 2015 European Communities (Assessment and Management of Flood Risks) (Amendment) Regulations 2010 and 2015 (as amended);
- S.I. No. 293 of 1988: European Communities (Quality of Salmonid Waters) Regulations 1988;
- European Union Water Framework Directive (2000/60/EC); and
- European Union Directive 2006/118/EC Groundwater Directive (the "daughter directive") (as amended).

11.2.2 National, Regional and Local Planning Policy

The Project has been reviewed in relation to planning policy specific to the water environment. Statutory national, regional and local planning policy frameworks and associated supplementary guidelines pertinent to this chapter and the Project are outlined below.

11.2.2.1 Relevant National Plans and Programmes

- Project Ireland 2024 – National Planning Framework (NPF)[1]
- National Development Plan (NDP)[2]
- Our Sustainable Future – A Framework for Sustainable Development for Ireland[3]
- Ireland's Environment – An Assessment[4]
- Wind Energy Development Guidelines for Planning Authorities[5]
- Draft Revised Wind Energy Development Guidelines[6]
- Flood mapping and management information developed and published through the National CFRAMS Programme[7]
- The Water Action Plan 2024: A River Basin Management Plan for Ireland[8]
- The Planning System and Flood Risk Management: Guidelines for Planning Authorities[9]
- The Greater Dublin Strategic Drainage Study (GDSDS)[10]

11.2.2.2 Relevant Regional Plans and Programmes

- Strategic Environmental Assessment (SEA) Statement: Regional Spatial and Economic Strategy for the Northern & Western Regional Assembly[11]

11.2.2.3 Relevant Local Plans

The Project is located within the jurisdiction of Roscommon County Council. The relevant local plans applicable to this assessment include:

- Roscommon County Development Plan 2022-2028[12]
- Strategic Environmental Assessment (SEA) Environmental Report for the Roscommon County Development Plan 2022-2028[13]

[1] Department of Housing, Planning and Local Government (2018) Project Ireland 2024 – National Planning Framework (NPF). Accessed 17/04/2025: https://www.npf.ie/
[2] Department of Public Expenditure and Reform (2021) National Development Plan (NDP)
[3] (Department of the Environment, Community and Local Government (2012) Our Sustainable Future – A Framework for Sustainable Development for Ireland. Accessed 17/04/2025: https://greenbusiness.ie/wp-content/uploads/2016/02/Our-Sustainable-Future.pdf
[4] Environmental Protection Agency (2016) Ireland's Environment – An Assessment. Accessed 24/10/2025: https://www.epa.ie/publications/monitoring--assessment/assessment/state-of-the-environment/irelands-environment-2016---an-assessment.php#:~:text=Summary%3A%20Ireland%27s%20Environment%202016%20provides,reported%20on%20in%20more%20detail.
[5] Department of Environment, Heritage and Local Government (2006) Wind Energy Development Guidelines for Planning Authorities
[6] Department of Housing, Planning and Local Government (2019) Draft Revised Wind Energy Development Guidelines
[7] Office of Public Works (2009 to present (March 2025)) National CFRAMS Programme. Accessed 14/01/2026: https://www.floodinfo.ie/
[8] Department of Housing, Local Government and Heritage (2024) The Water Action Plan 2024: A River Basin Management Plan for Ireland. Accessed 14/01/2026: https://www.gov.ie/en/department-of-housing-local-government-and-heritage/policy-information/river-basin-management-plan-2022-2027/
[9] Department of Environment, Heritage and Local Government/Office of Public Works (2009) The Planning System and Flood Risk Management: Guidelines for Planning Authorities. Accessed 14/01/2026: https://www.opr.ie/wp-content/uploads/2019/08/2009-Planning-System-Flood-Risk-Mgmt-1.pdf
[10] Dublin City Council (2005) The Greater Dublin Strategic Drainage Study (GDSDS)
[11] Northern & Western Regional Assembly (2020) Regional Spatial and Economic Strategy 2020-2032. Accessed 14/01/2026: https://www.nwra.ie/pdfs/rses-sea-document.pdf
[12] Roscommon County Council (2022) Roscommon County Development Plan 2022-2028. Accessed 18/09/2025: https://www.rosdevplan.ie/
[13] Roscommon County Council (2022) Strategic Environmental Assessment (SEA) Environmental Report for the Roscommon County Development Plan 2022-2028. Accessed 18/09/2025: https://www.rosdevplan.ie/roscommon-county-development-plan-2022-2028/

- Strategic Flood Risk Assessment (SFRA) for the Roscommon County Development Plan 2022-2028[14]

Policies and objectives pertinent to the water environment set out by Roscommon County Council within the Project Plan include those outlined in:

- Chapter 7: Infrastructure, Transport and Communications (Section 7.8: Water Services; Section 7.9: Surface Water Drainage; and Section 7.10 Flood Risk);
- Chapter 10: Natural Heritage (Section 10.2: Biodiversity; Section 10.3: Natura 2000 Sites; Section 10.5: Natural Heritage Areas; Section 10.8: Peatlands; and Section 10.9 Wetlands); and
- Chapter 12: Development Management Standards (Section 12.13 Storm Water Disposal; and Section 12.14 Flood Risk Protection).

11.2.2.4 Industry Guidelines

The assessment is carried out in accordance with guidance listed below:

- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports[15]
- Department of Environment, Heritage and Local Government (DoHLG) (2018) Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment[16]
- Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters[17]
- Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes[18]
- Department of Agriculture, Food and the Marine (DAFM) (2000) Forest Harvesting and the Environment Guidelines[19]

[14] Roscommon County Council (2022) Strategic Flood Risk Assessment (SFRA) for the Roscommon County Development Plan 2022-2028. Accessed 18/09/2025: https://www.rosdevplan.ie/roscommon-county-development-plan-2022-2028/
[15] Environmental Protection Agency (2022) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports. Accessed 14/01/2026: https://www.epa.ie/publications/monitoring--assessment/assessment/EIAR_Guidelines_2022_Web.pdf
[16] Department of Environment, Heritage and Local Government (DoHLG) (2018) Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment. Accessed 14/01/2026: https://www.gov.ie/en/department-of-housing-local-government-and-heritage/
[17] Inland Fisheries Ireland (2016) Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters. Accessed 21/102025: https://www.fisheriesireland.ie/media/guidelines-on-protection-of-fisheries-during-construction-works-in-and-adjacent-to-waters
[18] National Road Authority (NRA) (2008) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes. Accessed 14/01/2026: https://www.tii.ie/media/llvnszei/guidelines-on-procedures-for-assessment-and-treatment-of-geology-hydrology-and-hydrogeology-for-national-road-schemes.pdf
[19] Department of Agriculture, Food and the Marine (DAFM) (2000) Forest Harvesting and the Environment Guidelines. Accessed 14/01/2026: https://www.gov.ie/en/department-of-agriculture-food-and-the-marine/publications/regulation-forest-health-and-resources/#trees-and-the-law

- Department of Agriculture, Food and the Marine (2000) Forestry and Water Quality Guidelines[20]Good Agricultural and Environmental Condition (GAEC) Standards – GAEC 1: Good agricultural and environmental condition standards for soil and water management[21]
- NatureScot (2019) Guidance - Good Practice During Wind Farm Construction[22]
- Environmental Advice for Planning Practice Guide Wind Farms and Groundwater Impacts: A Guide to EIA and Planning Considerations[23]
- CIRIA C532 - Control of Water Pollution from Construction Sites[24]
- CIRIA C741 - Environmental Good Practice On-Site[25]
- CIRIA C753 - The SuDS Manual[26]
- CIRIA C786 - Culverts, Screen and Outfall Manual[27]
- Construction, Replacement or Alteration of Bridges and Culverts: A Guide to Applying for Consent under Section 50 of the Arterial Drainage Act, 1945[28]
- Planning Guidance on On-Shore Windfarm Developments[29]
- Scottish Environment Protection Agency (SEPA) & Northern Ireland Environment Agency (NIEA) (2000-2023) Guidance for Pollution Prevention (GPP) / Pollution Prevention Guidance (PPG) Series[30]

The guidance noted above relevant in similar adjacent jurisdictions (i.e., Northern Ireland, Scotland, United Kingdom) has been complied with for the purpose of this assessment as there is no equivalent applicable guidance in Ireland. Based on professional judgment and experience, we consider guidance prepared by DAERA, NIEA, SEPA, NatureScot, and DEFRA to represent an appropriate standard of good practice.

[20] Department of Agriculture, Food and the Marine (2000) Forestry and Water Quality Guidelines Accessed 14/01/2026: https://www.gov.ie/en/department-of-agriculture-food-and-the-marine/publications/regulation-forest-health-and-resources/#trees-and-the-law
[21] Department for Environment, Food & Rural Affairs (2012) Good Agricultural and Environmental Condition (GAEC) Standards – GAEC 1: Good agricultural and environmental condition standards for soil and water management. Accessed 14/01/2026: https://www.gov.uk/guidance/standards-of-good-agricultural-and-environmental-condition
[22] NatureScot (2019) Guidance - Good Practice During Wind Farm Construction, Accessed 14/01/2026: https://www.nature.scot/doc/good-practice-during-wind-farm-construction
[23] Department of Agriculture, Environment and Rural Affairs (DAERA) (2019) Environmental Advice for Planning Practice Guide Wind farms and Groundwater Impacts: A Guide to EIA and Planning Considerations. Accessed 14/01/2026: https://www.daera-ni.gov.uk/publications/best-practice-guidance-documents
[24] Construction Industry Research and Information Association (2001) C532 - Control of Water Pollution from Construction Sites
[25] Construction Industry Research and Information Association (2015) C741 - Environmental Good Practice On-Site
[26] Construction Industry Research and Information Association (2015) C753 - The SuDS Manual
[27] Construction Industry Research and Information Association (2019) C786 - Culverts, Screen and Outfall Manual
[28] Office of Public Works (2022) Construction, Replacement or Alteration of Bridges and Culverts: A Guide to Applying for Consent under Section 50 of the Arterial Drainage Act, 1945
[29] Scottish Environment Protection Agency (2017) Planning Guidance on On-Shore Windfarm Developments
[30] Scottish Environment Protection Agency & Northern Ireland Environment Agency (NIEA) (2000-2025) Guidance for Pollution Prevention (GPP) / Pollution Prevention Guidance (PPG) Series. Accessed 14/01/2026: https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/

11.2.2.5 Scoping Responses and Consultation

Information has been provided by a number of consultee organisations during the assessment (**Appendix 11.4**), and this is summarised in **Table 11.1**. The response to each point raised by consultees is also presented within the table, demonstrating where the design of the Project has addressed responses to specific issues indicated by respective consultees.

Table 11.1: Scoping Responses and Consultation

Consultee	Type and Date	Summary of Consultee Response with Relevance to This Chapter	Section where Addressed in this Report
EPA	25/07/2024 (response email)	• Provided links to datasets on licenced activities. • Provided links to datasets on waste, industrial emissions, integrated pollution control and historic waste licensed sites.	11.4.8 and 11.4.11
Inland Fisheries Ireland	16/07/2024 (response email)	• Provided links to water quality monitoring and fisher habitat survey data	11.4.7
Uisce Éireann / Irish Water	23/07/2024 (response email)	• Provided data on their water and sewer networks in the vicinity of the Project.	11.4.19
Roscommon County Council	16/07/2024 & 29/10/2025 (emails issued)	• No response received at time of writing	N/A

11.3 ASSESSMENT METHODOLOGY AND SIGNIFICANCE CRITERIA

11.3.1 Baseline Characterisation

This qualitative and quantitative assessment has been undertaken based on experienced professional judgement and assessment in compliance with statutory and industry guidance, including site visits for verification.

11.3.1.1 Study Area

Potential effects were considered within the Study Area. For purposes of this assessment, the hydrological Study Area includes the river reaches at and downstream from the Project, and the surface water catchments draining the Project as defined by the relevant water management units (refer to **Figure 11.2** and **Figure 11.3**). The hydrogeological Study Area extends to the underlying aquifer catchments (refer to **Figure 11.9** and **Figure 11.10**).

11.3.2 Desk Study

The desktop study involved collation and assessment of relevant information. All web-based data sources were verified as unchanged on 14th January 2026 comparative to the versions used to inform the assessment. The relevant information was obtained from the following sources:

- EPA Water Map Viewer[31]
- EPA HydroNet, Surface Water Levels, Flows and Groundwater Levels[32]
- Catchments Data[33]
- NPWS Designations Viewer[34]
- EPA Maps Designated Sites[35]
- Map of Irish Wetlands[36]
- OPW Flood Risk Management Plan (Shannon Upper & Lower River Basin)[37]
- OPW Flood Plans and Flood Maps[38]
- OPW Arterial Drainage Viewer[39]
- GSI Groundwater Body Descriptions[40]
- Met Éireann Meteorological Data[41]
- National River Basin Management Plan 2022-2027[42]
- Myplan.ie: National Planning Application Map Viewer[43]
- EPA Cycle 3: HA 26B Upper Shannon (Boyle) Catchment Report[44]
- EPA WFD Cycle 2: Catchment Upper Shannon Sub-catchment Breedoge_SC_010[45]
- EPA Cycle 3: HA 26C Upper Shannon Catchment Report[46]
- EPA WFD Cycle 2: Catchment Upper Shannon Sub-catchment Owenur_SC_010[47]
- EPA WFD Cycle 2: Catchment Upper Shannon Sub-catchment Shannon[Upper]_SC_030[48]

[31] Environmental Protection Agency Water Map Viewer. Accessed 14/01/2026: https://gis.epa.ie/EPAMaps/Water
[32] Environmental Protection Agency HydroNet – Surface Water Levels, Flows and Groundwater Levels. Accessed 14/01/2026: http://www.epa.ie/hydronet/#Water%20Levels
[33] Catchments.ie – Catchments Data. Accessed 14/01/2026: https://www.catchments.ie
[34] National Parks and Wildlife Service – Designations Viewer. Accessed 14/01/2026: https://www.npws.ie/maps-and-data
[35] Environmental Protection Agency Maps Designated Sites. Accessed 14/01/2026: https://gis.epa.ie/EPAMaps/
[36] Wetland Surveys Ireland – Map of Irish Wetlands. Accessed 14/01/2026: https://www.wetlandsurveys.ie/miw-intro
[37] Office of Public Works (2018) Flood Risk Management Plan (Barrow River Basin). Accessed 14/01/2026: https://www.floodinfo.ie/publications/?t=22&a=644
[38] Office of Public Works – Flood Plans and Flood Maps. Accessed 14/01/2026: https://www.floodinfo.ie/
[39] Office of Public Works – Arterial Drainage Viewer. Accessed 14/01/2026: https://www.floodinfo.ie/map/drainage_map/
[40] Geological Survey Ireland – Groundwater Body Descriptions. Accessed 14/01/2026: https://www.gsi.ie/en-ie/programmes-and-projects/groundwater/
[41] Met Éireann Meteorological Data. Accessed 14/01/2026: https://www.met.ie/climate/available-data/historical-data
[42] Department of Housing, Planning and Local Government (2024) River Basin Management Plan 2022 – 2027. Accessed: 14/01/2026: https://www.gov.ie/en/department-of-housing-local-government-and-heritage/policy-information/river-basin-management-plan-2022-2027/
[43] Myplan.ie – National Planning Application Map Viewer. Accessed: 14/01/2026: https://myplan.ie/national-planning-application-map-viewer
[44] Environment Protection Agency (2024) WFD Cycle 3: HA 14 Barrow Catchment Report. Accessed: 14/01/2026: https://www.catchments.ie/data/#/catchment/26B?_k=5myg4o
[45] Environment Protection Agency (2019) WFD Cycle 2: Catchment Barrow Sub-catchment Figile_SC_020. Accessed: 14/01/2026: https://www.catchments.ie/data/#/subcatchment/26B/26B_1?_k=0l7tkk
[46] Environment Protection Agency (2024) WFD Cycle 3: HA 26C Upper Shannon Catchment Report. Accessed: 14/01/2026: https://www.catchments.ie/data/#/catchment/26C?_k=yjwa58
[47] Environment Protection Agency (2019) WFD Cycle 2: Catchment Upper Shannon Sub-catchment Owenur_SC_010. Accessed: 14/01/2026: https://www.catchments.ie/data/#/subcatchment/26C/26C_3?_k=mdsps7 https://www.catchments.ie/data/#/subcatchment/07/07_11?_k=udvk97
[48] Environment Protection Agency (2019) WFD Cycle 2: Catchment Upper Shannon Sub-catchment Shannon[Upper]_SC_030. Accessed: 14/01/2026: https://www.catchments.ie/data/#/subcatchment/26C/26C_11?_k=21rvul

- EPA Cycle 3: HA 34 Moy & Killala Bay Catchment Report[49]
- EPA WFD Cycle 2: Catchment Moy & Killala Bay Subcatchment Moy_SC_030[50]
- Local Authority Waters Programme (LAWPRO) Carricknabraher Priority Area for Action[51]
- LAWPRO Killukin/Shannon Priority Area for Action[52]
- LAWPRO Owengarve Charlestown Priority Area for Action[53]
- SEAI Wind Atlas[54]
- DoHLG – EIA Portal[55]

11.3.3 Field Work

Field investigation and hydrological surveys to inform the Baseline hydrological conditions of the Wind Farm Site were undertaken by McCloy Consulting between September 2024 and February 2025 with the purpose of identifying / verifying existing natural and artificial site drainage characteristics and hydrological features, and undertaking surface water quality sampling.

The walkover surveys incorporated the lands within the Wind Farm Site, with particular emphasis on areas affected by proposed Wind Turbine locations and Site Access Road layout and known / mapped watercourses in order to fully assess potential issues with regards to:

- Disruption to watercourses through construction of infrastructure (i.e., roads / hard standing); and
- Likelihood of adverse effects on surface water movement / quality due to construction and operation of the Project.

11.3.4 Evaluation of Likely Effects

This assessment determines the nature, scale, and significance of the likely effects of the Project on the Baseline (current) scenario in accordance with a methodology stated within guidance documents outlined in **Section 11.2.2.4**, namely EPA (2022) and NRA (2008).

[49] Environment Protection Agency (2024) WFD Cycle 3. Accessed: 14/01/2026: https://www.catchments.ie/data/#/catchment/34?_k=phj5cd
[50] Environment Protection Agency (2019) WFD Cycle 2: Catchment Moy & Killala Bay Subcatchment Moy_SC_030. Accessed: 14/01/2026: https://www.catchments.ie/data/#/subcatchment/34/34_18?_k=8h0dl4
[51] Local Authority Waters Programme (2021) Carricknabraher Priority Area for Action. Accessed 14/01/2026: https://www.catchments.ie/wp-content/files/areaforactionreports/AFA0039%20Carricknabraher%20AFA%20Report.pdf
[52] Local Authority Waters Programme (2021) Killukin/Shannon Priority Area for Action. Accessed 14/01/2026: https://www.catchments.ie/wp-content/files/areaforactionreports/AFA0098%20Killukin%20Shannon%20AFA%20Report.pdf
[53] Local Authority Waters Programme (2021) Killukin/Shannon Priority Area for Action. Accessed 14/01/2026: https://www.catchments.ie/wp-content/files/areaforactionreports/AFA0145%20Owengarve%20Charlestown%20AFA%20Report.pdf
[54] Sustainable Energy Authority of Ireland – Wind Atlas. Accessed: 14/01/2026: https://maps.seai.ie/apps/WindAtlas/
[55] Department of Housing, Planning and Local Government – EIA Portal. Accessed: 14/01/2026: https://housinggovie.maps.arcgis.com/apps/webappviewer/index.html?id=d7d5a3d48f104ecbb206e7e5f84b71f1

The likely effect significance is defined by the combination of the sensitivity of the receptor and the magnitude of the effect. Following this, an overall effect significance is determined by considering the potential effect significance and the likelihood of the effect occurring.

11.3.4.1 Sensitivity

Sensitivity is defined as the potential for a receptor to be significantly affected by a proposed development (EPA, 2022). The EPA provides guidance on the assessment methodology, including defining general descriptive terms in relation to magnitude of impacts however, in terms of qualifying significance of the receiving environment the EPA guidance also states that:

"As surface water and groundwater are part of a constantly moving hydrological cycle, any assessment of significance will require evaluation beyond the Project Site boundary." (EPA, 2015).

To facilitate the qualification of hydrological and hydrogeological attributes, guidance specific to hydrology and hydrogeology as set out by National Roads Authority (NRA) 2008, has been used in conjunction with EPA guidance. The following **Table 11.2** presents rated categories and criteria for rating the sensitivity of Site attributes (NRA, 2008).

The scale and sensitivity of the receiving environment (receptor) has been categorised on a scale of "Extremely High" to "Low". The sensitivity criteria used for this assessment presented in Table 11.2 are based on:

- Vulnerability of a receptor to a particular pressure (degree of environmental response to any particular effect); and
- The importance or 'value' of the receptor (e.g., an area of international importance) should be considered more sensitive to potential effects than an area of little or no conservation value.

Table 11.2: Criteria for Rating Sensitivity of Attributes

Importance	Criteria	Typical Examples
Extremely High	Attribute has a high quality or value on an international scale	• River, wetland or surface water body ecosystem protected by international / EU legislation e.g. 'European Sites' designated under the Natural Habitats Regulations, the Birds Directive or 'Salmonid waters' designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988 • Groundwater supports river, wetland or surface water body ecosystem protected by EU legislation e.g. SAC or SPA status
Very High	Attribute has a high quality, significance or value on a regional or national scale	• 'High' overall WFD status • River, wetland or surface water body ecosystem protected by national legislation – NHA status

Importance	Criteria	Typical Examples
		• Quality Class A (Biotic Index Q4, Q5) • Flood plain protecting more than 50 residential or commercial properties from flooding • Nationally important amenity Site for wide range of leisure activities • Regionally Important Aquifer with multiple wellfields Groundwater supports river, wetland or surface water body ecosystem protected by national legislation – NHA status • Regionally important potable water source supplying >2500 homes • Inner source protection area for regionally important water source
High	Attribute has a high quality, significance or value on a local scale	• 'Good' overall WFD status • Salmon fishery • River, wetland or surface water body ecosystem proposed for protection by national legislation – pNHA • Quality Class B (Biotic Index Q3-4) • Flood plain protecting between 5 and 50 residential or commercial properties from flooding • Locally important amenity Site for wide range of leisure activities • Regionally Important Aquifer • Groundwater provides large proportion of baseflow to local rivers • Locally important potable water source supplying >1000 homes • Outer source protection area for regionally important water source • Inner source protection area for locally important water source • Well drained and/or high fertility soils
Medium	Attribute has a medium quality, significance or value on a local scale	• 'Moderate' overall WFD status • Coarse fishery • Quality Class C (Biotic Index Q3, Q2- 3) • Flood plain protecting between 1 and 5 residential or commercial properties from flooding • Locally Important Aquifer • Local potable water source supplying >50 homes • Outer source protection area for locally important water source • Moderately drained and/or moderate fertility soils
Low	Attribute has a low quality, significance or value on a local scale	• 'Poor / Bad' overall WFD status • Locally important amenity Site for small range of leisure activities • Quality Class D (Biotic Index Q2, Q1) • Flood plain protecting 1 residential or commercial property from flooding • Amenity Site used by small numbers of local people • Poor bedrock aquifer • Local potable water source supplying <50 homes • Poorly drained and/or low fertility soils

11.3.4.2 Magnitude

In terms of hydrology and hydrogeology, magnitude is qualified in line with relevant guidance, as presented in the following tables (NRA, 2008). The magnitude of change /

effect is influenced by the timing, scale, size, and duration of the effect; magnitude has been categorised on a scale of "Large Adverse" to "Large Beneficial"; defined in **Table 11.3**.

Magnitude of impact criteria include criteria as set out in Box 5.2 of the NRA guidance (2008) but provides additional criteria / examples to better allow assignation of magnitude of potential impacts. Additional examples have been developed through practice experience specific to onshore windfarm development in Ireland and elsewhere and are routinely accepted in practice.

Table 11.3: Qualifying the Magnitude of Effect on Hydrological Attributes

Magnitude of Impact	Description	Examples
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 / species • Increase in predicted peak flood level >100mm • Extensive loss of fishery (commercial and / or angling) • Extensive reduction in amenity value / utility function • Potential high risk of pollution to surface water changing water quality status • Loss of local water supply or change in quality with respect to drinking water standards (DWS) • Significant and permanent change over large scale i.e. Large changes in erosion and deposition regimes
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	• Increase in predicted peak flood level >50mm • Partial loss of fishery (commercial and / or angling) • Partial reduction in amenity value / utility function • Potential medium risk of pollution to surface water, changing water quality status • Temporary loss of local water supply or minor change in quality of supply with respect to drinking water standards • Detectable change to river morphology / fluvial geomorphology over a small scale i.e. some changes in erosion and deposition regimes
Small Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	• Increase in predicted peak flood level >10mm • Minor loss of fishery (commercial and / or angling) • Slight reduction in amenity value / utility function • Minor deterioration in water quality unlikely to affect the most sensitive receptor or insignificant change in water quality conditions not exceeding those expected due to naturally occurring fluctuations • No change in pressure or flow to local water supply or minor change in quality of supply with respect to drinking water standards • Minor change to river morphology / fluvial geomorphology
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	• No perceptible changes to baseline conditions. No measurable change in water quality. No change in the water feature's capacity to dilute pollutants and waste products • Negligible change in predicted peak flood level • Negligible reduction in amenity value / utility function • No measurable change to a surface water dependent ecosystem or fishery (commercial and / or angling)

Magnitude of Impact	Description	Examples
		• Unquantifiable or unqualifiable change to river morphology / fluvial geomorphology
Small Beneficial	Results in minor improvement of attribute quality	• Reduction in predicted peak flood level >10mm • Minor improvement over baseline water quality conditions • Partial improvement to sediment processes at the reach scale, including reduction in siltation and localised recovery of sediment transport processes • Partial improvements including enhancements to in-channel habitat, riparian zone and morphological diversity of the bed and / or banks • Slight improvement on baseline conditions with potential to improve flow processes at the reach scale
Moderate Beneficial	Results in moderate improvement of attribute quality	• Reduction in predicted peak flood level >50mm • Moderate improvement over baseline water quality conditions • Reduction in siltation and recovery of sediment transport processes at the reach or multiple reach scale • Partial creation of both in-channel and vegetated riparian habitat. Improvement in morphological diversity of the bed and / or banks at the reach or multiple reach scale. Includes partial or complete removal of structures and/or artificial materials • Notable improvements on baseline conditions and recovery of fluvial processes at the reach or multiple reach scale
Large Beneficial	Results in major improvement of attribute quality	• Reduction in predicted peak flood level >100mm • Major improvement over baseline water quality conditions • Improvement to sediment processes at the catchment scale, including recovery of sediment supply and transport processes • Extensive creation of both in-channel habitat and riparian zone. Morphological diversity of the bed and/ or banks is restored, such as natural planform, varied natural cross-sectional profiles, recovery of fluvial features (e.g. cascades, pools, riffles, bars) expected for river type. Removal of modifications, structures, and artificial materials • Substantial improvement on baseline conditions at catchment scale. Recovery of flow and sediment regime

Table 11.4: Qualifying the Magnitude of Effect on Hydrogeological Attributes

Magnitude of Impact	Description	Example
Large Adverse	Results in loss of attribute and /or quality and integrity of attribute	• Removal of large proportion of aquifer • Changes to aquifer or unsaturated zone resulting in extensive change to existing water supply springs and wells, river baseflow or ecosystems • Potential high risk to groundwater from polluted 9e.g., construction phase) run-off
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	• Removal of moderate proportion of aquifer • Changes to aquifer or unsaturated zone resulting in moderate change to existing water supply springs and wells, river baseflow or ecosystems

Magnitude of Impact	Description	Example
		• Potential medium risk to groundwater from polluted (e.g., construction phase) run-off
Small Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	• Removal of small proportion of aquifer • Changes to aquifer or unsaturated zone resulting in minor change to water supply springs and wells, river baseflow or ecosystems • Potential low risk to groundwater from polluted (e.g., construction phase) run-off
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 • No measurable change in groundwater levels, groundwater flow regime, groundwater quality with regards to drinking water supplies. No change to an aquifer.

The significance of a potential effect on the water feature is a product of the sensitivity of the water feature and the magnitude of the potential effect. Values can range from 'High' to 'Negligible' ('Imperceptible' to 'Profound') and effects may be considered 'Adverse' or 'Beneficial' depending on the sensitivity of the attribute and the magnitude of effect associated with the proposed development.

11.3.4.3 Significance Criteria

Considering the above definitions and rating structures associated with sensitivity, attribute importance, and magnitude of potential impacts, rating of significant environmental impacts is carried out in accordance with relevant guidance as presented in the **Table 11.5** below (NRA, 2008).

The magnitude of effect and receptor sensitivity are combined to evaluate and qualify if an effect is of profound, significant, moderate, slight, or imperceptible as outlined in **Table 11.5** below.

Table 11.5: Weighted Rating of Significant Environmental Effects

Sensitivity (Importance of Attribute)	Magnitude of Impact			
	Negligible (Imperceptible)	Small Adverse (Slight)	Moderate Adverse (Moderate)	Large Adverse (Significant to Profound)
Extremely High	Imperceptible	Significant	Profound	Profound
Very High	Imperceptible	Significant / Moderate	Profound / Significant	Profound
High	Imperceptible	Moderate / Slight	Significant / Moderate	Profound / Significant
Medium	Imperceptible	Slight	Moderate	Significant
Low	Imperceptible	Imperceptible	Slight	Slight / Moderate

The significance of potential effects arising as a product of the Project are defined in accordance with the criteria provided by the EPA, as presented in**Table 11.6** (EPA, 2022).

Table 11.6: Describing the Significance of Effects

Magnitude of Impact	Description
Imperceptible	An effect capable of measurement but without noticeable consequences
Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities
Moderate	An effect that alters the character of the environment in a manner consistent with existing and emerging baseline trends
Significant	An effect, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment
Profound	An effect which obliterates sensitive characteristics

11.3.4.4 Likelihood of Occurrence Criteria

The likelihood of the potential effects occurring is assessed based on historical data, quantitative analysis and professional judgement based on relevant experience as shown in **Table 11.7**.

Table 11.7: Evaluation of Likelihood of Occurrence

Likelihood of Occurrence	Criteria
Certain	Likely consequential effect in medium term and inevitable in long term (within the life of the Project).
Likely	Possible consequential effect in the short to medium term and / or likely but not inevitable in the long term.
Unlikely	Unlikely that any consequential effect would arise within the lifetime of the Project.
Rare	It is unlikely that any consequence would ever arise.

11.3.4.5 Determination of Overall Effect Significance

Potential impact significance (**Table 11.5**) and likelihood of occurrence (**Table 11.7**) are combined to determine an 'overall effect significance' as shown in the matrix in **Table 11.8**.

Table 11.8: Evaluation of Overall Effect Significance

Potential Significance	Likelihood of Occurrence			
	Rare	**Unlikely**	**Likely**	**Certain**
Profound / Significant	Minor	Moderate	**Major**	**Major**
Moderate	Minor	Minor	**Moderate**	**Major**
Slight	Not Significant	Minor	Minor	**Moderate**
Imperceptible	Not Significant	Not Significant	Minor	**Moderate**

In accordance with EPA EIAR Guidelines (2022), significance is determined by a combination of scientific and subjective concerns. This requires professional judgement of competent experts which can lead to differences in opinion where assessment is, to an extent, of a subjective nature. EIAR lays out the varying degrees of significance attributed to differing factors to provide clarity to the determination of effects.

Effects likely or certain to occur, and predicted to be of major or moderate significance, are considered to be 'significant' in accordance with the EPA Guidance 2022 and are highlighted in bold on the above table.

11.4 BASELINE DESCRIPTION

11.4.1 Introduction

Permission is being sought by the Applicant for the construction of 11 No. Wind Turbines, Turbine Foundations, Turbine Hardstands, Site Access Roads, a Permanent Met Mast, Onsite Substation, Internal Cabling, Temporary Construction Compounds, Borrow Pit, Permanent Spoil Storage, Grid Connection and all ancillary and associated works. Further details are provided in **Chapter 2: Project Description**.

For the purposes of this assessment, the main body of the Project where Wind Turbines, Turbine Foundations, Turbine Hardstands, Site Access Roads, Onsite Substation etc. are proposed is referred to as the 'Wind Farm Site' (refer to **section 11.1.5**).

The Onsite Substation and Grid Connection will connect to the national electricity grid via the existing Flagford 220kV substation. The Grid Connection cabling will be primarily located within the public road corridor. The total length of the proposed 110kV underground cabling route is c.17.5km. The proposed Grid Connection is discussed and assessed separately from the Wind Farm Site in the following sections.

The Project is located within the 'EIAR Boundary' as shown in **Figure 1.1**, which along with the 'Study Area' as described in **Section 11.3.1.1**, forms the spatial extent of this assessment.

Works associated with the preferred TDR are required at locations both within and outside of the EIAR Boundary. Therefore, baseline conditions relevant to the assessment of the TDR within the EIAR Boundary are per those described for the Wind Farm Site in the following sections.

Other areas of temporary works along the TDR between Galway Port and the Wind Farm Site outside of the EIAR Boundary have been screened with regards to potential significant effects on the surface and groundwater environment. Due to the scale and nature of the works (i.e., temporary road widening, construction of temporary load-bearing areas), no likely significant effects to the groundwater environment are anticipated. Works required in or near surface water bodies have the potential to adversely affect water quality and hydrology; therefore, surface water environmental baseline conditions at the relevant locations (as per **Appendix 16.3**) are provided within the following sections.

11.4.2 Site Description

The 'EIAR Boundary', as shown in **Figure 1.1**, has a total area of 10.4km^2 (c.1,040ha). It extends from c. 1.6km east of Frenchpark to c. 3.5km south-west of Carrick-On-Shannon. The EIAR Boundary predominantly covers an area of agricultural, peatland and commercial forested landscape, between Frenchpark and Elphin, in Co. Roscommon.

11.4.3 Topography

Maximum ground levels within the Wind Farm Site are on lands in the vicinity of proposed turbine T11 (c. 79m OD). The lowest ground levels are in the vicinity the proposed access into the Wind Farm Site from the north (L1217) (c. 65m OD) (refer to **Figure 11.1**).

11.4.4 Land Cover and Soils

The Wind Farm Site principal land use in the general area consists of agricultural pasture grazing land, peat harvesting and commercial forestry.

Superficial soils present within Wind Farm Site largely consists of cut-over raised peat, overlying sands and gravels, boulder clay (glacial till), or weathered rock. The superficial soils along the Grid Connection are predominantly boulder clay (glacial till) with short stretches of raised peat (refer to **Figures A2 and A2-1** of **Chapter 10: Soils and Geology**). Further information on land cover and species present within the Wind Farm Site is provided in detail within **Chapter 6: Biodiversity**. Further information on soils is provided in **Chapter 10: Soils and Geology**.

11.4.5 Meteorological Data Summary

Rainfall data from the Mount Dillon climate station (approx. 22km south-east from the Project) records a long-term average rainfall total of 1044.2mm during the 1981 – 2010 climatic period.

11.4.6 Hydrology

11.4.6.1 Surface Water Bodies / Catchments

Environmental Protection Agency (EPA) WFD dataset boundaries show that the Wind Farm Site lies within the Breedoge_SC_010 WFD river sub-catchment. The Grid Connection passes through the Breedoge_SC_010, Owenur_SC_010, and Shannon [Upper]_SC_030 WFD river sub-catchments (refer to **Figure 11.2**).

The TDR was assessed with respect to proposed works that could have an effect on the surface water environment. Using OSI and EPA information, one location was identified where road widening works are proposed at the N17 / N5 Roundabout, Charlestown (Location Ref: 3.11 as per **Appendix 16.3**) in the vicinity of surface water features. The proposed widening works are located within the Moy_SC_030 sub-catchment.

For the purposes of WFD classification and assessment, river sub-catchments are further delineated into river 'sub-basins'. The Wind Farm Site is located across three sub-basins; Carricknabraher_020 (IE_SH_26C020200) to the west, Breedoge_010 (IE_SH_26B090300) in the central section, and Mantua_010 (IE_SH_26M010200) to the east (refer to **Figure 11.3**).

The Grid Connection is located within the Mantua_010, Kinard_010 (IE_SH_26K070500), and Killukin_020 (IE_SH_26K020700) river sub-basins (refer to **Figure 11.3**). The river sub-basin within which the TDR widening works are proposed is the Charlestown Stream_010.

11.4.6.2 EPA Watercourses

Watercourses identified by EPA mapping within the EIAR Boundary are outlined in

Table 11.9 and shown on **Figure 11.4**.

Table 11.9: EPA Watercourses

Internal Ref & EPA Name / Code	River Sub-Catchment	River Sub-Basin	EPA Code	EPA Segment Code	Stream Order	Section of the Project
Ref 1: Unnamed Watercourse (IE_SH_26C020200)	Breedoge_SC_010	Carrick nabraher_020	-	26_2861	1	Wind Farm Site
Ref 2: Carricknabraher (IE_SH_26C020200)	Breedoge_SC_010	Carrick nabraher_020	26C02	26_13437	3	Wind Farm Site
Ref 3: Owennaforeesha (IE_SH_26B090300)	Breedoge_SC_010	Breedoge_010	26O04	26_1227	3	Wind Farm Site

Internal Ref & EPA Name / Code	River Sub-Catchment	River Sub-Basin	EPA Code	EPA Segment Code	Stream Order	Section of the Project
Ref 4: Unnamed Watercourse (IE_SH_26B090300)	Breedoge_SC_010	Breedoge_010	-	26_2614	2	Wind Farm Site
Ref 5: Breedoge (IE_SH_26B090300)	Breedoge_SC_010	Breedoge_010	26B09	26_4100	4	Grid Connection
Ref 6: Mantua (IE_SH_26B090300)	Breedoge_SC_010	Breedoge_010	26M01	26_1338	3	Wind Farm Site
Ref 7: Edenan and Kinclare (IE_SH_26B090300)	Breedoge_SC_010	Breedoge_010	26E18	26_2153	1	Grid Connection
Ref 8: Mantua (IE_SH_26M010200)	Breedoge_SC_010	Mantua_010	26M01	26_3671	1	Grid Connection
Ref 9: Kinard 26 (IE_SH_26K070500)	Owenur_SC_010	Kinard_010	26K07	26_2162	2	Grid Connection
Ref 10: Unnamed Watercourse (IE_SH_26K020700)	Shannon [Upper] SC_030	Killukin_020	-	26_1115	1	Grid Connection
Ref 11: Killukin (IE_SH_26K020700)	Shannon [Upper] SC_030	Killukin_020	26K02	26_1193	2	Grid Connection
Ref 12: Drumlion (IE_SH_26K020700)	Shannon [Upper] SC_030	Killukin_020	26D27	26_2794	1	Grid Connection
Ref 13: Killukin (IE_SH_26K020700)	Shannon [Upper] SC_030	Killukin_020	26K02	26_1497	2	Grid Connection

As noted above, the TDR was assessed against OSI and EPA mapping to establish the presence of watercourses / waterbodies in the vicinity of the proposed works that could affect water quality and hydrology.

A non-WFD classified tributary of the Mullaghanoe River (within the Charlestown Stream_010 river sub-basin) is located immediately north of the proposed road widening works at the N17 / N5 Roundabout, Charlestown. The tributary discharges to the Mullaghanoe River approximately 450 m downstream which is classified 'Good' status under the WFD.

No other watercourses / waterbodies were identified in the vicinity of proposed widening works along the TDR. Works proposed within the Terryland_010 river sub-basin (construction of a temporary load-bearing area) are located in Galway town at the R336 / L5034 Junction and are remote from any watercourses (Location Ref: 3.6 as per **Appendix 16.3**). Similarly, the works within the Boyle_010 river sub-basin (construction of a temporary access road) are located within agricultural lands (Location Ref: 3.13 as per **Appendix**

16.3). Water features in the immediate area are limited to discrete agricultural drainage ditches.

11.4.6.3 Wind Farm Site Drainage

Field survey observations indicate that the hydrology at the Wind Farm Site drains to natural source watercourses, headwaters of minor drains, agricultural and forestry drainage, peat drainage, ephemeral drainage features, and artificial trackside drains.

At the Wind Farm Site, all water features ultimately drain to the Carricknabraher, Owennaforeesha, and Mantua Rivers. The hydrological regime of the Wind Farm Site as determined by desktop studies and site walkovers are shown on **Figure 11.5**.

11.4.6.4 Wind Farm Site Watercourse Classification

The significance and sensitivity of water features on the site and the associated degree of protection subsequently deemed necessary is primarily dependent on:

- Environmental designations on the water feature or downstream environment.
- Fisheries or ecological potential in the water feature or in the downstream environment.
- Water feature morphology (natural substrate or artificial channel, soil / ground type);
- Water feature size, capacity to convey water and hydrological potential (flows) – proportionate to the size of the catchment drained by the water feature;
- Nature and topography of the surrounding land, i.e. wet, poorly drained soils and steep slopes (>10°) would require greater protection; and
- Sensitivity of the water feature to particular types of pollution, i.e. silts / nutrient enrichment / chemical pollution.

These attributes are established in the wider hydrological assessment.

The classification of watercourses to establish their hydraulic / hydrological and environmental significance has been determined via a combination of desktop assessments and site surveys (surveys undertaken between September 2024 and February 2025 (refer to **Section 11.3.3**)), with all channels subject to catchment and flow analysis by geographic information system (GIS) flow-raster accumulation analysis.

"***Major watercourses***" are largely as per OSI close scale vector mapping and were subject to ground truthing within the Wind Farm Site and are where the catchment draining to the

watercourse >0.25 km^2. The Carricknabraher, Owennaforeesha, and Mantua Rivers are examples of major watercourses in the vicinity of the Project as shown on the following

Plate 11.1 – 11.3.

Plate 11.1: Major Watercourse (Carricknabraher River)

Location	Carricknabraher River
Grid Ref.	
575216, 790226	

Plate 11.2: Major Watercourse (Owennaforeesha River)

Location	Owennaforeesha River
Grid Ref.	
575974, 789454	

Plate 11.3: Major Watercourse (Mantua River)

Location	Mantua River
Grid Ref.	
580047, 790056	

"Minor watercourses" represent tributary channels within the Wind Farm Site where the contributing catchment area was less than 0.25km^2 but where a baseflow is observed. Minor watercourses are the sources / upper reaches of the more identifiable downstream channels and appear as agricultural and forestry drainage ditches.

Plate 11.4: Minor Watercourse (Tributary of Carricknabraher River)

Location	Tributary of Carricknabraher River Draining East of Wind Farm Site
Grid Ref.	
575227, 790208	

Plate 11.5: Minor Watercourse (Tributary of Mantua River)

Location	Tributary of Mantua River Draining West of Wind Farm Site
Grid Ref.	
581079, 790552	

All "***other"*** drainage features (mapped or otherwise) comprising; dry or partially dry peat drains, agricultural ditches, forestry drainage, ephemeral drains, dry track drainage, grips or similar, are not sensitive or significant in the context of development hydrology and habitat potential due to their limited capacity to support water dependent habitats, and their limited capacity or potential to convey water.

Major watercourses, minor watercourses, and other drainage identified within the Wind Farm Site are shown at **Figure 11.5** and drainage management drawings shown at **Appendix 11.2** (also included as **Management Plan 3** of the **CEMP**).

11.4.7 Surface Water Quality

The following section is intended to provide a qualitative appraisal of existing surface water quality of those catchments within which the Project is located.

Following the publication of the European Communities (Water Policy) Regulations 2003 (as amended), waterbodies are given a classification based on annual average / percentile results from several individual monitoring stations.

The WFD classification is a combination of chemical, biological and hydromorphological elements; whereby, the overall status is the lowest of the combined constituents. The EPA also use the current water quality and trends to highlight waterbodies that are 'At Risk' of failing to meet their WFD objectives. Further details are provided in **Appendix 11.3**.

11.4.7.1 River Water Bodies / Water Framework Directive Status

The current / latest WFD status published by the EPA (2019-2024) of the receiving river waterbodies identified is summarised in the table below and shown on **Figure 11.6.**

Table 11.10: Summary of River Water Body Status

River Waterbody	2013 – 2018 Status	2016 – 2021 Status	2019 – 2024 Status	Objective	Risk Status	High Status (Blue Dot) Objective
Carricknabraher_020 (IE_SH_26C020200)	Poor	Poor	Poor	Good	At Risk	No
Breedoge_010 (IE_SH_26B090300)	Poor	Good	Good	Good	Not at Risk	No
Mantua_010 (IE_SH_26M010200)	Poor	Moderate	Moderate	Good	Review	No
Kinard_010 (IE_SH_26K070500)	Good	Good	Good	Good	Not at Risk	No
Killukin_020 (IE_SH_26K020700)	Moderate	Moderate	Moderate	Good	At Risk	No
Charlestown Stream_010 (IE_WE_34C280100)	Moderate	Moderate	Good	Good	At Risk	No

The WFD classification data available from Catchments.ie indicates the Carricknabraher_020, Mantua_010, and Killukin_020 river sub-basins have been assigned a status less than 'Good' due to ecological / biological (invertebrate) elements of the WFD classification.

Further information on the pre-existing pressures contributing to current WFD status is provided in **Section 11.4.7.2**.

11.4.7.2 Significant Pressures – Rivers

The EPA use current water quality data and trends to highlight waterbodies that are 'At Risk' of failing to meet their WFD objectives by 2027. The Water Action Plan 2024: A River Basin Management Plan for Ireland and the 'Cycle 3' WFD Reports (May 2024) (refer to **Section 11.3.2**) include summaries of local pressures within the catchments that present a risk to waterbodies meeting their WFD objectives.

The 'Sub-Catchment Assessments' (2019) relevant to the Project (refer to **Section 11.3.2**) also provide further background and evaluation of priority issues within the respective sub-catchments.

Review of the documents relevant to the Project found the significant pressures for the Carricknabraher_020 river sub-basin to be morphological (hydromorphology) and organic (peat) in nature.

The Carricknabraher_020 is located within the 'Carricknabraher Area for Action' (area for restoration). Regarding hydromorphology, the associated the 'Carricknabraher Priority Area for Action (PAA)' report (LAWPRO, 2021) (refer to **Section 11.3.2**) notes that nearly all river channels in the Carricknabraher PAA are part of the Boyle Arterial Drainage Scheme (ADS). This has led to the deepening and straightening of most of the river channels in the PAA, altering their natural flow and sediment regimes, as well as habitats due to these morphological changes. Regarding peat, the PAA report notes that degraded peatlands, and the drainage channels associated with them, often leads to the loss of sediment and nutrients to receiving surface waters. The PAA report notes that in the case of activities impacting on water quality, LAWPRO will work with the relevant organisations and authorities to address the issues.

The Matua_010, also within the Carricknabraher PAA, is currently categorised as 'Review' pending the outcome of local catchment assessments to determine whether it is 'At Risk' of failing to meet its future WFD objectives by 2027. No further information is currently available from the EPA on the status of the review.

With regards to the Grid Connection, significant pressures in the Killukin_020 river sub-basin (located in the Killukin Shannon area for restoration) are noted to be sediment (Domestic Wastewater Treatments Systems (DWTS)) and nutrients (agriculture). The 'Killukin/Shannon Priority Area for Action' report (LAWPRO, 2021) notes that further work is being undertaken to identify areas with highest impact i.e., water quality sampling to better understand nutrient levels in the catchment rivers.

With regards to the TDR, significant pressures in the Charlestown Stream_010 river sub-basin (located in the Owengarve Charlestown area for restoration) are noted to be hydrological and morphological (relating to the Moy ADS), and agriculture (nutrients). The 'Owengarve Charlestown Priority Area for Action' report (LAWPRO, 2021) notes that further

work is being undertaken to focus on agricultural related impacts on the Charlestown Stream_010 as well as potential impacts from ongoing arterial drainage maintenance. WFD compliance is specifically addressed further in **Appendix 11.3**.

11.4.7.3 Pollution Impact Potential

EPA online mapping provides datasets of Pollution Impact Potential (PIP) for nitrate and phosphorous: 'PIP-N' and 'PIP-P', respectively, and datasets indicating where agricultural measures are needed to restore water quality.

Within all river sub-basins associated with the Wind Farm Site, agriculture is not identified as a significant pressure and extant measures to protect water quality are appropriate. The Grid Connection passes though the Killukin_020 river sub-basin where measures to 'target phosphorus / sediment losses' are required.

Widening works associated with the TDR are required in the vicinity of a watercourse within the Charlestown_010 river sub-basin where measures to 'target phosphorus / sediment losses' are required.

11.4.7.4 Project Specific Surface Water Quality Assessment

In addition to a review of surface water quality data held by statutory bodies, independent water quality monitoring has been undertaken as part of this assessment to provide baseline water quality standards of water features draining the Wind Farm Site prior to any development.

Sampling was carried out by McCloy Consulting on the 19th February 2025. The Baseline assessment collected and assessed 4 no. representative surface water samples from watercourses draining the Wind Farm Site for a range of physico-chemical parameters. Monitoring locations are shown on **Figure 11.7**.

Water quality results were assessed for compliance against key parameter limits outlined in the Water Framework Directive (2000/60/EC), transposed in Ireland European Communities (Water Policy) Regulations 2003-22: European Communities Environmental Objectives (Surface Waters) Regulations 2009 (as amended).

In terms of the key indicators of water quality and / or pre-existing pollutants, chemical results obtained were within legislative limits indicting no pre-existing physico-chemical pressures. The current (2019-2024) less than 'Good' WFD status for the

Carricknabraher_020, Mantua_010, and Killukin_020 river sub-basins is due to the ecological / biological (invertebrate) elements of the WFD classification rather than water chemistry.

Table 11.11: Surface Water Results from Site-Specific Monitoring

Parameter	Sample ID				European Union (Drinking Water) Regulations 2023	Environmental Objectives Surface Water Regulations 2009 (as amended)	EC (Quality of Salmonid Waters) Regulations, 1988
	SW01	SW02	SW03	SW04			
Biochemical Oxygen Demand (mg/l)	<3	<3	<3	<3	-	High ≤ 1.3 mean Good ≤ 1.5 mean	≤5
Total Suspended Solids (mg/l)	<10	<10	<10	<10	-	-	≤25
Nitrate as NO_3 (mg/l)	1.9	1.5	1.3	1.8	50	-	-
Nitrite as NO_2 (mg/l)	<0.02	<0.02	<0.02	<0.02	0.5	-	≤ 0.05
Ortho-phosphate as PO_4-P (mg/l)	<0.06	<0.06	<0.06	<0.06	-	High ≤ 0.025 Good ≤ 0.035	-
Ammoniacal N (mg/l)	0.09	0.05	0.04	0.05	-	High ≤ 0.04 Good ≤ 0.065	- -

11.4.8 Surface Water Abstractions / Water Supplies

EPA provided data generated from their Water Abstraction Registration Database relating to water abstractions of 25 cubic meters (25,000 litres) or more per day that have been registered with the EPA. No active abstraction points were found in or proximal to the Wind Farm Site.

The lower reach of the Killukin River (within the Shannon (Upper)_060 river sub-basin) that is hydrologically connected to the Project (Grid Connection) is designated as a 'Drinking Water – River' in accordance with European Communities (Drinking Water) (No. 2) Regulations 2007 (SI no. 278/2007). No active abstraction points were found to be proximal to works associated with the TDR.

11.4.9 Surface Water Discharges

The EPA Urban Waste Water (UWW) emission points dataset notes a licenced 'Primary Effluent Emission Point' on the Owennaforeesha River at Bellanagare approximately 2.5km

upstream of the Project. EPA water quality data (2019-2024) for the Breedoge_010 river sub-basin (which includes the Owennaforeesha River) indicates Ammonium and Orthophosphate measurements equating to 'Moderate' WFD status but overall, the sub-basin has a 'Pass' for chemistry conditions, and urban wastewater is not identified as a pressure.

11.4.10 Domestic Discharges

No evidence was found of existing licenced domestic discharges in or proximal to the Wind Farm Site.

11.4.11 EPA Licenced Activities

A review was undertaken of EPA datasets on waste facilities, Industrial Emissions Licensing (IEL) facilities, and Integrated Pollution Control (IPC) sites. None were identified in proximity to the Wind Farm Site or in a location that would affect, or be affected by, the Project.

11.4.12 Habitats and Eco-Hydrology

Consideration has been given to local surface water and groundwater dependent ecosystems and habitats dependent on or prone to change due to variation in surface water and groundwater patterns at the Wind Farm Site. This is assessed fully within the accompanying **Chapter 6: Biodiversity** which should be read as the primary point of reference for assessment of habitats. It concludes that the mitigation measures proposed will ensure there will be no significant effects on water dependent ecosystems and habitats.

11.4.13 Aquatic Ecology / Fisheries

Detailed consideration has been given to aquatic ecology / fisheries on and downstream of the Project within **Chapter 9: Aquatic Ecology** which should be read as the primary point of reference for assessment of fisheries interests. It concludes that mitigation measures proposed will ensure there will be no significant adverse residual effect on any aquatic species or habitat at a local or catchment level as a result of the Project.

11.4.14 Aquaculture

EPA and DAFM datasets did not identify any aquaculture sites located downstream from the Project.

11.4.15 Designated Sites

Designated sites such as Special Areas of Conservation (SAC), Special Protected Areas (SPA), Ramsar sites, Natural Heritage Areas (NHA), proposed Natural Heritage Areas (pNHA) and similarly designated environmental receptors hydrologically connected to the Project, have been identified as part of this assessment.

Designated Sites were identified utilising the datasets available on the NPWS Designations Viewer, and were screened to identify hydrological those with sensitivities to the water environment that are connected to the Project, i.e. sites which lie in the upstream catchment of, or are on downstream streamlines of the watercourses draining the lands within which the Project is located. Only sites meeting these criteria are discussed further in this assessment and shown on **Figure 11.8**.

Terrestrial sites with ground or surface water-dependent flora and fauna are considered in **Chapter 6: Biodiversity**.

11.4.15.1 Cloonshanville Bog (SAC / pNHA)

Cloonshanville Bog SAC is designated as both a SAC and is a pNHA. The site supports several protected habitats, including Active Raised Bog, Degraded Raised Bog, Rhynchosporion vegetation and Bog Woodland. The north-western extent of the EIAR Boundary coincides with the boundary of the SAC.

Chapter 6: Biodiversity identifies Cloonshanville Bog SAC as falling within the Zone of Influence of the Project. The accompanying **Natura Impact Statement** (NIS) indicates that the bog comprises a number of raised bog ecotopes with limited interaction between groundwater and the raised bog habitats. Groundwater influence has only been reported within deeper artificial drains in cutaway bog areas to the west of the site. The active and degraded raised bog habitats present are characteristic ombrotrophic systems that are sustained primarily by rainfall and are typically isolated from the surrounding groundwater table.

Hydrologically, the SAC is separated from the Project to the south by the L1217 local road and associated deep cut roadside drains (c. 2 m below road level) which function as a hydraulic and surface water barrier. To the south-east, the SAC is further separated from the Project by the L1217 and the Carricknabraher River.

Groundwater in the vicinity occurs within shallow peat deposits overlying weakly permeable soils, and no significant groundwater volumes have been recorded. Consequently, any

potential disturbance to groundwater would be localised and temporary. Given that the qualifying habitats of Cloonshanville Bog SAC are ombrotrophic and dependent on rainfall rather than groundwater, and that any potentially groundwater-influenced flush habitats are both distant from and hydrologically separated from the Project area, the NIS concludes that there is no potential for direct or indirect impacts on the integrity of Cloonshanville Bog SAC arising from the Project. Therefore, the site is not assessed further within this chapter.

11.4.15.2 Lough Gara (Ramsar / SPA / pNHA)

Lough Gara is designated as a Ramsar site, SPA, and a pNHA. The site is an internationally important wetland, particularly for its wintering waterfowl populations. It is of special conservation interest for species including Whooper Swan (*Cygnus cygnus*) and Greenland White-fronted Goose (*Anser albifrons flavirostris*). Lough Gara is located approximately 9 km north-west (downstream) of the EIAR Boundary. The habitats and species for which the site is designated are ecologically sensitive to alterations in water quality, water quantity and flow regime and, therefore, the site is assessed further within this chapter.

11.4.15.3 Bellanagare Bog (SAC / SPA / pNHA)

Bellanagare Bog is designated as an SAC, SPA and pNHA. The site is classified as a western, or intermediate, raised bog, displaying characteristics of both raised bog and blanket bog. It is also of conservation interest for Greenland White-fronted Goose (*Anser albifrons flavirostris).* The site is located approximately 1.2 km south-west (upstream) of the EIAR Boundary. Although a portion of the designated site lies within the Carricknabragher_020 catchment (approximately 1.7 km²), the qualifying habitats are primarily precipitation-dependent raised peat bog systems, albeit with some groundwater influence. Given both the separation distance and the fact that the designated site lies more than 15 m higher in elevation than the Wind Farm Site, it is considered unlikely that the Project could affect hydrological or hydrogeological regimes at the designated site. **Chapter 6: Biodiversity** does not identify Bellanagare Bog as being within the Zone of Influence of the Project and it is, therefore, not assessed further in this chapter.

11.4.15.4 Kilglass and Grange Loughs (pNHA)

Kilglass and Grange Loughs are designated as a pNHA and are located approximately 8 km south-east (downstream) of the proposed Grid Connection. The group of lakes is characterised by extensive reed swamp and associated freshwater marsh habitats, together with areas of very wet grassland supporting species such as Star Sedge (*Carex echinata*) and Ragged Robin (*Lychnis flos-cuculi*), with large patches of Greater Tussock Sedge (*Carex paniculata*) and scattered willow species (*Salix spp.).* Portions of the shoreline are

noted to be particularly botanically rich. As the site supports water-dependent habitats and species and is hydrologically connected to the Project via the Grid Connection, it is assessed further within this chapter.

11.4.15.5 River Moy SAC

The River Moy SAC is located approximately 450 m west (downstream) of a proposed temporary widening works area on the turbine delivery route (TDR). The site is designated as a SAC due to the presence of habitat types and species that are rare or threatened in a European context, including Atlantic salmon (*Salmo salar*) and otter (*Lutra lutra*). As the Mullaghanoe River, which forms part of the designated site, supports water-dependent habitats and species and is hydrologically connected to the Project via the TDR, the site is assessed further within this chapter.

11.4.16 Hydrogeology

11.4.16.1 Groundwater Bodies

The Project is underlain by 4 no. groundwater bodies as defined by EPA mapping. The western section of the Wind Farm Site is underlain by the GWDTE-Bellanagare Bog (SAC000592) (IE_SH_G_241), GWDTE-Cloonshanville Bog (SAC000614) (IE_SH_G_067), Castlerea Bellanagare (IE_SH_G_054), and Carrick on Shannon (IE_SH_G_048) groundwater bodies.

The eastern section of the Wind Farm Site and the Grid Connection are underlain by the Carrick on Shannon (IE_SH_G_048) groundwater body (**Figure 11.9**). The characteristics of the groundwater bodies are summarised in the following sections. Refer to **Chapter 10: Soils and Geology** for further information on geology of the area.

- GWDTE-Bellanagare Bog is in an intermediate / western raised bog underlain by low-permeability muddy Carboniferous limestone with a clayey limestone till subsoil; the peat surface is highly dependent on diffuse rainfall recharge and shallow groundwater feeding numerous flushes, springs and small streams. Groundwater flow is largely shallow and local — emerging as seepages/flushes and discrete spring / rise features across the bog — so groundwater levels are naturally high within the peat.
- GWDTE-Cloonshanville Bog is a raised bog with extensive flush features; its hydrology is dominated by near-surface groundwater / peat water tables sustained primarily by direct rainfall recharge and impeded by peat / underlying low-permeability deposits. The central flush system shows localized groundwater emergence (diffuse seepage) rather than deep regional flow.

- Castlerea Bellanagare GWB is classed as a shallow / poorly productive bedrock area overlain locally by till and peat in places near bogs. Groundwater in this GWB is generally of limited transmissivity (poorly productive bedrock), with recharge dominated by rainfall infiltration and groundwater contributions to nearby streams and drinking-water source protection zones.
- Carrick on Shannon GWB is a karstified limestone aquifer with complex, shallow flow systems and strong connections to surface water. Recharge occurs via rainfall and swallow holes, leading to rapid water-level fluctuations. The aquifer is unconfined, highly vulnerable, and discharges to springs, turloughs, and rivers feeding the Shannon catchment.

11.4.16.2 Groundwater Quality / Water Framework Directive Status

The European Water Framework Directive (2000/60/EC) (WFD) requires the status of groundwater management units (groundwater bodies) within each river basin to be determined as 'Good' or 'Poor'.

For the period 2019-2024, the groundwater bodies underlying the Project have an overall WFD status of 'Good'. The overall status relates to both the quantitative and chemical (water quality) characteristics of a groundwater body. Each of the groundwater bodies is also delineated as a 'drinking water – groundwater' body.

Table 11.12: Summary of Groundwater Body Status

Groundwater Body	2013 – 2018 Status	2016 – 2021 Status	2019 – 2024 Status	Objective	At Risk
GWDTE-Bellanagare Bog (SAC000592) (IE_SH_G_241)	Good	Good	Good	Good	Not at Risk
GWDTE-Cloonshanville Bog (SAC000614) (IE_SH_G_067)	Good	Good	Good	Good	Not at Risk
Castlerea Bellanagare (IE_SH_G_054)	Good	Good	Good	Good	Not at Risk
Carrick on Shannon (IE_SH_G_048)	Good	Good	Good	Good	Not at Risk

11.4.16.3 Significant Pressures – Groundwater

The EPA use current water quality data and trends to highlight waterbodies that are 'At Risk' of failing to meet their WFD objectives by 2027.

The status of all groundwater bodies underlying the Project is currently 'Not at Risk' and there are no significant pressures associated with them.

11.4.16.4 Aquifer Classifications

A review of the available online GSI data indicates the bedrock aquifer underlying the majority of the Project is classified as a 'Regionally Important Aquifer - Karstified (conduit)' with the bedrock noted to be Ballymore Limestone Formation, Croghan Limestone Formation, and Bricklieve Limestone Formation.

Approximately 2.8km^2 of the western section of the Wind Farm Site is underlain by bedrock aquifer classified as 'Locally Important Aquifer (bedrock which is moderately productive only in local zones)' with the bedrock noted to be 'Boyle Sandstone Formation' (**Figure 11.10**). GSI mapping indicates there are no sand and gravel aquifers in the vicinity of the Project. Refer to **Chapter 10: Soils and Geology** for further detail on the geology within the EIAR Boundary and at the Wind Farm Site.

11.4.16.5 Groundwater Vulnerability

Groundwater vulnerability is a measure of the inherent geological and hydrogeological characteristics which determine the ease at which groundwater may potentially become contaminated via human activities at the surface. The vulnerability of groundwater is dependent upon multiple factors. These include the intrinsic toxicity of the contaminants in question, the quantity of contaminants that can reach the groundwater, the rate at which contaminants can flow to the groundwater and the attenuating capacity of the subsoils and bedrock through which the water travels.

Table 11.13: Groundwater Vulnerability Classes

Vulnerability Rating	Hydrogeological Conditions				
	Subsoil permeability (type) and thickness			Unsaturated zone	Karst features
	High permeability (sand/gravel)	Moderate permeability (e.g. sandy till)	Low permeability (e.g. clayey till, clay, peat)	Sand/gravel aquifers only	(<30m radius)
Extreme (E)	0 – 3.0m	0 – 3.0m	0 – 3.0m	0 – 3.0m	-
High (H)	>3.0m	3.0m – 10.0m	3.0m – 5.0m	>3.0m	N/A
Moderate (M)	N/A	>10.0m	5.0m – 10.0m	N/A	N/A
Low (L)	N/A	N/A	>10.0m	N/A	N/A

Source: Strive Report Series No. 6, Water Framework Directive – Recharge and Groundwater Vulnerability, Environmental Protection Agency, 2008

The GSI Groundwater Vulnerability Maps are informed by 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 (**Figure 11.12**).

The GSI maps indicates that groundwater within the western section of the Wind Farm Site ranges from 'Low' to 'Extremely High' vulnerability. The eastern section of the Wind Farm Site is shown to be classified as 'Low' vulnerability.

The lower vulnerability zones surrounding the at the Wind Farm Site coincide with low-permeability peat deposits / overlying peat (cut-over peat bog) that provide protection to the underlying aquifer. Areas identified as Extremely High coincide with locations underlain by till derived from limestones and alluvium, and where bedrock is at or near the surface (**Figure 11.11**).

The Grid Connection passes through areas with classifications ranging from 'Low' to 'Extremely High'. Given trench excavations will be shallow (i.e., 1.3 m deep and could run primarily in hard surface of the public roads), they are unlikely to cause a significant effect or adverse impact to groundwater.

11.4.17 Karst Features

A review of GSI online datasets identified 5 no. karst features within the EIAR Boundary. An enclosed depression is present at the entrance from the south into the western section of the Wind Farm Site. Two enclosed depressions, a turlough and swallow hole are noted along the Grid Connection.

The underling bedrock beneath the majority of the Project is noted to be limestone (Ballymore Limestone Formation, Croghan Limestone Formation, and Bricklieve Limestone Formation) which has the potential of developing karstic features; therefore, unmapped karstic features may be present. Geophysical surveys were undertaken across the Wind Farm Site to search for the presence of unmapped karst features (refer to **Appendix 10.1**). The surveys observed significant weathering at the original site of proposed Wind Turbine T6, informing design development and resulting in its relocation. No other unmapped karst features were identified by the geophysical survey.

11.4.18 Groundwater Abstractions (Drinking Water)

Roscommon County Council was unable to supply information regarding private water supplies / abstractions located in the vicinity of the Wind Farm Site.

GSI online mapping identifies Group Water Schemes (GWS) that are community-run water supply schemes. The mapping outlines the Zone of Contribution (ZoC) which is the land area that contributes water to supply source.

Two GWS / ZoC are shown to be within, or in proximity to, the EIAR boundary: the Peake GWS is located at the southern extent of the western section of the Wind Fram Site; and the Polecats GWS through which the Grid Connection passes (**Figure 11.13**).

Works associated with the Project in the vicinity of the Peake GWS are limited to minor areas of road widening. At their nearest point, the works are located approximately 450m and down-gradient from the GWS.

As the works are situated outside and hydraulically down-gradient of the ZoC, they do not lie within the groundwater catchment that contributes recharge to the GWS source. Therefore, the GWS is not considered likely to be affected by the Project.

11.4.19 Unregistered Water Supplies

To ensure a robust assessment, screening has been undertaken to identify properties potentially served by local, unrecorded water abstractions within the vicinity of the Wind Farm Site based on property and occupancy information determined by the Applicant.

DAERA (2019) and SEPA (2017) recommend a 250 m buffer between proposed turbine foundations and 100 m between roads, tracks and cable trenches and any potential drinking water (public or private) supply. A buffer per that guidance was applied to the proposed infrastructure within the Wind Farm Site (where construction work shall be undertaken) to provide the screening extent.

In total, 12 properties were identified within the screening extent. Of these, 6 no. properties are involved with the Project, Uisce Éireann mains supplies are noted to be present at 3 no. of the properties, and 2 no. properties are derelict.

A single receptor (H041) was identified within screening extent that may be reliant on an unregistered private water supply. The property is located on the L1217 road along which Internal Cabling is proposed to connect the eastern and westerns sections of the Wind Farm Site. Consideration is given to the dwelling water supply in the assessment of predicted environmental effects.

11.4.20 Wells and Springs

A review of GSI online data and information provided by EPA indicate a well / spring in the western extent of the Wind Farm Site which coincides with an area of cutover peat, located approximately 200m south-east of proposed infrastructure (Site Access Road).

One well / spring is shown to be within the EIAR Boundary along the Grid Connection. Uisce Éireann mains supplies are noted to be present at the location; therefore, it is unlikely any third-party is likely to be reliant on the well / spring for private water supplies.

Review of the Historical Map Viewer identified several historical wells and springs within the Wind Farm Site. None coincide with existing properties and / or registered abstractions points.

11.4.21 Flooding

The Project was assessed in relation to OPW Flood Maps which provide an indication of predicted Low, Medium, and High probability fluvial flood extents and information on past flood events.

Further information regarding flood risk from various sources is outlined in **Appendix 11.1** and is summarised in the following sections.

11.4.21.1 Fluvial Flooding

OPW National Indicative Fluvial Mapping (NIFM) indicates that the subject site is affected by fluvial flooding from the Owennaforeesha, Breedoge and Carricknabraher Rivers, and their tributaries.

Detailed site-specific modelling has been undertaken by McCloy Consulting to supplement the NIFM flood extents and gain a better understanding of flood risk at the Wind Farm Site. It was determined the site is affected by the 1% AEP and 0.1% AEP climate change flood extents, with slightly more extensive climate change flooding compared to the present-day scenario.

Fluvial flood extents relative to proposed infrastructure are outlined in figures included in **Appendix 11.1**.

The Grid Connection affects no significant fluvial floodplains other than those contiguous with existing roads, bridges and culverts in the vicinity of Flagford Substation (as shown on

OPW mapping). The cable route will not further encroach into existing floodplains compared to existing conditions.

In relation to the TDR, OPW flood mapping indicates proposed temporary construction areas (e.g., temporary road widening, construction of temporary load-bearing areas), are located in Flood Zone C.

11.4.21.2 Coastal Flooding

The Project is not in a coastal area and, therefore, does not require further detailed assessment of flooding from this source.

11.4.21.3 Pluvial Flooding

Review of the GSI groundwater flood datasets indicate that an area in the Wind Farm Site is affected by the indicative extents of the winter 2015 / 2016 surface water flooding. It is noted that the extents are indicative only and coincide with the Breedoge River at the Wind Farm Site. The GSI datasets indicate the Grid Connection is not impacted by historical surface water flooding.

Surface water flooding would not constrain development but would inform design of the infrastructure with a view to ensuring that surface water flow paths are maintained, and a suitable standard of protection is afforded to any development adjacent to areas predicted to be affected by flooding. Pluvial flooding is further assessed, and surface water management measures are further detailed in **Appendix 11.1**.

11.4.21.4 Urban Drainage Flooding

Both the Wind Farm Site and the Grid Connection are rural and there is no significant urban drainage infrastructure in their vicinity.

11.4.21.5 Groundwater Flooding

GSI groundwater flooding probability mapping indicates no predicted or historic groundwater flood extents within the Wind Farm Site. No area prone to potential above ground surface flooding were identified along the Grid Connection.

11.4.21.6 Historical Flood Extents

OPW 'Past Flood Event' mapping (available through floodmaps.ie) indicates one historic flood event and two recurring flood events at, and within the vicinity of, the Wind Farm Site. Two located within the EIAR Boundary are detailed below:

- A historic flood event was reported at Loughbally, Roscommon on 31st October 1970 (Flood ID 555), at the Loughbally Bridge (at the time called the "Metal Bridge") from the Breedoge River. The County Engineer noted that "for the last ten days the whole area has been flooded. The road from Frenchpark to Matua has been blocked by water, and it has been impossible to use the road due to the volume of water covering it at the bridge—popularly known as the Metal Bridge".
- The recurring flood events at Kinclare and Kilnamryall (Flood IDs 822 & 1174) are associated with GSI Turlough Data, dated 14th April 2005.

No historic flood events are noted along the Grid Connection.

11.4.21.7 Artificial Sources of Flooding

OSI mapping indicates that there are no impoundments, reservoirs, or canals in close proximity to, or which would drain towards the Wind Farm Site.

11.4.21.8 OPW Arterial Drainage Schemes

The Wind Farm Site lies significantly within the benefitting and works areas of the Boyle Major Arterial Drainage Scheme, completed from 1982 to 1992. The scheme involved significant modification of waterways, with 26,800 acres of benefitting land. The majority of watercourses within the subject sites, indicating significant modification to increase channel capacity, and ongoing OPW maintenance.

11.4.22 Baseline Summary and Receptor Sensitivities

The Baseline assessment identified the receptors which have the potential to demonstrate sensitivity to the Project; the receptors and their sensitivity / value are summarised within the following table. Sensitivity is based on the Baseline assessment and determined in accordance with the rationale previously described.

Table 11.14: Baseline Receptor Sensitivity and Rational

Type	Receptor	Sensitivity	Rationale
The Wind Farm Site			
Hydrological	On-site watercourses draining the Carricknabraher_020 river sub-basin	Low	Carricknabraher_020 (and its tributaries within the Wind Farm Site) have a WFD 'Poor' classification and lack of instream ecological diversity.
	On-site watercourses draining the Breedoge_010 river sub-basin	High	Breedoge_010 (and its tributaries within the Wind Farm Site) have a WFD 'Good' classification and good

Type	Receptor	Sensitivity	Rationale
			ecological conditions in the lower reaches.
	On-site watercourses draining the Mantua_010 river sub-basin	Medium	Mantua_010 (and its tributaries within the Wind Farm Site) have a WFD 'Moderate' classification and reduced ecological potential due to adjacent land use.
	Off-site designated site (Lough Gara SPA / Ramsar)	Extremely High	Designated site with international importance hydrologically connected to the Wind Farm Site.
	Floodplains	Medium	The Wind Farm Site coincides with floodplains associated with the Owennaforeesha, Breedoge and Carricknabraher Rivers.
Hydrogeological	Bedrock Groundwater / Aquifers	High	The limestone bedrock aquifer underlying the Site is classified as a 'Regionally Important Aquifer'.
		Medium	The sandstone bedrock aquifer underlying the Site is classified as a 'Locally Important Aquifer (bedrock which is moderately productive only in local zones'.
	Private Water Supply	Low	Single dwelling / property on L1217 reliant on private water supply.
	Karst Features	High	Karst features located at the Wind Farm Site.
Terrestrial	The Wind Farm Site	Low	Proposed infrastructure prone to damage including potential for water damage of electrical infrastructure in a flood event; potential for structural damage of access infrastructure in the event of hydraulic incapacity.
Grid Connection			
Hydrological	Watercourses draining the Mantua_010 river sub-basin	Medium	Mantua_010 (and its tributaries) have a WFD 'Moderate' classification.
	Watercourses draining the Kinard_010 river sub-basin	High	Kinard_010 (and its tributaries) have a WFD 'Good' classification.
	Watercourses draining the Killukin_020 river sub-basin	Medium	Killukin_020 (and its tributaries) have a WFD 'Moderate' classification.
	Proposed Natural Heritage Area (Kilglass and Grange Loughs pNHA)	High	Site with reed swamps, freshwater marshes, and varied flora and fauna

Type	Receptor	Sensitivity	Rationale
			hydrologically connected to the Grid Connection.
	Floodplains	Medium	Route in proximity to discrete areas of fluvial floodplain.
Hydrogeological	Bedrock Groundwater / Aquifers	High	The limestone bedrock aquifer underlying the Site is classified as a 'Regionally Important Aquifer'.
	Abstractions / PWS	High	The Grid Connection passes through the Polecats GWS / ZoC.
	Karst Features	High	Two enclosed depressions, a turlough and swallow hole are noted along the Grid Connection.
Turbine Delivery Route			
Hydrological	Watercourses draining to the Charlestown_010 river sub-basin	High	Mullaghanoe River (Charlestown_010 river sub-basin) located 450m downstream from TDR works has a WFD 'Good' classification.
	Designated site (River Moy SAC)	Extremely High	Designated site with international importance hydrologically connected to the TDR.

11.5 PREDICTED ENVIRONMENTAL EFFECTS

11.5.1 Do-Nothing Scenario

If the Project was not constructed, there would be no changes to existing land-use i.e., agricultural pasture grazing land, peat harvesting, and commercial forestry would continue across the majority of the Wind Farm Site.

Licenced felling operations are managed as per the felling licence(s) granted by the Minister for Agriculture, Food & the Marine under the Forestry Act 2014. Refer to **Appendix 2.2: Harvest Management Plan** (HMP) for further detail on existing forestry pertinent to the Project.

Any existing potential effects on the water environment from on-going agricultural, peat harvesting, and commercial forestry operations within the Wind Farm Site would remain unchanged in a Do-Nothing scenario. Peat extraction is noted by the EPA as a pressure within the Carricknabraher_020 river sub-basin (**Section 11.4.7.2**).

An opportunity to reduce carbon emissions in Ireland would be forgone and the States obligations to comply with the Climate Change and Low Carbon Emissions Act 2015-21 would be impeded in a Do-Nothing scenario.

11.5.2 Baseline Evolution

The Baseline conditions of the water environment will change over time. Changes likely to occur without the Project may be due to either natural variability and / or other factors such as nearby developments or changes in land use.

11.5.2.1 Hydrology, Drainage and Flood Risk

The principal factor concerning the likely evolution of Baseline conditions in relation to hydrology / hydrogeology is climate change. The Baseline has been assessed with regards to present day rainfall and fluvial flows, but predicted effects of climate change have also been considered using the Mid-Range Future Scenario (MRFS) which allows +20% for extreme rainfall and +20% for peak fluvial flood flows.

The MRFS represents a projected future scenario for the end of the century (i.e., 2100). Given the relatively short timeframe between this assessment and proposed commencement of construction works (<10 years) and designed operating life of the Project (35 years), the MRFS is appropriate for assessing likely evolution of baseline hydrological conditions. The effects of other proposed and / or consented developments are assessed in **Section 11.13**.

11.5.2.2 Surface and Groundwater Quality

This assessment has considered the existing Baseline with regard to surface and groundwater quality and the future status / objectives for future years, as defined by the EPA for the relevant river catchments and groundwater bodies.

Regarding the Wind Farm Site, changes to Baseline conditions in relation to water quality may occur due to continued pressures as a result of sediment and nutrient issues caused by peat harvesting within the sub-catchment, and morphological pressures resulting from cyclical maintenance works associated with the Boyle Arterial Drainage Scheme (under the arterial drainage scheme, river channels are maintained by the OPW on a 4-to-5-year cycle) (**Section 11.4.7.2**).

With regards to the Grid Connection, changes to Baseline conditions in relation to water quality may occur due to continued pressures as a result of sediment (domestic wastewater treatments systems (DWTS)) and nutrients (agriculture) (**Section 11.4.7.2**).

The Water Framework Directive (WFD) aims at maintaining 'High' status of waters where it exists, preventing any deterioration in the existing status of waters and achieving at least 'Good' in relation to all waters by 2027. To achieve this, 'Areas for Action' have been identified where measures to improve water quality shall be implemented. Whilst the Carricknabraher_020 and Killukin_020 river sub-basins are currently noted to be 'At Risk' of failing to achieve their 2027 WFD objectives, a conservative approach assumes the relevant 'actions' will be implemented and there will be improvements to water quality within those catchments.

As noted in the Do-Nothing section (**Section 11.5.1**), licenced felling operations are managed as per the felling licence(s) granted by the Minister for Agriculture, Food & the Marine under the Forestry Act 2014. No changes to baseline conditions are, therefore, expected from on-going felling operations. The effects of other proposed and / or consented developments are assessed in **Section 11.13**.

11.5.3 Activities Associated with Construction, Operation and Decommissioning

This section describes the potential likely effects on hydrological patterns and water quality that have the potential to arise at and downstream of the Project in the absence of mitigation, during the following development phases:

- Construction;
- Operation and maintenance; and
- Decommissioning.

During each phase some of the activities undertaken have the potential to modify hydrological regimes and affect water quality at the Wind Farm Site and the downstream environment. Due to the nature of the Wind Farm Site and work undertaken, the hazards and associated effects will be similar for each phase; with an increased likelihood during the construction phase.

11.5.3.1 Components Contributing to Predicted Environmental Effects

During the enabling works, tree felling is required to create access track corridors and space for turbines and other infrastructure. The total area needed to accommodate turbines and

associated infrastructure is approximately 37.6 ha. Details in relation to forestry and felling work are included in **Appendix 2.2**.

Felling of trees may result in increased mobilisation and transportation via surface water runoff of dissolved and / or sediment-bound nutrients / phosphate fertilisers from the disturbed soils and breakdown of organic matter (brash etc) into the wider water environment. The tree felling activities required as part of the Project will be subject to a tree felling licence granted by the Minister for Agriculture, Food, and the Marine, in accordance with the Forestry Act 2014 and the Forestry Regulations 2017 (S.I. 191/2017). During construction, the Project comprises construction of infrastructure which would be likely to cause change to local hydrology and water quality, comprising earthworks, excavations at Borrow Pits, plant movements with associated use of lubricants and fuel oils, spoil handling and placement of aggregates and cementitious materials, and dewatering associated with construction of the Temporary Construction Compounds, Turbine Foundations, development of Borrow Pits, building foundations, Site Access Roads, and cable trenches.

The operational phase of the Project (the designed operating life estimated to be 35 years) would cause runoff from Site Access Roads, Turbine Foundations and Turbine Hardstands via drainage features, would require onsite welfare facilities with associated waste holding tank, and potentially necessitate storage and use of oils, fuels and lubricants on-site, each with the potential to cause adverse effects on the environment without adequate avoidance, design, or mitigation measures.

Activities associated with the decommissioning phase at the end of the operating design life are generally as per those for the construction phase i.e., earthworks, plant movements with associated use of lubricants and fuel oils, spoil handling and placement of aggregates and cementitious materials, and dewatering associated with removal of turbines, buildings, hard standing areas, and buried structures followed by reinstatement and restoration of ground cover.

11.5.4 Likely Significant Effects

The likely effects of the Project on the surface and groundwater environment prior to any avoidance, careful design, or additional mitigation are summarised in the following sections.

11.5.4.1 Changes in Runoff

New temporary and permanent impermeable surfaces, as well as temporary compaction of soils due to construction phase plant and site traffic movements, may cause increased rate and volume of surface water runoff due to the reduced permeable area on the Wind Farm Site through which rainfall can infiltrate. Impermeable surfaces will cause an increased "flashy" response to rainfall events, with increased water velocities in new and existing drainage features. As a consequence, the effect would be likely to cause temporary or permanent increases in surface water runoff rates and volumes, leading to increased flood risk and increased effects of erosion and scour in downstream watercourses. Similarly, loss of permeable areas is likely to cause reduced potential for groundwater recharge affecting aquifers.

Excavations, and in particular Borrow Pits and linear works such as Site Access Roads, drainage ditches and cable trenches, are likely to act as barriers to runoff resulting in ponding, or development of preferential flow routes, diverting surface water away from its current route. Consequently, temporarily or permanently redirected surface water flows may starve areas where water currently flows, or cause flooding of areas where water currently does not flow.

Works to existing surface watercourses (such as installation of culverts) have the potential to cause an obstruction to flow and may alter conveyance capacities, potentially causing temporary or permanent restrictions in watercourse channels, affecting upstream water levels and increasing flood risk.

11.5.4.2 Changes to Surface & Ground Water Quality (Sediment / Suspended Pollution)

Temporary activities required to construct windfarm infrastructure would require felling, excavations, ground disturbance (due to excavations and plant and vehicle movements), stripping and excavation of peat and soils, and temporary spoil deposition. Exposed soils have potential to release fine sediments in surface water runoff or where excavations come in contact with surface watercourses.

Construction of hardstanding areas and Site Access Roads would require the development of Borrow Pits, and importing, handling and placement of aggregate which would have the potential to release fine sediments into surface water runoff. The proximity of such works to surface watercourse will increase the risk of pollution to the wider water environment.

Temporary surface water or shallow groundwater gathering in excavations has the potential to be significantly polluted due to contact with excavated surfaces and aggregates. Discharge of intercepted contaminated groundwater during passive or active dewatering has the potential to pollute the wider water environment if not disposed of correctly.

Silt and suspended sediments and debris entering watercourses would have the potential to adversely modify stream morphologies, smother habitats and harm aquatic flora and fauna.

11.5.4.3 Changes to Water Quality (Nutrient Loss)

Felling of trees has the potential to result in increased mobilisation and transportation via surface water runoff of dissolved and / or sediment-bound nutrients / phosphate fertilisers from the disturbed soils into the wider water environment, as well as loss of nutrients to the water environment from decomposed vegetative matter.

Such a potential effect is likely to be realised during and after felling, and during disturbance of soils during earthworks. Nutrient enrichment entering waterbodies has the potential to adversely affect water quality, with associated effects to fish and aquatic ecology.

11.5.4.4 Changes to Water Quality (Chemical Pollution of Surface Water and Groundwater)

Temporary storage and use onsite of chemicals, fuels and oils associated with construction activities, and use of wet concrete and other cementitious material, may result in potentially harmful substances entering the water environment. Possible pathways to hydrological and hydrogeological receptors may include; accidental spillages, improper transport and refuelling, or inappropriate storage and disposal procedures, by gradual leakage or single failure of storage tanks or refuelling mechanisms. Temporary presence of alum-based flocculants (used to remove suspended solids from surface water) has the potential to enter surface waters if unregulated.

The horizontal directional drilling (HDD) proposed to facilitate the underground Grid Connection cable crossing of watercourses at several locations has the potential to cause pollution to surface and groundwaters as a result of 'frac-outs' ('fracture-out') e.g., where drilling fluids such as bentonite could be accidentally released into the water environment. During the operational phase of the Project, the presence of oils and lubricants associated with turbine maintenance has a similar potential to enter and pollute the water environment.

Wastewater effluent from temporary construction phase welfare facilities and permanent Onsite Substation building welfare facilities has the potential to enter surface water or shallow groundwater.

As a consequence, chemical pollutants from construction activities, storage of materials, or from coliforms from wastewater entering watercourses have the potential to adversely affect water quality, with associated effects to fish and aquatic ecology.

11.5.4.5 Changes to Hydromorphology

During construction phase, silt and suspended sediments entering watercourses increase can lead to a change in sediment dynamics within the channel at the site of works, as well as downstream.

Altering sediment regime and other hydromorphological processes may reduce the resilience of the channel to future changes in water and sediment inputs (e.g., climate and / or land use change).

Introducing significant steps within channels (e.g., at channel diversions) has the potential to alter the continuity of sediment transfer by causing excessive erosion and / or deposition at these locations.

Engineering works have the potential to alter flow conditions (discharge and velocity, as well as flow patterns) within channels. Temporary watercourse diversions / realignments can have a local adverse impact on flows in the waterbodies. Similarly, where water is diverted across catchments it can alter the natural discharge of the channels, changing flow, sediment regime and other hydromorphological processes.

11.6 MITIGATION MEASURES (EMBEDDED & DESIGN MEASURES)

11.6.1 Embedded Mitigation

The magnitude and significance of those effects determined as being likely to be a consequence of the Project can be substantially mitigated or eliminated through a proactive design approach to render all likely effects insignificant. The approach aims to avoid identified sensitive baseline receptors.

This section identifies the embedded mitigation (design) measures imposed and outlines the resulting magnitude and significance of residual effects. Additional mitigation is then specified to further reduce and / or eliminate remaining residual effects.

Detail of the design evolution highlighting considerations made with regards to hydrology, hydrogeology and water quality management is presented in **Chapter 3: Alternatives Considered**.

The Project layout has evolved so that the design avoids environmental constraints pertinent to the water environment, per the following sections.

11.6.1.1 Avoiding Water Features (Watercourse Buffer Zones)

As a precautionary measure, and in accordance with the guidance adhered to for this Project (set out below), buffer / exclusion zones to 'major' and 'minor' watercourses were adopted as constraints in the design layout, and for incorporation as a construction buffer in relation to construction activities in proximity to watercourses. Watercourses are classified in the Baseline assessment at **Section 11.4.6.4**.

Avoidance measures (i.e. buffer or exclusion zones) have been developed in accordance with legislation and industry guidance outlined in this section. Maintaining intact buffer zones between infrastructure and 'major' and 'minor' water features allows:

- Protection of water quality by filtering runoff within riparian vegetation before it enters the watercourse;
- Space for natural fluvial processes such as channel shape and planform adjustment, which help restore and maintain the natural dynamic balance of river systems and associated habitats;
- Vegetation to be maintained and further establish to stabilise banks and reduce soil erosion;
- Access for the maintenance and inspection of watercourses and for dealing with any residual risk of pollution incidents; and
- Habitat for plants and animals to form part of a habitat network.

The rationale adopted in relation to water feature buffers is informed by knowledge, understanding and experience of similar developments whereby infill, disturbance, construction activity or storage of materials proximal to watercourses should be avoided.
The following publications include industry guidance around buffer exclusion zones to watercourses. The guidance relied on is relevant and similar in nature to the construction and operational activities for the Project:

- In relation to works near water, IFI (2016) recommends buffers of at least 5m from the watercourse, with bridge foundations recommended to be placed at least 2.5m from riverbanks so as not to impact on the riparian habitat;

- Regarding management of sediments and runoff from construction-phase works, concrete / cement mixing, or washing areas, SEPA / NIEA (2018) recommends a buffer of 10m from watercourses to prevent suspended solids or other pollutants from entering the water environment;
- In relation to on-site construction-phase oil / fuel storage and refuelling, SEPA / NIEA (2023) recommends a buffer of 10m from a watercourse and 50m from a well, borehole, or spring;
- To mitigate potential impact of wind farm developments such as Site Access Roads and Turbine Foundations on the water environment, DAERA (2019) recommends buffers zones of 10m from surface watercourses, 50m from water features not used for water supplies, and 250m from designated wetlands and water features used for drinking water;
- In relation to wetlands and groundwater dependent terrestrial ecosystems, SEPA, (2017) recommends a screening distance of 100m from roads, tracks, and trenches, and 250m from Turbine Foundations; suitable buffers taking into account ground cover, waterlogging, and slope should be proposed around sensitive receptors; and
- Regarding management of sediments and runoff from exposed ground in relation to agriculture, GAEC (2012) recommends buffers of up to 10m in order to protect surface waters from pollution by suspended solids, and nutrient enrichment by organic / inorganic fertilisers.

The significance classification of watercourses (major / minor / other) is shown on **Figure 11.5**. Conservative minimum hydrological buffer zones, bearing in mind the previous guidance documents are implemented in the Project as shown in **Table 11.15:** Minimum Adopted Hydrological Buffer Zones . Buffers are indicated on Surface Water Management drawings included in **Appendix 11.2** (also included as **Management Plan 3** of the **CEMP**).

Table 11.15: Minimum Adopted Hydrological Buffer Zones

Water Features	Width of Adopted Buffer
Major Watercourses (catchment >0.25 km^2)	**50m**
Minor Watercourses (catchment <0.25 km^2)	**10m**
Other Drainage Features	**Managed on-site by diversion / temporary blocking in accordance with GGPs and PPGs.**

New infrastructure is designed to lie outside hydrological buffer zones for major and minor watercourses. This includes those elements of the works associated with earthworks and greatest potential for spillage or leakage of chemical pollutants, i.e.:

- All Turbine Foundation, Turbine Hardstand (i.e., crane pads and associated working areas);
- All Borrow Pits;
- Temporary and permanent spoil and peat management areas; and
- Enabling works compound, Onsite Substation, and Temporary Construction Compound, fuel and chemical storage areas and any other platforms.

New Site Access Roads are to lie outside of buffer zones; with the exception of locations where they unavoidably cross over watercourses. Careful consideration has been given to the routing of Site Access Roads in order to avoid / limit crossing of watercourses. Where crossings are proposed, appropriate design measures will be incorporated to control or reduce the potential effect of the Project on the receiving environment (refer to **Section 11.8.1.7** of this chapter and **Appendix 11.2** (also included as **Management Plan 3** of the **CEMP**).

Development located within buffers includes drainage infrastructure due to their requirement to be located at natural low points often coinciding with watercourses. In instances where drainage infrastructure is located within buffers, construction works will be managed through the use of additional surface water management measures, described in **Section 11.8.1**.

Protection of other drainage features will be managed during and following construction by means of diversion and / or temporary blocking (with prior settlement features upstream of, and outside, the drainage channel), using filtration check dams or similar, in order to prevent residual indirect potential pollution downstream caused by connectivity to downstream waterways.

11.6.1.2 Abstractions

With regards to known or potential potable water abstractions identified in the previous screening assessment, the proposed infrastructure layout within the Wind Farm Site is such that no turbines and associated significant infrastructure are sited within 250 m of screened locations (refer to **Sections 11.4.18** to **11.4.20**).

Additional mitigation during the construction phase for works associated with Internal Cabling along the L1217 road within 100 m of a single dwelling reliant on a PWS are outlined in **Section 11.8**.

11.6.1.3 Forestry

Wind Turbines T2, T4, T5, T6, T7, T10, and T11, require felling within commercial forestry. To facilitate the construction of the Project, it is estimated that c.43.7 ha of commercial coniferous forestry will be felled.

To ensure a tree clearance method that reduces the potential for sediment and nutrient runoff, the construction methodology will follow the specifications set out in the relevant guidance i.e., 'Forest Harvesting and the Environment Guidelines' (DAFM, 2000) and 'Forestry and Water Quality Guidelines' (DAFM, 2000). The use of existing commercial forestry infrastructure will be maximised to lessen disturbance from machines used for felling. Appropriate methods are outlined in **Appendix 2.2** and summarised below:

- Brash, logs, or debris will not be allowed to enter the aquatic zones and relevant watercourses. Felled tree to be stacked in a responsible manner to prevent contamination of watercourses with organic rich leachate exuding from cuttings. Refuelling and maintenance of machinery will be conducted at dry, elevated ground, at least 50 m from aquatic zones and 20 m from watercourses.
- Sediment traps will be installed within relevant watercourses before harvesting commences, at strategic locations identified on the ground. Sediment traps will be monitored and maintained (i.e., cleaned out and/or added to, as appropriate) throughout felling, extraction, and periodically thereafter, until the site stabilises. There will be a 20m buffer around aquatic zones (10m either side) and 10m buffer around relevant watercourses (5m either side) identified in maps. Existing drains will be incorporated and enhanced where necessary and will integrate with the proposed renewable energy development's drainage system.
- Onsite supervision will be present during operations to ensure that felling and extraction are carried out appropriately and that water protection measures are adequate and remain effective throughout, and to trigger contingency measures, if necessary (e.g., to cease operations if rainfall creates a risk of sediment mobilisation and runoff). All staff must always wear high-visibility jackets and hard hats. All personnel on site must have appropriate Health and Safety training. All felling/harvesting operations to comply with the Forest Harvesting and the Environment Guidelines and Forestry and Water Quality Guidelines.

11.6.1.4 Floodplains

All proposed 'critical infrastructure' / 'highly vulnerable development' (i.e., the Onsite Substation and Wind Turbines) are appropriately sited in Flood Zone C, in accordance with the OPW Guidelines (OPW, 2009) and is resilient to the effect of climate change.

While the majority of the proposed Site Access Roads are sited in Flood Zone C, with the exception of where watercourses are required to be crossed to provide access, one Site Access Road within the western section of the Wind Farm Site is proposed in Flood Zone A and Flood Zone B. As parts of the 'less vulnerable' (OPW, 2009) proposals are sited in Flood Zone A, a Justification Test is required and has been prepared (refer to **Appendix 11.1**).

Drainage infrastructure to be installed (refer to **Section 11.8.1.9** and **Appendix 11.1**) ensures a standard of flood protection from surface water for the 1% AEP / 1 in 100-year rainfall event, including allowance for climate change.

Construction works associated with the Grid Connection (underground cable to a depth of 1.3 m) will follow the route of existing road corridors and cross watercourses either via existing bridges and culverts (with either an undercrossing or an overcrossing), or via Horizontal Direction Drilling (HDD). The cable route affects no significant fluvial floodplains other than those contiguous with existing road bridges and culverts. The cable route will not further encroach into existing floodplains compared to existing conditions.

Similarly, during the operational phase of the Project, the cable route would by its nature (buried) have no effect on flooding by causing restrictions or disruption to flood flows.

During decommissioning phase, underground cables will be removed while the ducting will be left in-situ. As such there would be no effect on flooding caused by restrictions or disruption to flood flows.

While risk of flooding given the nature of the Grid Connection is not likely to be significant, the Applicant will take a precautionary approach and adopt standard and proven appropriate measures to avoid earthworks becoming inundated and potentially transporting sediment off-site into the water environment. Measures will comprise:

- Routinely checking weather warnings and planning for adverse weather conditions;
- Storing plant and materials in areas outside areas prone to flooding;
- Implementing temporary drainage systems to alleviate localised surface water flood risk and prevent surface water ingress to the construction working areas; and
- Prevent obstruction of existing surface runoff pathways.

The nature of the Grid Connection (underground cable) and the methods used to cross watercourses (i.e., within existing bridge decks or by HDD) would have no potential to affect watercourse morphology, and so potential for effects at watercourse crossings are not considered further.

Further details on the proposed Grid Connection construction methods are provided in **Chapter 2: Project Description**.

Other effects associated with proposed construction activities for the Grid Connection would be similar to those described in **Section 11.5.4** and would be solely associated with the construction phase. No operational effects are anticipated.

11.6.1.5 Site Drainage Management and SuDS Design

The Project adopts a surface water management plan / site drainage design using the principles of Sustainable Drainage, promoting the principles of onsite retention of flows and use of buffers and silt removal techniques. All drainage related mitigation measures will be encompassed by a robust and proven Sustainable Drainage System (SuDS) design proposed as part of the Project which will be used to control drainage and silt management on the site.

The proposed on-site drainage is set out in detail at **Appendix 11.2** (also included as **Management Plan 3** of the **CEMP**) and the accompanying set of drainage drawings. The drainage manages flood risk at the Wind Farm Site, provides environmental protection and manages water quality and silt / suspended sediment, and avoids unnecessary disruption to existing hydrological patterns by adhering to the following principles:

- Site Access Roads and Turbine Hardstand drainage adopts SuDS principles and ensures that runoff from new Site Access Roads and Turbine Hardstand shall be reduced to the pre-development greenfield rate. The drainage system caters for protection for up to a 1 in 100-year / 1% AEP rainfall event including allowance for climate change;
- The drainage plan adopts sub-catchments to manage runoff from the Wind Farm Site where sub-catchments mimic natural topography to avoid "crossing catchments" which could locally affect flood risk;
- Drainage maintains existing overland flow routes and channels. Existing natural flow paths are maintained through the use of piped crossings under road alignments at natural depressions and at regular intermediate intervals;

- Drainage reduces potential disruption caused by excavations with implementation of floated track in areas where deep peat has been identified. This approach prevents unnecessary disturbance to the peat mass and maintains the natural hydrological regime;
  - Floated roads are proposed in all areas where active or deep peat occurs, as this method substantially reduces environmental and geotechnical impacts. Unlike full peat excavation which requires the removal, transport, handling, and storage of large volumes of peat floated tracks involve placing geotextile and aggregate directly on the peat surface. This results in minimal excavation, limited to surface vegetation stripping and minor grading, allowing the road to "float" on the peat body.
  - The adoption of floated roads was recommended following ecological and soil assessments (**Chapter 6 Biodiversity** and **Chapter 10 Soils and Geology**), which concluded that this method provides the lowest-impact solution. Floated tracks help minimise habitat disturbance, reduce soil displacement, and significantly lower carbon emissions that would otherwise arise from excavating and transporting peat. Full peat removal exposes large areas, increases sediment mobilisation risk, and disrupts long-established hydrological pathways. In contrast, floated tracks preserve the underlying peat and its hydrological integrity, thereby reducing the likelihood of drainage-induced settlement, peat oxidation, and carbon release.
- Drainage minimises transporting rainfall runoff in long linear drainage swales by providing regular channel "breakouts", whereby water is encouraged to flow overland, thus maintaining existing natural hydrological patterns;
- Drainage reducing surface water flow rates and volumes by attenuating runoff from tracks and hardstands "at source" by providing check-dams in swales, whereby the flow velocity and rate of discharge is artificially reduced to mimic natural properties. This provides an additional layer of protection rather than relying solely on "end of line" attenuation basins;
- Drainage provides attenuation and settlement ponds at main surface water discharge locations at end of drainage "runs", where runoff from significant new impermeable areas is treated and attenuated before being discharged, either by dispersal overland, or over a riparian zone adjacent to a watercourse; and
- Proposals include temporary drainage and settlement features at Borrow Pits, which are a potential source of sediments and reduced quality runoff due to dust and sludge caused by rock breaking, crushing and heavy plant movements.

Drainage design will reduce chemical, silt and other suspended pollutant transport by providing a "treatment train" of two to three stages of pollutant removal to all surface water runoff, nominally by:

- Ensuring that drainage swales are designed to convey flows at a low velocity by using a wide, flat-bottomed drain;
- Providing settlement and filtration features in all linear drainage swales (check dams, filtration dams) to reduce flow velocity and encourage settlement;
- Encouraging appropriate vegetation growth in the base of all linear drainage to provide additional filtration of water;
- Providing settlement ponds at discharge locations in order to provide treatment to contaminated runoff prior to discharge;
- Discharging surface water runoff over undisturbed vegetated ground, hence allowing any remaining silts and other pollutants to drop out of flows before entering the watercourse (having the effect of polishing the runoff); and
- Preventing the discharge of surface water runoff flows directly to existing watercourses or drainage. Discharges will be via SuDS and buffer zones which will act as a filter strip, allowing deposition of suspended solids and other pollutants.

Consideration specific to the proposed infrastructure elements are documented in the detailed site-specific drainage management / SuDS design – refer to **Appendix 11.2** (also included as **Management Plan 3** of the **CEMP**) and accompanying drainage drawings.

11.6.1.6 Drainage at Upgraded Tracks

The Project design includes the upgrading of sections of existing Site Access Roads associated with the existing agricultural, forestry and peat extraction lands. As such, the proposed upgrade works (maintenance of existing running surface and associated drainage) may encounter current track drainage which is locally significant in terms of drainage function.

In these instances, additional mitigation measures will be deployed including placement of temporary silt barriers (e.g., check dams) within retained and replacement drains. Additional mitigation is discussed further in **Section 11.8.1.9** and will be used where appropriate.

11.6.1.7 Watercourse Crossings

As described in **Section 11.6.1**, the number of watercourse and drainage crossings has been minimised through the principle of avoidance at the layout design stage. There are 7

no. watercourse crossings within the Wind Farm Site. 6 no crossings of which are required for the internal Site Access Roads and 1 no. crossing is associated with the Internal Cabling that runs along the L1217. Of the 7 no. water crossings, 5 no. are classified as major watercourses and 2 no.as minor watercourse.

Crossings are designed to accommodate the track width and minimise length of affected channel. Hydraulic design of crossings has been undertaken as per the guidance and requirements provided in CIRIA C786 "Culverts, Screen and Outfall Manual", with primary parameters as follows:

- Width of the culvert will be greater than the width of the active drainage channel;
- Alignment of the culvert will suit the alignment of the drainage channel, i.e. preserve the existing direction of flow;
- The slope of the culvert will not exceed the slope of the bed of the existing drainage channel;
- Detailed design of crossings will comply with OPW Section 50 guidelines, which will include providing freeboard to design flood levels and ensuring no increase in flood risk elsewhere as a result of the bridge / culvert. Detailed hydraulic design of culverts and similar structures post permission is normal and accepted practice for wind farms in Ireland; and
- Fisheries shall be protected by adopting the guidance stated in 'Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters' as published by Inland Fisheries Ireland (2016).

Hydraulic design of crossings has been undertaken as part of this assessment and details are provided in a 'Watercourse Crossing Schedule' included as part of **Appendix 11.1**. The crossings are subject to Section 50 consent and have been designed to give a minimum 0.3m freeboard at the inlet to the 1 % AEP Climate Change design standard.
Culvert form (type) detailed in the Watercourse Crossing Schedule is informed by site-specific assessments (i.e., **Chapter 9: Aquatic Ecology**). Clear-span / bottomless crossings are required at the proposed 5 no. crossings on major / significant watercourse to:

- Ensure preservation of the stream habitats (substrate for spawning etc.); and
- To avoid instream works during the construction of the crossings that could adversely affect water quality (i.e., bed disturbance causing release of sediment etc).

Design drawings for bottomless / clear-span crossings have been provided as part of the planning application and are included as part of the Drainage Management Drawings within

Appendix 11.2 (also included as **Management Plan 3** of the **CEMP**). Elsewhere, culverts shall be of a closed conduit type.

In total, there are 8 watercourse crossings along the Grid Connection within the public road network between the Wind Farm Site and the 220kV Flagford Substation. At each location, the cable will be laid within the road deck over/under the existing culvert, or Horizontal Directional Drilling (HDD) under the watercourse shall be employed. Details on the proposed HDD methods are provided in **Chapter 2: Project Description** and **Planning Drawings NO. 6575-JOD-CGWF-XX-DR-C-0301 – 0315 (Drainage and Crossing Details)** and **6575-JOD-CGWF-XX-DR-C-0901 – 0913 (Trench Details)**.
Crossing all other existing culverts will be carried out using open trenching with either an undercrossing or an overcrossing, or by HDD depending on the depth and the condition of the culvert. Details are provided in **Chapter 2: Project Description** and **Planning Drawings NO. 6575-JOD-CGWF-XX-DR-C-0301 – 0315 (Drainage and Crossing Details)** and **6575-JOD-CGWF-XX-DR-C-0901 – 0913 (Trench Details)**.

During decommissioning phase, underground cables at the Wind Farm Site will be removed while the ducting will be left in-situ. The Grid Connection will be permanent be owned by ESBN Therefore, no works within watercourses shall be required during any phase of the Project.

Consultation and any required approval will be sought from all relevant stakeholders and regulators in accordance with OPW Section 50 guidelines (OPW, 2022), at the pre-construction detailed design stage for all works in and affecting watercourses and drains.

11.6.1.8 Borrow Pits

The 2 no. Borrow Pits which are to be backfilled with spoil are sited outside hydrological pollution prevention buffer zones; however, they have the potential to be a source of sediment that would cause reduced quality runoff requiring treatment. Measures that will be implemented in full to control reduced quality runoff from spoil comprise filtration of runoff through boundary aggregate bunds and across intact vegetated buffers.

11.7 EFFECT OF THE PROJECT

Magnitude and likelihood of the potential environmental effects have been determined based on criteria outlined within **Section 11.3** taking into account the effect of avoidance measures and normal designed-in measures proposed and described in preceding sections.

The associated impact significance of these effects on the receptors affected (following the implementation of avoidance and design measures proposed) has been determined in accordance with the rationale described previously and the results are presented in summary **Table 11.16**, **Table 11.17**, and **Table 11.18**

11.7.1 Effect of the Project (the Wind Farm Site)

Table 11.16: Potential Magnitude and Significance of Impacts to Receptors – Including Effect of Embedded Avoidance & Design

Receptor and Sensitivity	Potential Effect	Phase of Development	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
The Wind Farm Site						
On-site watercourses draining the Carricknabraher _020 river sub-basin (Low)	Changes in runoff	Construction, Operational & Decommissioning	**Negligible** No change in the water feature's capacity to dilute pollutants and waste products; Negligible change in predicted peak flood level	Imperceptible	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the Project	**Not Significant** Increased runoff from impermeable infrastructure is to be attenuated to a greenfield equivalent rate and will adopt "soft" rural SuDS features to ensure response to rainfall is not exacerbated. Design of watercourse crossings on-site when adopting best practice design standards as stated result in a not significant localised effect in terms of restricted capacity that would cause any change to flood risk.
	Hydro - morphological change	Construction & Decommissioning	**Small Adverse** Minor change to river morphology / fluvial geomorphology	Imperceptible	**Likely** Possible consequential effect in the short to medium term	**Minor Adverse** New crossings associated with site access are proposed over major watercourses at the Wind Farm Site within the river sub-basin (1 no. over unnamed watercourse (Ref 1) and 1 no. over Carricknabraher (Ref 2)). The crossings will be open span, with no direct impact to watercourse morphology. However, temporary short-term construction activities within and adjacent to watercourses at the Wind Farm Site within the river sub-basin could result in mobilisation and release of silt / sediment that could cause a temporary minor change in sediment and stream morphology within and downstream of those channels.
		Operational	**Negligible** Unquantifiable or unqualifiable change to river morphology / fluvial geomorphology	Imperceptible	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the Project	**Not Significant** It is unlikely that works would be required during the operational phase of the Project that would necessitate any in-stream working or that would directly affect watercourse morphology. Design of watercourse crossings on-site when adopting best practice design standards as stated result in a not significant localised effect in terms of restricted capacity, bank and bed erosion /

Receptor and Sensitivity	Potential Effect	Phase of Development	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
The Wind Farm Site						
						deposition, and sediment transfer that would affect long-term natural hydromorphological processes.
	Silt / suspended solid pollution of surface waters	Construction & Decommissioning	**Moderate Adverse** Potential medium risk of pollution to surface water	Slight Adverse	**Likely** Possible consequential effect in the short to medium term	**Minor Adverse** Temporary short-term construction activities near watercourses would be likely to cause a temporary but fundamental change in water quality in watercourses on the Wind Farm Site.
		Operational	**Small Adverse** Minor deterioration in water quality unlikely to affect the most sensitive receptor or insignificant change in water quality conditions not exceeding those expected due to naturally occurring fluctuations	Imperceptible	**Likely** Possible consequential effect in the short to medium term	**Minor Adverse** In the absence of additional mitigation measures e.g., improper maintenance of permanent SuDS drainage features / improper site management, the operation of the Project would be likely to cause a temporary, small adverse (minor deterioration in water quality) change with regards to sediment / suspended pollution in watercourses within the Wind Farm Site.
	Chemical pollution of surface waters	Construction & Decommissioning	**Moderate Adverse** Potential medium risk of pollution to surface water	Slight Adverse	**Likely** Possible consequential effect in the short to medium term	**Minor Adverse** Spillage of oils, chemicals, or cementitious material associated with temporary construction and arising due to improper site management would be likely to cause a temporary but fundamental change in water quality in watercourses on the Wind Farm Site.
		Operational	**Small Adverse** Minor deterioration in water quality unlikely to affect the most sensitive receptor or insignificant change in water quality conditions not exceeding those expected due to naturally occurring fluctuations	Imperceptible	**Likely** Possible consequential effect in the short to medium term	**Minor Adverse** Accidental spillage / leaks of oils, chemicals, or other materials stored on site arising due to improper site management, would be likely to cause a temporary, small adverse (minor deterioration in water quality) change in watercourses within the Wind Farm Site.

Receptor and Sensitivity	Potential Effect	Phase of Development	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
The Wind Farm Site						
On-site watercourses draining the Breedoge_010 river sub-basin (High)	Changes in runoff	Construction, Operational & Decommissioning	**Negligible** No change in the water feature's capacity to dilute pollutants and waste products; Negligible change in predicted peak flood level	Imperceptible	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the Project	**Not Significant** Increased runoff from impermeable infrastructure is to be attenuated to a greenfield equivalent rate and will adopt "soft" rural SuDS features to ensure response to rainfall is not exacerbated. Design of watercourse crossings on-site when adopting best practice design standards as stated result in a not significant localised effect in terms of restricted capacity that would cause any change to flood risk.
	Hydro - morphological change	Construction & Decommissioning	**Small Adverse** Minor change to river morphology / fluvial geomorphology	Slight / Moderate Adverse	**Likely** Possible consequential effect in the short to medium term	**Moderate Adverse** New crossings associated with site access are proposed over major watercourses at the Wind Farm Site within the river sub-basin (1 no. over at Owennaforeesha River (Ref 3), 1 no. over unnamed watercourse (Ref 4), and 1 no. over Mantua (Ref 5)). The crossings will be open span, with no direct impact to watercourse morphology. However, temporary short-term construction activities within and adjacent to watercourses at the Wind Farm Site within the river sub-basin could result in mobilisation and release of silt / sediment that could cause a temporary minor change in sediment and stream morphology within and downstream of those channels.
		Operational	**Negligible** Unquantifiable or unqualifiable change to river morphology / fluvial geomorphology	Imperceptible	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the Project	**Not Significant** It is unlikely that works would be required during the operational phase of the Project that would necessitate any in-stream working or that would directly affect watercourse morphology. Design of watercourse crossings on-site when adopting best practice design standards as stated result in a not significant localised effect in terms of restricted capacity, bank and bed erosion / deposition, and sediment transfer that would affect long-term natural hydromorphological processes.

Receptor and Sensitivity	Potential Effect	Phase of Development	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
The Wind Farm Site						
	Silt / suspended solid pollution of surface waters	Construction & Decommissioning	**Moderate Adverse** Potential medium risk of pollution to surface water	Moderate / Significant Adverse	**Likely** Possible consequential effect in the short to medium term	**Major Adverse** Temporary short-term construction activities near watercourses would be likely to cause a temporary but fundamental change in water quality in watercourses on the Wind Farm Site.
		Operational	**Small Adverse** Minor deterioration in water quality unlikely to affect the most sensitive receptor or insignificant change in water quality conditions not exceeding those expected due to naturally occurring fluctuations	Slight / Moderate Adverse	**Likely** Possible consequential effect in the short to medium term	**Moderate Adverse** In the absence of additional mitigation measures e.g., improper maintenance of permanent SuDS drainage features / improper site management, the operation of the Project would be likely to cause a temporary, small adverse (minor deterioration in water quality) change with regards to sediment / suspended pollution in watercourses within the Wind Farm Site.
	Chemical pollution of surface waters	Construction & Decommissioning	**Moderate Adverse** Potential medium risk of pollution to surface water	Moderate / Significant Adverse	**Likely** Possible consequential effect in the short to medium term	**Major Adverse** Spillage of oils, chemicals, or cementitious material associated with temporary construction and arising due to improper site management would be likely to cause a temporary but fundamental change in water quality in watercourses on the Wind Farm Site.
		Operational	**Small Adverse** Minor deterioration in water quality unlikely to affect the most sensitive receptor or insignificant change in water quality conditions not exceeding those expected due to naturally occurring fluctuations	Slight / Moderate Adverse	**Likely** Possible consequential effect in the short to medium term	**Moderate Adverse** Accidental spillage / leaks of oils, chemicals, or other materials stored on site arising due to improper site management, would be likely to cause a temporary, small adverse (minor deterioration in water quality) change in watercourses within the Wind Farm Site.
On-site watercourses draining the Mantua_010 river sub-basin	Changes in runoff	Construction, Operational & Decommissioning	**Negligible** No change in the water feature's capacity to dilute pollutants and waste products;	Imperceptible	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the Project	**Not Significant** Increased runoff from impermeable infrastructure is to be attenuated to a greenfield equivalent rate and will adopt "soft" rural SuDS features to ensure response to rainfall is not exacerbated.

Receptor and Sensitivity	Potential Effect	Phase of Development	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
The Wind Farm Site						
(Medium)			Negligible change in predicted peak flood level			Design of watercourse crossings on-site when adopting best practice design standards as stated result in a not significant localised effect in terms of restricted capacity that would cause any change to flood risk.
	Hydro - morphological change	Construction & Decommissioning	**Small Adverse** Minor change to river morphology / fluvial geomorphology	Slight Adverse	**Likely** Possible consequential effect in the short to medium term	**Minor Adverse** There are no direct works on 'major / significant' watercourses within the river sub-basin that would affect watercourse morphology. Temporary short-term construction activities within upper reaches of the watercourses at the Wind Farm Site would likely result in mobilisation and release of silt / sediment that could cause a temporary change in sediment dynamics in those channels at, and immediately downstream of, the Wind Farm Site.
		Operational	**Negligible** Unquantifiable or unqualifiable change to river morphology / fluvial geomorphology	Imperceptible	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the Project	**Not Significant** It is unlikely that works would be required during the operational phase of the Project that would necessitate any in-stream working or that would directly affect watercourse morphology. Design of watercourse crossings on-site when adopting best practice design standards as stated result in a not significant localised effect in terms of restricted capacity, bank and bed erosion / deposition, and sediment transfer that would affect long-term natural hydromorphological processes.
	Silt / suspended solid pollution of surface waters	Construction & Decommissioning	**Moderate Adverse** Potential medium risk of pollution to surface water	Moderate Adverse	**Likely** Possible consequential effect in the short to medium term	**Moderate Adverse** Temporary short-term construction activities near watercourses would be likely to cause a temporary but fundamental change in water quality in watercourses on the Wind Farm Site.

Receptor and Sensitivity	Potential Effect	Phase of Development	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
The Wind Farm Site						
		Operational	**Small Adverse** Minor deterioration in water quality unlikely to affect the most sensitive receptor or insignificant change in water quality conditions not exceeding those expected due to naturally occurring fluctuations	Slight Adverse	**Likely** Possible consequential effect in the short to medium term	**Minor Adverse** In the absence of additional mitigation measures e.g., improper maintenance of permanent SuDS drainage features / improper site management, the operation of the Project would be likely to cause a temporary, small adverse (minor deterioration in water quality) change with regards to sediment / suspended pollution in watercourses within the Wind Farm Site.
	Chemical pollution of surface waters	Construction & Decommissioning	**Moderate Adverse** Potential medium risk of pollution to surface water	Moderate Adverse	**Likely** Possible consequential effect in the short to medium term	**Moderate Adverse** Spillage of oils, chemicals, or cementitious material associated with temporary construction and arising due to improper site management would be likely to cause a temporary but fundamental change in water quality in watercourses on the Wind Farm Site.
		Operational	**Small Adverse** Minor deterioration in water quality unlikely to affect the most sensitive receptor or insignificant change in water quality conditions not exceeding those expected due to naturally occurring fluctuations	Slight Adverse	**Likely** Possible consequential effect in the short to medium term	**Minor Adverse** Accidental spillage / leaks of oils, chemicals, or other materials stored on site arising due to improper site management, would be likely to cause a temporary, small adverse (minor deterioration in water quality) change in watercourses within the Wind Farm Site.
Off-site designated site (Lough Gara SPA / Ramsar Site) (Extremely High)	Changes in runoff	Construction, Operational & Decommissioning	**Negligible** No change in the water feature's capacity to dilute pollutants and waste products; Negligible change in predicted peak flood level	Imperceptible	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the Project.	**Not Significant** Increased runoff from impermeable infrastructure is to be attenuated to a greenfield equivalent rate and will adopt "soft" rural SuDS features to ensure response to rainfall is not exacerbated. Design of watercourse crossings on-site when adopting best practice design standards as stated result in a not significant localised effect in terms of restricted capacity that would cause any change to flood risk. The drainage strategy adopted ensures that natural catchments are mirrored and ensures that water is

Receptor and Sensitivity	Potential Effect	Phase of Development	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
The Wind Farm Site						
						not lost from the catchments that would result in a loss of available water draining into the designated site.
	Hydro - morphological change	Construction & Decommissioning	**Negligible** Unquantifiable or unqualifiable change to river morphology / fluvial geomorphology	Imperceptible	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the Project	**Not Significant** Temporary short-term construction activities within and adjacent to watercourses at the Wind Farm Site could result in mobilisation and release of silt / sediment that could cause a temporary minor change in sediment and stream morphology within those channels in the absence of additional mitigation. However, it is unlikely hydromorphological processes within the designated site would be affected by the short-term construction activities within watercourses at the Wind Farm Site.
		Operational	**Negligible** Unquantifiable or unqualifiable change to river morphology / fluvial geomorphology	Imperceptible	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the Project	**Not Significant** It is unlikely that works would be required during the operational phase of the Project that would necessitate any in-stream working or that would directly affect watercourse morphology at the Site or in the downstream environment. Design of watercourse crossings on-site when adopting best practice design standards as stated result in a not significant localised effect on long-term natural hydromorphological processes – consequently, hydromorphology of the designated site would also be unaffected during the operational phase of the Project.
	Silt / suspended solid pollution of surface waters	Construction & Decommissioning	**Small Adverse** Minor deterioration in water quality unlikely to affect the most sensitive receptor or insignificant change in water quality conditions not exceeding those expected due to naturally occurring fluctuations	Significant Adverse	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the Project.	**Moderate Adverse** Riparian buffer zones, avoidance, and control of reduced quality runoff (silt / suspended solids) from the temporary works would cause runoff from the Wind Farm Site to have no effect exceeding normal seasonal or pre-existing fluctuations. However, in the absence of additional mitigation, temporary short-term construction activities within upstream watercourses may, though unlikely, cause

Receptor and Sensitivity	Potential Effect	Phase of Development	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
The Wind Farm Site						
						a small / detectable but temporary change in water quality at the designated site.
		Operational	**Small Adverse** Minor deterioration in water quality unlikely to affect the most sensitive receptor or insignificant change in water quality conditions not exceeding those expected due to naturally occurring fluctuations	Significant	**Rare** It is unlikely that any consequence would ever arise.	**Minor Adverse** Riparian buffer zones, avoidance, and control of reduced quality runoff (silt / suspended solids) from the permanent works would cause runoff from the Wind Farm Site to have no effect exceeding normal seasonal or pre-existing fluctuations. In the absence of additional mitigation measures e.g., improper maintenance of permanent SuDS drainage features / improper site management, the operation of the Project could, though unlikely to arise, cause a temporary, small adverse change (minor deterioration in water quality) with regards to sediment / suspended pollution at the designated site.
	Chemical pollution of surface waters	Construction & Decommissioning	**Moderate Adverse** Potential medium risk of pollution to surface water	Profound	**Likely** Possible consequential effect in the short to medium term	**Major Adverse** Spillage of oils, chemicals, or cementitious material associated with temporary construction and arising due to improper site management may cause a temporary change in water quality in at the designated site.
		Operational	**Small Adverse** Minor deterioration in water quality unlikely to affect the most sensitive receptor or insignificant change in water quality conditions not exceeding those expected due to naturally occurring fluctuations	Significant	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the Project.	**Moderate Adverse** Accidental spillage / leaks of oils, chemicals, or other materials stored on site arising due to improper site management, could cause a temporary, small adverse (minor deterioration in water quality) at the designated site.
Bedrock Groundwater / Aquifers (Medium to High)	Alteration of Groundwater	Construction, Operational & Decommissioning	**Negligible** No measurable change in groundwater levels, groundwater flow regime, or groundwater	Imperceptible	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the Project	**Not Significant** Excavations and dewatering required within the Wind Farm Site boundary are not anticipated to affect groundwater levels within the context of the overall groundwater body / aquifer.

Receptor and Sensitivity	Potential Effect	Phase of Development	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
The Wind Farm Site						
			quality. No change to an aquifer.			
	Chemical pollution of groundwater	Construction & Decommissioning	**Small Adverse** Potential low risk to groundwater from polluted run-off	Slight to Moderate Adverse	**Likely** Possible consequential effect in the short to medium term.	**Minor to Moderate Adverse** Spillage of oils, chemicals, or cementitious material associated with temporary construction and / or arising due to improper site management during construction phase would be likely to cause a change in groundwater quality. Whilst potential localised effects (i.e., within the Wind Farm Site) would likely be significant in the absence of additional mitigation, effects beyond the Wind Farm Site in the context of the wider groundwater bodies / aquifers are likely to be less significant.
		Operational	**Small Adverse** Potential low risk to groundwater from polluted run-off	Slight to Moderate Adverse	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the Project	**Minor Adverse** Accidental spillage / leaks of oils, chemicals, or other materials are unlikely during the operational phase that would cause a deterioration in water quality in the context of the overall groundwater aquifer.
Private Water Supply (PWS) (Low)	Disruption to quantity or quality of supply	Construction	**Small Adverse** Potential low risk to groundwater from polluted (e.g., construction phase) run-off	Imperceptible	**Likely** Possible consequential effect in the short to medium term.	**Minor Adverse** Construction of the Internal Cabling proximal to the dwelling would not cause any excavations to a depth that would cause disruption or displacement of shallow flow paths serving a PWS source. A significant accidental spillage of fuel oil or similar could feasibly cause a low risk of pollution to groundwater that could cause a temporary short-term change in water quality.
		Operational & Decommissioning	**Negligible** No measurable change in groundwater quality with regards to drinking water supplies.	Imperceptible	**Rare** It is unlikely that any consequence would ever arise.	**Not Significant** Accidental spillage / leaks of oils, chemicals, or other materials are unlikely during the operational phase that would cause a deterioration in water quality. During decommissioning, underground cables will be removed while the ducting will be left in-situ avoiding the need for earthworks.

Receptor and Sensitivity	Potential Effect	Phase of Development	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
The Wind Farm Site						
Karst Features (High)	Reduced Groundwater Quality	Construction	**Small Adverse** Potential low risk to groundwater from polluted (e.g., construction phase) run-off	Slight Adverse	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the development.	**Minor Adverse** Karst features are primarily a geotechnical risk, but they may act as a direct conduit (pathway) for potential pollutants to groundwater receptor.
Tracks, turbines and associated building (Low)	Flood risk to Project (risk to occupants and infrastructure due to identified potential risk of flooding)	Construction, Operational & Decommissioning	**Negligible** Negligible change in predicted peak flood levels	Imperceptible	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the Project	**Not Significant** All proposed wind farm infrastructure is sited in Flood Zone C as defined in the OPW Guidelines and is resilient to the effect of climate change. The Project has been designed to avoid areas potentially susceptible to pluvial ponding.
Floodplains (Medium)	Increased flood risk elsewhere	Construction, Operational & Decommissioning	**Negligible** No change in predicted peak flood levels	Imperceptible	**Rare** It is unlikely that any consequence would ever arise.	**Not Significant** All proposed wind farm infrastructure including the Onsite Substation is sited in Flood Zone C as defined in the OPW Guidelines (OPW, 2009) and is resilient to the effect of climate change. Where Site Access Roads are required to cross watercourses within the Wind Farm Site, crossing design will comply with OPW Section 50 guidelines, which will include providing freeboard to design flood levels ensuring no increase in flood risk elsewhere due to the bridge / culvert.

11.7.2 Effect of the Project (Grid Connection)

Table 11.17: Potential Magnitude and Significance of Impacts to Receptors – Including Effect of Embedded Avoidance & Design

Receptor and Sensitivity	Potential Effect	Phase of Development	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
Grid Connection						
Surface Watercourses within Mantua_010; Kinard_010; and Killukin_020 river sub-basins (Medium to High)	Reduced water quality	Construction	**Small Adverse** Minor deterioration in water quality unlikely to affect the most sensitive receptor or insignificant change in water quality conditions not exceeding those expected due to naturally occurring fluctuations	Slight to Moderate Adverse	**Likely** Possible consequential effect in the short to medium term.	**Minor to Moderate Adverse** All watercourse crossings coincide with existing road crossings and culverts; the cable will be laid within the road deck over/under the existing culvert, or via HDD under the watercourse. Methods will not cause requirement for any in-stream work or work that would directly cause potential for pollution of the watercourse. Other effects associated with typical proposed Grid Connection construction activities would be similar to those described in **section 11.5.4.2** (e.g., sediment / suspended pollution or chemical pollution of surface water runoff and groundwater) and would be solely associated with the construction phase.
		Operational	**Negligible** No perceptible changes to baseline conditions. No measurable change in water quality	Imperceptible	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the Project	**Not Significant** During the operational phase of the Project, the Grid Connection would by its nature (buried) have no effect on water quality.
	Changes to watercourse morphology	Construction, Operational	**Negligible** No change to river morphology / fluvial geomorphology	Imperceptible	**Rare** It is unlikely that any consequence would ever arise.	**Not Significant** All watercourse crossings coincide with existing road crossings and culverts; the cable will be laid within the road deck over the existing culvert, or via HDD under the watercourse. Methods will not cause requirement for any in-stream work or work that would directly affect watercourse morphology.
Proposed Natural Heritage Area	Reduced water quality	Construction	**Small Adverse** Minor deterioration in water quality unlikely to	Moderate Adverse	**Unlikely** Unlikely that any consequential	**Moderate Adverse** All watercourse crossings coincide with existing road crossings and culverts; the cable will be laid within the

Receptor and Sensitivity	Potential Effect	Phase of Development	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
Grid Connection						
(Kilglass and Grange Loughs pNHA) (High)			affect the most sensitive receptor or insignificant change in water quality conditions not exceeding those expected due to naturally occurring fluctuations		effect would arise within the lifetime of the development.	road deck over/under the existing culvert, or via HDD under the watercourse. Methods will not cause requirement for any in-stream work or work that would directly cause potential for pollution of the watercourse. Other effects associated with typical proposed Grid Connection construction activities would be similar to those described in **section 11.5.4.2** (e.g., sediment / suspended pollution or chemical pollution of surface water runoff and groundwater) and would be solely associated with the construction phase.
		Operational	**Negligible** No perceptible changes to baseline conditions. No measurable change in water quality	Imperceptible	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the development.	**Not Significant** During the operational phase of the Proposed Development, the cable route would by its nature (buried) and have no effect on water quality.
Floodplains (Medium)	Flood risk to the Project	Construction, Operational	**Negligible** No change in predicted peak flood levels	Imperceptible	**Rare** It is unlikely that any consequence would ever arise.	**Not Significant** The cable route affects no significant fluvial floodplains other than those contiguous with existing road bridges and culverts. The cable route will not further encroach into existing floodplains compared to existing conditions.
	Increased flood risk elsewhere	Construction, Operational	**Negligible** No change in predicted peak flood levels	Imperceptible	**Rare** It is unlikely that any consequence would ever arise.	**Not Significant** Appropriate techniques to manage surface water around working areas during construction would be implemented. The cable route would by its nature (buried) have no effect on flooding by causing restrictions or disruption to flood flows.
Bedrock Groundwater / Aquifers (High)	Reduced Groundwater Quality	Construction	**Small Adverse** Potential low risk to groundwater from polluted (e.g., construction phase) run-off	Slight / Moderate Adverse	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the Project.	**Minor Adverse** Limited potential for short term slight deteriorations in water quality due to excavations that would release sediments; use of mechanical plant with associated fuels and lubricants.

Receptor and Sensitivity	Potential Effect	Phase of Development	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
Grid Connection						
		Operational	**Negligible** No measurable change in groundwater quality.	Imperceptible	**Rare** It is unlikely that any consequence would ever arise.	**Not Significant** During the operational phase of the Project, the cable route would by its nature (buried) have no effect on water quality.
	Reduced Groundwater Quantity	Construction, Operational	**Negligible** No measurable change in groundwater levels, groundwater flow regime, No change to an aquifer.	Imperceptible	**Rare** It is unlikely that any consequence would ever arise.	**Not Significant** Shallow excavations associated with cable laying would not be anticipated to cause any change in groundwater flow routes.
Groundwater Scheme / Zone of Contribution (High)	Reduced Groundwater Quality	Construction	**Small Adverse** Potential low risk to groundwater from polluted (e.g., construction phase) run-off	Slight / Moderate Adverse	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the Project.	**Minor Adverse** Limited potential for short term slight deteriorations in water quality due to excavations that would release sediments; use of mechanical plant with associated fuels and lubricants.
		Operational	**Negligible** No measurable change in groundwater quality.	Imperceptible	**Rare** It is unlikely that any consequence would ever arise.	**Not Significant** During the operational phase of the Project, the cable route would by its nature (buried) have no effect on water quality.
	Reduced Groundwater Quantity	Construction & Operational	**Negligible** No measurable change in groundwater levels, groundwater flow regime	Imperceptible	**Rare** It is unlikely that any consequence would ever arise.	**Not Significant** Shallow excavations associated with cable laying would not be anticipated to cause any change in groundwater flow routes.
Karst Features (High)	Reduced Groundwater Quality	Construction	**Small Adverse** Potential low risk to groundwater from polluted (e.g., construction phase) run-off	Slight Adverse	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the development.	**Minor Adverse** Karst features are primarily a geotechnical risk, but they may act as a direct conduit (pathway) for potential pollutants to groundwater receptor.

11.7.3 Effect of the Project (Turbine Delivery Route)

Table 11.18: Potential Magnitude and Significance of Impacts to Receptors – Including Effect of Embedded Avoidance & Design

Receptor and Sensitivity	Potential Effect	Phase of Development	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
Turbine Delivery Route						
Surface Watercourses within the Charlestown Stream_010 river sub-basin (High)	Reduced Water Quality	Construction	**Small Adverse** Minor deterioration in water quality unlikely to affect the most sensitive receptor or insignificant change in water quality conditions not exceeding those expected due to naturally occurring fluctuations	Slight Adverse	**Likely** Possible consequential effect in the short to medium term.	**Minor Adverse** Temporary road widening is required adjacent to a tributary of the Mullaghanoe River. Temporary short-term construction activities adjacent to watercourse would be likely to cause a temporary change in water quality in the absence of additional mitigation. Spillage of oils, chemicals, or cementitious material associated with temporary construction and arising due to improper site management would be likely to cause a temporary change in water quality.
		Operational & Decommissioning	**Negligible** No changes to baseline conditions	Imperceptible	**Rare** It is unlikely that any consequence would ever arise.	**Not Significant** Works required to facilitate the turbine delivery shall be temporary during the construction phase only.
Designated site (River Moy SAC) (Very High)	Reduced Water Quality	Construction	**Small Adverse** Minor deterioration in water quality unlikely to affect the most sensitive receptor or insignificant change in water quality conditions not exceeding those expected due to naturally occurring fluctuations	Moderate Adverse	**Likely** Possible consequential effect in the short to medium term.	**Moderate Adverse** Temporary road widening is required adjacent to a tributary of the Mullaghanoe River which forms part of the River Moy SAC. Temporary short-term construction activities adjacent to watercourse would be likely to cause a temporary change in water quality in the absence of additional mitigation. Spillage of oils, chemicals, or cementitious material associated with temporary construction and arising due to improper site management would be likely to cause a temporary change in water quality.
		Operational & Decommissioning	**Negligible** No changes to baseline conditions	Imperceptible	**Rare** It is unlikely that any consequence would ever arise.	**Not Significant** Works required to facilitate the turbine delivery shall be temporary during the construction phase only.

11.8 ADDITIONAL MITIGATION MEASURES – CONSTRUCTION PHASE

Additional mitigating measures, over and above the designed-in / embedded mitigation previously detailed, will be used when appropriate to reduce or prevent the residual hazards which may not be fully mitigated by the design evolution and avoidance. Although significant effects are not likely, these additional mitigation measures will be implemented as part of best practice.

11.8.1 Pollution Prevention Measures

During all phases of the Project, the site manager will ensure that mitigation measures as identified within this assessment are fully implemented and that activities are carried out in such a manner as to prevent or reduce effects.

To ensure best practice on site and to help avoid pollution release to watercourses, IFI 'Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters' (2016) will be adhered to. The Guidance on Pollution Prevention (GPP) series (SEPA / NIEA, 2022), relevant in similar adjacent jurisdictions, will be consulted and complied with to help avoid pollution release to watercourses. Key requirements for control of chemical pollution risk that will be implemented include those outlined in the following sections.

The following sections should be read in conjunction with the construction management information provided within **Chapter 2: Project Description**, **Appendix 2.1: Construction Environmental Management Plan (CEMP)**, and **Appendix 11.2** (also included as **Management Plan 3** of the **CEMP**).

11.8.1.1 Storage

All equipment, materials and chemicals required for the Project will be stored away from any watercourse (i.e. outside previously stated buffer zones) and in accordance with GPP5: Works and Maintenance in or Near Water and GPP6: Working at Construction and Demolition Sites. Chemical, fuel and oil stores will be sited on impervious bases in accordance with GPP2: Above Ground Oil Storage Tanks and within a secured bund of 110% of the storage capacity.

Storage space shall be located within the Temporary Construction Compound (as described in **Chapter 2: Development Description**); the same conditions shall apply where materials are stored at main working areas (e.g. turbine cranepads).

11.8.1.2 Vehicles and Refuelling

Standing machinery will have drip trays placed underneath to prevent oil and fuel leaks causing pollution. Spill kits will also be available in designated areas throughout the Wind Farm Site. Refuelling of vehicles and machinery will be carried out on an impermeable surface in designated areas away from any watercourse or drainage ditches (i.e., outside previously stated buffer zones, refer to **Section 11.6.1.1**) and will adhere to best practice as detailed in PPG7.

11.8.1.3 Maintenance

On-site maintenance (outside of the Temporary Construction Compound) to construction plant will be avoided in all practicable instances, unless vehicles have broken down necessitating maintenance at the point of breakdown. Spill / leak prevention measures (spill kit, drip trays, absorbent booms) will be put in place to avoid spills of oils or fuels prior to carrying out any maintenance works.

11.8.1.4 Cement and Concrete Batching

Measures to prevent discharge of alkaline wastewaters or contaminated storm water to watercourses / groundwater will be determined before commencement of works. Concrete contaminated water will be discharged to a lined basin in order that it be contained for authorised disposal off site. Wastewater spillage will be minimised by using settling tanks and recycling water. Spill kits will also be available in designated areas throughout the Wind Farm Site.

11.8.1.5 Mess and Welfare Facilities

Mess and welfare facilities will be required during the construction phase and will be located at the Temporary Construction Compounds. Foul effluent disposal shall be via sealed cesspools with periodic tankered removal by a licensed waste haulier for licensed offsite disposal (i.e., there shall be no emission of treated or untreated foul effluent on the Wind Farm Site).

11.8.1.6 Construction in the Vicinity of Watercourses

The following procedures will apply to the general construction activities required within defined watercourse buffer zones:

- No unnecessary stripping / removal of vegetation;
- No spoil deposition or stockpiling of excavated material;
- No storage or use of chemicals, fuels, or other lubricants;

- Due consideration will be given to the prevailing ground and weather conditions (refer to **Section 11.8.2**) when programming the execution of the works in order to ensure that works are undertaken during periods of predicted low flow and low rainfall in order to minimise contact with water; and
- Ensure that roadside drains do not discharge directly into watercourses, but rather through a riparian buffer area of intact vegetation as denoted on design drawings.

11.8.1.7 *Construction of Watercourse Crossings*

Construction of watercourse crossings will be programmed to coincide with periods of predicted low flow in the affected channel (determined by rainfall and would generally coincide with summer months) and adhere to working period restrictions imposed.

Construction will be strictly as per the design for each identified watercourse crossing and will fully implement all SuDS and additional mitigating measures proposed at the detailed design stage. For purposes of outline design, the proposed mitigation will include:

- Installation of silt fences parallel to the watercourse channel in the vicinity of the proposed crossing;
- Installation of small cut-off drains to prevent natural surface runoff entering area of construction activity;
- Installation of filtration or other silt entraining features within the watercourse channel immediately downstream of the works location; and
- Use of over pumping where deemed appropriate.

11.8.1.8 Construction in the Vicinity of Private Water Supplies

There shall be no storage of chemicals, fuels, or other lubricants and no refuelling permitted within 100 m of private water supplies.

An Emergency Response Plan for dealing with an accidental spillage of chemicals, fuels, or other lubricants shall be prepared prior to works commencing and communicated to all operatives.

Emergency response measures shall include the following:

- Establish that there is not an immediate risk of fire, if there is call the Fire Brigade and evacuate the area;
- Stop the source of the leak – i.e. by turning off the tap, plugging the leak or rolling over the drum (if it is safe to do so);
- Contain the spillage by bunding using sandbags, earth banks, absorbent materials etc. Seal any drains to prevent entry of oil and place booms across any receiving watercourses to contain and absorb surface oil;
- If necessary, contact the Emergency Response Team;

- Notify the Environmental Manager. The Environmental Manager will assess the requirement to notify other agencies i.e. EPA or the sewage undertaker; and,
- Clean up within the contained area. All contaminated earth and materials arising from the spillage are classifies as hazardous waste and are to be disposed of via a licensed haulier to a licensed recipient in line with approved hazardous waste removal procedures.

11.8.1.9 Temporary SuDS

SuDS, comprising temporary drainage and silt management features will be constructed prior to earthworks (including preliminary or enabling works including felling) proceeding to construct linear works (tracks / hardstanding areas / cable routes), turbine bases, and other infrastructure.

Drainage will be provided to temporary earthworks. Permanent drainage will be installed in advance of or in parallel with completion of tracks and hardstanding areas; a planning design for permanent drainage is shown on drawings within **Appendix 11.1** and **Appendix 11.2** (also included as **Management Plan 3** of the **CEMP**).

Temporary measures will include:

- Temporary silt fences erected in areas where risk of pollution to watercourses has been identified e.g. track watercourse crossing locations and areas where tracks lie within watercourse buffer zones;
- Installing temporary constructed settlement features such as sumps or settlement basins in areas where water is to be discharged. Principles and design standards for sizing of treatment are stated in **Appendix 11.2** (also included as **Management Plan 3** of the **CEMP**);
- Upslope temporary cut-off drainage channels approximately parallel to the proposed Site Access Roads alignment installed in advance of any excavated cuttings for the Site Access Roads or Turbine Hardstand areas;
- Drains, natural flow paths and cut-off drain outlet locations will be identified and charted, in order to ensure that piped crossings can be installed in advance of or adjacent to the track construction;
- Settlement ponds will be constructed in advance of commencing excavations for foundations and at any other locations where dewatering of reduced quality runoff is expected;
- Drainage swales will be installed in parallel with Site Access Road construction. Note that this may require that drainage swales are reformed on an ongoing basis as Site Access Road alignments are modified to their eventual finished design level.

The prevention measures described above will be in place at all times during the construction phase to prevent the conveyance of silts to receiving watercourses. Further detail on the measures above is elaborated in **Appendix 11.2** (also included as **Management Plan 3** of the **CEMP**).

11.8.1.10 Electrical Cable Laying

Internal Cabling and Grid Connection laying works will be managed and limited in accordance with **Section 11.8.2** (Responding to Weather) so that execution of the works is undertaken during periods with low rainfall likely to coincide with low superficial groundwater levels in order to reduce the likelihood of runoff entering the excavations.

Excavation of cable trenches will be carried out over short distances, with frequent backfilling of trenches to minimise opportunity for the ingress of water into open trenches, temporary silt traps will be provided in longer trench runs and on steeper slopes, and peat and spoil will be stored in line with a Spoil Management Plan, which is included as part of the detailed CEMP (**Appendix 2.1**).

11.8.1.11 Dewatering of Excavations & Borrow Pits

Dewatering of excavations may be required, depending on groundwater levels and flow, although based on the existing Site Investigations (SI) information (refer to **Chapter 10: Soils and Geology** and associated appendices), shallow groundwater is considered to be likely.

The majority of Turbine Foundations will be gravity based. Turbines T1 and T3 are likely to be constructed with deep piled foundation, comprising rotary bored piles into bedrock, with potential dewatering below the bedrock aquifer groundwater table anticipated at these locations.

SI works indicate that the bedrock is overlain by 3 – 8m of overburden, is variably weathered, and initially rock weak. The 2 no. Borrow Pits will be excavated only as required, subject to the results of the confirmatory ground investigations and the encountered bedrock quality. Groundwater from fractured and weathered bedrock and shallow groundwater encountered at these locations will require dewatering.

All contaminated groundwater or rainfall runoff collected in excavations will be discharged via settlement ponds or filter strips prior to entry to the receiving water environment. Temporary pumping of groundwater will be carried out as required to facilitate excavation

and remove wastewater with high concentrations of suspended soils into settlement features.

The earthworks will not take place during severe weather conditions if they present a risk to materials management or stability.

Any settlement lagoons or filter strips associated with dewatering will be regularly inspected, particularly after periods of heavy rainfall and prior to periods of forecast heavy rainfall. Maintenance (to clear blockages or remove silt) will be carried out in periods of dry weather where practicable.

Settlement features at Borrow Pits and wider maintenance requirements are further considered in **Appendix 11.2** (also included as **Management Plan 3** of the **CEMP**).

11.8.1.12 Piling Activities

All piling works will utilise best practice rotary bored piling techniques, avoiding the use of driven piling methods that could increase the risk of preferential pathways for contaminant migration. Drilling fluids (if required) will be selected to be non-toxic and environmentally acceptable, and their use will be strictly controlled. Closed-loop systems will be employed where practicable to minimise losses to ground.

The integrity of the borehole will be maintained throughout construction, and temporary casing will be installed where required to prevent collapse of overburden materials and to minimise the potential for vertical hydraulic connectivity between superficial deposits and the underlying bedrock aquifer. Piles will be constructed to ensure adequate sealing of the annulus, preventing the creation of preferential pathways for contaminant migration (i.e., vertical movement of water and contaminants) between strata. For bored piles, concreting techniques (e.g. tremie through casing) will seal the annulus, avoiding long-term connections between shallow peat/bog water and deeper bedrock groundwater.

11.8.1.13 Dust Management

Loose track material generated during the use of Site Access Roads and the Temporary Construction Compounds will be prevented from reaching watercourses by surface water drainage systems installed at aggregate based hard standing areas. In dry weather dust suppression methods such as by a dust suppression bowser will be employed.

11.8.1.14 Maintenance of Pollution Prevention Measures

All SuDS and additional pollution prevention measures installed will be subject to a regular maintenance regime for the life of the construction phase in order to maintain functionality of all features. This will comprise:

- Unblocking of drains;
- Maintenance of access road and other hard standing surfaces;
- Replacement of filtration features; and
- Removal of silt build-up from settlement and filtration features.

11.8.2 Responding to Weather

The works programme for the construction phase will take account of weather forecasts and predicted rainfall in the region. Monitoring of weather forecasts shall be the responsibility of a suitably qualified Environmental Consultant / Environmental Clerk of Works (ECoW).

Work will be suspended or scaled back if heavy rain is forecast. The extent to which works will be scaled back or suspended will relate directly to scale and nature of the work proposed, the proximity to a receiving watercourse, and the amount of rainfall forecast. Using the safe threshold rainfall values below will allow work to be safely controlled (from a water quality perspective) in the event of forecasting of an impending high rainfall intensity event.

Works will be suspended if forecasting suggests any of the following is likely to occur:

- >10 mm/hr (i.e. high intensity local rainfall events);
- >25 mm in a 24-hour period (heavy frontal rainfall lasting most of the day); or,
- >half monthly average rainfall in any 7 days.

Prior to works being suspended the following control measures shall be completed:

- Secure all open excavations; and
- Provide temporary or emergency drainage to prevent back-up of surface runoff.

Contractor will avoid working during heavy rainfall and for up to 24 hours after heavy events to ensure drainage systems are not overloaded. ECoW shall check drainage after rainfall event and prior to recommencement of works.

11.9 MITIGATING MEASURES – OPERATIONAL PHASE

Mitigation of the effects of the Project will comprise the following:

- Ensure best practice is adhered to on the Wind Farm Site and avoid pollution release to watercourses by incorporating pollution prevention measures (as outlined in **Section 11.8.1**) into management policy;
- Permanent welfare facilities will be installed as part of control building / Onsite Substation facilities. Foul effluent will be disposed of through the use of sealed cesspools with periodic tankered removal by a licensed waste haulier for licensed offsite disposal (i.e. there shall be no emission on the site); and
- Cyclical maintenance of permanent SuDS drainage features installed during the construction phase, including unblocking of drains, maintenance of access road and other hard standing surfaces, and removal of silt build-up from settlement features. An outline maintenance programme is included in **Appendix 11.2** (also included as **Management Plan 3** of the **CEMP**).

11.10 MITIGATING MEASURES – DECOMMISSIONING PHASE

As noted in **Section 11.5.3**, activities associated with the decommissioning phase at the end of the operating design life are generally as per those for the construction phase, and as such, mitigation measures outlined in the construction phase will be followed as appropriate during the decommissioning phase of the Project.

The Irish Wind Energy Association (IWEA) states that when decommissioning a wind farm "*the concrete bases could be removed, but it may be better to leave them under the ground, as this causes less disturbance*". Therefore, the Turbine Foundations will remain in-situ, the Turbine Hardstand areas will be allowed to revegetate naturally, and Site Access Roads will be left for use by the relevant landowner(s). Internal Cabling will also be removed while the ducting will be left in-situ.

Prior to the decommissioning work, a comprehensive plan will be drawn submitted to the local authority for approval that takes account of the findings of this EIAR and the contemporary legislative requirements at that time, to manage and control the component removal and ground reinstatement.

11.11 WATER QUALITY MONITORING

A water quality monitoring program will be implemented to monitor effects on the surface water quality regime during the infrastructure construction, operational and decommissioning phases of the Project, in order to:

- Demonstrate that the mitigation measures and surface water management is performing as designed;
- Provide validation that the in-place mitigation measures are not having an adverse effect upon the environment; and
- Indicate the need for additional mitigation measures to prevent, reduce or remove any effects on the water environment, such as additional temporary settlement or filtration structures or short-term flocculant dosing to suit observed site conditions.

The monitoring would be informed by existing water quality baseline data and baseline monitoring rounds undertaken prior to the commencement of the construction phase.

It is proposed that the water monitoring extent, duration and frequency will be agreed with the local authority or the relevant regulating body post-consent and will nominally consist of physicochemical and biological monitoring. The extent, duration and frequency of the monitoring will be proportionate to the level of activity during each phase of the Project and the associated perceived risks.

A Water Quality Monitoring Plan (**Management Plan 2**) is included within the Construction and Environmental Management Plan (CEMP) appended to the EIAR in **Appendix 2.1**.

11.12 MITIGATING MEASURES AND RESIDUAL EFFECTS

The following tables detail the assessed impact magnitude, likelihood and associated significance as a function of the matrix stated previously of all receptors identified as previously having an unmitigated impact significance greater than 'not significant'.

11.12.1 Mitigated Effects of the Project (the Wind Farm Site)

Table 11.19: Mitigated Effects (the Wind Farm Site)

Receptor and Sensitivity	Potential Effect	Phase of Development	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
The Wind Farm Site						
On-site watercourses draining the Carricknabraher _020 river sub-basin (Low)	Silt / suspended solid pollution of surface waters	Construction, Operational & Decommissioning	**Negligible** No perceptible changes to baseline conditions. No measurable change in water quality.	Imperceptible	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the Project.	**Not Significant** Surface water management and pollution control and in particular to work in and adjacent to watercourses, is likely to result in no permanent change and an insignificant temporary change in conditions exceeding natural or pre-existing conditions.
	Hydro - morphological change	Construction & Decommissioning	**Negligible** No perceptible changes to baseline conditions.	Imperceptible	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the Project.	**Not Significant** Surface water management and pollution control (silt / sediment) and in particular to work in and adjacent to watercourses, is likely to result in no permanent change and an insignificant temporary change in conditions exceeding natural or pre-existing conditions.
	Chemical pollution of surface waters	Construction & Decommissioning	**Negligible** No perceptible changes to baseline conditions. No measurable change in water quality.	Imperceptible	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the Project.	**Not Significant** Pollution prevention measures proposed to control chemical pollution at all phases is likely to result in no permanent or temporary change in conditions exceeding natural or pre-existing conditions. Robust water quality monitoring will permit a rapid response to any residual risk.
		Operational	**Small Beneficial** Minor improvement over baseline water quality conditions	Imperceptible	**Likely** Possible consequential effect in the short to medium term and / or likely but not inevitable in the long term.	**Minor Beneficial** Pollution prevention measures proposed to control chemical pollution at all phases is likely to result in no permanent or temporary change in conditions exceeding natural or pre-existing conditions. Robust water quality monitoring will permit a rapid response to any residual risk. During the operational phase, the change of land use within the footprint of the Wind Farm Site will likely have a slight / minor beneficial effect on the receiving water environment compared to existing conditions i.e., water quality pressures (sediment and nutrient

Receptor and Sensitivity	Potential Effect	Phase of Development	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
The Wind Farm Site						
						issues caused by extensive peat harvesting) noted within the Carricknabraher_020 river. Habitat management and enhancement measures proposed (refer to **Appendix 6.2**) include enhancement of raised bog remnant habitats found in the Wind Farm Site. Therefore, the Project would contribute to improvement measures with respect to pressures associated with peat identified in the Carricknabraher_020 river sub-basin / 'Carricknabraher Area for Action' (area for restoration).
On-site watercourses draining the Breedoge_010 river sub-basin (High)	Silt / suspended solid pollution of surface waters	Construction, Operational & Decommissioning	**Negligible** No perceptible changes to baseline conditions. No measurable change in water quality.	Imperceptible	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the Project.	**Not Significant** Surface water management and pollution control and in particular to work in and adjacent to watercourses, is likely to result in no permanent change and an insignificant temporary change in conditions exceeding natural or pre-existing conditions.
	Hydro - morphological change	Construction & Decommissioning	**Negligible** No perceptible changes to baseline conditions.	Imperceptible	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the Project.	**Not Significant** Surface water management and pollution control (silt / sediment) and in particular to work in and adjacent to watercourses, is likely to result in no permanent change and an insignificant temporary change in conditions exceeding natural or pre-existing conditions.
	Chemical pollution of surface waters	Construction, Operational & Decommissioning	**Negligible** No perceptible changes to baseline conditions. No measurable change in water quality.	Imperceptible	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the Project.	**Not Significant** Pollution prevention measures proposed to control chemical pollution at all phases is likely to result in no permanent or temporary change in conditions exceeding natural or pre-existing conditions. Robust water quality monitoring will permit a rapid response to any residual risk.
On-site watercourses draining the Mantua_010 river sub-basin	Silt / suspended solid pollution of surface waters	Construction, Operational & Decommissioning	**Negligible** No perceptible changes to baseline conditions. No measurable	Imperceptible	**Unlikely** Unlikely that any consequential effect would arise	**Not Significant** Surface water management and pollution control and in particular to work in and adjacent to watercourses, is likely to result in no permanent change and an

Receptor and Sensitivity	Potential Effect	Phase of Development	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
The Wind Farm Site						
(Medium)			change in water quality.		within the lifetime of the Project.	insignificant temporary change in conditions exceeding natural or pre-existing conditions.
	Hydro - morphological change	Construction & Decommissioning	**Negligible** No perceptible changes to baseline conditions.	Imperceptible	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the Project.	**Not Significant** Surface water management and pollution control (silt / sediment) and in particular to work in and adjacent to watercourses, is likely to result in no permanent change and an insignificant temporary change in conditions exceeding natural or pre-existing conditions.
	Chemical pollution of surface waters	Construction, Operational & Decommissioning	**Negligible** No perceptible changes to baseline conditions. No measurable change in water quality.	Imperceptible	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the Project.	**Not Significant** Pollution prevention measures proposed to control chemical pollution at all phases is likely to result in no permanent or temporary change in conditions exceeding natural or pre-existing conditions. Robust water quality monitoring will permit a rapid response to any residual risk.
Off-site designated site (Lough Gara SPA / Ramsar Site) (Extremely High)	Silt / suspended solids pollution of surface waters	Construction, Operational & Decommissioning	**Negligible** No perceptible changes to baseline conditions. No measurable change in water quality.	Imperceptible	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the Project.	**Not Significant** Riparian buffer zones, avoidance, and control of reduced quality runoff from the temporary and permanent works would cause runoff from the site to have no effect exceeding normal seasonal or pre-existing fluctuations. Surface water management and pollution control in particular to work in and adjacent to watercourses, is likely to result in no permanent change and an insignificant temporary change in conditions exceeding natural or pre-existing conditions.
	Chemical pollution of surface waters	Construction, Operational & Decommissioning	**Negligible** No perceptible changes to baseline conditions. No measurable change in water quality.	Imperceptible	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the Project.	**Not Significant** Pollution prevention measures proposed to control chemical pollution at all phases is likely to result in no permanent or temporary change in conditions exceeding natural or pre-existing conditions. Robust water quality monitoring will permit a rapid response to any residual risk.

Receptor and Sensitivity	Potential Effect	Phase of Development	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
The Wind Farm Site						
Bedrock Groundwater / Aquifers (Medium to High)	Chemical pollution of groundwater	Construction, Operational & Decommissioning	**Negligible** No measurable change in groundwater quality. No change to an aquifer.	Imperceptible	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the Project.	**Not Significant** Pollution prevention measures proposed to control chemical pollution at all phases is likely to result in no permanent or temporary change in conditions exceeding natural or pre-existing conditions.
Private Water Supply (Low)	Disruption to quantity or quality of supply	Construction	**Negligible** No measurable change in groundwater quality.	Imperceptible	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the Project.	**Not Significant** Pollution prevention measures proposed to control chemical pollution at all phases is likely to result in no permanent or temporary change in conditions exceeding natural or pre-existing conditions.
Karst Features (High)	Reduced Groundwater Quality	Construction	**Negligible** No measurable change in groundwater quality.	Imperceptible	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the development.	**Not Significant** Pollution prevention measures proposed to control chemical pollution during construction phase is likely to result in no permanent or temporary change in conditions exceeding natural or pre-existing conditions.

11.12.2 Mitigated Effect of the Project (Grid Connection)

Table 11.20: Mitigated Effects (Grid Connection)

Receptor and Sensitivity	Potential Effect	Phase of Development	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
Grid Connection						
Surface Watercourses within Mantua_010; Kinard_010; and Killukin_020 river sub-basins (Medium to High)	Reduced water quality	Construction	**Negligible** No perceptible changes to baseline conditions. No measurable change in water quality	Imperceptible	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the Project.	**Not Significant** Surface water management and pollution control and in particular to work in and adjacent to watercourses, is likely to result in no permanent change and an insignificant temporary change in conditions exceeding natural or pre-existing conditions. Pollution prevention measures proposed to control chemical pollution during construction phase is likely to result in no permanent or temporary change in conditions exceeding natural or pre-existing conditions. Robust water quality monitoring will permit a rapid response to any residual risk.
Proposed Natural Heritage Area (Kilglass and Grange Loughs pNHA) (High)	Reduced water quality	Construction	**Negligible** No perceptible changes to baseline conditions. No measurable change in water quality	Imperceptible	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the Project.	**Not Significant** Surface water management and pollution control and in particular to work in and adjacent to watercourses, is likely to result in no permanent change and an insignificant temporary change in conditions exceeding natural or pre-existing conditions. Pollution prevention measures proposed to control chemical pollution during construction phase is likely to result in no permanent or temporary change in conditions exceeding natural or pre-existing conditions. Robust water quality monitoring will permit a rapid response to any residual risk.
Bedrock Groundwater / Aquifers (High)	Reduced Groundwater Quality	Construction	**Negligible** No measurable change in groundwater quality. No change to an aquifer.	Imperceptible	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the Project.	**Not Significant** Pollution prevention measures proposed to control chemical pollution during construction phase is likely to result in no permanent or temporary change in conditions exceeding natural or pre-existing conditions.

Receptor and Sensitivity	Potential Effect	Phase of Development	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
Grid Connection						
Groundwater Scheme / Zone of Contribution (High)	Reduced Groundwater Quality	Construction	**Negligible** No measurable change in groundwater quality. No change to an aquifer.	Imperceptible	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the Project.	**Not Significant** Pollution prevention measures proposed to control chemical pollution during construction phase is likely to result in no permanent or temporary change in conditions exceeding natural or pre-existing conditions.
Karst Features (High)	Reduced Groundwater Quality	Construction	**Negligible** No measurable change in groundwater quality.	Imperceptible	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the development.	**Not Significant** Pollution prevention measures proposed to control chemical pollution during construction phase is likely to result in no permanent or temporary change in conditions exceeding natural or pre-existing conditions.

11.12.3 Mitigated Effects of the Project (Turbine Delivery Route)

Table 11.21: Mitigated Effects (Turbine Delivery Route)

Receptor and Sensitivity	Potential Effect	Phase of Development	Magnitude	Potential Effect Significance	Likelihood	Overall Effect Significance and Rationale
Turbine Delivery Route						
Surface Watercourses within the Charlestown Stream_010 river sub-basin (High)	Reduced Water Quality	Construction	**Negligible** No perceptible changes to baseline conditions. No measurable change in water quality	Imperceptible	**Unlikely** Unlikely that any consequential effect would arise within the lifetime of the development.	**Not Significant** Surface water management and pollution control and in particular to work in and adjacent to watercourses, is likely to result in no permanent change and a not significant temporary change in conditions exceeding natural or pre-existing conditions. Pollution prevention measures proposed to control chemical pollution during construction phase is likely to result in no permanent or temporary change in conditions exceeding natural or pre-existing conditions. Robust water quality monitoring will permit a rapid response to any residual risk.
Designated site (River Moy SAC) (Very High)						

11.13 CUMULATIVE EFFECTS

An assessment has been undertaken of the cumulative effect on the water environment of the Project in conjunction with other known wind farms and other developments that are proposed, in planning, construction, or operation at the time of the application that could give rise to significant cumulative effects (refer to **Chapter 2: Project Description** and **Appendix 2.4** for further details of cumulative developments).

The assessment aims to determine potential for cumulative impact within the hydrological and hydrogeological setting of the Project caused by an accumulation of other (similar) developments.

The hydrological and hydrogeological setting for the purposes of the assessment of other developments is the downstream catchments hydrologically connected to the Project as identified on EPA mapping as described in **Section 11.4.6.1**. No similar developments are located within the stated hydrological and hydrogeological setting.

11.13.1 Other Developments

All other proposed, permitted or approved developments with potential for cumulative effects that are located within 10km from the Wind Farm Site are outlined in **Appendix 2.4**. The 10km radius distance search area selected for other development, other than wind farms, is considered to be reasonable for cumulative impact assessment for EIAR and consistent with the EPA "Guidelines on the information to be contained in environmental impact assessment reports" (2022) and best practice. The developments were screened within the hydrological and hydrogeological setting as set out in **Section 11.13**.

In those catchments hydrologically connected to the Wind Farm Site, 2 no. were identified within the Breedoge_010 river sub-basin (all conditional), 4 no. in the Carricknabragher_020 (the majority with 'conditional' status and one undetermined), and 1 no. in the Boyle_010 (conditional).

In those catchments hydrologically connected to the Grid Connection, 29 no. were identified within the Shannon (Upper)_060 river sub-basin (the majority 'conditional' one with 'pre-validation' status), 3 no. in the Killikin_010 (all conditional), and 4 no. in the Owenur_010 (all conditional).

11.13.2 Cumulative Assessment

The greatest risk to the environment is during the construction phase of these projects when the civil engineering works are undertaken. It is reasonable to assume that any cumulative development that has been approved for planning, is awaiting a decision, or is to submit further information to the planning authority, e.g., via planning conditions, has demonstrated (or will demonstrate prior to approval) that it would have no adverse effect on the environment and would incorporate good practice measures (e.g., construction phase and permanent SuDS, pollution prevention measures in management policy) into their designs. Such measures would manage the rate, quantity and quality of surface water runoff such that potential effects on hydrology and hydrogeology (water environment) would be negligible.

11.13.3 Cumulative Effects Summary

As no likely significant residual water environment effects are predicted arising from the Project, there is no potential significant cumulative effect to the water environment in conjunction with any other pre-existing or other future proposed / consented development.

11.14 SUMMARY AND CONCLUSION (AND STATEMENT OF SIGNIFICANCE)

This assessment identifies the potential hydrological and hydrogeological impacts, including surface and groundwater quality of the Project. It provides appropriate baseline information, enabling the potential effects to be identified.

Aspects of the design, construction, operation, and decommissioning of the Project that may potentially affect the receiving water environment have been identified and the pathways for effects assessed.

Embedded mitigation (design) measures integrated as part of the design substantially mitigate or eliminate likely significant effects to identified baseline receptors through avoidance and reduction. These measures (as outlined in **Section 11.6**) include:

- Avoidance of water features based on baseline constraints mapping;
- Design of site elements to minimise effects on the water environment including protection of potable ground water supplies; and
- A surface water management plan comprising the use of SuDS (drainage) embedded in the design to prevent pathways for pollution.

It has been determined that without additional mitigation (as outlined in **Section 11.8**), the Project is likely to cause significant adverse effects to the water environment (up to "major"

significance) primarily driven by hydrological connectivity to watercourses, the sensitivity (WFD status) of receiving watercourses and designated site downstream from the Wind Farm Site, and a "minor" adverse effect to groundwater. As such, informed by the Baseline assessment and pathways identified, additional mitigation proposed (as detailed in **Section 11.8**) includes construction phase pollution prevention procedures in accordance with best practice guidance.

Implementation of the additional mitigation proposed eliminates or reduces the predicted significance of effect to all receptors to "not significant". As outlined in **Section 11.3.4.5**, likely effects graded below major or moderate significance are not considered to be 'significant' in accordance with the EPA Guidance 2022.

Monitoring of the effect of the Project (during all phases) on the water environment will be provided by the Applicant through physicochemical water quality monitoring (as outlined in **Section 11.11**). Monitoring will demonstrate that the mitigation measures and surface water management is performing as designed, provide validation that the in-place mitigation measures are not having an adverse effect upon the water environment, and indicate the need for additional mitigation measures to prevent, reduce or remove any effects on the water environment.

As noted previously (**Section 11.2.1**, **Section 11.4.7.1**, and **Section 11.4.16.2**) a fundamental requirement of the WFD is to attain good ecological status of water bodies and that deterioration in the status of surface water and groundwater bodies is prevented. Any effect that would compromise the achievement of a WFD objective or result in the deterioration in the status of a water body would be a significant adverse effect. This chapter and assessment outlines embedded mitigation (**Section 11.6**) and additional mitigation measures (**Section 11.8**) specifically in relation to management of water (detailed further in **Appendix 11.2** (also included as **Management Plan 3** of the **CEMP**) to prevent deterioration of water quality and quantity. Implementation of the mitigation measures which result in an overall "not significant" effect in EIA terms are also appropriate to ensure that the present WFD status of receiving waterbodies is maintained (i.e., protecting chemical, biological including invertebrate, and hydromorphological conditions) and no aspect of the Project would compromise WFD objectives for improvement. WFD compliance is specifically addressed further in **Appendix 11.3**.

There is no likelihood of significant cumulative effects over and above any pre-existing effect caused by existing, proposed or consented projects.