9. HYDROLOGY AND HYDROGEOLOGY

9.1 Introduction

9.1.1 Background and Objectives

Hydro-Environmental Services (HES) was engaged by MKO to provide a description and assessment of the direct and indirect effects of the Existing Development on the hydrological (surface water) and hydrogeological (groundwater) environment.

The Existing Development, detailed fully in Chapter 4 of this remedial Environment Impact Assessment Report (rEIAR) includes all works carried out at the Wind Farm Site and Grid Connection Site from November 2019 to the present day.

As detailed in Section 1.1.1 in Chapter 1 of this EIAR/rEIAR, the various project components are described and assessed using the following references: 'Subject Development', 'Existing Development', 'Prospective Development', 'Permitted Development', 'Site', 'Wind Farm Site', 'Grid Connection Site', 'BMEP Site', 'Grid Connection', '2017 EIAR', the 'November 2020 Peat Slide', and 'proposed turbines' or 'proposed turbine locations'.

This chapter presents:

- A description of the baseline sensitivity and importance of the receiving hydrological and hydrogeological environment based on the baseline site conditions prior to the commencement of construction of the Existing Development;
- The mitigation and monitoring measures which were implemented during the construction of the Existing Development for the protection of the hydrological and hydrogeological environment;
- An assessment of the residual effects of the Existing Development on the hydrological and hydrogeological environment;
- An assessment of the effects from the Existing Development in cumulation with the potential effects of the Prospective Development;
- An assessment of the cumulative effects from the Existing Development and other projects in the surrounding area, and considers the transboundary effects.

9.1.2 Statement of Authority

Hydro-Environmental Services (HES) are a specialist geological, hydrological, hydrogeological and environmental practice which delivers a range of water and environmental management consultancy services to the private and public sectors across Ireland and Northern Ireland. HES was established in 2005, and our office is located in Dungarvan, County Waterford.

Our core areas of expertise and experience include upland hydrology and windfarm drainage design. We routinely complete impact assessment reports for hydrological and hydrogeological aspects for a variety of project types.

This chapter of the rEIAR was prepared by Michael Gill and Conor McGettigan.

Michael Gill (BA, BAI, Dip Geol., MSc, MIEI) is an Environmental Engineer and Hydrogeologist with over 22 years' environmental consultancy experience in Ireland. Michael has completed numerous hydrological and hydrogeological impact assessments of wind farms and renewable projects in Ireland. He has substantial experience in surface water drainage design and SUDs design and surface water/groundwater interactions. For example, Michael has worked on the 100 wind farm-related projects including original application for Meenbog Windfarm.

Conor McGettigan (BSc, MSc) is an Environmental Geoscientist with over 5 years' experience in the environmental sector in Ireland. Conor holds an M.Sc. in Applied Environmental Science (2020) and a B.Sc. in Geology (2016) from University College Dublin. Conor has prepared the hydrology and hydrogeology chapter of environmental impact assessment reports for several wind farm developments on peatlands. Conor has also worked on several substitute consent applications for works in peatlands including peat extraction at the Ballivor Bog Group. Conor also routinely prepares hydrological and hydrogeological assessment reports, WFD compliance assessment reports and flood risk assessments for a variety of development types including wind farms.

9.1.3 Scoping and Consultation

The scope for this assessment has been informed by consultation with statutory consultees, bodies with environmental responsibility and other interested parties as summarised in Section 2.8 of Chapter 2 of the rEIAR. Details of these scoping responses pertaining to hydrology and hydrogeology are listed below in **Table 9-1**. Further details are outlined in Section 2.8.2 of this rEIAR.

Table 9-1 Scoping Responses Relevant to Hydrology and Hydrogeology

Consultee	Description	Addressed in Section
Geological Survey Ireland (GSI)	*"The Groundwater Data Viewer indicates an aquifer classed as a 'Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones' underlies the proposed wind farm development. The Groundwater Vulnerability map indicates the range of groundwater vulnerabilities within the area covered is variable. We would therefore recommend use of the Groundwater Viewer to identify areas of High to Extreme Vulnerability and 'Rock at or near surface' in your assessments, as any groundwater-surface water interactions that might occur would be greatest in these areas."*	Refer to Section 9.3.9
Donegal County Council (DCC)	*DCC made several comments and recommendations regarding the completion of the wind farm with respect to hydrology and hydrogeology.* No comments were raised in respect to the Existing Development and the rEIAR.	This is addressed in the accompanying EIAR for the Prospective Development
Health Service Executive (HSE)	*"All drinking water sources, both surface and ground water, must be identified. Public and Group Water Scheme sources and supplies should be identified in addition to any private wells supplying potable water to houses in the vicinity of the proposed development. Measures to ensure that all sources and supplies are protected should be described. The Environmental Health Service recommends that a walk-over survey of the site is undertaken in addition to a desktop analysis of Geological Survey of Ireland data in order to identify the location of private wells used for drinking water purposes. Any potential significant impacts to drinking water sources should be assessed. Details of bedrock, overburden, vulnerability, groundwater flows, aquifers and catchment areas should be considered when assessing potential impacts and any proposed mitigation measures."*	Section 9.3.13 identifies all water resources. All effects on local water sources are assessed in Section 9.5.2.15 (Public Water Supplies) and Section 9.5.2.19 (Groundwater levels and private wells).
Uisce Éireann	*"Where the development proposal has the potential to impact an Uisce Éireann Drinking Water Source(s), the applicant shall provide details of measures to be taken to ensure that there will be no negative impact to Uisce Éireann's Drinking Water Source(s) during the construction and operational phases of the development. Hydrological /*	All effects on local water sources are assessed in Section 9.5.2.15 (Public Water Supplies - surface water abstractions)

Consultee	Description	Addressed in Section
	hydrogeological pathways between the applicant's site and receiving waters should be identified as part of the report."	
	"Where the development proposes the backfilling of materials, the applicant is required to include a waste sampling strategy to ensure the material is inert."	No backfill material was imported. All backfilling was completed with local peat and overburden which was excavated from the work areas during the construction process. The effects are assessed in Section 9.5.2.3 (peat and spoil management).
	"Mitigations should be proposed for any potential negative impacts on any water source(s) which may be in proximity and included in the environmental management plan and incident response"	All mitigation measures which were implemented for the protection of surface waters are detailed in Section 9.5.2.
	"Any and all potential impacts on the nearby reservoir as public water supply water source(s) are assessed, including any impact on hydrogeology and any groundwater/ surface water interactions" *"Any potential impacts on the assimilative capacity of receiving waters in relation to Uisce Éireann discharge outfalls including changes in dispersion / circulation characterises. Hydrological / hydrogeological pathways between the applicant's site and receiving waters should be identified within the report"* *"Any potential impact on the contributing catchment of water sources either in terms of water abstraction for the development (and resultant potential impact on the capacity of the source) or the potential of the development to influence / present a risk to the quality of the water abstracted by Uisce Éireann for public supply should be identified within the report."*	All effects on the Lough Mourne surface water abstraction are detailed in Section 9.5.2.15.
Inland Fisheries Ireland (IFI)	IFI made comments relating to the Grid Connection as the Wind Farm Site is not within IFI's jurisdiction. IFI note that the Eske is an important sub-catchment for brown trout, Atlantic salmon and European eel. IFI state that it is imperative that water quality are protected in the Lowerymore_020 and _030 waterbodies which both achieved High status in the most recent EPA report. The rEIAR should assess the impacts with regards to water pollution and changes to hydrology and should include all aspects of the development.	An assessment of the effects associated with the Grid Connection in the Eske sub-catchment are presented in Sections 9.5.2.11 and 9.5.2.12. The effects on WFD Status and objectives are presented in Section 9.5.2.18.
Northern Ireland Environmental Agency (NIEA)	The Wind Farm Site is located upstream of the Corgary Trout Farm (AFFNI 7). The Groundwater Team request an assessment of the potential impact on groundwater flows, aquifers and private groundwater well supplies. The Wind Farm Site is connected to the River Derg which form part of the River Foyle and Tributaries SAC and ASSI	Effects on downstream designated sites are presented in Section 9.5.2.17. Effects on groundwater levels are presented in Section 9.5.2.7, effects on groundwater quality are

Consultee	Description	Addressed in Section
	and is adjacent to the Killeter Forest Bogs and Lakes ASSI and Croagh Bogs ASSI.	presented in Sections 9.5.2.8 (hydrocarbons), 9.5.2.9 (cement-based products) and 9.5.2.10 (wastewater). Effects on groundwater wells supplies are presented in Section 9.5.2.19. Effects on surface water quality which could affect the trout farm are presented in 9.5.2.6 (excavation dewatering), 9.5.2.8 (hydrocarbons), 9.5.2.9 (cement-based products) and 9.5.2.10 (wastewater).
Irish Peatland Conservation Council (IPCC)	The IPCC requested that the following points in relation to hydrology are addressed in the rEIAR: Has the additional excavation or rock altered the hydrological impact and regime of the development and the landscape? What have been the impacts from the deviations, the peat-slide and the currently consented development on the Water Framework Directive? What are the direct and cumulative impacts to the qualifying interests of the designated sites from the deviations and the peat slide?	The effects from the rock extraction at the borrow pits on the water environment is presented in Section 9.5.2.4 (water quality) and Section 9.5.2.7 (groundwater levels). The effects of the Existing Development on WFD Status and objectives are presented in Section 9.5.2.18 The effects of the Existing Development on designated sites are presented in Section 9.5.2.17.

9.1.4 Relevant Legislation

The rEIAR is prepared in accordance with the requirements of European Union Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (the 'EIA Directive') as amended by Directive 2014/52/EU.

The requirements of the following legislation are also complied with:

- Planning and Development Acts, 2000 (as amended);
- Planning and Development Regulations, 2001 (as amended);
- S.I. No 296/2018: European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 which transposes the provisions of the EIA Directive as amended by the Directive 2014/52/EU into Irish Law;
- S.I. No. 477/2011: European Communities (Birds and Natural Habitats) Regulations, implementing EU Directives 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive) and 79/409/EEC on the conservation of wild birds (the Birds Directive);
- S.I. No. 293/1988: Quality of Salmon Water Regulations;

- Water Framework Directive (2000/60/EC) (as amended by Decision No. 2455/2011/EC; Directive 2008/32/EC; Directive 2008/105/EC; Directive 2009/31/EC; Directive 2013/39/EU; Council Directive 2013/64/EU; and Commission Directive 2014/101/EU ("WFD");
- S.I. No. 272/2009: European Communities Environmental Objectives (Surface Waters) Regulations 2009, as amended, and S.I. No. 722/2003 European Communities (Water Policy) Regulations, as amended, which implement EU Water Framework Directive (2000/60/EC) and provide for the implementation of 'daughter' Groundwater Directive (2006/118/EC);
- European Communities (Water Policy) Regulations 2003 (S.I. No. 722/2003);
- S.I. No: 122/2010: European Communities (Assessment and Management of Flood Risks) Regulations, resulting from EU Directive 2007/60/EC;
- S.I. No. 684/2007: Waste Water Discharge (Authorisation) Regulations, resulting from EU Directive 80/68/EEC on the protection of groundwater against pollution caused by certain dangerous substances (the Groundwater Directive);
- S.I. No. 9/2010: European Communities Environmental Objectives (Groundwater) Regulations 2010, as amended; and,
- S.I. No. 296/2009: European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009, as amended.

Relevant Northern Irish legislation was also reviewed and considered during the assessment of transboundary hydrological impacts. The following legislation was consulted:

- S.R. 2017 No. 81: Water Environment (Water Framework Directive) Regulations (Northern Ireland) 2017;
- S.R. 2015 No. 351: Water Framework Directive (Classification, Priority Substances and Shellfish Waters) Regulations (Northern Ireland) 2015;
- S.R. 2009 No. 254: Groundwater Regulations (Northern Ireland) 2009;
- S.R. 2009 No. 376: Water Environment (Floods Directive) Regulations (Northern Ireland) 2009; and,
- S.R. 2007 No. 147: Water Supply (Water Quality) Regulations (Northern Ireland) 2007.

9.1.5 Relevant Guidance

The Hydrology and Hydrogeology chapter of this rEIAR is carried out in accordance with guidance contained in the following:

- Circular Letter PL 1/2017: Implementation of Directive 2014/52/EU on the effects of certain public and private projects on the environment (EIA Directive);
- Environmental Protection Agency (2022): Guidelines on the information to be contained in Environmental Impact Assessment Reports (hereafter referred to as EPA, 2022);
- Institute of Geologists Ireland (2013) Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements;
- DoE/NIEA (2015): Wind farms and groundwater impacts - A guide to EIA and Planning considerations";
- OPW (2009) The Planning System and Flood Risk Management;
- National Roads Authority (2008) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- Wind Energy Development Guidelines for Planning Authorities, 2006 (the DoEHLG 2006 Guidelines) and the Draft Revised Wind Energy Development Guidelines (Draft DoHLGH 2019 Guidelines);
- Inland Fisheries Ireland (2016): Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Watercourses;
- Good Practice During Wind Farm Construction (Scottish Natural Heritage, 2010);
- PPG1 - General Guide to Prevention of Pollution (UK Guidance Note);
- PPG5 – Works or Maintenance in or Near Water Courses (UK Guidance Note);

- CIRIA (Construction Industry Research and Information Association) Guidance on 'Control of Water Pollution from Linear Construction Projects' (CIRIA Report No. C648, 2006);
- Wind Farms and Groundwater Impacts: A guide to EIA and Planning considerations (DoE/NIEA, April 2015);
- Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors. CIRIA C532. London, 2001;
- Land Types for Afforestation (Forest Service, 2016b):
- Forest Protection Guidelines (Forest Service, 2002);
- Forest Operations and Water Protection Guidelines (Coillte, 2013);
- Forestry and Water Quality Guidelines (Forest Service, 2000b); and,
- Forests and Water, Achieving Objectives under Ireland's River Basin Management Plant 2018-2021 (DAFM, 2018).

9.2 Assessment Methodology

9.2.1 Desk Study

A desk study of the Wind Farm Site and Grid Connection Site and the water study area (refer to Section 9.2.5 below for a definition of the study area) was completed in January and February 2024 to collect all relevant hydrological, hydrogeological and meteorological data. The desk study was completed to supplement site specific data which has been gathered for the Wind Farm Site and Grid Connection Site and detailed in Section 9.2.2. This desk study was checked and updated, where necessary (as new data may have been published), in November 2025 and updated further in June 2026.

The Wind Farm Site is located nearby (within 3-5kms), or in some places adjacent to (actually running along the border) the Northern Ireland border and therefore falls within river catchments located in both Ireland and Northern Ireland. The following remedial impact assessment therefore considers transboundary hydrological and hydrogeological impacts, with the former being more relevant. The residual cumulative impacts of other developments are also assessed where required.

The desk study involved consultation with the following sources for the Republic of Ireland:

- Environmental Protection Agency Databases (www.epa.ie);
- Geological Survey of Ireland - Groundwater Database (www.gsi.ie);
- Met Eireann Meteorological Databases (www.met.ie);
- National Parks & Wildlife Services Public Map Viewer (www.npws.ie);
- Water Framework Directive Map Viewer (www.catchments.ie);
- Bedrock Geology 1:100,000 Scale Map Series, Sheet 3 (Geology of South Donegal). Geological Survey of Ireland (GSI, 1999);
- Geological Survey of Ireland - Groundwater Body Characterisation Reports;
- OPW Flood Mapping (www.floodmaps.ie);
- Environmental Protection Agency – Hydrotool Viewer (www.epa.ie);
- Aerial Photography, 1:5,000 and 6" base mapping; and,
- My plan.ie: National Planning Applications Map Viewer ((https://myplan.ie/national-planning-application-map-viewer).
- Department of Agriculture, Environment and Rural Affairs (DAERA) online mapping databases); and,
- Northern Ireland Environment Agency (www.ni-environment.gov.uk).

The desk study also included a review of all available site-specific reports and assessments which have been previously completed in relation to the Wind Farm Site and Grid Connection Site. The consulted documents included the following:

- Meenbog Wind Farm Environmental Impact Assessment Report (2017). Environmental Impact Assessment Report for the Proposed Meenbog Wind Farm, County Donegal. Prepared for Planree Ltd.

- Meenbog Wind Farm 2019 Construction and Environmental Management Plan (CEMP) updated from 2017 under condition compliance and submitted to Donegal County Council).

Fehily Timoney (FT) produced a Peat Stability Assessment (PSA) Report for the Existing Development (FT, 2026) which is included as Appendix 8-1 of this rEIAR. The desk study components of the PSA included review of the following:

- FT (2021): Meenbog Wind Farm – Peat Stability Assessment of Meenbog Wind Farm Site;
- Ionic (2021) completed a peat stability assessment of the Existing Development in 2021 (Appendix D of Appendix 8-2); and,
- AFRY (2023) completed a site visit in October 2023 to assess the overall site stability of the constructed works. AFRY's Technical Note is included in Appendix A of Appendix 8-1 (Note that AFRY acquired Ionic Consulting Ltd (Ionic) in July 2022.
- All available notes and construction records which were recorded during the construction of the Existing Development.

9.2.2 Baseline Monitoring and Site Investigations

A comprehensive and robust hydrological dataset has been collected at the Wind Farm Site and Grid Connection Site across multiple phases of site investigations which included site investigations completed as part of the baseline assessment for the 2017 EIAR, site investigations completed during the construction phase of the Existing Development, site investigations completed in the aftermath of the November 2020 Peat Slide and site investigations completed specifically for the purposes of this rEIAR.

HES completed a detailed review of the 2017 EIAR submitted for the Permitted Development, associated files and site investigations as part of the baseline hydrology and hydrogeology assessment of this rEIAR. The intrusive site investigations (detailed in full in Chapter 8: Land, Soils and Geology of this rEIAR) for the Existing Development included mapping the distribution and depth of blanket peat along with assessing the mineral subsoil/bedrock interface beneath the peat at key locations. Hydrological surveys and monitoring included drainage mapping, surface water flow monitoring, surface water quality sampling and field hydrochemistry.

Additional hydrological monitoring was completed during the construction of the Existing Development by MKO and HES in line with the requirements set out in the 2017 EIAR and the associated 2019 Construction Environmental Management Plan (CEMP), an updated version of the 2017 CEMP which was submitted to DCC in compliance with the conditions of grant for the Permitted Development. This monitoring comprised the following:

- Installation of sondes to provide continuous turbidity monitoring. 3 no. sondes were installed on 9th September 2019 and 3 no. additional sondes were installed following the November 2020 Peat Slide;
- A suitably qualified Ecological Clerk of Works (ECoW) undertook daily visual check of waterbodies during the construction phase. These checks included the maintenance of sondes, visual inspection of surface water sampling points and visual inspection of all visual check locations (12 no. locations);
- Monthly grab sampling at 4 no. sampling locations from August 2019 to April 2026;
- Intensive grab sampling was also completed on the Mourne Beg River in the aftermath of the November 2020 Peat Slide;
- MKO completed biological monitoring at 19 no. locations in November 2020;
- Triturus Environmental Ltd. completed biological monitoring at 10 no. locations in October 2021; and,
- MKO completed biological monitoring at 10 no. locations in October 2023.

For the specific purposes of this rEIAR:

- FT have completed further assessments on peat stability to verify that the peat remains stable at the Wind Farm Site and to inform the PSRA for the Existing Development;

- MKO have also completed several multi-disciplinary walkover surveys at the Wind Farm Site between 2021 and 2026;
- 5 no. groundwater monitoring wells were drilled at the Wind Farm Site in April 2025 by Peterson Drilling Services Ltd under the supervision of HES;
- Groundwater samples were obtained from 3 of these wells on 10th April 2025 and at 2 no. nearby streams in order to characterise the existing groundwater quality at the Wind Farm Site;
- Subsequent groundwater sampling was completed on the 5 no. monitoring wells on 5th February 2026; and,
- Triturus Environmental Monitoring also completed extensive aquatic monitoring in July 2024 and July 2025 including biological Q-rating monitoring.

The data obtained from all of these site investigations have been used in the characterisation, description and assessment of the hydrological and hydrogeological environment.

9.2.3 Impact Assessment Methodology

The guideline criteria (EPA, 2022) for the assessment of likely significant effects require that likely effects are described with respect to their extent, magnitude, type (i.e. negative, positive or neutral) probability, duration, frequency, reversibility, and transfrontier nature (if applicable). The descriptors used in this environmental impact assessment are those set out in the EPA, 2022 glossary of effects as shown in Chapter 1 of this rEIAR.

In addition to the above methodology, the importance of the water environment receptors was assessed on completion of the desk study and site investigations. Levels of importance which are defined in **Table 9-2** for hydrology and **Table 9-3** for hydrogeology are used to assess the potential effects that the Existing Development may have had on them.

Table 9-2: Estimation of Importance of Hydrology Criteria (NRA, 2008)

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

Importance	Criteria	Typical Example
		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.

Table 9-3: Estimation of Importance of Hydrogeology Criteria (NRA, 2008)

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

9.2.4 Overview of Impact Assessment Process

The conventional source-pathway-target model (see below, top) was applied to assess potential effects on downstream environmental receptors (see Figure 9-1 below, bottom as an example for earthworks associated with the Existing Development) as a result of the Existing Development.

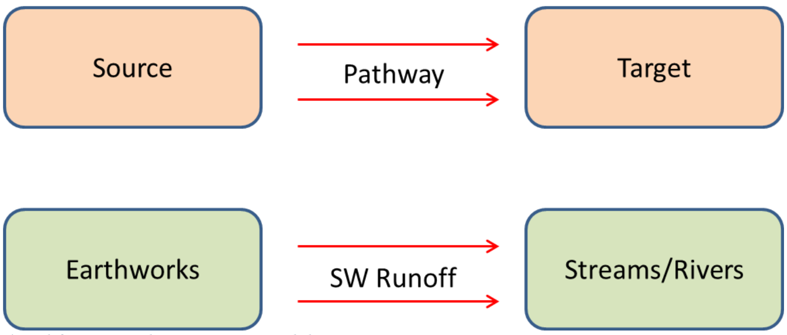

Figure 9-1: Conventional Source-Pathway-Target Model

The descriptors used in this environmental impact assessment are those set out in the EPA, 2022 glossary of effects as shown in Table 1-2 of Chapter 1 of this rEIAR. The description process clearly and consistently identifies the key aspects of any remedial impact source, namely its character, magnitude, duration, likelihood and whether it is of a direct or indirect nature.

9.2.5 Water Study Area

The water study area for the hydrological environment (surface water) is delineated by the surface water catchments within which the Wind Farm Site and Grid Connection Site is located. The regional surface water catchments and sub-catchments within which the Wind Farm Site and Grid Connection Site is located are detailed in Section 9.3.3.

The water study area for the hydrogeological environment (groundwater) is delineated by the bedrock aquifers and groundwater bodies which are mapped beneath the Wind Farm Site and Grid Connection Site. These bedrock aquifers and groundwater bodies are detailed in Section 9.3.8.

9.2.6 Limitations and Difficulties Encountered

The retrospective impact assessment has been carried out based on the availability of the information relating to the construction of the Existing Development. The retrospective impact assessment has been enhanced by the large quantity of information available for the baseline environment, which was presented in the 2017 EIAR. In addition, a large quantum of data (water quality data) is available for the construction phase as a detailed water monitoring programme was implemented as per the 2017 EIAR and the 2019 CEMP associated with the Permitted Development.

Sufficient information was available to characterise the receiving hydrological and hydrogeological environment and to inform a robust remedial impact assessment.

9.3 Receiving Environment

9.3.1 Site Description and Topography

The Site refers to the three distinct elements – the Wind Farm Site, Grid Connection Site, and BMEP Site combined, measures approximately 1,018 hectares (ha). Please note that no activities associated with the Existing Development occurred within the BMEP Site and therefore this site is not discussed further in this rEIAR Chapter.

9.3.1.1 Wind Farm Site

The Wind Farm Site is located in County Donegal approximately 8 km southwest of the twin towns of Ballybofey and Stranorlar and approximately 12 km northeast of Donegal Town. The eastern and southern boundaries of the Wind Farm Site are defined by the border with Co. Tyrone, Northern Ireland. The closest town in Northern Ireland is Castlederg which is located ~17.1km to the southeast. The Wind Farm Site has a total area of ~892ha in area.

Current landcover/use at the Wind Farm Site is comprised of a partially constructed wind farm, areas of commercial forestry and blanket bog, and roadways. The surrounding landcover/use predominantly comprises peat bogs, commercial forestry and other seminatural areas with limited residential use along local roads.

Prior to the construction of the Existing Development, a network of existing forestry roads provided access in and around the Wind Farm Site. The Wind Farm Site was covered by blanket bog with very few natural mineral subsoil or bedrock exposures. However, a number of pre-existing borrow pits where the subsoil and bedrock profile were observed and showed that the peat directly overlies bedrock, weathered bedrock or very thin pockets of subsoils.

The elevation of the Wind Farm Site ranges between ~180 and 313mOD (metres above Ordnance Datum), with elevations generally decreasing and sloping in a north or north-westerly direction. A small section in the south of the Wind Farm Site slopes to the southeast. The Wind Farm Site is generally bordered on all sides by forestry plantations with the eastern and southern boundaries also being defined by the Northern Ireland border. The majority of the Wind Farm Site slopes in a north-westerly direction towards the Bunadowen River which flows through the Wind Farm Site. The southern section of the Wind Farm Site slopes to the southeast towards the Glendergan River. Topography of the Wind Farm Site is shown on Figure 9-2.

Existing access is from the N15 National Primary Road in the northwest of the Wind Farm Site and via a local road in the north Wind Farm Site. The N15 National Primary Road runs south-west to north-east, with the Wind Farm Site lying about 2km east of the road.

Construction of the Existing Development commenced in November 2019, at which point the majority of the civil engineering works, including wind farm access roads, 110kV electrical substation, turbine hardstands, turbine foundations, and ancillary works were substantially completed over the following 12-month period up to the November 2020 Peat Slide. The as-built infrastructure footprint of the Existing Development is ~32.6 ha (including the onsite 110kV substation which is located within the Wind Farm Site) and is approx. ~3.7% of the Wind Farm Site (892 ha).

9.3.1.2 Grid Connection Site

The Grid Connection Site extends from the Wind Farm Site entrance along the N15 National Road to the L-2595 Local Road, then proceeds to the L-1985 Local Road where it travels east along the road and through agricultural lands parallel to the Local Road before continuing along the L-19852 Local Road and finally following a private road to reach the Clogher 110kV substation. The Grid Connection Site is ~9ha.

The Clogher substation is situated approximately 6.5 km from the on-site substation within the Wind Farm Site. The length of the Grid Connection underground cabling route from the on-site 110kV substation to Clogher 110kV substation is ~9.4km.

The landcover/use in the lands surrounding the Grid Connection Site is predominantly forestry with sections of peat cutting, farming and open peatlands.

Ground elevations along the Grid Connection Site are greatest in the vicinity of the Wind Farm site entrance where ground elevations stand at ~153mOD. Elevations decrease along the N15 to the southwest, with the lowest elevations being at ~80mOD. Ground elevations along the Grid Connection rise again from the N15 towards Clogher 110kV substation which stands at ~142mOD.

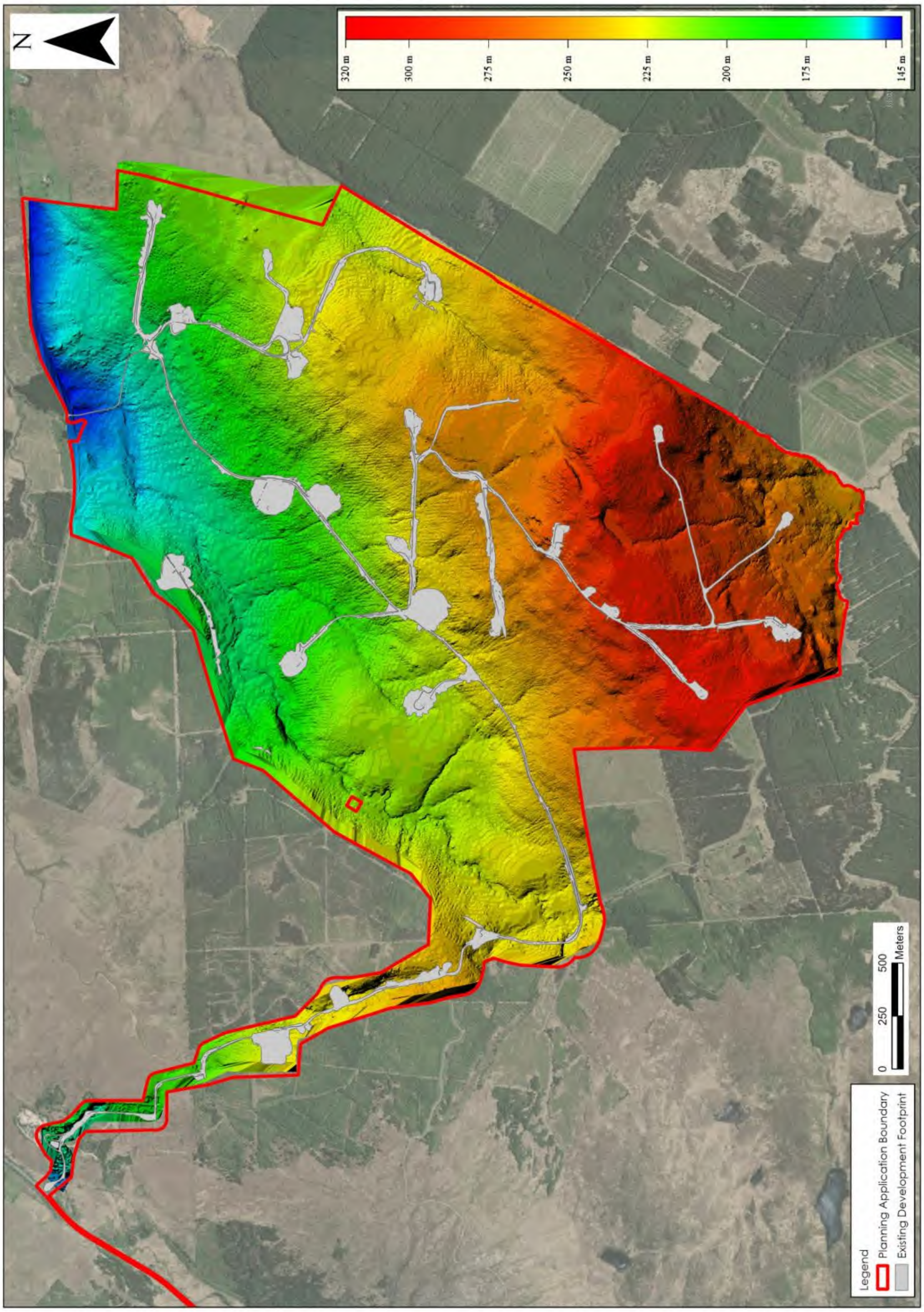

Figure 9-2: Wind Farm Site Topography

9.3.2 Water Balance

9.3.2.1 Wind Farm Site

Long term Annual Average Rainfall (AAR) and evaporation data were sourced from Met Éireann (www.met.ie). The 30-year AAR (1981-2010) recorded at Ballybofey (Lough Mourne), located ~2km northwest of the Wind Farm Site are presented in **Table 9-4**. The long-term AAR at Ballybofey (Lough Mourne) is 1,931mm/year.

However, the rainfall data from Ballybofey (Lough Mourne) is likely to underestimate the actual AAR at the Wind Farm Site due to elevation differences. Ballybofey (Lough Mourne) rainfall station stands at an elevation of 101mOD whilst the topography at the Wind Farm Site ranges up to 327mOD.

Met Éireann also provide a grid of AAR for the entire country for the period of 1991 to 2020. Based on this more site-specific modelled rainfall values, the AAR at the Wind Farm Site ranges from 2,004 to 2,185mm/year. The conservative value of 2,185mm/year is taken as the AAR for the Wind Farm Site. This is considered to be the most accurate estimate of AAR from the available desk study sources.

Table 9-4 Average long-term Rainfall Data (mm)

Station		X-Coord		Y-Coord		Ht (MAOD)		Opened		Closed		
Lough Mourne		110700		23500		101		1963		N/A		
Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec	Total
214	152	170	113	101	107	122	154	162	211	204	221	1,931
Wind Farm Site (X-Cord: 205000 Y-Cord:387000)												
Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec	Total
237	199	177	128	126	127	152	165	169	213	235	257	2,185

In addition, HES installed a rain gauge at the Wind Farm Site on 24th November 2020. The daily rainfall volumes from 24th November 2020 to 17th December 2025 have subsequently been recorded and the data is presented in **Figure 9-3** below. The greatest daily rainfall was recorded on 20th February 2022 with 75.6mm of rainfall. During the monitoring period the month with the greatest rainfall was February 2022 with a total volume of 399mm of precipitation recorded at the Wind Farm Site.

Note that the rain gauge was not recording correctly between the 22nd February and 24th April 2024. The data recorded during this period was omitted in the preparation of this rEIAR chapter. Following routine maintenance, the rain gauge resumed operation and continued recording the daily rainfall totals for the Wind Farm Site.

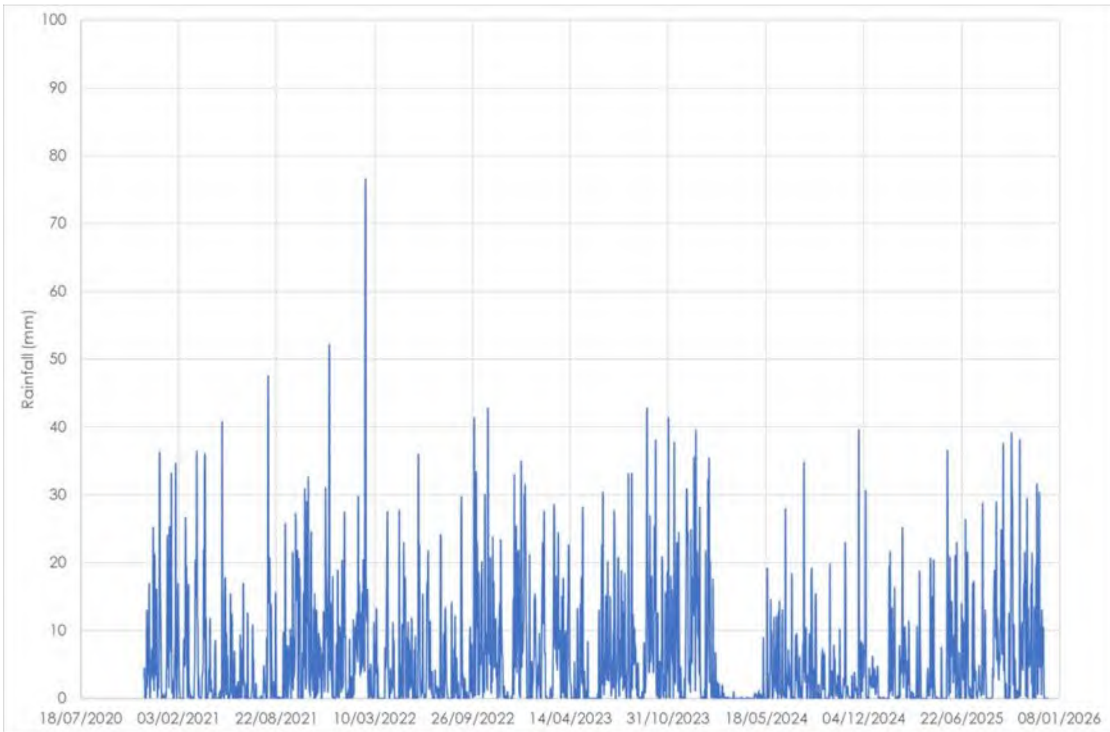

Figure 9-3: Daily Rainfall Data at Site (Dec 2020 – December 2025)

The closest synoptic[1] station where the average Potential Evapotranspiration (PE) is recorded is at Belmullet, located ~36km west of the Wind Farm Site. The long-term average PE for this station is 527.1mm/year. This value is used as a best estimate of the PE at the Wind Farm Site. Actual Evaporation (AE) is estimated as 500.7mm/year (which is 0.95 × PE).

The Effective Rainfall (ER) represents the water available for runoff and groundwater recharge. The ER for the Wind Farm Site is calculated as follows:

Effective Rainfall (ER) = Average Annual Rainfall (AAR) – Actual Evapotranspiration (AE)

= 2,185mm/year – 501mm/year

ER = 1,684mm/year

Groundwater recharge coefficient estimates are available from the GSI (www.gsi.ie). Within the Wind Farm Site groundwater recharge coefficients are mapped as ranging from 4 to 10% due to the coverage of blanket peat, the sloping nature of the local topography and the low to moderate permeability of the underlying bedrock aquifer.

An estimate of ~67mm/year average annual groundwater recharge is given for the Wind Farm Site. This calculation is based on a conservative recharge coefficient of 4% (*i.e.* 96% surface water runoff). This means that the hydrology of the Wind Farm Site is characterised by high surface water runoff rates and relatively low groundwater recharge rates. This is supported by on-site observations made during the site walkover surveys whereby a high density of headwater streams and drains were recorded within the Wind Farm Site.

Therefore, conservative annual recharge and runoff rates for the Wind Farm Site are estimated to be ~67mm/yr and 1,617mm/yr respectively. These calculations do not consider the footprint of the Existing Development and therefore, reflects the baseline recharge and runoff rates of the Wind Farm Site prior to the commencement of construction activities.

[1] Meteorological station at which observations are made for synoptic meteorology and at the standard synoptic hours of 00:00, 06:00, 12:00, and 18:00.

Met Éireann's Translate Project (https://www.met.ie/science/translate) provides projections for a range of future climate change scenarios, as Ireland's future climate will depend on global greenhouse gas emissions reductions. The severity of any future climate change will depend on the degree of future warming. In relation to precipitation chances, the models show that summer rainfall may decrease by approximately 9% and winter rainfall could increase by up to 24%. In a 1.5°C world, average winter and summer precipitation rates are projected to be 5.41mm/day and 3.53mm/day respectively in Co. Donegal. In a 4°C world, the average winter and summer precipitation rates in Co. Donegal are projected to be 5.88mm/day and 3.27mm/day respectively.

In addition to average rainfall data, extreme value rainfall depths are available from Met Éireann. **Table 9-5** presents return period rainfall depths for the area of the Wind Farm Site. These data are taken from https://www.met.ie/climate/services/rainfall-return-periods and they provide rainfall depths for various storm durations and sample return periods (1-year, 50-year, 100-year).

Table 9-5 Return Period Rainfall Depths (mm) for the Wind Farm Site

	Return Period (Years)			
Storm Duration	1	5	30	100
5 mins	4.9	5.9	8.7	10.7
15 mins	8.1	9.7	14.3	17.6
30 mins	10.9	13.8	19.3	23.7
1 hour	14.8	18.7	26.1	32.1
6 hours	32.2	40.7	56.9	70.0
12 hours	43.6	55.1	77.0	94.7
24 hours	59.0	74.6	104.2	128.2
2 days	76.78	90.1	125.6	150.4

9.3.2.2 Grid Connection Site

The AAR along the Grid Connection Site ranges from a minimum of 1,723mm/yr in the southwest to a maximum of 2,185mm/yr in the vicinity of the Wind Farm Site. The conservative AAR for the Grid Connection Site is also taken to be 2,185mm/year.

9.3.3 Regional and Local Hydrology

9.3.3.1 Wind Farm Site

The vast majority of the Wind Farm Site is located in the Foyle River surface water catchment within Hydrometric Area No. 1. This river basin district is an international river basin district with ~3% of this district located in Northern Ireland. Meanwhile, a small area in the northwest of the Wind Farm Site is mapped in the Donegal Bay North regional surface water catchment, with Hydrometric Area No. 37 of the North Western River Basin District.

Within the Foyle River catchment, the Wind Farm Site is located in the Mourne Beg River sub-catchment (MourneBeg_SC_010). The Mourne Beg River, a tributary of the Mourne River, flows to the southeast from Lough Mourne, situated ~2km northeast of the Wind Farm Site entrance. The Mourne Beg River flows to the east, ~150m north of the Wind Farm Site before it crosses into Northern Ireland. Further downstream, this watercourse discharges into the River Derg, ~15km to the east. The River Derg continues to the east. The Mourne River is formed at the meeting of the River Derg and the River Strule, ~27km east of the Wind Farm Site. The Mourne River then flows to the north, through the town of Strabane, before it confluences with the Finn River to form the River Foyle.

In terms of WFD river sub-basins, the Wind Farm Site is located in a total of 5 no. WFD river sub-basins within the Mourne Beg River sub-catchment.

- The northwest of the Wind Farm Site is located in the Mourne Beg_010 WFD river sub-basin. This area is drained by the EPA mapped Croaghonagh Stream (EPA Code: 01C31). Note that this stream is referred to as the Mary Breen's Burn on local OSI mapping (note that the Mary Breen's Burn will be utilised for the remainder of this chapter). Mary Breen's Burn flows to the northeast and discharges into the Mourne Beg River (EPA Code: 01M01), ~1.8km northeast of the Wind Farm Site.
- A small area in the northeast of the Wind Farm Site is also mapped in the Mourne Beg_010 WFD river sub-basin. Here, the Mourne Beg River is located ~100m north of the Wind Farm Site.
- Much of the Wind Farm Site is located in the Bunadaowen_010 WFD river sub-basin. This area is drained by the Bunadowen River (EPA Code: 01B01) and several of its smaller tributaries. There is a high density of mapped watercourses in this area of the Wind Farm Site.
- A small area in the northeast of the Wind Farm Site is mapped in the Mourne Beg River (Derrygoonan) WFD river sub-basin. This area is drained by the Shruhanagarve Stream (EPA Code: 01S26) which flows to the northeast, before it discharges into the Mourne Beg River.
- The southeast of the Wind Farm Site is located in the Glendergan River WFD river sub-basin. An unnamed tributary of the Glendergan River flows to the south from the area of the Wind Farm Site. The Glendergan River itself forms the southeastern boundary of the Wind Farm Site. This watercourse discharges into the River Derg ~3.7km to the southeast.

Within the Donegal Bay North surface water catchment, the Wind Farm Site is mapped in the Eske River sub-catchment (Eske_SC_010). Within this area, a tributary of the Lowerymore River, referred to by the EPA as the Barrack Hill Stream (EPA Code: 37B16) flows to the southwest in the vicinity of the Wind Farm Site entrance. The Lowerymore River (EPA Code: 37L01) flows to the southwest, through Barnesmore Gap, before discharging into Lough Eske ~8.7km to the southwest.

A regional hydrology map showing the WFD catchments and sub-catchments is shown as **Figure 9-4**. A local hydrology map showing WFD river sub-basins is shown as **Figure 9-5**. Meanwhile, **Table 9-6** below details the locations of the components of the Existing Development with respect to the WFD regions.

Note that the spelling of some of the local watercourses draining the Wind Farm Site varies depending on the source of mapping. The EPA blueline database refers to the Bunadowen River and the Shruhanagarve Stream. It is noted that the spelling is slightly different on the OSI Discovery Series maps i.e. Bunadowen River and Shruhangarve Stream. Furthermore, the WFD use Bunadaowen_010 when referring to this surface waterbody. For the purposes of this rEIAR, all watercourses will be referred to by the names assigned on the EPA blueline database as this is the most current and authoritative source of hydrological information. WFD naming will be used when discussing the WFD status and objectives.

9.3.3.2 Grid Connection Site

The Grid Connection Site is predominantly located in the Donegal Bay North catchment and the Eske River sub-catchment (Eske_SC_010). The Grid Connection passes through the Lowerymore_020 and Lowerymore_030 WFD river sub-basins.

Within the Donegal Bay north catchment there are a total of 14 no. watercourse crossings along the Grid Connection underground cabling route. These crossings include the following:

- A crossing over the EPA mapped Barrack Hill Stream (EPA Code: 37B16) occurs at the Wind Farm Site entrance.
- 2 no. crossings over the Lowerymore River along the N15, at Barnes Bridge and further to the west at Keadew Bridge.
- A total of 7 no. crossings over tributary streams of the Lowerymore River between Barnes Bridge and Keadew Bridge. These streams are generally unnamed by the EPA

with the exception of the Friarsbush Stream (EPA Code: 37F07). These streams flow to the south from the slopes of Croaghconnellagh Mountain.
- 2 no. crossings over watercourses along the L-1495. A crossing over an unnamed stream close to the N15 and a crossing over the Millanalamphry River (EPA Code: 37M37).
- A crossing along a local road over the outfall stream from Lough Craig.
- A crossing over a small 1^{st} order stream (unnamed) to the north of Clogher 110kV substation. This stream feeds into Lough Craig.

Note that these watercourse crossings existed as part of the baseline environment as crossings along the public road network or along existing forestry access tracks within the Wind Farm Site.

Table 9-6: Components of the Existing Development with Respect to WFD Regions

Existing Development	Main EPA Mapped Watercourses	WFD River Sub-Basin	WFD Sub-Catchment	WFD Regional Surface Water Catchment
Grid Connection underground cabling route, site access roads, peat and spoil management areas and drainage works	Lowerymore River	Lowerymore_020	Eske_SC_010	Donegal Bay North
Turbine foundations, site access roads, felling, drainage works, internal cabling	Glendergan River	Glendergan River	Leaghany River_SC_010	Foyle
1 no. substation, 1 no. peat cell, 0.6km of the Grid Connection underground cabling route, drainage works, peat and spoil management areas and site access roads	Mary Breen's Burn Stream and Mourne Beg River	Mourne Beg_010	Mourne Beg_SC_010	
Turbine foundations, 2 no. temporary construction compounds, 3 no. borrow pits, site access roads, felling, internal cabling, peat and spoil management areas and drainage works	Bunadowen River	Bunadaowen_010		
Turbine foundations, 3 no. borrow pits, site access roads, felling, internal cabling, peat and spoil management areas and drainage works	Shruhanagarve Stream	Mourne Beg River (Derrygoonan)		

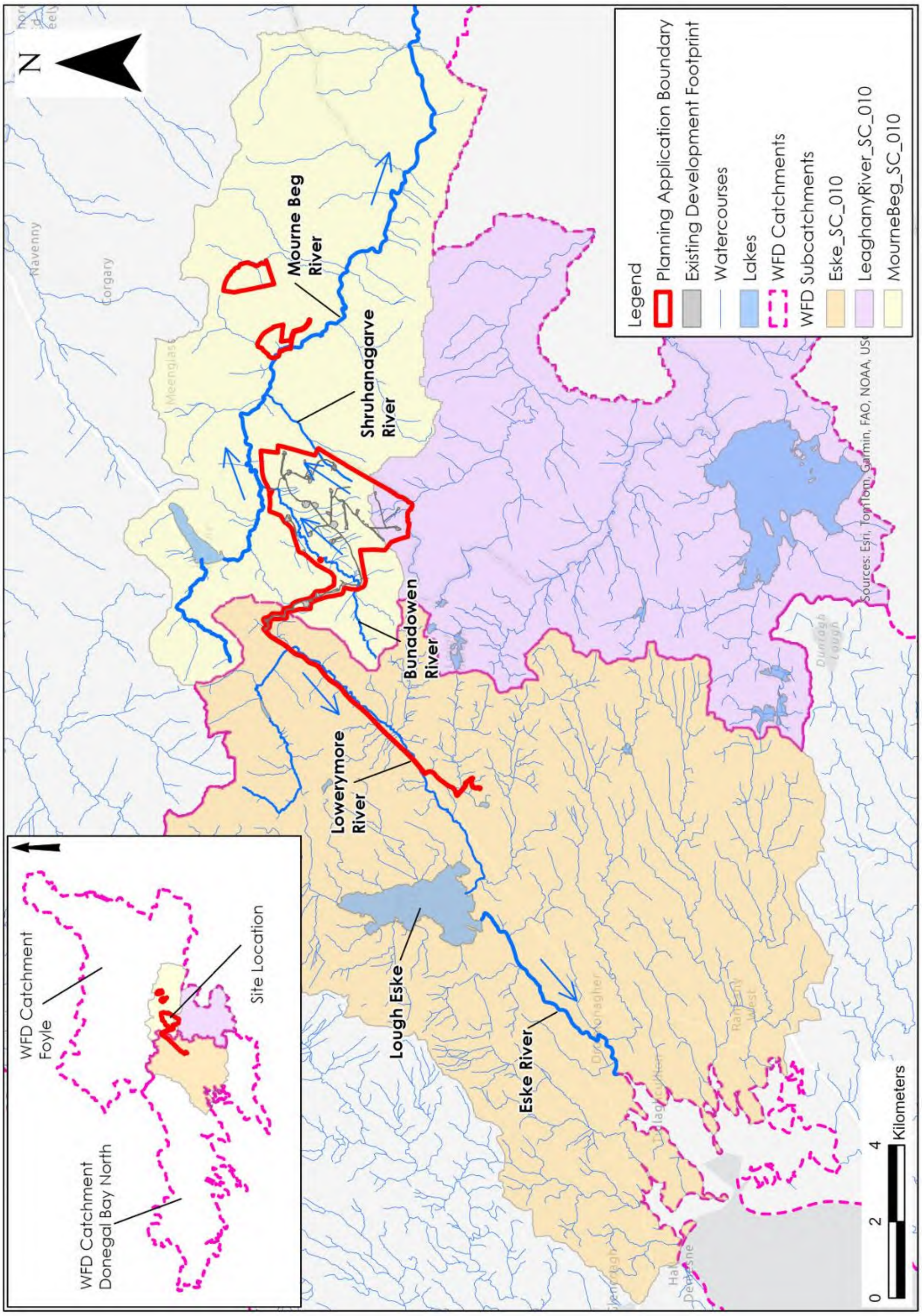

Figure 9-4: Regional Hydrology Map

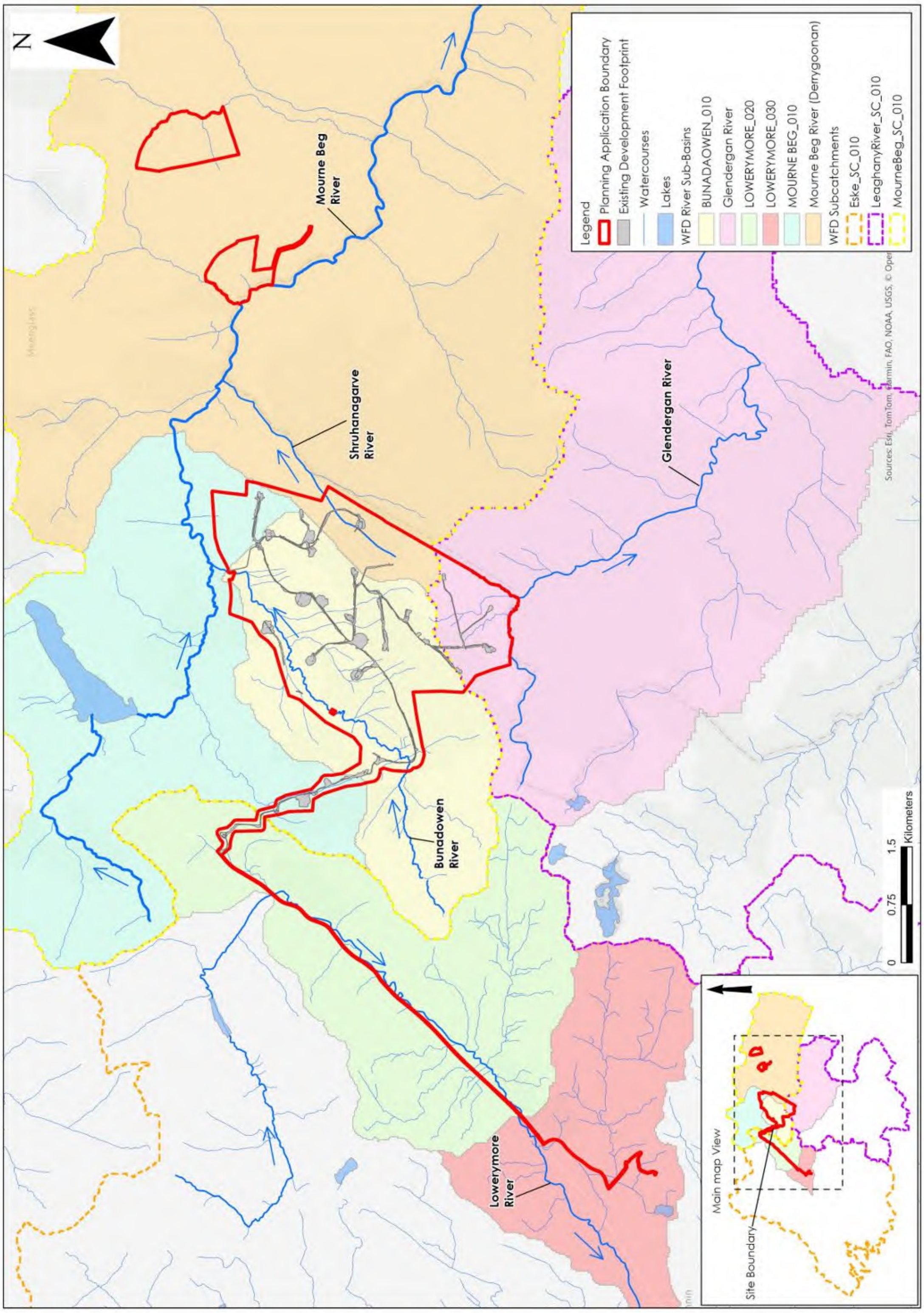

Figure 9-5: Local Hydrology Map

9.3.4 Surface Water Flows

An OPW gauging station is located on the Bunadowen River within the Wind Farm Site. This station, named the Croaghnagawna Station (Station No: 01054), records water levels and flow volumes. The Bunadowen River at this location has an upstream catchment size of 4.9km^2 and the 95%tile (percentile) flow volume is recorded as being 0.021m^3/s. This means that that 95% of the time the flow in the Bunadowen River at this location is at or above 0.021m^3/s. However, there are no gauging stations along the Mourne Beg or Glendergan rivers in the vicinity of the Wind Farm Site for which flow data is available.

Therefore, the EPA's hydrotool, available on www.catchments.ie, was consulted in order to estimate baseline flow volumes in the local area. The Hydrotool dataset contains estimates of naturalised river flow duration percentiles. Several nodes were consulted in the vicinity and downstream of the Wind Farm Site. **Figure 9-6** below presents the estimated flow duration curves for each of the consulted Hydrotool Nodes downstream of the Wind Farm Site. The locations of the consulted nodes are shown on **Figure 9-9** below.

EPA Hydrotool Nodes are available on the Bunadowen River and the Mourne Beg River in the vicinity of the Wind Farm Site. No modelled flow volumes are available for the watercourses within Northern Ireland. Flow volumes are also available on the Lowerymore River downstream of the Wind Farm Site and the Grid Connection.

The 95%tile flow at Node 01_373 on the Bunadowen River, upstream of its confluence with the Mourne Beg River, is estimated to be 0.045m^3/s (45l/s). This indicates that 95% of the time, the flow at this location is estimated to be at or above 0.045m^3/s. Due to the increasing catchment size, the 95%tile flow at the nodes along the Mourne Beg River downstream of the Wind Farm Site are larger. For example at Node 01_1848, the furthest available downstream node, the 95%tile flow is estimated to be 0.258m^3/s (253l/s). Similarly, the flow volumes in the Lowerymore River increase progressively downstream. The increasing flow volumes downstream are associated with the increased upstream catchment of the respective waterbodies.

This means that those watercourses in close proximity to the Wind Farm Site would have been more susceptible to effects than those located further downstream. It is worth nothing that the construction of the Existing Development did not in any way rely upon the dilution/assimilative capacity of any downstream watercourse.

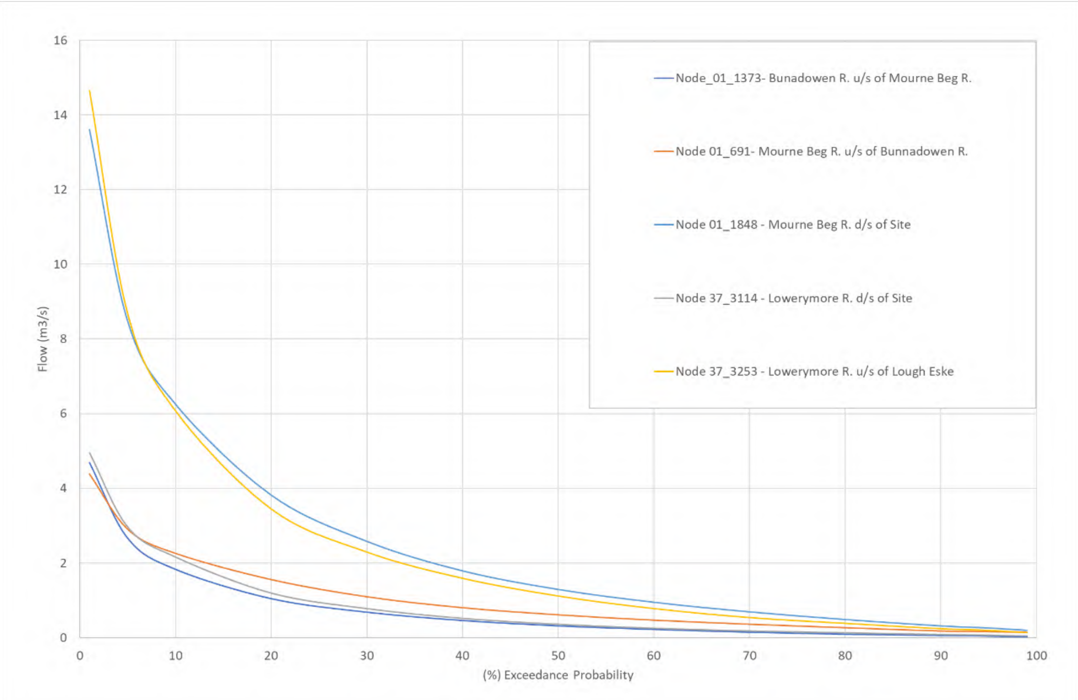

Figure 9-6: EPA Hydrotool Node Flow Duration Curves

Surface water flows were measured by HES at the Wind Farm Site on 20th September 2017. The recorded flow volumes are shown in **Table 9-7** below. The watercourses monitored are typical of the headwater streams that drain towards the Bunadowen River.

Table 9-7: Surface Water Flow Monitoring (20th September 2017)

Location	Easting	Northing	Channel Width (m)	Water Depth (m)	Flow Volume (m^3/s)
FM1	208130	387062	1.1	0.35	0.033
FM2	206135	385190	0.5	0.09	0.013
FM3	205791	385190	1.1	0.15	0.080
FM4	206593	386681	0.4	0.09	0.011

9.3.5 Wind Farm Site Drainage

9.3.5.1 Drainage - Baseline Environment

Prior to the construction of the Existing Development, the drainage within the Wind Farm Site comprised of numerous manmade drains that are were in place predominately to drain the forestry plantations. This internal forestry drainage pattern is influenced by the local topography, peat cover, layout of the forest plantation and by the pre-existing forestry road network. The forestry plantations, which cover the majority of the Wind Farm Site are generally drained by a network of mound drains which typically run perpendicular to the topographic contours and feed into collector drains, which discharge to interceptor drains down-gradient of the plantation.

Mound drains and ploughed ribbon drains are generally spaced approximately every 15-20m and 2m respectively. Interceptor drains are generally located up-gradient (cut-off drains) and down-gradient of forestry plantations. Interceptor drains are also located up-gradient of existing forestry access roads. Culverts are located on existing access roads at stream and drain crossings and at low points under access roads which drain runoff onto down-gradient forest plantations.

A schematic of a typical standard forestry drainage network and one which is representative of the Wind Farm Site drainage network is shown as **Figure 9-7.** The forestry drains are the primary drainage routes towards the natural streams, but the flows in the higher elevated drains are generally very low or absent most of the time.

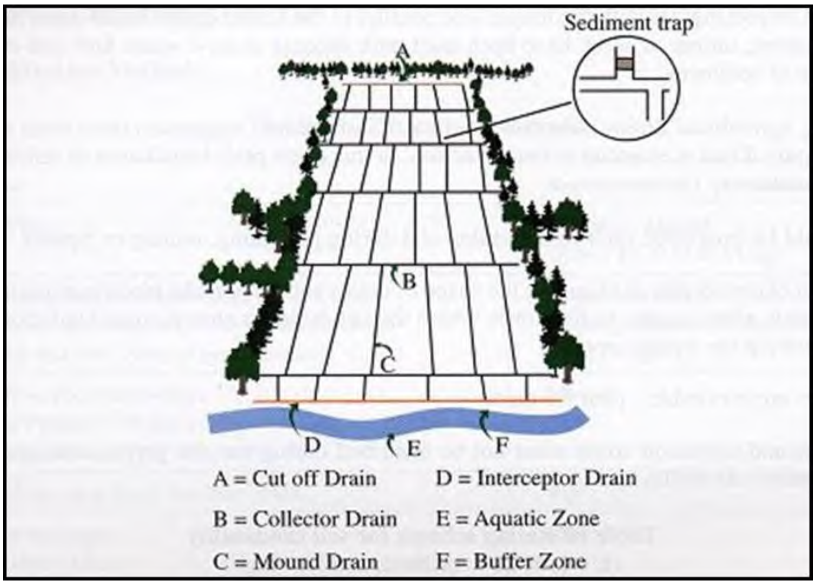

Figure 9-7: Schematic of Forestry Drainage

9.3.5.2 Drainage - Existing Environment

Prior to the commencement of construction works for the Existing Development, drainage management systems were inserted around work areas and were integrated with the pre-existing forestry site drainage network described above.

The drainage system was designed to mitigate effects on surface watercourses by runoff control and drainage management:

- In the first instance, disturbance to natural drainage features was avoided, minimising any works in or around artificial drainage features, and diverting clean surface water flow around excavations and construction areas.
- Secondly, any drainage waters from works areas within the Wind Farm Site that might carry silt or sediment was collected to allow for attenuation and settlement prior to controlled diffuse release. All runoff from works areas was attenuated and treated to a high quality prior to release.

A schematic of the existing site drainage management is shown as **Figure 9-8** below.

The layout of the Existing Development drainage network in included as Appendix 4-4 of this rEIAR. The drainage design included the use of the following:

- Interceptor Drains: These were installed upgradient of works areas to collect clean surface water runoff and prevent it from reaching construction areas. Clean water is diverted around the works area where it is released over the ground as sheet flow.
- Swales: These shallow drains were used to collect runoff from the construction areas and collects any sediment laden water.
- Check Dams: These dams controlled the velocity of flows within the interceptor drains and drainage swales, ensuring that the flow is non erosive. The check dams are comprised of straw bales or stone and were installed at regular intervals.
- Level Spreaders: This is located at the end of the interceptor drains and converts the concentrated drain flow to a diffuse sheet flow which is released onto very gently sloping vegetated ground downgradient of works areas. Level spreaders were only used on slopes of less than 6% grade.
- Piped Sloped Drains: These are used to convey surface water from interceptor drains downslope to flat areas without causing erosion.

- Vegetation Filters: These are existing vegetated areas which receive water from the interceptor/piped slope drains. These areas remove suspended solids and promote diffuse infiltration.
- Stilling Ponds: These ponds are located at the end of swales and intercept runoff which is potentially laden with sediment and provide attention which promotes the settlement of suspended solids. A primary and secondary pond were constructed at each location. Water outflows from the settlement pond through a stone dam, partially wrapped in a geotextile membrane, which controls flow velocities and trapped any sediment that had not yet settled out of suspension. Downstream of the ponds the water is redistributed as diffuse sheet flow in filter strips.
- Roadside Berms: Low-level berms were used to contain sediment within the road corridor and prevent runoff into the wind farm drainage system at uncontrolled locations. The berms ensure that runoff is allowed to access the drainage system only via the stilling ponds.
- Culverts: 5 no. new stream culverts were installed along with 19 no. culvert upgrades.
- Silt Fences: These were used as an additional water protection measure around the existing watercourses in certain locations, particularly where works were completed within the 50m stream buffer.

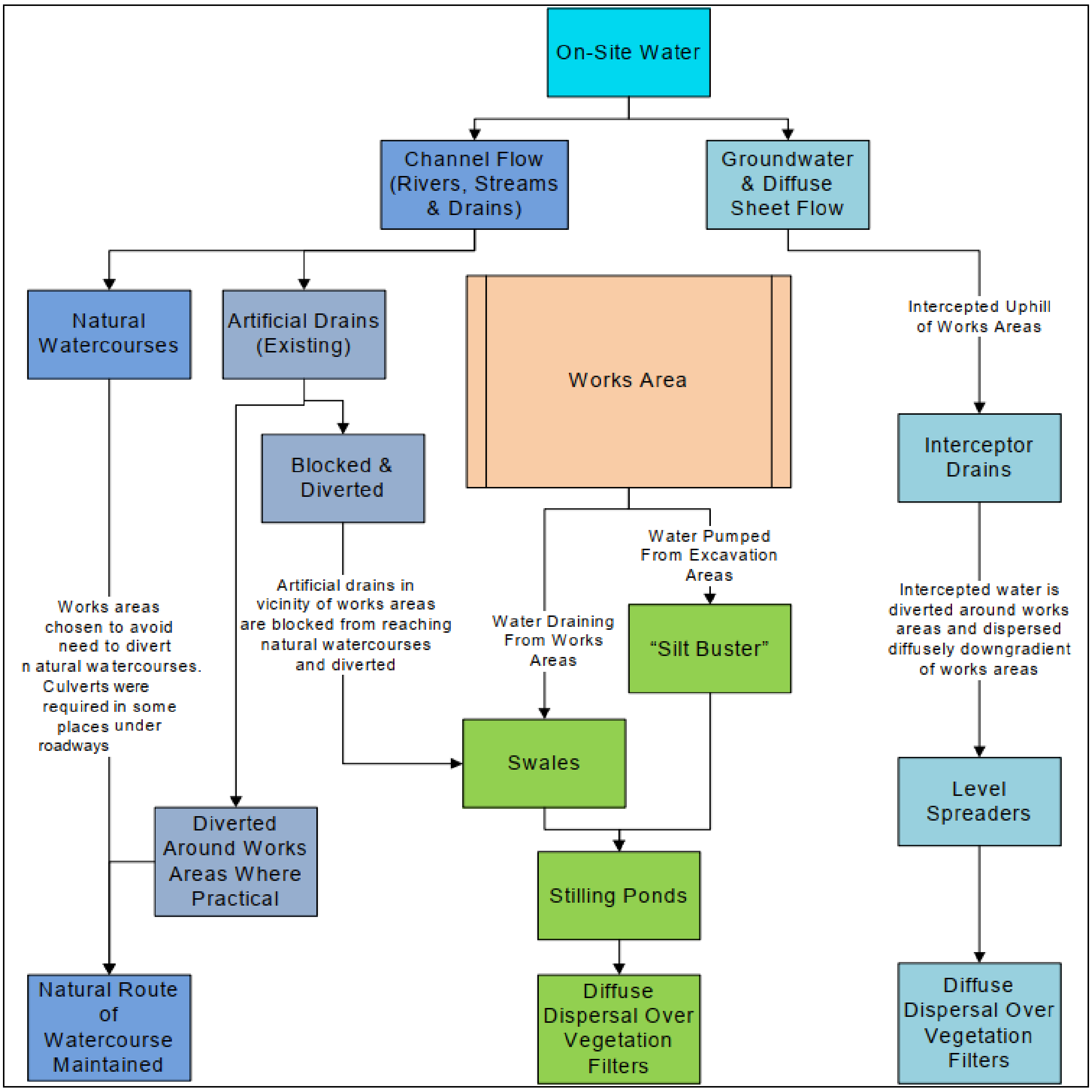

Figure 9-8: Schematic of Existing Site Drainage Management

9.3.6 Summary Flood Risk Assessment

9.3.6.1 Wind Farm Site

A Flood Risk Assessment of the Wind Farm Site has been carried out by HES, the findings of which are presented in full in **Appendix 9-1** and are summarised below.

To identify those areas as being at risk of flooding, the OPW's Past Flood Events Maps, the National Indicative Fluvial Mapping, CFRAM River Flood Extents, historical mapping (i.e. 6" and 25" base maps) and the GSI Groundwater Flood Maps were consulted. These flood maps are available to view at Flood Maps - Floodinfo.ie.

The OPW Past Flood Events Maps have no records of recurring or historic flood instances within the Wind Farm Site. Similarly, identifiable text on local available historical 6" or 25" mapping does not identify any lands that are "liable to flood". There is one mapped historic flood event located ~4.24km to the southwest of the Wind Farm Site (Flood ID: 4194) that is of no consequence to the Existing Development.

The GSI's Winter 2015/2016 Surface Water Flood Map shows surface water flood extents for this winter flood event. This flood event is recognised as being the largest flood event on record in many areas. The flood map for this event records 1 no. surface water flood zone within the south of the Wind Farm Site. This area has the possibility of flooding again if there is similar heavy rainfall to 2015/2016 winter. However, this flood zone is not in the vicinity of the Existing Development.

No CFRAM mapping has been completed for the area of the Wind Farm Site. The closest mapped CFRAM fluvial flood zones are along the Finn River, ~5.5km to the northeast at Stranolar.

The National Indicative Fluvial Flood Map for the Present Day Scenario maps a flood zone within the centre of the Wind Farm Site along the Bunadowen River. The flood zones from this river are constrained to be immediate vicinity of the channel and do not encroach any significant distance upon the Wind Farm Site. The Existing Development largely avoids the mapped fluvial flood zones with the exception of ~306m^2 of as-built road (Flood Bone B, of which 305m^2 is also in Flood Zone A). This area is infinitesimally small in comparison to the total area of the NIFM fluvial flood zones within the Wind Farm Site (892 ha). Therefore, the proposed footprint within the flood zone represents 0.003% of the flood zone within the Wind Farm Site. The emplacement of this infrastructure had no potential to result in any significant displacement of floodwaters. All other elements of the Existing Development including the onsite substation, turbine foundations and hardstands, are located in Flood Zone C and are considered to be at low risk of flooding.

Furthermore, the Wind Farm Site is not mapped within any historic or modelled groundwater flood zones.

The main risk of flooding at the Wind Farm Site is via fluvial flooding along the Bunadowen River. As stated previously, none of the components of the Existing Development are located within the modelled flood zones.

Surface water ponding/pluvial flooding may occur in some flat areas of the Wind Farm Site due to the presence of low permeability peat at the surface. Mostly the risk of pluvial flooding is low.

In general the risk of flooding at the Wind Farm Site is low due to the elevated and sloping nature of the land and the high density of forestry drains and natural streams which flow downslope.

9.3.6.2 Grid Connection Site

In addition to the Flood Risk Assessment completed for the Wind Farm Site, the potential for flooding at the Grid Connection Site has also been assessed.

The OPWs Past Flood Events Map records the presence of a recurring flood event (Flood ID: 4194) on the Lowerymore River near Barnesmore Gap in close proximity to the Grid Connection Site along the N15.

The GSI's Winter 2015/2016 Surface Water Flood Map does not record any historic flood zones along the Grid Connection. Flood zones are mapped at Lough Eske downstream of the Grid Connection Site.

No CFRAM mapping has been completed for the area of the Grid Connection Site.

The National Indicative Fluvial Flood Map for the Present Day Scenario maps fluvial flood zones along the Lowerymore River adjacent to the Grid Connection Site. The flood zones are largely constrained to the immediate vicinity of the river channel to the east of the N15. The flood zones do overlap with the N15 at the existing watercourse crossings located at Barnes Bridge and Keadew Bridge. The flood zones are also mapped to encroach upon a small section of the N15 in the townland of the Tawnawully Mountains.

The Grid Connection Site is not mapped within any historic or modelled groundwater flood zones.

In summary, save for the minor overlap of flood zones with the N15 (as discussed above), the Grid Connection is at low risk of flooding.

9.3.7 Surface Water Quality

9.3.7.1 EPA Water Quality Monitoring

Biological Q-rating[2] data for EPA monitoring points in the local catchments downstream of the Site are presented below. The Q-Rating is a water quality rating system based on both the habitat and the invertebrate community assessment and is divided into status categories ranging from Q1 (Bad) to 4-5 (High).

A map of EPA monitoring locations, and the most recent status results, are shown on **Figure 9-9** below.

2 The Q-Rating scheme method is used whereby a Quality-index is assigned to a river or stream based on macroinvertebrate data.

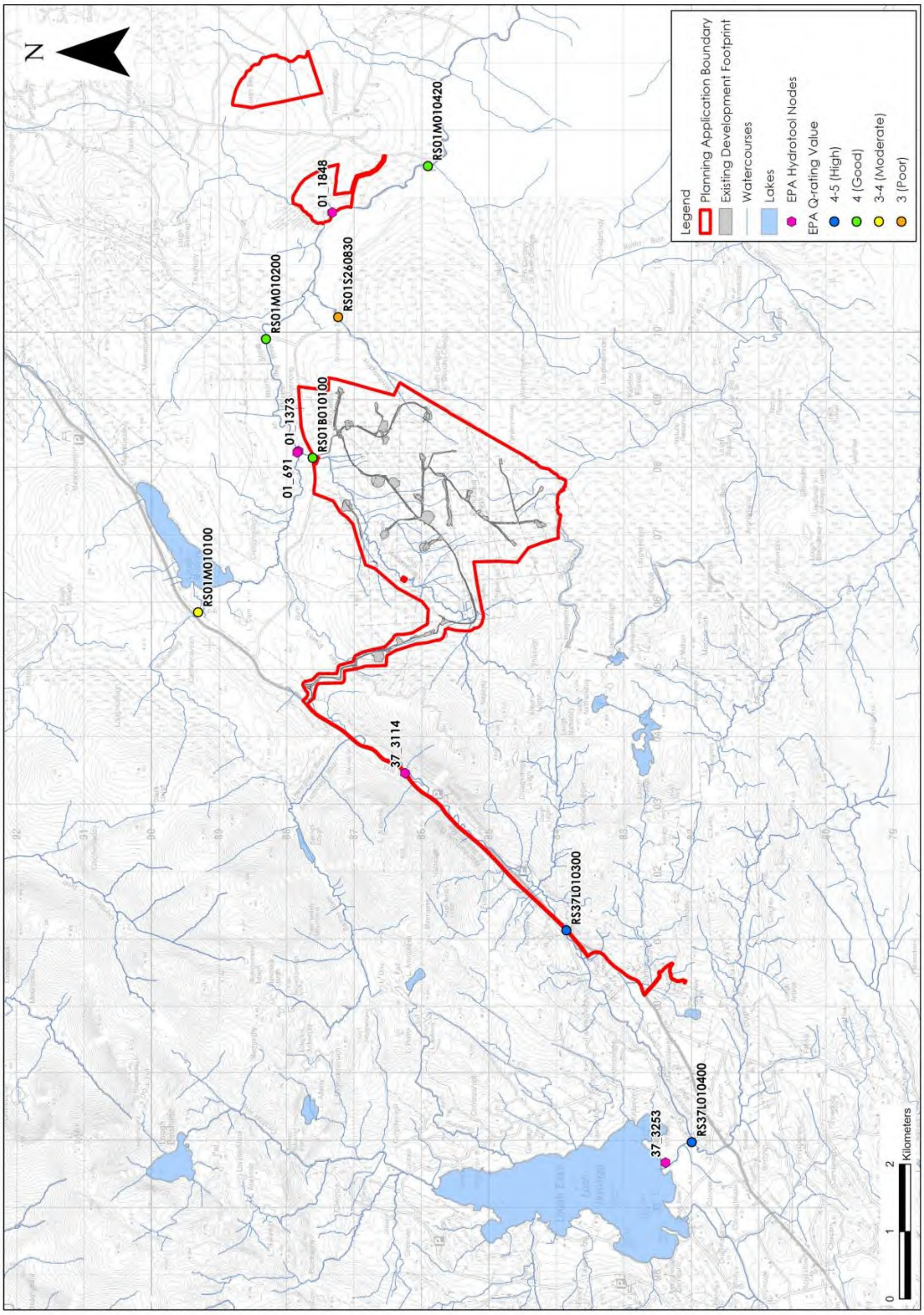

Figure 9-9: EPA Water Monitoring Locations (with Most-Recent Status) and EPA Hydrotool Nodes

9.3.7.1.1 Baseline (Pre-November 2019)

EPA Q-rating monitoring was completed on several dates and at multiple locations in the local area prior to the commencement of construction works at the Wind Farm Site and Grid Connection Site. All available Q-rating values for watercourses in the vicinity and downstream of the Wind Farm Site were consulted from 2010 to 2019. These data are presented in **Table 9-8**.

In the vicinity of the Wind Farm Site within the Mourne Beg river sub-catchment, the Q-rating status of the Bunadowen River ranged from 'Poor' to 'Moderate' Q-status in the years preceding the construction phase. This watercourse was found to be of 'Bad' Q-status in 2016 (*i.e.* Q2/0) and of 'Poor' Q-status in 2017 (Q2-3) upstream of its confluence with the Mourne Beg River (Station ID: RS01B010100). Meanwhile, the status improved to 'Moderate' Q-status (Q3-4) in the 2019 monitoring round.

Downstream of Bunadowen River, status of the Mourne Beg River also improved in the years preceding the construction of the Existing Development. At a bridge southwest of Tonreagh (Station ID: RS01M010200), the Mourne Beg River achieved 'Bad' Q-status in 2016 (Q2-3/0) and improved to 'Good' Q-status in 2019.

No EPA monitoring was completed on the Shruhanagarve Stream or the Glendergan River in the vicinity of the Wind Farm Site during this period.

Within the Eske sub-catchment, the Lowerymore River achieved 'Good' Q-status (Q4) in 2018 at Barnes Bridge (Station ID: RS37L010100). Further downstream the Lowerymore River achieved 'High' Q-status at Keadew Bridge (Station ID: RS37L010300) and at a bridge upstream of Lough Eske (Station ID: RS37L010400).

9.3.7.1.2 Construction of the Existing Development

Construction work on the Existing Development commenced in November 2019. Although some construction activities have occurred on a sporadic basis throughout the period from November 2019 to the present, the vast majority of construction activities occurred during the 12-month period from November 2019 to November 2020. Works on the electricity substation and associated underground cabling connection to the grid continued until the second quarter of 2021. Construction temporarily resumed for approximately 6 weeks in Q3 of 2022., during which some additional works were carried out on site roads, internal site ducting, hardstanding areas, borrow pits, and peat cells.

EPA Q-rating monitoring has been completed at 4 no. locations downstream of the Wind Farm Site during the construction phase. These data are presented in **Table 9-8**.

In 2020, the Bunadowen River achieved a 'Good' Q-status upstream of its confluence with the Mourne Beg River (Station ID: RS01B010100). Further downstream, the Mourne Beg River was also found to be of 'Good' Q-status at a bridge southwest of Tonreagh (Station ID: RS01M010200). However, the Shruhanagarve Stream, was found to be of 'Bad' Q-status (Q1) at Shruhanagarve Bridge (Station ID: RS01S260830). This status is linked to the November 2020 Peat Slide which occurred at the Wind Farm Site. Downstream of this watercourse, the Mourne Beg River was found to be of 'Moderate' Q-status (Q3-4) upstream of Croagh Bridge (Station ID: RS01M010420).

Subsequent monitoring completed by the EPA in 2022 showed that the Q-status on the Bunadowen River and the Mourne Beg River at a bridge southwest of Tonreagh remained unchanged with a 'Good' Q-status. Meanwhile, the Shruhanagarve Stream and the Mourne Beg River further downstream both experienced an improvement in Q-status. The Shruhanagarve Stream achieved a 'Poor' Q-status (Q3) whilst the Mourne Beg River achieved a 'Good' Q-status upstream of Croagh Bridge in 2022.

The latest monitoring round, completed by the EPA in 2025, shows that the watercourses in the vicinity and immediately downstream of the Wind Farm Site (i.e. the Shruhanagarve Stream, the Bunadowen River and the Mourne Beg River) are of 'Good' status.

Within the Eske sub-catchment, the Lowerymore River achieved a Q4-5 rating ('High' Q-status) downstream of the Wind Farm Site and Grid Connection Site at Keadew Bridge (Station ID:

RS37L010300) in 2021. The Lowerymore River was also found to be of 'High' Q-status upstream of Lough Eske (Station ID: RS37L010400).

Within the Eske sub-catchment, the Lowerymore River achieved 'Good' Q-status at Barnes Bridge (Station ID: RS37L010100) in 2024.

9.3.7.1.3 Summary EPA Water Quality Monitoring

The EPA biological monitoring is summarised as follows:

- The Bunadowen River and the Mourne Beg River upstream of the Shruhanagarve Stream did not experience any deterioration on Q-ratings during the Construction Phase.
- An improvement was recorded in the Bunadowen River between 2019 and 2020 ('Moderate' to 'Good' Q-status).
- The Shruhanagarve Stream achieved a 'Bad' Q-status in 2020 following the November 2020 Peat Slide. However an improvement to 'Poor' Q-status was subsequently recorded in 2023. The Q-status further improved to 'Good' in 2025.
- The Mourne Beg River downstream of the Shruhanagarve Stream also recorded an improvement in Q-status from 'Moderate' in 2020 to 'Good' in 2022 and 2025.
- The Lowerymore River did not experience any deterioration in Q-status from the pre-construction baseline to the most recent available EPA Q-rating (2024). The Lowerymore River has remained at 'Good' or 'High' Q-status.

Table 9-8: Summary EPA Biological Monitoring Data (2011-2025)

EPA Station ID	Station Location	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
		Pre-Construction									Construction Phase					
Mourne Beg River Sub-Catchment																
RS01M010100	Mourne Beg River u/s Lough Mourne	2.5					3.5			4			3.5			3.5
RS01B010100	Bunadowen River u/s Mourne Beg River	3		3			2	2.5		3.5	4		4			4
RS01M010200	Mourne Beg River at a bridge SW of Tonreagh	3		3			2.5			4	4		4			4
RS01S260830	Shruhangarve River at Shruhanagarve Bridge										1		3			4
RS01M010420	Mourne Beg River d/s of Wind Farm Site										3.5		4			4
Lowerymore River Sub-Catchment																
RS37L010100	Lowerymore River at Barnes Bridge	4		3					4						4	
RS37L010300	Lowerymore River at Keadew	4.5				4.5			4.5			4.5				
RS37L010400	Lowerymore River u/s of Lough Eske	4							4.5			4.5				

9.3.7.2 Northern Ireland Environmental Agency Monitoring

The Northern Ireland Environment Agency (NIEA), an agency with the Department of Agriculture Environment and Rural Affairs (DAERA) is responsible for water quality monitoring in Northern Ireland. Water bodies are assessed against a number of elements as required by the Water Environment (Water Framework Directive) Regulations (Northern Ireland) 2017. For surface waters, ecological status is assessed against five classes: bad; poor; moderate; good; and high. Chemical status surface water bodies are assessed against two classes: good and failing to achieve good. The status of a water body is determined by the lowest test element and follows the one-out, all-out rule. The ecological status of a river waterbody is consequently assigned as a combination of lowest test element from the chemical testing and biological testing.

The Glendergan River was classified in 2015 and 2018 as 'Moderate' and in 2021 as 'Poor' ecological status. In 2021, due to the inclusion of 'forever' chemicals and Cybermethrin in the assessment process, none of the assessed water bodies met good or high 'Overall Surface Water Status', which in turn decreased ecological status classification of most catchments in Northern Ireland. The decrease in ecological status in the Glendergan River is a result of change in assessment methodology, rather than being attributed to activities at the Wind Farm Site. This is also highlighted in the NIEA's Northern Ireland Water Framework Directive Statistics Report 2021. In 2024 the status returned to 'Moderate'.

When river water quality was assessed without 'forever' chemicals in Glendergan River, it was assigned status 'Good' in 2021, an improvement from the 2015 and 2018 classification, when it was classed as 'Moderate'.

9.3.7.3 Additional Biological Water Quality Assessments

MKO and Triturus Environmental Ltd have completed additional biological water quality assessments in order to supplement the EPA/NIEA monitoring described above. A map of the additional monitoring locations is shown on **Figure 9-10** below.

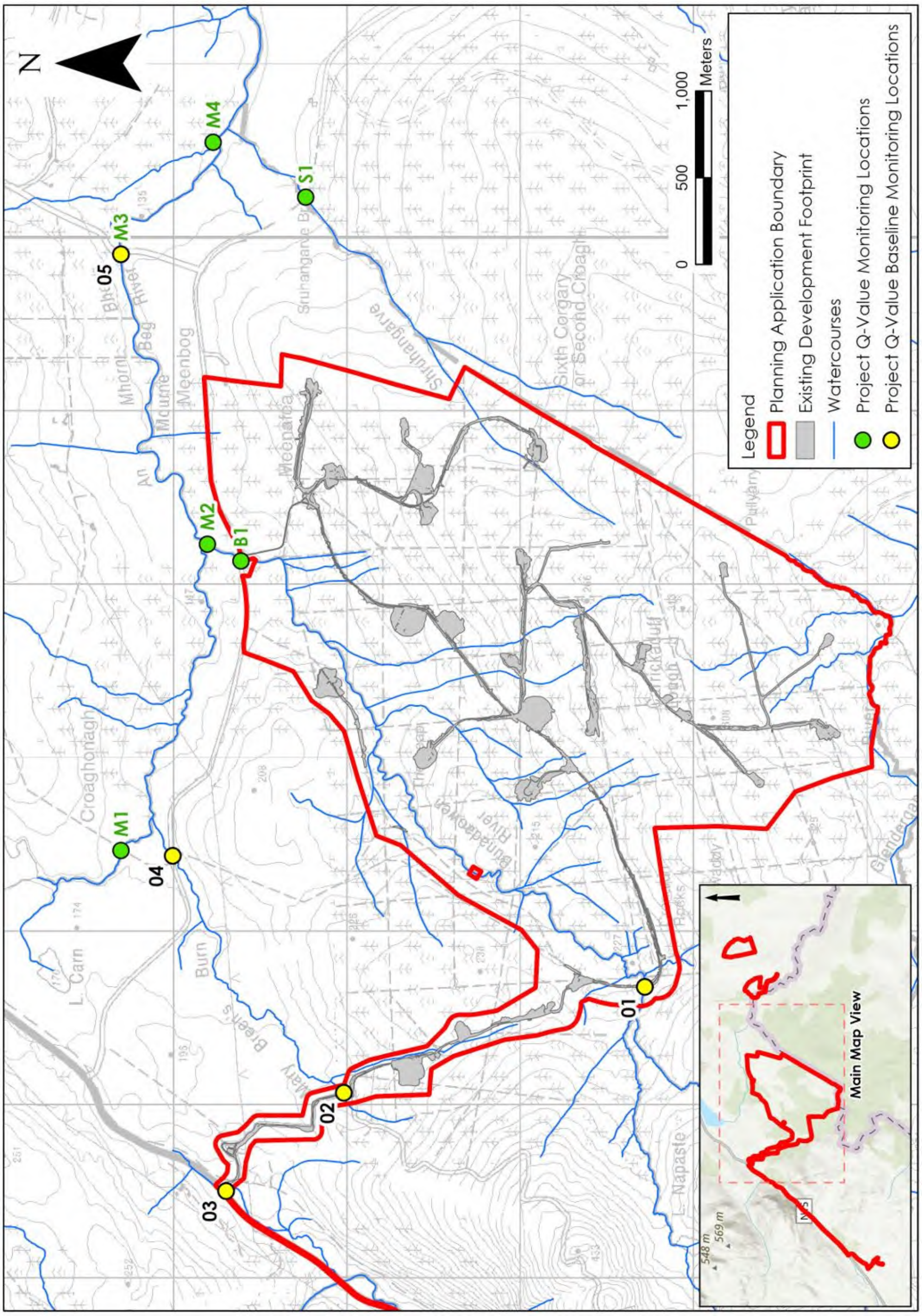

Figure 9-10: Additional Biological Monitoring Locations (Pre-November 2019)

MKO completed baseline surveys at 5 no. locations within and downstream of the Wind Farm Site in September 2014 to assess aquatic macroinvertebrates for Q-Value determination of the baseline environment. The results are presented in **Table 9-9** below.

All 5 no. sampling locations were assigned a 'Moderate' Q-status (Q3-4). The sampling locations included the Bunadowen River, 2 no. locations along the Mary Breen's Burn, the Mourne Beg River and the Barrack Hill Stream. No baseline monitoring was undertaken on or downstream of the Shruhanagarve Stream. However, it is likely to have been in a similar condition to the other local watercourses.

Table 9-9: MKO Q-Rating Assessment (2014)

Watercourse	Sampling Location ID	Year	EPA Q-Rating Status
Mourne Beg River Sub-Catchment			
Bunadowen	SP1 (01)	2014	Q3-4
Mary Breen's Burn	SP2 (02)	2014	Q3-4
Mary Breen's Burn	SP4 (04)	2014	Q3-4
Mourne Beg	SP5 (05)	2014	Q3-4
Eske Sub-Catchment			
Barrack Hill	SP3 (03)	2014	Q3-4

A total of 3 no. rounds of biological water quality assessments were completed in 2020 (MKO), 2021 (Triturus Environmental Ltd) and 2023 (MKO). During these monitoring rounds a total of 39 no. kick samples were taken.

6 no. sampling locations were common across the 3 no. monitoring cycles and the results of the kick sampling at these locations are presented in **Figure 9-11** below. During these monitoring rounds, the Q-ratings of the Mourne Beg River (M1 – M5), Bunadowen River (B1) and Shruhanagarve Stream (S1) in the vicinity and downstream of the Wind Farm Site ranged from Q3.5 ('Moderate' Q-status) to Q4.5 ('High' Q-status). The monitoring shows no deterioration in the Q-rating status of these watercourses. 4 no. monitoring locations (M1, M4, M5 and S1) show an improvement in Q-ratings during this period while no change was recorded at 4 no. monitoring locations (M2, M3 and B1).

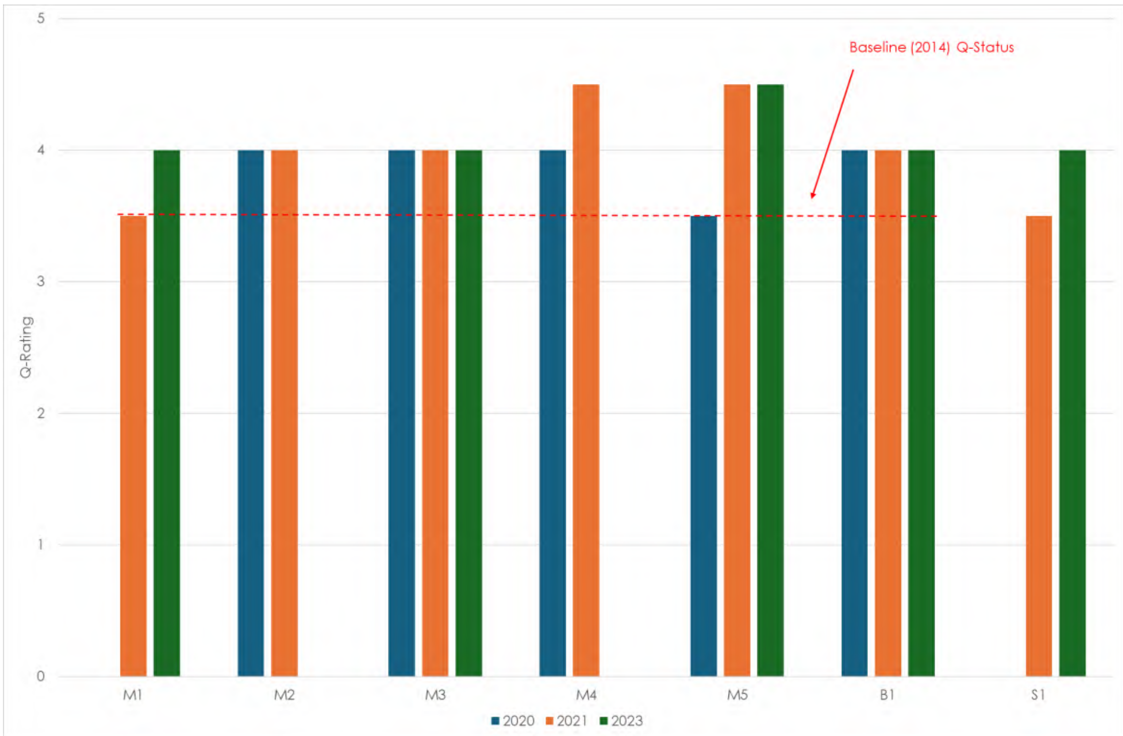

Figure 9-11: Additional Q-Rating Monitoring Results (2020, 2021 and 2023)

Triturus Environmental Ltd completed an additional 2 no. rounds of biological water quality monitoring (18 no. kick samples each) in July 2024 and July 2025. The results are presented in Table 9-10 and are summarised below:

- Mary Breen's Burn (SP2) and an unnamed stream (SP1) achieved 'Poor' and 'Good' Q-status respectively in both monitoring rounds.
- The Bunadowen River achieved 'Poor' Q-status at all locations (SP3-SP5) in both monitoring rounds.
- The Shruhanagarve Stream (SP6) achieved 'Poor' Q-status in 2024 and an improved 'Moderate' Q-status in 2025.
- The Glendergan River achieved 'Poor' Q-status at both locations (SP7 and SP8) in both monitoring rounds.
- The status of the Mourne Beg River typically remained constant throughout both monitoring rounds. 4 of the 8 no. monitoring locations recorded 'Good' Q-status in the 2024 monitoring round, with 5 no. locations achieving 'Good' Q-status in 2025. 1 no. location (SP9) achieving 'Poor' Q-status in both rounds. An improvement in Q-status was also recorded at SP10, SP11 and SP15. Meanwhile, only 1 no. location experienced a deterioration in status (SP12).
- Within the Eske catchment, the Barrack Hill Stream and the Lowerymore River achieved 'Good' Q-status in both monitoring rounds.

Table 9-10: Triturus Environmental Ltd Monitoring Post Construction Phase (2024 - 2025)

Watercourse	Sampling Location ID	July 2024	July 2025
Mourne Beg River Sub-Catchment			
Unnamed Stream	SP1	Q4	Q4
Mary Breen's Burn	SP2	Q3	Q3
Bunadowen River	SP3	Q3	Q3
Bunadowen River	SP4	Q3	Q3
Bunadowen River	SP5	Q3	Q3
Shruhanagarve Stream	SP6	Q3	Q3-4
Glendergan River	SP7	Q3	Q3
Glendergan River	SP8	Q3	Q3
Mourne Beg River	SP9	Q3	Q3
Mourne Beg River	SP10	Q3-4	Q4
Mourne Beg River	SP11	Q3	Q3-4
Mourne Beg River	SP12	Q4	Q3
Mourne Beg River	SP13	Q4	Q4
Mourne Beg River	SP14	Q4	Q4
Mourne Beg River	SP15	Q3-4	Q4
Mourne Beg River	SP16	Q4	Q4
Eske Sub-Catchment			
Barrack Hill Stream	Sample Point 17	Q4	Q4
Lowerymore River	Sample Point 18	Q4	Q4

9.3.7.3.1 Summary Additional Biological Monitoring

The additional biological monitoring is summarised as follows:

- Baseline monitoring was completed in 2014 and found that the local watercourses in the vicinity of the Wind Farm Site (Bunadowen River, Mary Breens Burn and the Mourne Beg River and the Barrack Hill Stream) were of 'Moderate' Q-status.
- Monitoring completed during the Construction Phase did not record any deterioration in Q-ratings.
- Improvements in Q-ratings were recorded across several locations including on the Shruhanagarve Stream in the years after the November 2020 Peat Slide.
- Monitoring has showed that the tributaries of the Mourne Beg River draining the Wind Farm Site are typically of 'Poor' or 'Moderate' Q-status. The Mourne Beg River itself is generally of 'Good' status downstream of the Wind Farm Site.

9.3.7.4 Surface Water Quality Monitoring

9.3.7.4.1 *Baseline (Pre-November 2019)*

As part of the 2017 EIAR HES completed surface water monitoring at 4 no. locations on the Bunadowen River in September 2017.

Field hydrochemistry measurements of electrical conductivity (µS/cm), pH (pH units) and temperature (°C) were taken at these 4 no. monitoring locations and the results are summarised as follows:

- Electrical conductivity (EC) values for drains and natural surface waters at the Wind Farm Site area ranged between 39 and 45µS/cm. This indicates that surface water flow was derived predominantly from rainfall input / runoff during this sampling event.
- The pH values were slightly acidic, ranging from 5.6 to 5.7. Slightly acidic pH values of surface waters would be typical of peatland environments due to the decomposition of peat.
- In addition, the Precambrian bedrock (and related till subsoils where present) which underlie the study area would have slightly acidic groundwater characteristics which would have some effect on surface water chemistry especially during dry periods, when baseflow is likely to be more prevalent.

Surface water samples were taken from the Bunadowen River on 20th September 2017 for laboratory analysis and the results are summarised as follows:

- Total suspended solids were <10mg/L in all samples;
- Ammonia N was below the laboratory detection limit of 0.03mg/L in all samples;
- BOD was less than 1mg/L in all samples;
- Nitrite was below the laboratory detection limit of 0.03mg/L in samples;
- Nitrate was also below the laboratory detection limit of 0.2mg/L in all samples and phosphorus ranged between 0.027 and 0.045mg/L which would be considered low. The low levels of nutrients reported in the samples would be typical of surface water quality from a peatland environment; and,
- Chloride which ranged between 6.6 and 8.1mg/L is typical of surface waters in a non-coastal setting.

9.3.7.4.2 *Surface Water Quality Monitoring During Construction of the Existing Development*

During the Construction Phase, MKO was engaged to undertake a water quality monitoring programme in line with the requirement set out in the 2017 EIAR. This included continuous turbidity monitoring, daily visual checks of waterways and monthly hydrochemistry monitoring.

Visual Checks

Visual checks were completed at 12 no. locations on watercourses in the vicinity and downstream of the Wind Farm Site and Grid Connection Site during the construction works. The locations of these inspection points are shown on Figure 9-12.

Daily visual checks noted any localised increases in turbidity in onsite water courses, general site conditions, and recorded mitigation measures necessary as outlined in the CEMP or discussed with the relevant personnel such as the project hydrologist, geologist, or site manager.

Surface Water Chemistry Monitoring

Surface water monitoring (grab sampling) has been ongoing throughout the construction phase of the Existing Development. Monthly grab sampling commenced at 4 no. locations within the Wind Farm Site in September 2019. These locations (SW1-SW4) were on the Bunadaowen River and Mary Breen's Burn. Monthly sampling at these locations was paused between February 2023 and November 2024, with the exception of sampling completed in October 2024, May 2024 and July 2024, as all key water quality parameters had been stable for almost 2 years. Monthly monitoring started again November 2024 to inform this rEIAR.

Additional monitoring locations were added to the water quality monitoring programme in response to the November 2020 Peat Slide. These locations were situated on the Mourne Beg River upstream (M-Beg 2) and downstream (M-Beg 1) of the Shruhanagarve Stream. Sampling was also completed further downstream on the River Derg (Derg-1 and Derg-2). The frequency of grab sampling at these locations has been amended in response to water quality trends, particularly the concentrations of suspended solids. Daily sampling commenced on 13th November 2020 at these locations following the November 2020 Peat Slide and continued until late December 2020. Weekly sampling was undertaken throughout 2021 on the Mourne Beg River whilst sampling ceased on the River Derg in March 2021 as concentrations had returned to baseline levels. Monthly monitoring continued on the Mourn Beg River until Spring 2026 to inform this rEIAR.

Table 9-11 below presents a summary of the surface water grab sampling completed on local natural watercourses for each year of the construction phase. A comprehensive water quality dataset has been obtained with a total of 554 no. grab samples obtained from the local watercourses. The sampling locations are shown on Figure 9-12.

Table 9-11: Surface Water Monitoring Summary (Grab Sampling on Natural Watercourses)

Year	Sampling Frequency	No. Samples	Locations
2019	Monthly - commenced in Sept 2019	16	SW1, SW2, SW3, SW4
2020	Monthly	48	SW1, SW2, SW3, SW4
	Daily - commenced 13/11/2020	142	M-Beg 1, M-Beg 2, Derg-1, Derg-2
2021	Monthly (No data for Fab/Aug/Dec)	36	SW1, SW2, SW3, SW4
	Weekly	96	M-Beg 1, M-Beg 2
	Weekly – ceased 03/03/2021	18	Derg-1, Derg-2
2022	Monthly (No data for Jan/Dec)	40	SW1, SW2, SW3, SW4
	Monthly (No data for Dec)	22	M-Beg 1, M-Beg 2
2023	Sampling in Jan/Feb/Oct	12	SW1, SW2, SW3, SW4
	Sampling in Jan/Dec	4	M-Beg 1, M-Beg 2
2024	Sampling in May/July Monthly sampling recommended in Nov	24	SW1, SW2, SW3, SW4, M-Beg 1, M-Beg 2
2025	Monthly Sampling	72	SW1, SW2, SW3, SW4, M-Beg 1, M-Beg 2
2026	Monthly sampling – data available until end April	24	SW1, SW2, SW3, SW4, M-Beg 1, M-Beg 2
Total		**554**	

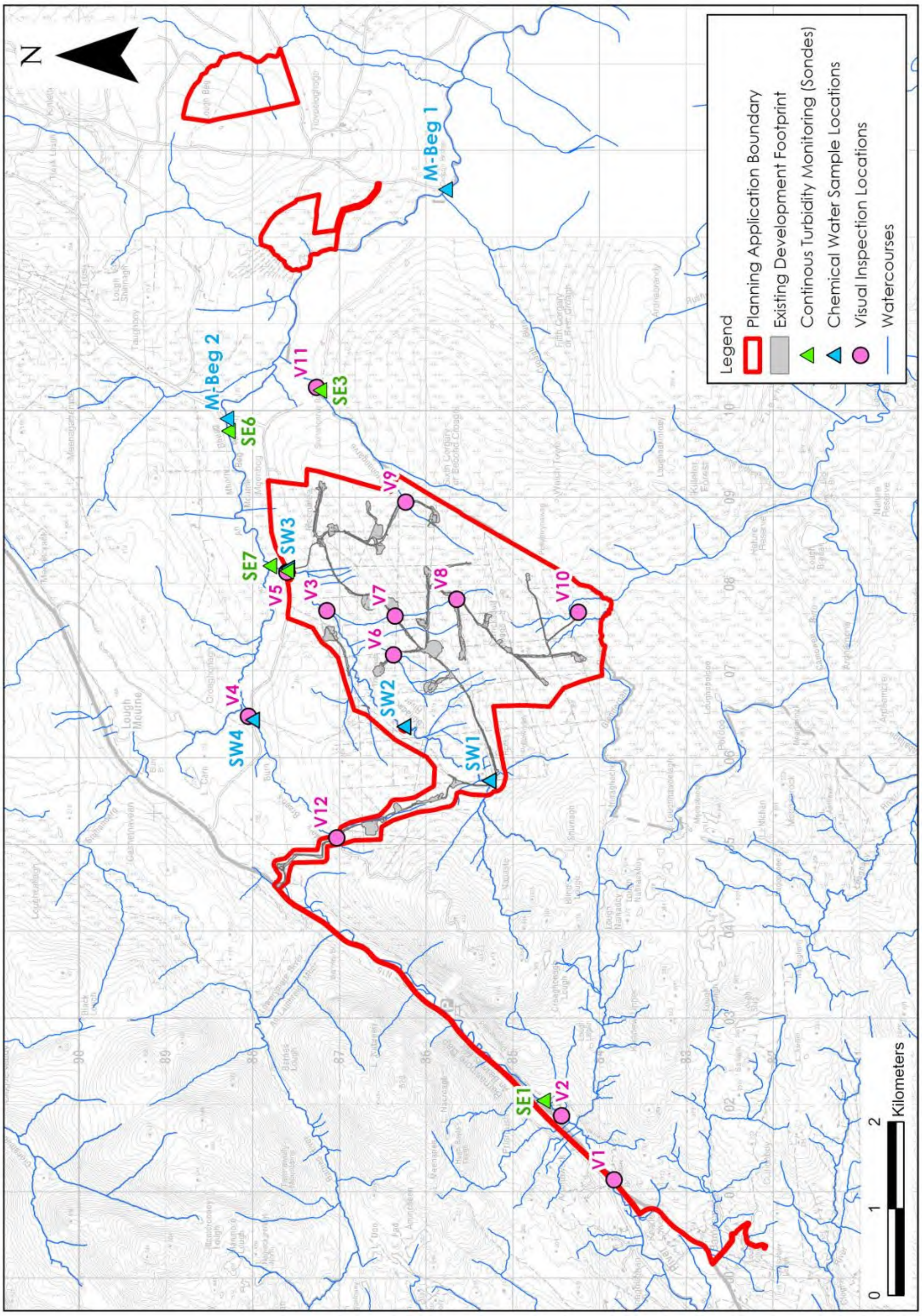

Figure 9-12: Monitoring Locations

To characterise the surface water conditions in the local watercourses, a statistical analysis of the dataset was completed using the median, mean and 95%tile concentrations of the key parameters. The results are presented against the relevant Environmental Quality Standards (EQS) for BOD, Ammonia and Orthophosphate as per S.I. 272/2009. The analysis used a screening value equal to the 95%tile good status threshold as set out in S.I. 272. Meanwhile, the EQS of 25mg/l was used for TSS as per S.I. 293/1988. The results are summarised in **Table 9-12** below and as follows:

- Suspended solids concentrations at SW1 to SW4 have largely been well below the below 25mg/l EQS. Only 1 no. exceedance has been recorded with respect to suspended solids concentrations. This occurred at SW2 on the 30th November 2020. Note that an additional analysis and discussion with respect to suspended solids concentrations is provided below for the monitoring locations on the Mourne Beg and Derg rivers downstream of the Shruhanagarve Stream as these results have been impacted (albeit a short-term impact) by the November 2020 Peat Slide.
- Samples have largely found to be compliant with respect to Ammonia. The watercourses in the vicinity of the Wind Farm Site have greatest compliance (94 - 100%). Meanwhile, slightly more exceedances were recorded further downstream in the River Derg.
- Elevated levels of orthophosphate were recorded across all sampling stations in the monthly samples dating from March, April, and June 2020. Exceedances were recorded at SW3 and SW4 in November 2021, at SW5 in September 2025, at SW3 in June 2025 and at SW4 in January 2026. Levels subsequently returned to baseline concentrations. Samples were found to be 93 - 100% compliant with respect to orthophosphate.
- Elevated BOD concentrations have been recorded at several monitoring stations throughout 2024, 2025 and 2026. Samples were found to be 81 - 100% compliant with respect to BOD.

Table 9-12: Water Quality Monitoring During Construction (Surface Water Grab Sampling on Bunadaowen River)

Sampling Location	Parameter	Mean	Median	95%tile	Max	EQS	% Below EQS
SW1	TSS	6	5	10	18	≤25	100%
	BOD	1.32	1.0	3.0	3.0	Good status ≤2.6 (95%ile)	89.8%
	Ammonia	0.03	0.02	0.05	0.07	Good status ≤0.140 (95%ile)	100%
	Ortho-P	0.03	0.03	0.06	0.12	Good status ≤0.075 (95%ile)	96%
SW2	TSS	7.1	5	10.1	68	≤25	98.3%
	BOD	1.4	1.0	3.0	3.0	Good status ≤2.6 (95%ile))	84.7%
	Ammonia	0.03	0.03	0.04	0.09	Good status ≤0.140 (95%ile)	100%
	Ortho-P	0.03	0.03	0.06	0.06	Good status ≤0.075 (95%ile)	100%
SW3	TSS	6.4	6	10	17	≤25	100%
	BOD	1.5	1.0	3.0	3.0	Good status ≤2.6 (95%ile)	81.4%
	Ammonia	0.03	0.02	0.05	0.11	Good status ≤0.140 (95%ile)	100%
	Ortho-P	0.04	0.03	0.06	0.36	Good status ≤0.075 (95%ile)	98.3%
SW4	TSS	6.4	7	10	16	≤25	100%
	BOD	1.4	1.0	3.0	3.0	Good status ≤2.6 (95%ile)	86.4%
	Ammonia	0.08	0.03	0.18	1.48	Good status ≤0.140 (95%ile)	94.9%
	Ortho-P	0.04	0.03	0.06	0.24	Good status ≤0.075 (95%ile)	96.6%
M-Beg 1	TSS	Refer to Table 9-13				≤25	
	BOD	1.2	1.0	3.0	4.0	Good status ≤2.6 (95%ile)	90.6%
	Ammonia	0.03	0.03	0.08	0.31	Good status ≤0.140 (95%ile)	99.1%
	Ortho-P	0.04	0.03	0.06	0.83	Good status ≤0.075 (95%ile)	99.1%
	TSS	Refer to Table 9-13				≤25	

Sampling Location	Parameter	Mean	Median	95%tile	Max	EQS	% Below EQS
M-Beg 2	BOD	1.3	1.0	3.0	5.0	Good status ≤2.6 (95%ile)	92.3%
	Ammonia	0.03	0.02	0.05	0.12	Good status ≤0.140 (95%ile)	100%
	Ortho-P	0.03	0.03	0.03	0.06	Good status ≤0.075 (95%ile)	100%
Derg 1	TSS	Refer to Table 9-13				≤25	
	BOD	1.5	1.0	6.7	10.0	Good status ≤2.6 (95%ile)	93.2%
	Ammonia	0.08	0.06	0.16	0.37	Good status ≤0.140 (95%ile)	88,6%
	Ortho-P	0.04	0.03	0.07	0.11	Good status ≤0.075 (95%ile)	95.5%
Derg 2	TSS	Refer to Table 9-13				≤25	
	BOD	1.0	1.0	1.0	2.0	Good status ≤2.6 (95%ile)	100%
	Ammonia	0.13	0.07	0.16	2.52	Good status ≤0.140 (95%ile)	86.5%
	Ortho-P	0.06	0.03	0.08	0.72	Good status ≤0.075 (95%ile)	93.2%

Suspended Solids Concentrations – November 2020 Peat Slide

Surface water grab sampling commenced on the Mourne Beg River on the 13th November 2020 following the November 2020 Peat Slide. This dataset records the immediate impact of the November 2020 Peat Slide on the receiving waters and their subsequent recovery. The TSS concentrations are presented graphically in Figure 9-13 and summarised in **Table 9-13**.

The highest concentrations were recorded immediately following the November 2020 Peat Slide at the downstream monitoring locations on the Mourne Beg River and the River Derg. A maximum concentration on the Mourne Beg River of 875mg/l was recorded on the 13th November 2020 at M-Beg 1. The effects extended downstream along the River Derg with concentrations of 349mg/l and 951mg/l recorded at Derf-1 and Derg-2 on the same date. However, the grab sampling results indicate that TSS concentrations stabilised and returned to background concentrations in the Mourne Beg River and the River Derg by the 24th November 2020. The effect with regard to suspended solids concentrations was therefore a temporary effect.

Following 2020, TSS concentrations decreased substantially across all monitoring locations, indicating progressive recovery of water quality conditions. At M-Beg 1, mean annual TSS concentrations ranged from 3.0 to 6.8 mg/L between 2021 and 2026, while 95%tile concentrations ranged from 4.8 to 12.4 mg/L. No exceedances of the 25 mg/L screening threshold were recorded during this period, with all samples remaining below the threshold.

Similarly, TSS concentrations at Derg-1 and Derg-2 returned to low levels by 2021, with mean concentrations of 4.3 mg/L and 3.9 mg/L, respectively, and 95%tile concentrations of 8.0 mg/L and 5.6 mg/L. No exceedances of the 25 mg/L threshold were recorded following 2020.

Overall, the monitoring results indicate that the November 2020 Peat Slide caused a temporary increase in suspended sediment concentrations. However, the receiving waters quickly recovered and all grab samples obtained since 2021 were below the 25mg/L EQS. The data indicate no evidence of persistent sediment-related impacts in the receiving watercourses following the initial post-slide period. This data is consistent with the improvement in biological q-ratings discussed above.

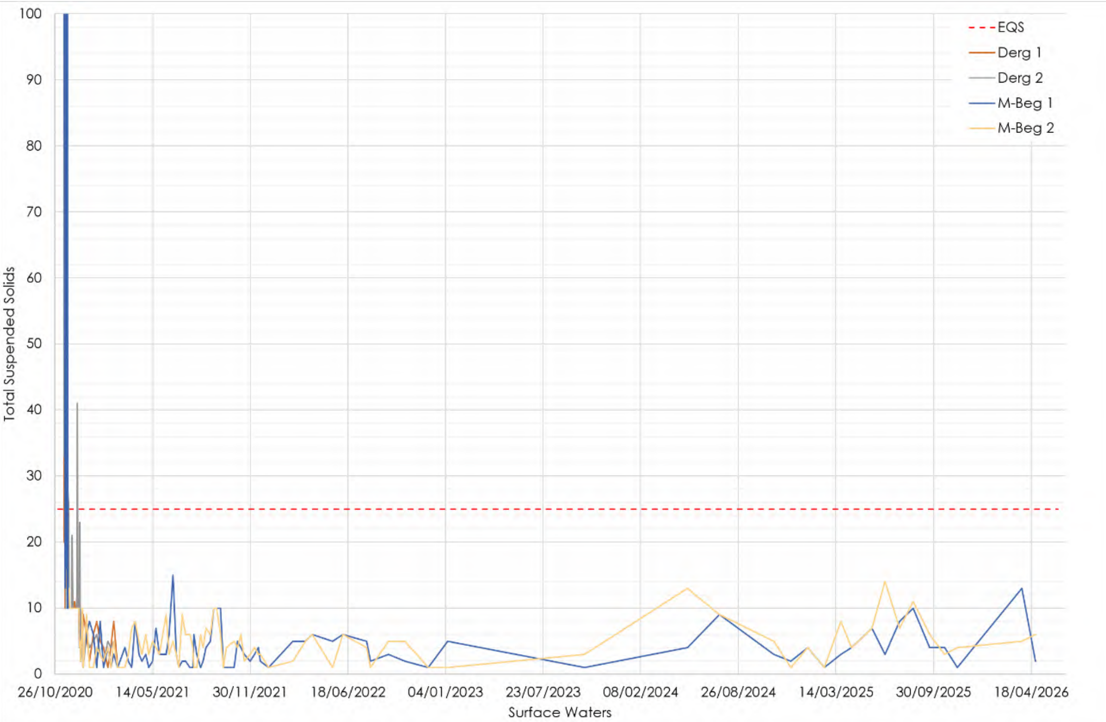

Figure 9-13: Suspended Solids Concentrations on the Mourne Beg and Derg Rivers (Grab Sampling)

Table 9-13: Summary of Suspended Solids Concentrations in Grab Samples Downstream of the November 2020 Peat Slide

Location	Year	N	Median (mg/l)	Mean (mg/l)	Max (mg/l)	95%tile (mg/l)	EQS	No. Exceedance	% Compliant
M-Beg 1	2020	36	10	54.1	875	248	25	6	83.3%
	2021	48	3	3.7	15	10		0	100%
	2022	11	5	3.7	6	6		0	100%
	2023	2	3	3	5	4.8		0	100%
	2024	4	3.5	4.5	9	8.2		0	100%
	2025	12	4	4.2	10	8.9		0	100%
	2026	4	6	6.7	13	12.4		0	100%
Derg-1	2020	35	10	40.1	951	53.4		3	91.4%
	2021	9	4	4.3	8	8		0	100%
Derg-2	2020	35	10	27.8	349	68.8		9	71.4%
	2021	9	4	3.8	6	5.6		0	100%

Continuous Turbidity Monitoring

3 no. sondes (MSe1. MSe3 and MSe4) were installed as a water quality early warning system on the Lowerymore, Bunadowen and Shruhanagarve watercourses on 9th September 2019, prior to the commencement of construction. Additional sondes (MSe 5, 6, and 7) were subsequently installed in various locations along the Mourne Beg River to monitor turbidity upstream of active works and downstream of the Shruhanagarve Stream which had been effected by the November 2020 Peat Slide. MSe3, located on the Shruhanagarve Stream was lost during the November 2020 Peat Slide and was reinstated on 18th December 2020. The locations of the sondes are shown Figure 9-12.

Turbidity is a measure of the cloudiness of a fluid and may be used as an indicator of potential suspended solids. The purpose of the sondes was to act as an early warning system of potential sediment input into receiving waters and allowed further investigations and remedial action to be undertaken if required. The sondes were not used as a measure of water quality, which was instead assessed through chemical and biological monitoring.

The continuous turbidity monitoring results are presented in Figure 9-14, below. The data has been recorded at 15 minute intervals and is summarised in Figure 9-14 as average daily turbidity concentrations. Turbidity can be used as a proxy for total suspended solids (3 NTU = ~1 mg/L TSS), with the TSS EQS of 25mg/L included in the figure as ~75NTU.

The construction phase water quality monitoring data can be summarised as follows:

- The vast majority of the daily turbidity averages are well below the equivalent TSS EQS.
  - A total of 0.73% of the average daily turbidity data exceeded 75NTU at MSe1.
  - A total of 1.95% of the average daily turbidity data exceed 75NTU at MSe 3 on the Shruhanagarve Stream.
  - A total of 3.6% of the average daily turbidity data exceeded 75NTU at MSe4.
  - A total of 0.23% of the average daily turbidity data exceed 75NTU at MSe5.
  - A total of 0.08% of the average daily turbidity data exceeded 75NTU at MSe6.
  - A total of 0.09% of the average daily turbidity data exceeded 75NTU at MSe7.
- The average daily turbidity data exceeded 75NTU on several occasions. On 28th May 2020, the average turbidity concentration at MSe3 on the Shruhanagarve was recorded as 153NTU. An exceedance was also recorded at MSe4 on the Bunadowen River on 12th August 2020 (92.8NTU). The daily average turbidity concentrations quickly returned to background concentrations. Short term increases in suspended solids concentrations are common in watercourses draining peatlands following periods of intense or prolonged rainfall.
- Several exceedances were also recorded at MSe3 in late September 2020. Several elevated average daily turbidity concentration were recorded between 25th and 1st October. The average daily turbidity concentrations exceed 400NTU on each of these dates. The concentrations returned to background levels for much of October, with some brief peaks recorded on 10th, 11th, 13th and 14th October. These spikes in turbidity were brief and not indicative of significant water quality issues at the Wind Farm Site.
- A peat failure occurred on the 12th November 2020 and the NTU concentrations in the Shruhanagarve Stream were at background concentrations in the preceding days. Some elevated turbidity concentrations were recorded following reinstallation of MSe3 on 21st, 22nd and 26th December 2020. However, the turbidity concentrations quickly returned to background levels. There have also been brief spikes in the daily average turbidity concentrations at MSe3 on 16th January 2021, 21st July 2021 and 8th December 2021. Inspection of the 15-minute interval turbidity readings revealed that the turbidity spikes on these dates were brief, typically lasting 15 minutes to 1 hour. Such short-term spikes in turbidity are common in peatland environments, particularly following periods of heavy rainfall. A review of the rainfall data has shown that many of these

spikes were preceded by a period of intense precipitation and likely represent a small plume of suspended sediment moving through the water column. The spikes could also have resulted from temporary obstruction from a leaf or organic debris. Importantly, the short-term spikes are common, interpreted as transient sediment pulses or localised obstruction/disturbances and are not indicative of sustained water quality impacts.

- Several exceedances have also been recorded at other monitoring stations during the winter of 2021/2022 and in the spring and early summer of 2022. Many of these occurred on the Lowerymore River (MSe1), with some elevated concentrations also recorded at MSe7 in August 2022. Again, these spikes in turbidity were brief and not indicative of significant water quality issues at the Wind Farm Site.
- All daily average turbidity concentrations have been well below 75NTU since August 2022, with the exception of MSe5 on 29th November 2023. A brief spike in turbidity was recorded across a 30-minute interval on this date, with concentrations quickly returning to baseline levels. Therefore, this represented a short-term localised disturbance and is not indicative of any wider water quality issue.

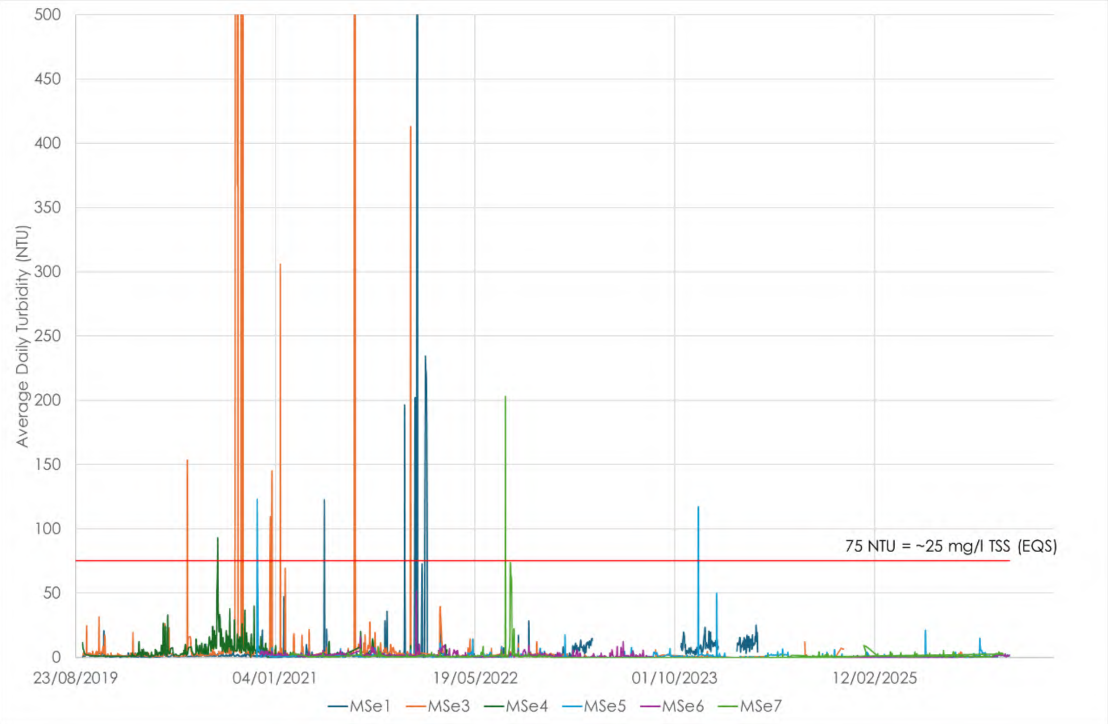

Figure 9-14: Continuous Turbidity Monitoring Data

9.3.7.5 Summary Water Quality

A comprehensive dataset has been obtained in relation to water quality in all watercourses draining the Wind Farm Site and Grid Connection Site.

The following is a brief summary of the preceding sections:

- The water quality data indicates that there has been no deterioration in water quality in the Bunadaowen River, or the Mourne Beg River upstream of the Shruhanagarve Stream;
- A short-term significant negative effect occurred as a result of the November 2020 Peat Slide, however monitoring has shown that water quality has since returned to baseline / pre-construction levels.
  - Surface water grab sampling indicates that the November 2020 Peat Slide resulted in a temporary increases in suspended solids in the Mourne Beg

River and the River Derg. The effects were short-lived with TSS concentrations quickly returning to baseline levels.
  - The biological monitoring data shows a short term deterioration in water quality in the Shruhanagarve Stream and downstream Mourne Beg River associated with the November 2020 Peat Slide. The monitoring data now indicates a recovering trend in the Shruhanagarve Stream, whilst the Mourne Beg River downstream is exceeding its pre-construction baseline status.
- The combined EPA biological monitoring and the additional biological monitoring completed by MKO and Triturus Environmental Ltd indicate that, based on biological factors, there has been no long-term deterioration in water quality in the Mourne Beg, Lowerymore and Bunadowen rivers;
- Data obtained from the Northern Ireland Environmental Agency also indicates that there has been an improvement in status in the Glendergan River; and,
- The water quality monitoring during the construction phase shows that the samples obtained from the Bunadowen River and Mary Breen's Burn do not indicate a decrease in water quality.

9.3.8 Hydrogeology

9.3.8.1 Wind Farm Site

The vast majority of the Wind Farm Site is underlain by Precambrian quartzites, gneisses and schists. A very small section near the site entrance is mapped to be underlain by granites and other igneous intrusive rocks. These rocks are classified by the GSI as being a Poor Aquifer – Bedrock which is Generally Unproductive except for Local Zones (Pl) (www.gsi.ie). A bedrock geology aquifer map is attached as **Figure 9-15**.

The 5 no. boreholes drilled at the Wind Farm Site in April 2025 encountered typically strong grey SCHIST with occasional weak layers at depths of 0.4 to 3.5mbgl. No significant ingress of groundwater was recorded with slow to very slow groundwater strikes recorded on the drilling logs.

In terms of Groundwater Bodies (GWBs), the vast majority of the Wind Farm Site is underlain by the Castlederg GWB. Meanwhile, a small area in the west is underlain by the Donegal South GWB. Both GWBs are characterised by poorly productive bedrock.

The Precambrian and igneous rocks generally have an absence of inter-granular permeability, and most groundwater flow is expected to be in the uppermost part of the aquifer comprising a broken and weathered zone typically less than 3m thick, a zone of interconnected fissuring 10m thick, and a zone of isolated poorly connected fissuring typically less than 150m (GSI, 2004). Recharge occurs diffusely through the thin/permeable subsoil and rock outcrops, although is limited by any thicker till/peat and the low permeability bedrock itself. Therefore, most of the effective rainfall is not expected to recharge the aquifers.

No significant groundwater flow has occurred or is expected either in the deeper bulk of bedrock as any jointing or fractures visible at the exposures were noted to be very tight. Some of the pre-existing borrow pits had depths of up to 5 - 6m below the local ground surface and no groundwater seepage (or evidence of past or intermittent seepage) was noted.

Groundwater flowpaths (where present) are short (30-300m), with groundwater discharging to nearby streams and small springs. Groundwater flow directions follow topography and therefore groundwater directions within the Wind Farm Site are towards the primary streams draining the Wind Farm Site (GSI, 2004).

The above desk study information is supported by on-site observations from the bedrock exposures at the existing borrow pits. The bedrock was noted to be largely competent and massive. Limited groundwater flow is restricted to the top of the rock or within a very thin weathered zone (0.2 – 03m). Also, the pockets of mineral subsoil (where present) are not acting as preferential groundwater flowpaths due to their silty composition, limited thickness and disconnected lateral distribution. Therefore, the overall groundwater flow at the base of the peat is insignificant. Groundwater baseflow contribution to local streams is very low all year round. Overall, the hydrology of the Wind Farm Site is dominated by surface water runoff on the bog surface and within the existing drainage channels.

Local groundwater flow directions mimic topography, whereby groundwater flows from topographic high points to lower elevated discharge areas at local streams (GSI, 2004).

9.3.8.2 Grid Connection Site

The Grid Connection Site is also underlain by Precambrian quartzites, gneisses and schists and granites and other igneous intrusive rocks. In terms of GWBs the Grid Connection Site is underlain by the Donegal South GWB. The GSI's Characterisation Report (GSI, 2004) states that this GWB is composed of low transmissivity rocks. Most of the groundwater flux is likely to be in the uppermost weathered part of the aquifer. Recharge is limited in areas of thick till/peat and also due to the low permeability bedrock itself. Therefore, most of the effective rainfall does not recharge the aquifers. Flow paths are short (30-300 m) with groundwater discharging rapidly to the streams crossing the aquifer.

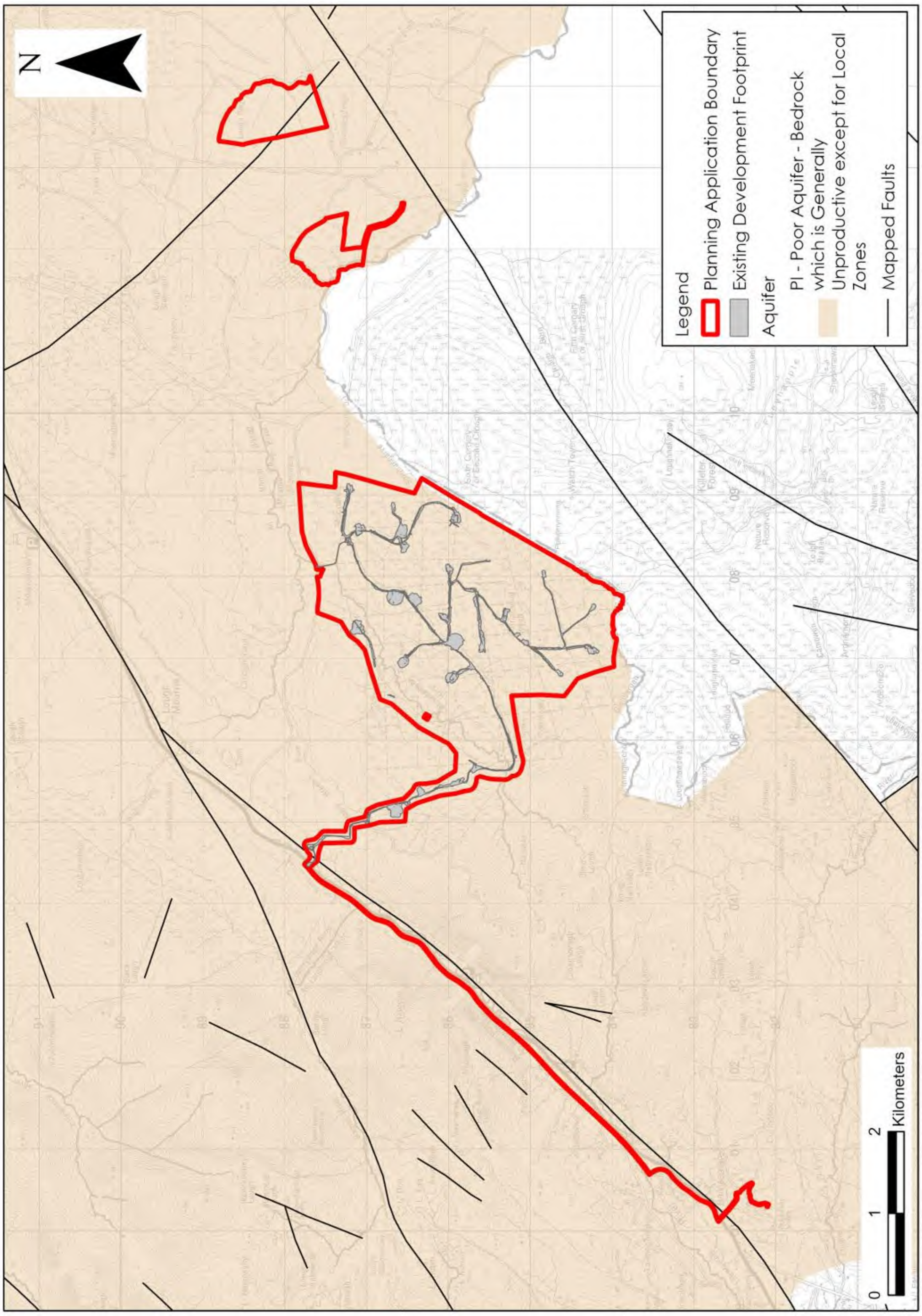

Figure 9-15: Bedrock Aquifer Map

9.3.9 Groundwater Vulnerability

9.3.9.1 Wind Farm Site

The GSI describe groundwater vulnerability as a term used to represent the natural ground characteristics that determine the ease with which groundwater may be contaminated by human activities. Groundwater vulnerability embodies the characteristics of the intrinsic geological and hydrogeological features at a site that determine the ease of groundwater contamination. Groundwater vulnerability is related to recharge acceptance, whereby in areas where recharge occurs more readily, a higher quantity of contaminants will have access to groundwater.

The vulnerability rating of the bedrock aquifer underlying Wind Farm Site is mapped by the GSI (www.gsi.ie) to range from 'Moderate' to 'Extreme-X'. Most of the Wind Farm Site has a vulnerability rating of 'Moderate' to 'High', with the 'Extreme' rating relating to areas where subsoil is shallow or absent and where bedrock is outcropping.

Site investigations at the Wind Farm Site comprising of peat probes, trial pits and gouge cores have revealed that the depth to rock is typically shallow. Given the shallow depth to rock and the nature of the subsoils (silts, clays, sands and gravels), the vulnerability at the Wind Farm Site ranges from 'High' to 'Extreme' in accordance with **Table 9-14**.

However, due to the low permeability nature of the underlying bedrock aquifers, groundwater flowpaths are likely to be short (30 – 300m), with recharge emerging close by and discharging into local surface water streams. This means there is a low potential for groundwater dispersion and movement within the aquifer, therefore surface water bodies such as drains and streams/rivers are more vulnerable (to contamination from human activities) than groundwater at the Wind Farm Site.

9.3.9.2 Grid Connection Site

The GSI mapped groundwater vulnerability along the Grid Connection Site ranges from 'Moderate' to 'Extreme'. The areas of 'Extreme' vulnerability are located in the south of the Grid Connection Site in the vicinity of the Clogher 110kV substation. This area is underlain by a Poor Bedrock Aquifer which is of low permeability and surface water is considered to be the primary sensitive receptor

Table 9-14: Groundwater Vulnerability and Subsoil Permeability and Thickness

Vulnerability Rating	Hydrogeological Conditions				
	Subsoil Permeability (Type) and Thickness			Unsaturated Zone	Karst Features
	High permeability (sand/gravel)	Moderate permeability (e.g. Sandy subsoil)	Low permeability (e.g. Clayey subsoil, clay, peat)	(Sand/gravel aquifers only)	(<30 m radius)
Extreme (E)	0 - 3.0m	0 - 3.0m	0 - 3.0m	0 - 3.0m	-
High (H)	>3.0m	3.0 - 10.0m	3.0 - 5.0m	>3.0m	N/A
Moderate (M)	N/A	>10.0m	5.0 - 10.0m	N/A	N/A
Low (L)	N/A	N/A	>10.0m	N/A	N/A

Notes: (1) N/A = not applicable.
(2) Precise permeability values cannot be given at present.
(3) Release point of contaminants is assumed to be 1-2 m below ground surface.

9.3.10 Groundwater Hydrochemistry

9.3.10.1 Wind Farm Site

The GSI's Groundwater Body Characterisation Reports for the Castlederg and Donegal South GWBs state that no data is available with respect to these particular GWBs. However, based on data from Calcareous/Non-calcareous classification of bedrock in the Republic of Ireland (WFD,2004), alkalinity for this bedrock type generally ranges from 14 – 400mg/L while electrical conductivity and hardness were reported to have mean values of 446µS/cm and 200mg/L respectively.

Groundwater sampling of the 3 no. monitoring wells (25MW1, 25MW and 25MW3) was completed by HES on 10th April 2025. In addition 2 no. surface water samples (SWA and SWB) were obtained from local watercourses adjacent to 25MW4 and 25MW5. The local hydrogeological regime. *i.e.* short groundwater flowpaths which discharge to local surface watercourses, allowed these surface water samples to be used as a proxy from groundwater quality at 24MW4 and 25MW5. A second round of groundwater sampling was completed at all 5 no. monitoring wells on 5th February 2026.

The field chemistry data, taken with a calibrated YSI ProDSS, are presented in **Table 9-15**. The recorded pH ranges between 6.30 – 7.48, while dissolved oxygen ranges between 1.61 – 11.73mg/L. The specific electrical conductivity ranged 126 - 768µS/cm is typical of groundwaters from Precambrian rocks, although the lower range may also indicate shallower/newer groundwater, or leakage from surface water (noting all the wells were sealed using packed bentonite).

Table 9-15: Summary of field chemistry from GWS sample locations (April 2025 and February 2026)

Location	Date	Temp (°C)	DO (mg/L)	SPC (µS/cm)	pH [H^+]
25MW1	10/04/2025	10.6	1.61	377	6.90
	05/02/2026	9.2	4.23	476.9	7.0
25MW2	10/04/2025	9.1	1.84	126	6.44
	05/02/2026	9.6	5.3	225	7.18
25MW3	10/04/2025	9.6	6.5	257	7.27
	05/02/2026	9.3	6.23	579	7.48
SWA	10/04/2025	6.5	11.73	235	6.30
SWB	10/04/2025	9.4	11.66	252	6.85
25MW4	05/02/2026	9.4	4.06	669	7.33
25MW5	05/02/2026	9.7	4.9	768	7.23

The laboratory data of the samples indicates that the water is typically of an acceptable chemical quality relative to the Groundwater Regulations (S.I 9/2010). Nitrate and nitrite were below the limit of detection of the laboratory in all samples apart from nitrate in SWA (5.01 mg/l NO3) in April 2025 and 25MW04 (5.5mg/l NO3) in February 2026. Chloride ranged from 2.5 to 38.819.1mg/l and was generally well below the EQS. All samples were below the EQS set out in S.I 9/2010 (24mg/l) with the exception of 25MW05 in February 2026. This is slightly above the expected background concentrations but remains well below the drinking water parametric value of 250mg/l and does not in itself indicate contamination of groundwaters but may represent slight natural variability. No petroleum hydrocarbons were recorded in any of the samples. Iron and manganese concentrations were high in most of the groundwater samples, but this can likely be attributed to the presence of peat soils at the Wind Farm Site. Elevated concentrations of these parameters are commonly associated with reducing groundwater conditions and can be naturally occurring and are not necessarily indicative of groundwater contamination.

Summary results are presented in **Table 9-16** and **Table 9-17** whilst the full laboratory reports are included in **Appendix 9-3**.

Table 9-16: Groundwater Sampling Laboratory Results (April 2025)

Parameter	EQS	Sample ID				
		MW01	MW02	MW03	SWA	SWB
Ammonia (mg/l)	-	0.165	0.164	0.198	0.353	0.048
Nitrite – N (mg/l)	0.5*/0.1+	<0.01	<0.01	<0.01	<0.01	<0.01
Ortho-phosphate (mg/l)	0.035*	0.025	0.034	0.029	0.025	0.03
Nitrate – NO_3 (mg/l)	37.5+	<4.4	<4.4	<4.4	5.01	<4.4
Chloride (mg/l)	24*/250+	3.5	15.3	18.9	19.1	15.7
BOD (mg/l)		2.2	1.9	1.5	1.9	<1
Iron (µg/L)	200*+	**478**	**5,470**	43	**1,000**	**227**
Magnesium (mg/L)	50*	20.3	3.98	26.3	1.46	1.2
Manganese (µg/L)	50*+	1,240	1,010	533	6.76	6.58
TDS (mg/L)	-	331	285	739	149	91.0
Sulphate (mg/L)	187.5*/250+	16.5	4.09	15.2	<1	1.59
Total TPH (>C6-C40) (ug/l)	-	<10	<10	<10	<10	<10

(*) S.I. No. 9/2010 – Groundwater Regulations
() S.I. 99/2023 – Drinking Water Regulations

Table 9-17: Groundwater Sampling Laboratory Results (February 2026)

Parameter	EQS	Sample ID				
		25MW01	25MW02	25MW03	25MW04	25MW05
Ammonia as N (mg/l)	-	0.035	0.123	0.041	0.159	0.21
Nitrite – N (mg/l)	0.5*/0.1+	<0.01	<0.01	<0.01	<0.01	<0.01
Ortho-phosphate (mg/l)	0.035*	0.012	0.014	<0.01	<0.01	0.017
Nitrate – NO_3 (mg/l)	37.5+	<4.4	<4.4	<4.4	5.5	<4.4
Chloride (mg/l)	24*/250+	14.4	10.9	19.4	21.5	38.8
BOD (mg/l)		1.8	1.8	2.9	2.6	5.3
Iron (µg/L)	200*+	**1,120**	**4,090**	21.1	**800**	**4,030**
Magnesium (mg/L)	50*	20.1	3.76	21.4	20.3	19.4
Manganese (µg/L)	50*+	**1,580**	**912**	**953**	**509**	**1,320**
TDS (mg/L)	-	305	131	306	409	495
Sulphate (mg/L)	187.5*/250+	13.5	6.5	7.56	7.44	27.5
Total TPH (>C6-C40) (ug/l)	-	<0.1	<0.1	<0.1	<0.1	<0.1

(*) S.I. No. 9/2010 – Groundwater Regulations
(+) S.I. 99/2023 – Drinking Water Regulations

9.3.10.2 Grid Connection Site

No groundwater sampling was required at the Grid Connection Site due to the shallow nature of the works. Effects on groundwater quality would not have occurred.

9.3.11 Water Framework Directive

The EU Water Framework Directive (2000/60/EC), as amended by Directives 2008/105/EC, 2013/39/EU and 2014/101/EU ("WFD"), was established to ensure the protection of the water environment. The Directive was transposed in Ireland by the European Communities (Water Policy) Regulations 2003 (S.I. No. 722/2003).

The Water Action Plan 2024 was published in September 2023 and is Ireland's 3rd River Basin Management Plan. Its objectives include the following:

- Ensure full compliance with relevant EU legislation;
- Build on the achievements of the 2nd Cycle;
- Prevent deterioration and maintain a 'high' status where it already exists;
- Protect, enhance and restore all waters with aim to achieve at least good status by 2027;
- Ensure waters in protected areas meet requirements; and,
- Implement targeted actions and pilot schemes in focused sub-catchments aimed at restoring impacted waters and protecting waters from deterioration.

Our understanding of these objectives is that surface waters, regardless of whether they have 'Poor' or 'High' status, should be treated the same in terms of the level of protection and mitigation measures employed, i.e. there should be no negative change in status at all. Furthermore any development must not in any way prevent a waterbody from achieving at least good status by 2027.

9.3.11.1 Groundwater Body Status

Local Groundwater Body (GWB) and Surface water Body (SWB) status information is available from (www.catchments.ie).

The Castlederg and Donegal South GWBs, which underlie the Wind Farm Site and Grid Connection Site, achieved 'Good' status in the 3 no. most recent WFD cycles (2013-2018, 2016-2021 and 2019-2024). The status is defined based on the quantitative status and chemical status of the GWB. These GWBs have been deemed to be 'not at risk' of failing to meet their respective WFD objectives. Furthermore, no significant pressures have been identified on these GWBs. Summary WFD information for these GWBs is presented in **Table 9-18** below.

Table 9-18: WFD Groundwater Body Status

GWB	Overall Status 2013-2018	Overall Status 2016-2021	Overall Status 2019-2024	3rd Cycle Risk Status	WFD Pressures
Castlederg	Good	Good	Good	Not at risk	None
Donegal South	Good	Good	Good	Not at risk	None

9.3.11.2 Surface Water Body Status

A summary of the WFD status and risk result for Surface Water Bodies (SWBs) in the vicinity and downstream of the Wind Farm Site and Grid Connection Site are shown in **Table 9-19** below.

Within the Foyle surface water catchment, the Mourne Beg_010 SWB in the vicinity of the Wind Farm Site achieved 'Poor' status in the 3 no. most recent WFD cycles (2013-2018, 2016-2021 and 2019-2024). Meanwhile, the status of the Bunadaowen_010 SWB improved from 'Moderate' to 'Good' status in the latest WFD cycle (2019-2024). The east of the Wind Farm Site is drained by the Mourne Beg River (Derrygoonan) SWB which experienced a deterioration from 'Moderate' to 'Poor' status in the most recent WFD cycle. The status of the Glendergan River has improved from 'Poor' to 'Moderate'. Downstream of the Wind Farm Site the Mourne Beg River (Lisnacloone) and the Derg River (Milbrook) SWBs are of 'Moderate' and 'Poor' status respectively.

The majority of SWBs in the vicinity and downstream of the Wind Farm Site within the Foyle catchment have been deemed to be 'at risk' of failing to meet their respective WFD objectives.

The 3rd Cycle Foyle Catchment Report (EPA, 2024) states that the significant pressure affecting the greatest number of waterbodies in this catchment is agriculture. The significant pressures impacting the SWBs in the vicinity and downstream of the Wind Farm Site are as follows:

- Agriculture is only listed as a significant pressure on the Derg River (Millbrook).
- Forestry is a significant pressure on the Mourne Beg_010, Bunadaowen_010 and Mourne Beg River (Derrygoonan) SWBs in the vicinity of the Wind Farm Site. The catchment report states that the significant issues are arising primarily as a result from clear felling and associated operations, which results in nutrient loads, acidification and sediment loads.
- Abstraction for the Lough Mourne Public Water Supply (PWS) was identified as a significant pressure on the Mourne Beg_010 SWB with habitat alternation due to hydrological changes identified as the issue.
- Abstraction is also listed as a significant pressure on the Mourne Beg River (Derrygoonan) SWB. According to the DAERA mapping this abstraction is for hydro power.

- Peat drainage and peat extraction have been identified as a significant pressure on the Mourne Beg River (Derrygoonan) and the Derg River (Millbrook).
- Unknown anthropogenic pressures are also listed to be impacted several SWBs including the Mourne Beg River (Derrygoonan) SWB.

Within the Donegal Bay North surface water catchment, the Lowerymore_010 and _020 SWBs in the vicinity and downstream of the Wind Farm Site and Grid Connection Site achieved 'High' status in the latest 3 no. WFD cycles. Further downstream, the Eske_010 SWB and the Eske lake waterbody are of 'Good' status. With regard to risk status, the status of the Eske lake waterbody is currently under review while the Lowerymore River is 'not at risk'. No significant pressures have been identified on these SWBs. Further details are provided in the WFD Compliance Assessment attached as **Appendix 9-3**.

Table 9-19: WFD Surface Waterbody Status

SWB	Overall Status 2013-2018	Overall Status 2016-2021	Overall Status 2019-2024	3rd Cycle Risk Status	WFD Pressures
Foyle Catchment					
Mourne Beg_010	Poor	Poor	Poor	At risk	Forestry & abstractions
Bunadaowen_010	Poor	Moderate	Good	At risk	Forestry
Mourne Beg River (Derrygoonan)	Moderate	Moderate	Poor	At risk	Forestry, peat, abstraction & unknown
Glendergan River	Moderate	Poor	Moderate	Under review	None
Mourne Beg River (Lisnacloone)	Moderate	Moderate	Moderate	At risk	Unknown
Derg River (Millbrook)	Moderate	Moderate	Poor	At risk	Unknown, agriculture & peat
Donegal Bay North Catchment					
Lowerymore_020	High	High	High	Not at risk	None
Lowerymore_030	High	High	High	Not at risk	None
Eske_010	Good	Good	Good	Not at risk	None
Lough Eske	Good	Good	Good	Under review	None

9.3.12 Designated Sites and Habitats

9.3.12.1 Wind Farm Site

Within the Republic of Ireland designated sites include Natural Heritage Areas (NHAs), Proposed Natural Heritage Areas (pNHAs), Special Areas of Conservation (SACs), candidate Special Areas of Conservation (cSAC) and Special Protection Areas (SPAs). Within Northern Ireland designated sites include Special Areas of Conservation (SACs), Areas of Special Scientific Interest (ASSIs), Local Nature Reserves (LNRs) and National Natures Reserves (NNRs). A designated site map for the area is shown as **Figure 9-16**.

The Existing Development is not located within any designated conservation site, however, there are designated sites within the Wind Farm Site boundary and in close proximity to some elements of the Existing Development. Small sections of Croaghonagh Bog SAC/ (Site Code: 000129) and Cashelnavean Bog NHA (Site Code: 000122) are located within Wind Farm Site. The Wind Farm Site is also hydrologically connected to some downstream designated sites including the Lough Eske and Ardnamona Wood SAC (Site Code: 000163) along the Lowerymore River and the River Finn SAC along the Mourne Beg River.

The connectivity of all local designated sites to the Wind Farm Site are assessed as follows:

- Croaghonagh Bog SAC/pNHA (Site Code: 000129) is located immediately to the east of the Wind Farm Site entrance road with a portion of the SAC falling within the Wind Farm Site boundary. This area of the Wind Farm Site is located in the catchment of the Lowerymore River. The SAC/pNHA is located upstream of the site access road and the works areas, therefore limiting the potential for effects to occur. However, the SAC/pNHA are predominantly located in the catchment of Mary Breen's Burn and is therefore hydrologically connected to other elements of the Wind Farm which are drained by this watercourse, although with an increased separation distance.
- Cashelnavean Bog NHA (Site Code: 000122) is located d to the west of the N15, with a small section of it overlapping with the N15 and the Wind Farm Site entrance. No direct hydrological connections exist between the Existing Development and this NHA.
- Barnesmore Bog NHA (Site Code: 002375) is located ~400m west of the Wind Farm Site. This NHA is located upstream of the Wind Farm. Therefore, there is no potential hydrological and hydrogeological connectivity.
- Lough Eske and Ardnamona Wood SAC/pNHA (Site Code: 000163) are located ~5km southwest of the Wind Farm Site. The Lowerymore River provides a direct hydrological connection between the Wind Farm Site and Grid Connection Site and this SAC.
- The River Finn SAC (Site Code: 002301) is located downstream of the Wind Farm Site along the Mourne Beg River. The works areas associated with the Existing Development are hydrologically connected to this SAC.

Meanwhile designated sites within Northern Ireland were identified using the Northern Ireland Environment Agency (NIEA) Catchment Map viewer. Designated sites within Northern Ireland and in close proximity to the Wind Farm Site include:

- The River Foyle and Tributaries SAC (Site Code: UK0030320) is located downstream of the Wind Farm Site along the Mourne Beg River and the Glendergan River.
- Croagh Bog ASSI (ASSI378) is located downstream of the Wind Farm Site and along the lower reaches of the Shruhanagarve Stream.
- The River Foyle and Tributaries ASSI (ASSI229) is located downstream of the Wind Farm Site along the Mourne Beg River and the Glendergan River.
- Killeter Forest Bogs and Lakes ASSI is located ~1km to the south of the Wind Farm Site. The Glendergan River acts as a hydraulic barrier between the Wind Farm Site and this ASSI.

9.3.12.2 Grid Connection Site

A small section of the Grid Connection Site (along the N15) overlaps with the mapped extent of the Cashelnavean Bog NHA. The Grid Connection Site runs in close proximity to the Barnesmore Bog NHA which is located topographically upgradient of the Grid Connection Site. Lough Eske and Ardnamona Wood SAC are located immediately downstream of the Grid Connection Site at Keadew Bridge.

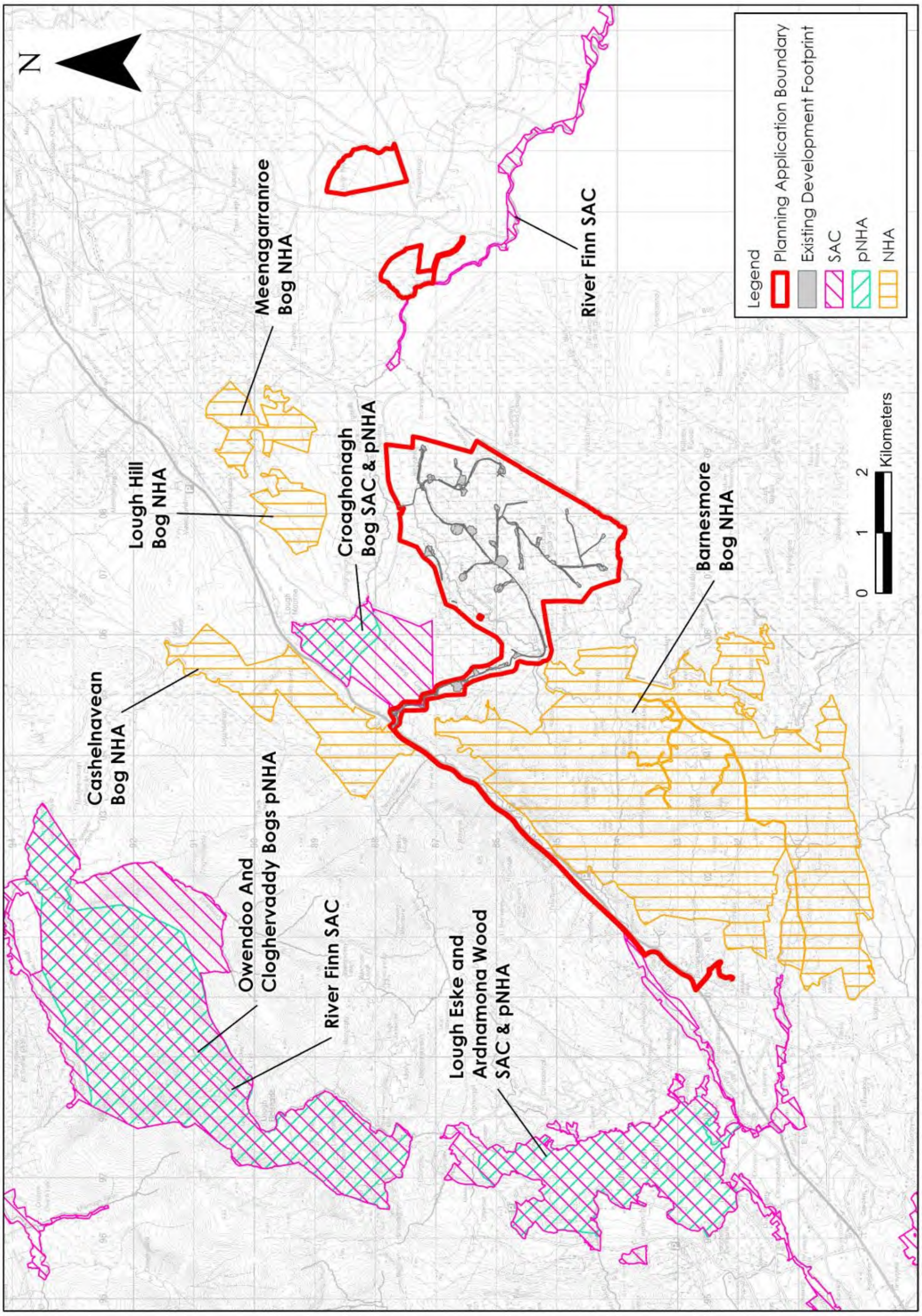

Figure 9-16: Designated Sites Map

9.3.13 Water Resources

9.3.13.1 Groundwater Resources

The GSI do not map the presence of any National Federation registered Group Water Schemes (GWS) or Public Water Schemes (PWS) or an associated Source Protection Area (SPA) within the Wind Farm Site and Grid Connection Site or in the surrounding lands.

A search of private well locations (accuracy of 1 – 50m only) was undertaken using the GSI well database (www.gsi.ie). The GSI database does not record any wells in the vicinity of the Wind Farm Site. The closest mapped groundwater wells are located ~2km northeast of the Wind Farm Site and are reported as having a poor yield class.

An information request was submitted to Uisce Éireann to identify any additional water resources within a 5km buffer of the Wind Farm Site. No additional groundwater resources were identified.

The retrospective impact assessment on local groundwater well supplies, presented in Section 9.5.2.19, is conservative by assuming that all private dwellings in the local area contain a groundwater well supply.

A map of nearby mapped groundwater wells is included as **Figure 9-17**.

9.3.13.2 Surface Water Resources

There are no mapped Drinking Water Protected Areas (DWPA) within or immediately downstream of the Wind Farm Site and Grid Connection Site. The closest DWPA is Lough Mourne located upstream of the Wind Farm Site. However, Uisce Éireann abstract water from the Bunadowen River within the Wind Farm Site and pump it to Lough Mourne Reservoir, ~1.7km to the north. This abstraction is currently not mapped on the online WFD database (www.catchments.ie).

In the Donegal Bay North Catchment, the Eske_020 SWB upstream of Donegal Town and downstream of Lough Eske is listed as a DWPA.

Lough Cullionboy in the vicinity of the Grid Connection Site is also identified as a DWPA. This lake is located ~370m west of Clogher 110kV substation.

An information request was submitted to Uisce Éireann to identify any additional water resources within a 5km buffer of the Wind Farm Site. No additional surface water resources were identified. The only abstraction location identified was from Lough Mourne upstream of the Wind Farm Site.

Within Northern Ireland the Derg/Strule catchment is identified as a DWPA.

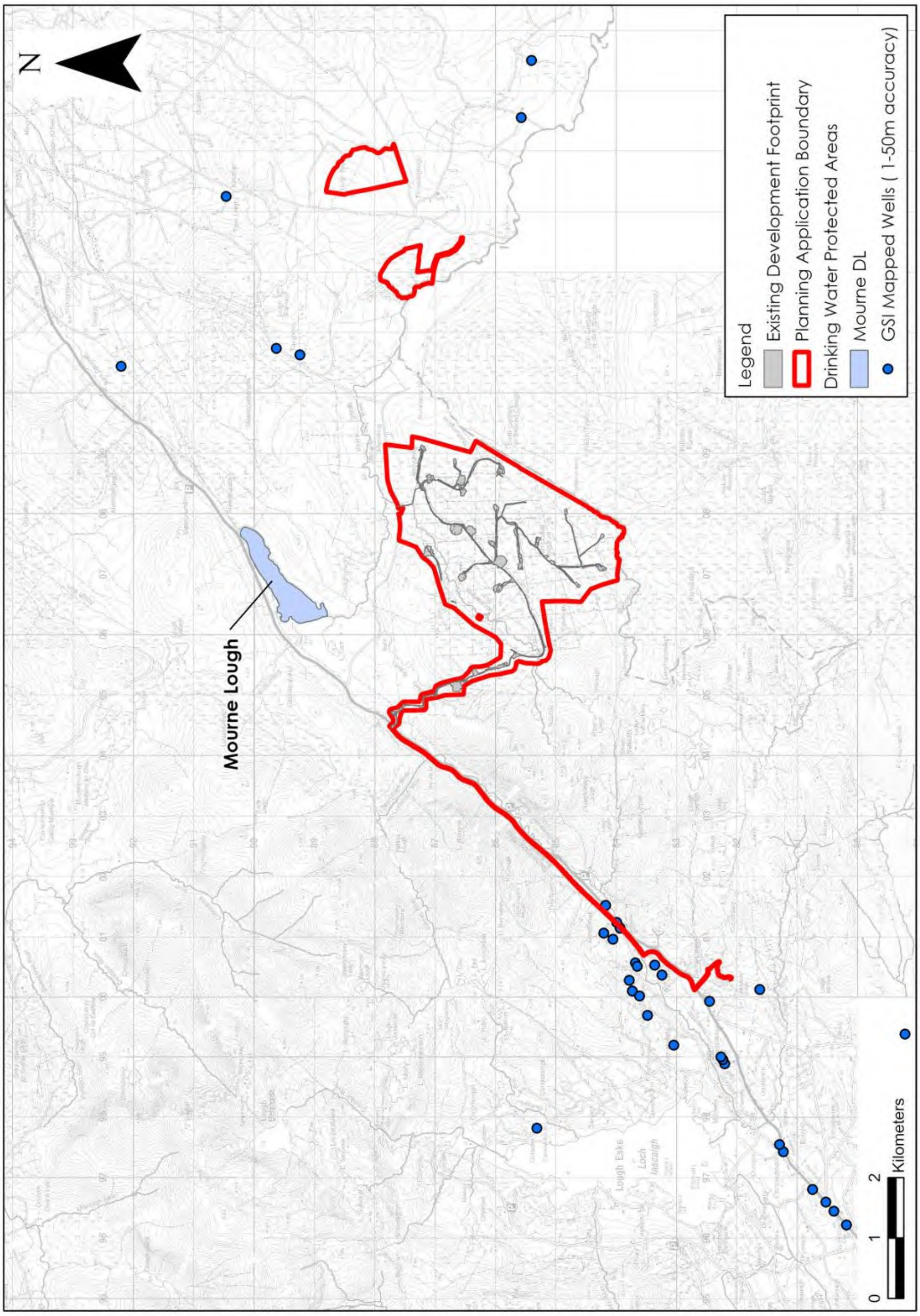

Figure 9-17: Local Water Resources (www.gsi.ie)

9.3.14 Receptor Sensitivity and Importance

This section discusses the sensitivity of the receiving hydrological and hydrogeological environment in terms of the Existing Development and identifies those receptors which will be carried forward into the retrospective impact assessment.

Due to the nature of Existing Development, which comprised of near surface construction activities, combined with the local hydrogeological regime (low permeability peat soils overlying a Poor Bedrock Aquifer), effects on groundwater quality and quantity were generally negligible. The primary risks to groundwater would have been from hydrocarbon spillages and leakages. These risks are common potential effects at all construction sites (such as road works and industrial sites). All potential contamination sources were carefully managed at the Wind Farm Site and Grid Connection Site during the construction phase and mitigation measures were implemented to deal with these effects.

The following groundwater receptors are identified for impact assessment:

- Groundwater quality in the Poor Bedrock Aquifer underlying the Wind Farm Site and Grid Connection Site. Based on the criteria set out in **Table 9-3**, this aquifer can be considered as being of Low Importance;
- Local private groundwater well supplies; and,
- The WFD status of the Castlederg and Donegal South GWBs underlying the Wind Farm Site and Grid Connection Site.

Due to the nature of Existing Development, which comprised of near surface construction activities, and the local hydrological regime (low rates of groundwater recharge and high rates of surface water runoff), surface waters are considered to be the most sensitive receptor. The quantification of flow volumes presented in Section 9.3.4 indicates that the surface watercourses in the immediate vicinity of the Wind Farm Site and Grid Connection Site would have been most susceptible to potential effects. Further downstream, the watercourses would be less susceptible to potential effects due to increasing flow volumes which provide a greater dilution effect. It is worth nothing that the construction of the Existing Development did not in any way rely upon the dilution/assimilative capacity of any downstream watercourse.

The following surface water receptors are identified for impact assessment:

- All watercourses within and downstream of the Wind Farm Site and Grid Connection Site including Mary Breen's Burn, Shruhanagarve Stream, Bunadowen River, Glendergan River, Mourne Beg River and Lowerymore River. Prior to the commencement of construction and based on the criteria detailed in **Table 9-2**, the Mourne Beg and Lowerymore rivers were considered to be of Very High Importance based on their assigned Q-rating status. Meanwhile, the Bunadowen River was considered to be of High Importance. No pre-construction phase data is available for the Shruhanagarve Stream but it is likely to have been in similar condition to the Bunadowen River and Mary Breen's Burn;
- The WFD status of all SWBs downstream of the Wind Farm Site and Grid Connection Site; and
- The Lough Mourne DWPA which is partly sourced from the Bunadowen River and the Lough Cullionboy DWPA due to its proximity to the Grid Connection.

In terms of designated sites, only those designated sites which are hydrologically/hydrogeologically linked with the Wind Farm Site and Grid Connection Site have been included in the impact assessment. These were the only designated sites which could have been impacted by the Existing Development and include the:

- Lough Eske and Ardnamona Wood SAC/pNHA (Site Code: 000163) and the River Finn SAC (Site Code: 002301). Based on the criteria detailed in **Table 9-2,** these sites can be considered to be of Extremely High Importance. The River Finn SAC would have been most susceptible to potential effects, as the vast majority of the Existing Development is located within the upstream catchment of the Finn River.

- Croaghonagh Bog SAC/pNHA (Site Code: 00129) can also be considered to be of Extremely High Importance. This designated site is located downstream of the Existing Development.
- River Foyle and Tributaries SAC / ASSI which are located downstream of the Wind Farm Site along the Mourne Beg and Glendergan rivers.
- Croagh Bog ASSI (ASSI378) is located downstream of the Wind Farm Site and along the lower reaches of the Shruhanagarve Stream.

9.4 Characteristics of the Existing Development

The Existing Development is described in full in Chapter 4 of this rEIAR.

The Existing Development comprises of all works completed at the Wind Farm Site and Grid Connection Site from November 2019 to the present day.

In summary the Existing Development consists of the following:

- Upgrading of access junctions, tracks and roads, and construction of new site access roads;
- 18 no. wind turbine foundations and hardstand areas at various stages of development;
- A 110kV Electrical substation with 2 no. control buildings with welfare facilities, associated electrical plant and apparatus, security fencing and underground wastewater holding tank;
- 110kV underground grid connection cabling (including joint bays, communication chambers, earth sheath links, and ancillary works along the underground electrical cabling route) connecting the wind farm 110kV substation to the Clogher Substation in the townland of Cullionboy. This cabling route is primarily located within the public road corridor;
- Internal wind farm underground cabling at various stages of development;
- 2no. temporary construction compounds;
- 3no. borrow pits;
- Peat and spoil management;
- Forestry felling;
- Site drainage and sediment control measures; and
- All associated site development works.

Construction of the Existing Development commenced in November 2019. The majority (>90%) of construction activity associated with construction of wind farm infrastructure took place during a 12-month period from November 2019 to November 2020, with works along the substation and Grid Connection continuing until early 2021. Some construction works recommenced in Q3 of 2022 for a period of 6 weeks.

Works were completed in accordance with the 2019 CEMP for the Permitted Development (Appendix 4-4). The 2019 CEMP also detailed emergency response procedures to be followed in the event of a peat slide and these measures were implemented following the November 2020 Peat Slide.

Ongoing activities associated with the Existing Development are limited to periodic maintenance of the substation, site tracks, and sediment and erosion control measures as well as environmental monitoring. The Existing Development has been confirmed as stable, from an environmental perspective and safe from a Health and Safety perspective.

9.5 Assessment of Significant Effects and Mitigation Measures

9.5.1 Do -Nothing Scenario

The 'Do Nothing' Scenario is an alternative scenario to retaining and regularising the Existing Development. In this scenario, should the Existing Development not secure substitute consent it will remain in-situ as an unauthorised and partially completed wind farm, which is, in effect, the "do nothing" option insofar as it represents the current situation as of the date of the application for Substitute Consent.

The Do Nothing Scenario would not result in any new effects on the water environment. The effects of the works completed to date are assessed for the Existing Development in Section 9.5.2 below. The Do Nothing Scenario would not result in any additional change.

9.5.2 Existing Development – Assessment of Effects and Mitigation Measures

For the purposes of the retrospective impact assessment the effects associated with the November 2020 Peat Slide are assessed separately from the other construction phase activities. This separate assessment reflects the distinct nature and scale of the November 2020 Peat Slide which differ from the planned construction activities assessed elsewhere. The remediation works completed in the aftermath of the November 2020 Peat Slide do not form part of the Existing Development and have been assessed cumulatively in Section 9.5.5.2

Note that separate retrospective impact assessments are presented for the works completed at the Wind Farm Site and at the Grid Connection Site (Section 9.5.2.11 and 9.5.2.12).

9.5.2.1 Effects from Construction Earthworks on Surface Waters

Construction phase activities at the Existing Development locations within the Wind Farm Site required varying degrees of earthworks which resulted in the excavation of peat, subsoil and occasionally bedrock. Potential sources of sediment-laden water included:

- Drainage and seepage water resulting from excavations;
- Drainage water from felled areas;
- Stockpiled excavated material providing a point source of exposed sediment; and,
- Erosion of sediment from emplaced site drainage channels.

These activities could have resulted in the release of suspended solids to surface watercourses, resulting in an increase in the suspended sediment load, increased turbidity which in turn could have affected the water quality and fish stocks of downstream water bodies. The effects on all watercourses downstream of the Wind Farm Site could have been significant if not mitigated against.

Note that potential effects associated with sediment entrainment in runoff from peat and spoil storage areas are dealt with separately in Section 9.5.2.3 below.

Construction of the Existing Development commenced in November 2019. The majority (>90%) of construction activity associated with construction of wind farm infrastructure took place during a 12-month period from November 2019 to November 2020, with works along the substation and Grid Connection continuing until early 2021. Some construction works recommenced in Q3 of 2022 for a period of 6 weeks. Environmental monitoring and periodic maintenance has continued up to the present.

This assessment focuses on the effects associated with the construction of the Existing Development. The effects associated with peat movement at the Wind Farm Site, including the November 2020 Peat Slide and the associated emergency works which are addressed separately in Sections 9.5.2.13, 9.5.2.14 and 9.5.2.15.

Peat Slide.

Pathways: Drainage and surface water discharge routes.

Receptors: Surface watercourses in the vicinity and downstream of the Wind Farm Site including the Mourne Beg River and its tributaries (Mary Breen's Burn, Bunadowen River, Shruhanagarve Stream), the Glendergan River and the Lowerymore River and the associated water-dependant ecosystems.

Mitigation Measures:

The Existing Development was constructed as per the methodology and guidelines prescribed in the 2017 EIAR and detailed in the 2019 CEMP (refer to Appendix 4-3 of this rEIAR).

<u>Mitigation by Avoidance</u>

The key mitigation measure implemented during the construction phase was the avoidance of sensitive hydrological features where possible, by application of suitable buffer zones (i.e. 50m to main watercourses).

The majority of the Existing Development is located outside of the delineated 50m natural watercourse (river and stream) buffer zones. Silt fences were installed as an additional water protection measures around existing watercourses in certain locations, particularly where works occurred within the hydrological buffer zone. The silt fences were installed as single, double or triple silt fences depending on the space available and the anticipated loading. Further details in silt fences are included in the CEMP.

The large setback distance from sensitive hydrological features meant that adequate room was maintained for the drainage mitigation measures (discussed below) to be properly installed and operate effectively. The buffer zone:

- Avoided physical damage (river/stream banks and river/stream beds) to watercourses and associated release of sediment;
- Avoided excavations within close proximity to surface watercourses;
- Avoided the entry of suspended sediment from earthworks into watercourses; and,
- Avoided the entry of suspended sediment from the construction phase drainage system into watercourses, achieved in part by ending drain discharge outside the buffer zone and allowing percolation across the vegetation of the buffer zone.

<u>Mitigation by Design:</u>

The following controls and treatment systems were implemented during the construction phase:

- Source controls:
  - Interceptor drains, erosion and velocity control measures such as use of sand bags and other similar/equivalent or appropriate systems.
  - Small working areas, covering stockpiles, weathering off stockpiles, cessation of works in certain areas or other similar/equivalent or appropriate measures.
- In-Line controls:
  - Interceptor drains, oversized swales, erosion and velocity control measures such as check dams, silt bags, silt fences, sedimats, and collection sumps, temporary sumps, sediment traps, pumping systems, settlement ponds, temporary pumping chambers, or other similar/equivalent or appropriate systems.
- Treatment systems:
  - Temporary sumps and ponds, temporary storage lagoons, sediment traps, and settlement ponds.

It should be noted for the Wind Farm Site that an extensive network of forestry and roadside drains already existed, and these were integrated and enhanced as required and used within the Wind Farm Site drainage system. The integration of the existing forestry drainage network and the Wind Farm Site drainage network was relatively simple. The key elements were the upgraded and improvements to water treatment elements, such as in line controls and treatment systems, including silt traps and settlement ponds.

The main elements of interaction with the pre-existing drainage were as follows:

- Drains were constructed around the footprint of the Existing Development and conveyed clean runoff water to the downstream drainage systems, there was no direct discharge (without treatment for sediment reduction, and attenuation for flow management) of runoff from the wind farm drainage system into the pre-existing site drainage network. This reduced the potential for any increased risk of downstream flooding or sediment transport/erosion;
- Silt traps were placed in the pre-existing drains where appropriate;
- Silt fences were placed downstream of the works areas where appropriate;
- Runoff from individual work areas was not discharged into the pre-existing drain network but discharged locally at each work location through settlement ponds; and,
- Drains running parallel to the pre-existing roads which were upgraded and were targeted to the opposite side of the road. Velocity and silt control measures such as silt fences were used during the construction works.

Pre-emptive Site Drainage Management:

The works programme for the construction phase of the development also considered weather forecasts, and predicted rainfall in particular. Large excavations and movements of soil/subsoil or vegetation stripping were suspended or scaled back when heavy rain was forecast. The extent to which works were scaled back or suspended related directly to the amount of rainfall forecast.

Timing of Site Construction Works:

Construction of the site drainage system was only carried out during periods of low rainfall, therefore, minimising runoff rates. This reduced the risk of entrainment of suspended sediment in surface water runoff, and transport via this pathway to surface watercourses. Construction of the drainage system during this period also ensure that attenuation features associated with the drainage system were in place and operational for all subsequent construction works.

Monitoring:

An inspection and maintenance plan for the on-site drainage system was prepared in advance of commencement of any works. Regular inspections of all installed drainage systems were undertaken, especially after heavy rainfall, to check for blockages, and ensure there was no build-up of standing water in parts of the systems where it is not intended. Inspections were also completed after tree felling. The inspections were completed by the ECoW and Project Hydrologist.

Any excess build-up of silt levels at dams, the settlement pond, or any other drainage features that may decrease the effectiveness of the drainage feature, was removed.

During the construction phase field testing and laboratory analysis of a range of parameters with relevant regulatory limits and EQSs was undertaken for each primary watercourse, and specifically following heavy rainfall events (i.e. weekly, monthly and event based).

The detailed surface water quality monitoring plan for the construction phase was set out in the CEMP.

Assessment of Effects:

No significant increase in suspended solids entrainment was recorded in downstream surface watercourses as a result of the earthworks associated with the Existing Development. Monitoring data indicates that there was no significant increase in suspended solids entrainment in local surface watercourses either prior to the November 2020 Peat Slide or subsequent to the re-establishment of baseline water quality conditions following the associated short-term effect (refer to Section 9.5.2.13 below). The continuous turbidity monitoring recorded several peaks in turbidity concentrations. However, these were short-lived, with the turbidity quickly returning to background concentrations. Short-lived spikes in turbidity concentrations can occur naturally in peatland environments following periods of intense rainfall.

Monthly water quality sampling indicates that there has been no deterioration in water quality from the pre-construction condition. EPA monitoring data indicates that, based on biological factors, that there has been no deterioration in water quality. Therefore, it can be concluded that the earthworks associated with the construction of the Existing Development did not have a significant effect on downstream water quality.

Residual Effects: The potential for the release of suspended solids to watercourse receptors during earthworks is a risk to water quality and the aquatic quality of the receptor. Proven best practice measures to mitigate the risk of releases of sediment have been implemented at the Wind Farm Site and Grid Connection Site and broke the pathway between the potential sources and the receptor.

Any residual effects on surface water quality due to earthworks were therefore, at worst, a negative, indirect, imperceptible and temporary effect.

Significance of Effects: For the reasons outlined above, no significant effects on the surface water quality occurred.

9.5.2.2 Effects from Tree Felling

The majority of the Wind Farm Site comprises a commercial coniferous forestry plantation. As part of the works for the Existing Development, tree felling was required within and around the development footprint to allow the construction of turbine bases, access roads, and other ancillary infrastructure. A total of 73.57ha of forestry has been felled as part of the Existing Development. The majority of the felling works were completed between November 2019 and November 2020, with minor felling completed post November 2020.

Felling works would have had the potential to impact surface water quality from:

- Exposure of soil and subsoils due to vehicle tracking, and skidding or forwarding extraction methods resulting in a source of suspended sediment which can become entrained in surface water runoff and enter surface watercourses;
- Entrainment of suspended sediment in watercourses due to vehicle tracking through watercourses;
- Damage to roads resulting in a source of suspended sediment which can become entrained in surface water runoff and enter surface watercourses;
- Release of sediment attached to timber in stacking areas; and,
- Nutrient release.

Pathways: Drainage and surface water discharge routes.

Receptors: Surface watercourses in the vicinity and downstream of the Wind Farm Site including the Mourne Beg River and its tributaries (Mary Breen's Burn, Bunadowen River, Shruhanagarve Stream), the Glendergan River and the Lowerymore River and the associated water-dependant ecosystems.

Mitigation Measures:

Details on the mitigation measures designed to reduce the risk of the entrainment of suspended solids and nutrient release in surface watercourses are set out in the 2019 CEMP. These measures are best practice methods and were derived from the following guidance:

- Forestry Commission (2011): Forests and Water Guidelines;

- Forestry Commission, Edinburgh;
- Coillte (2013) Forest Operations & Water Protection Guidelines;
- DAFM (2017). Felling and Reforestation Policy;
- Coillte (2009) Methodology for Clear Felling Harvesting Operations;
- Forest Service (2000): Forestry and Water Quality Guidelines. Forest Service,
- DAF, Johnstown Castle Estate, Co. Wexford; and,
- Forest Service, (2000): Code of Best Forest Practice – Ireland. Forest Service,
- DAF, Johnstown Castle Estate, Co. Wexford.

The mitigation measures detailed in the CEMP are reproduced below:

- Machine combinations were chosen which were most suitable for the ground conditions at the time of felling and to minimise soils disturbance;
- Use of buffer zones for aquatic zones as per the Forest service (2000) guidance;
- Roads and culverts were checked and maintained during felling operations;
- No tracking of vehicles through watercourses occurred;
- Where possible, existing drains were not disturbed during felling works;
- Ditches which drain from the felling area towards existing surface watercourses were blocked, and temporary silt traps were constructed. No direct discharge of such ditches to watercourses occurred during felling. Drains and sediment traps were installed during ground preparation works. Collector drains were excavated at an acute angle to the contour (~0.3%-3% gradient), to minimise flow velocities. Main drains from collector drains included water drops and rock armour, as required, where there were steep gradients, and were not placed at right angles to the contour;
- Sediment traps were sited outside of buffer zones and had no direct outflow into the aquatic zone. Machine access was maintained to enable the accumulated sediment to be excavated. Sediment was carefully disposed of away from all aquatic zones. Where possible, all new silt traps were constructed on even ground and not on sloping ground;
- In areas, particularly sensitive to erosion, it was necessary to install double or triple sediment traps. This measure was reviewed on site during construction works;
- All drainage channels tapered out before entering the aquatic buffer zone. This ensured that discharged water gently fanned out over the buffer zone before entering the aquatic zone, with sediment filtered out from the flow by ground vegetation within the zone. On erodible soils, silt traps were installed at the end of the drainage channels, to the outside of the buffer zone;
- Drains and silt traps were maintained throughout all felling works, ensuring that they were clear of sediment build-up and are not severely eroded. Correct drain alignment, spacing and depth ensured that erosion and sediment build-up were minimised and controlled;
- Brash mats were used to support vehicles on soft ground, reducing peat and mineral soils erosion and avoiding the formation of rutted areas, in which surface water ponding could occur. Brash mat renewal took place when they became heavily used and worn. Provision was made for brash mats along all off-road routes, to protect the soil from compaction and rutting. Where there was a risk of severe erosion occurring, extraction was suspended during periods of high rainfall;
- Timber was stacked in dry areas, and outside a local 50m stream buffer zone. Straw bales and check dams were emplaced on the down gradient side of timber storage/processing sites;
- Works were carried out during periods of no, or low rainfall, in order to minimise entrainment of exposed sediment in surface water run-off;
- Refuelling or maintenance of machinery was not permitted within 50m of an aquatic zone. Dedicated refuelling areas were used during the felling works; and,
- Branches, logs or debris were not allowed to build up in aquatic zones. All such material was removed when harvesting operations were completed, but care was taken to avoid removing natural debris deflectors.

Assessment of Effects: No significant increase in suspended solids entrainment was recorded in downstream surface watercourses as a result of the tree felling activities. Monitoring data indicates that there was no significant increase in suspended solids entrainment in local surface watercourses either prior to the November 2020 Peat Slide or subsequent to the re-establishment of baseline water quality conditions following the associated short-term effect (refer to Section 9.5.2.13 below). The continuous turbidity monitoring recorded several peaks in turbidity concentrations. However, these were short-lived, with the turbidity quickly returning to background concentrations. Short-lived spikes in turbidity concentrations can occur naturally in peatland environments following periods of intense rainfall. Monthly water quality sampling indicates that there has been no deterioration in water quality from the pre-construction condition. EPA monitoring data also indicates that, based on biological factors, that there has been no deterioration in water quality. Therefore, it can be concluded that the tree felling associated with the construction of the Existing Development has not had a significant effect on downstream water quality.

Residual Effect: Proven forestry best practice measures to mitigate the risk of releases of sediment have been implemented at the Wind Farm Site and broke the pathway between the potential sources and the receptor.

Any residual effects on surface water quality due to tree felling were therefore, at worst, a negative, indirect, imperceptible and temporary effect.

Significance of Effects: For the reasons outlined above, no significant effects on the surface water quality occurred.

9.5.2.3 Effects from Peat and Spoil Management

Approximately 450,900m^3 of peat and spoil was excavated during the construction of the Existing Development. This total includes material excavated from site roads, turbine foundation, hardstands, the sub-station site, and peat recovered from wall 1 following the November 2020 Peat Slide. Peat and spoil generated from the Existing Development was managed in the 3 no. peat storage cells (45,800m^3), used to partially restore the borrow pits (94,000m^3), and side-cast in appropriate locations around the Wind Farm Site (311,100m^3).

Surface waters are very sensitive to potential contamination from sediment entrainment. Peat and subsoil storage areas can be a significant source of sediment laden runoff. In the absence of mitigation measures this can result in the release of suspended sediment to downstream surface watercourses. Material was side-cast across the Wind Farm Site and all surface waters downstream of the Wind Farm Site are considered in this impact assessment.

Pathway: Overland flow and site drainage network.

Receptors: All watercourses in the vicinity and downgradient of the peat and spoil management areas, including Mary Breen's Burn, the Bunadowen River, the Shruhanagarve Stream, the Glendergan River, the Lowerymore River and the Mourne Beg River and the associated water-dependant ecosystems.

Mitigation Measures:

All peat cells and berms were constructed in accordance with the environmental management measures set out in the CEMP for the Wind Farm.

Excavated peat was side-cast throughout the Wind Farm Site and any excess peat was used to backfill the onsite borrow pits or contained within engineered peat cells.

- During the initial placement of peat and subsoil, silt fences were used to control surface water runoff from the peat and spoil management areas.
- Drainage from peat and spoil management areas was ultimately routed to an oversized swale at the BPs and a number of settlement ponds with appropriate storage and settlement designed for a 1 in 100 year 6 hour return period before being discharged to the on-site drains.
- Peat and spoil management areas, particularly the locations of side-cast peat, were sealed with a digger bucket and vegetated as soon possible to reduce sediment

entrainment in runoff. Once re-vegetated and stabilised peat/subsoil storage areas were no longer a potential source of silt laden runoff.

- While surface water was contained in these excavations, the design proposal was to control the level of water by creating a single point outlet from the basin-like area that ensured the water does not overtop. The berms associated with the peat cells were constructed in a manner which prevented water retention with large rocks placed with an 'open bond' to allow water to pass through the berm in a controlled manner. Interceptor drains were already installed upgradient of the peat cell area before any extraction began.

Assessment of Effects: No significant increase in suspended solids entrainment was recorded in downstream surface watercourses as a result of the peat and spoil management. Monitoring data indicates that there was no significant increase in suspended solids entrainment in local surface watercourses either prior to the November 2020 Peat Slide or subsequent to the re-establishment of baseline water quality conditions following the associated short-term effect (refer to Section 9.5.2.13 below). Monthly water quality sampling indicates that there has been no deterioration in water quality from the pre-construction condition. EPA monitoring data also indicates that, based on biological factors, that there has been no deterioration in water quality. Therefore, it can be concluded that the management of peat and spoil in relation to the construction of the Existing Development has not had a significant effect on downstream water quality.

Residual Effect: The potential for the release of suspended solids to watercourse receptors is a risk to water quality and the aquatic quality of the receptor. However, there was no direct discharge to surface watercourses during the construction phase. Proven and effective measures to mitigate the risk of releases of sediment have been implemented and broke the pathway between the potential sources and the receptor.

Any residual effects on surface water quality due to peat and spoil management were therefore, at worst, a negative, indirect, imperceptible and temporary effect.

Significance of the Effects: For the reasons outlined above, no significant effects on the downstream surface watercourses occurred.

9.5.2.4 Effects on Surface and Groundwater Quality from the Borrow Pits

As part of the Existing Development, 3 no. of borrow pits were constructed or partially constructed on the Wind Farm Site. All 3 no. BPs are located in the Bunadaowen_010 WFD river sub-basin and are underlain by a Poor Bedrock Aquifer. Therefore, groundwater flowpaths are relatively short and any groundwater underlying the borrow pits follow surface topography and discharge to local streams and the Bunadowen River.

Following rock extraction, the borrow pits have been partially backfilled with excavated peat and spoil in accordance with the approved construction methodology. Since the cessation of peat deposition, the borrow pits have begun to revegetate.

The activities at the borrow pits, including the excavation and removal of bedrock, had the potential to affect local surface and groundwater quality.

Pathway: Groundwater recharge, lateral groundwater flowpaths and discharge to local surface watercourses.

Receptors: All watercourses in the vicinity and downgradient of the borrow pits, including the Bunadowen River and the Mourne Beg River and the associated water-dependant ecosystems.

Mitigation Measures:

All borrow pits were excavated and backfilled in accordance with the environmental management measures set out in the 2019 CEMP.

Mitigation measures with respect to the protection of water quality included:

- Interceptor drainage ditches were excavated on all sides of the borrow pit to catch surface water runoff, and direct it to downstream re-distribution locations;
- As the borrow pit excavations progressed, surface water and groundwater ingress was removed via pumping to settlement ponds, and re-distribution locally across natural vegetated areas.
- Run-off from the borrow pit areas was controlled via a single outlet that was installed at each borrow pit.
- Where required additional specialist treatment, including sediment bags and silt fences, was employed to ensure no deterioration in downstream water quality occurred.

Furthermore, mitigation measures with respect to hydrocarbons were implemented (refer to Section 9.5.2.8).

Assessment of Effects: In relation to surface water quality, no significant increase in suspended solids entrainment was recorded in downstream surface watercourses as a result of the activities at the borrow pits. Biological Q-monitoring data on the Bunadowen River has also been reviewed. This river is considered to be the primary receptor in terms of water quality as it is located downstream of all 3 no. borrow pits, with all groundwater discharging to local surface watercourses. EPA monitoring revealed the Bunadowen River to be of 'Good' Q-status during the construction phase in 2020 and again in 2022. Monthly water quality sampling indicates that there has been no deterioration in water quality from the pre-construction condition. Therefore, it can be concluded that the activities at the borrow pits have not had a significant effect on downstream water quality.

In relation to groundwater quality, local groundwater in the vicinity of the borrow pits will discharge to nearby surface water features and surface waters are considered to have been the primary sensitive receptors. Nevertheless, the groundwater quality monitoring completed by HES did not encounter any groundwater contamination downgradient of the borrow pits. The samples were of reasonably good quality indicating that the borrow pits have not had a negative effect on the local groundwater quality. Therefore, it can be concluded that the activities at the borrow pits have not had a significant effect on local groundwater quality.

Residual Effect: There was no direct discharge to surface watercourses from the borrow pits during the construction phase. Proven and effective measures to mitigate the risk of contamination of groundwater and surface water have been implemented and broke the pathway between the potential sources and the receptor.

Any residual effects on surface or groundwater quality due to the activities at the borrow pits were therefore, at worst, a negative, indirect, imperceptible and temporary effect.

Significance of the Effects: For the reasons outlined above, no significant effects on the downstream surface watercourses occurred.

9.5.2.5 Effects from Morphological Changes to Watercourses at the Wind Farm Site

Diversion, culverting, road crossing of surface watercourses can result in morphological changes, changes to drainage patterns and alteration of aquatic habitats. Construction of structures over watercourses has the potential to significantly interfere with water quality and flows during the construction phase.

Several watercourse crossings were constructed/upgraded as part of the Existing Development including:

- A 5m wide clear-span bridge was constructed over the Bunadowen River.
- 26 no. new culverts were installed over streams/drains within the Wind Farm Site.
- 76 no. culverts were upgraded over streams/drains along forestry access tracks.

Construction or upgrade of watercourse crossings have the potential to effect local surface water quality in the absence of best practice procedures and appropriate mitigation measures.

Pathway: Site drainage network.

Receptors: All watercourses in the vicinity and downgradient of the Existing Development, including the Mary Breen's Burn, the Bunadowen River, the Mourne Beg River, the Glendergan River and the Shruhanagarve Stream and the associated water-dependant ecosystems.

Mitigation Measures:

The clear-span bridge over the Bunadowen River was upgraded to the specifications of the Office of Public Works (OPW) bridge design guidelines 'Construction, Replacement or Alteration of Bridges and Culverts - A Guide to Applying for Consent under Section 50 of the Arterial Drainage Act, 1945', and in consultation with Inland Fisheries Ireland (IFI).

Mitigation measures are detailed below:

- Works were monitored by the ECoW
- The crossing was a clear span bridge and the banks remained undisturbed. No in-stream excavation works occurred at this location and therefore there was no direct impact on the Bunadowen River at the crossing location.
- All guidance / mitigation measures required by the OPW and/or the Inland Fisheries Ireland (IFI)[3] was incorporated into the design of the crossing;
- All drainage measures were installed in advance of the works;
- Plant and equipment were not permitted to track across the watercourse;
- Access to the opposite side of the watercourse for excavation and foundation installation was provided via a steel walkway and handrail which spanned the stream;
- Steel boxes for concrete reinforcement were constructed in close proximity to the work for ease of installation and were fixed by competent persons. Steel boxes were placed into position by a 360 excavator. Concrete was placed using an excavator or, where practical, poured from the chute of a truck. A banksman directed the truck once on-site.
- Concrete plinths were poured as per the structural designer's request.

Meanwhile, all new culverts and culvert upgrades at crossings were suitably sized for the expected peak flows in the relevant drain/stream. Some culverts were installed to manage drainage waters from works areas, particularly where the waters had to be taken from one side of a roadway to the other for discharge. The size of culverts were influenced by the depth of the track or road sub-base. In all cases, culverts were oversized to allow mammals to pass through the culvert. All culverts were inspected regularly to ensure they were not blocked by debris, vegetation or any other material that may impede conveyance.

Assessment of Effects: Monthly water quality sampling indicates that there has been no deterioration in water quality from the pre-construction condition. EPA monitoring data indicates that, based on biological factors, that there has been no deterioration in water quality. Therefore, it can be concluded that the construction of the watercourse crossings has not had a significant effect on downstream water quality.

Residual Effect: Proven and effective measures to protect water quality were implemented and broke the pathway between the sources and the receptor.

Any residual effects due to the construction or upgrade of watercourse crossings were therefore, at worst, a negative, indirect, imperceptible and brief effect.

Significance of Effects: For the reasons outlined above, no significant effects on stream morphology or stream water quality occurred.

[3] *Inland Fisheries Ireland (2016): Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters*

9.5.2.6 Effects on Surface Water Quality from Excavation Dewatering

Some minor groundwater/surface water seepages may have occurred in excavations and the borrow pits. This would have created additional volumes of water to be treated by the runoff management system. Inflows required management and treatment to reduce suspended sediments.

Whilst minor groundwater seepages may have occurred at all excavation locations, the deepest excavations would have had the greatest potential for inflows. Some minor surface water seepages could have occurred during deeper excavations, such as the borrow pits, peat cells and turbine foundation which would have created additional volumes of water to be treated by the runoff management system.

Pathway: Overland flow and site drainage network.

Receptors: Surface watercourses in the vicinity and downstream of the Wind Farm Site including the Mourne Beg River and its tributaries (Mary Breen's Burn, Bunadowen River, Shruhanagarve Stream), the Glendergan River and the Lowerymore River and the associated water-dependant ecosystems.

Mitigation Measures:

Management of groundwater seepages and subsequent treatment prior to discharge into the drainage network was completed as follows:

- Appropriate interceptor drainage, to prevent upslope surface runoff from entering excavations were put in place;
- If required, pumping of excavation inflows prevented build-up of water in the excavation;
- The interceptor drainage discharged to the site constructed drainage system or onto natural vegetated surfaces and not directly to surface waters;
- The pumped water volumes were discharged via volume and sediment attenuation ponds adjacent to excavation areas, along with use of more specialist treatment systems such as a Silt bags;
- There was no direct discharge to surface watercourses, and therefore no risk of hydraulic loading or contamination occurred; and,
- Monitoring of excavations by a suitably qualified person occurred during the construction phase.

Assessment of Effects: No significant increase in suspended solids entrainment was recorded in downstream surface watercourses as a result of excavation dewatering. No significant increase in suspended solids entrainment was recorded in local surface watercourses during the construction of the Existing Development as a result of excavation dewatering. Monitoring of the receiving waterbodies by the project ECOW found no evidence of gross siltation. Monthly water quality sampling indicates that there has been no deterioration in water quality from the pre-construction condition. EPA monitoring data indicates that, based on biological factors, that there has been no deterioration in water quality. Therefore, it can be concluded that excavation dewatering has not had a significant effect on downstream water quality.

Residual Effect: The potential for the release of suspended solids to watercourse receptors is a risk to water quality and the aquatic quality of the receptor. However, there was no direct discharge to surface watercourses during the construction phase. Proven and effective measures to mitigate the risk of releases of sediment have been implemented and broke the pathway between the potential sources and the receptor.

Any residual effects on surface or groundwater quality due to the dewatering of excavations were therefore, at worst, a negative, indirect, imperceptible and brief effect.

Significance of the Effects: For the reasons outlined above, no significant effects on downstream surface watercourses occurred.

9.5.2.7 Effects on Groundwater Levels During Excavation Works

There would have been no potential for effects on groundwater levels at most excavation locations due to the shallow nature of the works. However, deeper excavations at the borrow pits or at the turbine bases may have had the potential to effect local groundwater levels.

Nonetheless, significant groundwater level effects would not have occurred due the local hydrogeological regime (Poor Bedrock Aquifer) and the topographic setting of the Wind Farm Site on the side of a hill.

Pathway: Groundwater flowpaths.

Receptor: Groundwater levels within the underlying Castlederg GWB.

Assessment of Effects:

The Existing Development is underlain by bedrock that has been classified as a Poor Aquifer – Bedrock which is Generally Unproductive except for Local Zones (Pl).

Dewatering at the deeper excavations was achieved through the intermittent use of pumping, indicating a very low level of groundwater incursion. The hydrogeological setting of the Existing Development meant that no significant groundwater dewatering occurred during the construction phase.

The elements of the Existing Development which had the greatest potential to effect groundwater levels were the excavation at the borrow pits. Moreover, direct rainfall and surface water runoff were the main inflows that required water volume and water quality management. For the avoidance of doubt, dewatering it is considered a requirement to permanently drawdown the local groundwater table by means of over pumping, e.g. as would be required for the operation of a bedrock quarry in a valley floor. It is considered that this example is very different in scale and operation from that of a temporary shallow borrow pit on the side of a hill. This is further elaborated in the series of bullet points as follows:

- Firstly, the borrow pit areas are located on the side of local hills where the ground elevations are between 200 and 300m OD;
- These elevations are significantly above the elevations of the local valleys and streams;
- The borrow pits extend to approximately 8 – 13 m below ground level. However, in the context of the topographical/elevated setting of the borrow pits, this depth range is relatively shallow;
- The local bedrock comprises quartzites, gneisses and schists is known to be generally unproductive. This means that groundwater flows are minor;
- Observations from the borrow pit exposures show that the bedrock is massive with very little, if any fractures. Any jointing / fractures that were seen were noted to be very tight;
- No significant groundwater inflows were recorded at any of the borrow pits. Limited groundwater flow was restricted to the top of the rock or within a very thin zone of weathered rock;
- The flow paths (i.e. the distance from the point of recharge to the point of discharge) in this type of geology will be short, localised, and will also be relatively shallow;
- No regional groundwater flow regime, i.e. large volumes of groundwater flow, will be encountered at these elevations;
- Therefore, shallow groundwater inflows are largely fed by recent rainfall, and possibly by limited groundwater seepage from localised shallow bedrock;
- The sloping nature of the ground on the hills where the borrow pits are located along with the coverage of peat means groundwater recharge is going to be very low;
- As such the shallow groundwater flow system is small in comparison to the expected surface water flows from the bog surface;
- This means that there is a preference for high surface water runoff as opposed to groundwater recharge and flow; and,
- Hence, the management of surface water formed the largest proportion of water to be managed and treated.

Relevant environmental management guidelines from the EPA quarry 2006 guidance document – "Environmental Management in the Extractive Industry" in relation to groundwater issues were implemented during the construction phase. The mitigation measures and construction methodologies for the borrow pits are detailed in full in the CEMP.

Residual Effects: Due to large topographic elevation and hydrogeology of the Wind Farm Site, the residual effects on groundwater levels were, at worst, localised, short term, imperceptible, and of negative effect. Effects would have been limited to the immediate vicinity (less than 30 – 300m) of the excavations.

Significance of Effects: For the reasons outlined above, no significant effects on local groundwater levels occurred.

9.5.2.8 Effects from the Release of Hydrocarbons

Accidental spillage during refuelling of construction plant with petroleum hydrocarbons is a significant pollution risk to groundwater, surface water and associated ecosystems, and to terrestrial ecology. The accumulation of small spills of fuels and lubricants during routine plant use can also be a pollution risk. Hydrocarbon has a high toxicity to humans, and all flora and fauna, including fish, and is persistent in the environment. It is also a nutrient supply for adapted micro-organisms, which can rapidly deplete dissolved oxygen in waters, resulting in death of aquatic organisms. In the absence of mitigation measures there may have been the potential for effects on surface water and groundwater quality.

Pathway: Groundwater flowpaths and surface water via the site drainage network.

Receptors: Surface watercourses in the vicinity and downstream of the Wind Farm Site including the Mourne Beg River and its tributaries (Mary Breen's Burn, Bunadowen River, Shruhanagarve Stream), the Glendergan River and the Lowerymore River and the associated water-dependant ecosystems.

Mitigation Measures:

The mitigation measures implemented to avoid release of hydrocarbons at the Wind Farm Site were as follows:

- All plant was inspected and certified to ensured that they were leak free and in good working order prior to use.
- Wherever possible, vehicles were refuelled off-site, particularly for regular road-going vehicles.
- On-site refuelling of machinery was carried out at designated refuelling areas at various locations throughout the Wind Farm Site and Grid Connection Site.
- Heavy plant and machinery were refuelled on-site by a fuel truck that came to the Wind Farm Site and Grid Connection Site as required on a scheduled and organised basis.
- Other refuelling was carried out using mobile double skinned fuel bowser.
- All refuelling was carried out outside designated watercourse buffer zones.
- Only designated trained and competent operatives were authorised to refuel plant on-site.
- Mobile measures such as drip trays and fuel absorbent mats were used during refuelling operations as required.
- All plant and machinery were equipped with fuel absorbent material and pads to deal with any event of accidental spillage.
- An emergency plan for the construction phase to deal with accidental spillages was included within the Construction and Environmental Management Plan (Appendix 4-3). Spill kits were available to deal with and accidental spillage in and outside the re-fuelling area. However no spills were recorded during the construction of the Existing Development.

Assessment of Effects: No spills were recorded during construction of the Existing Development. Therefore, it was not necessary to employ any of the emergency response measures in relation to hydrocarbons.

Residual Effect: The potential for the release of hydrocarbons to groundwater and watercourse receptors is a risk to surface water and groundwater quality, and also the aquatic quality of the surface water receptors. However, no spills were recorded on site. Proven and effective measures to mitigate the risk of releases of hydrocarbons were implemented and broke the pathway between the source and each receptor.

Any residual effects on surface or groundwater quality from hydrocarbons were therefore, at worst, a negative, indirect, imperceptible and short-term effect.

Significance of Effects: For the reasons outlined above, no significant effects on surface water or groundwater quality occurred.

9.5.2.9 Effects from the Release of Cement-Based Products

Concrete pours have been completed at turbine locations and at other Existing Development work locations. Concrete and other cement-based products are highly alkaline and corrosive and can have significant negative impacts on water quality.

Placed concrete in foundations and the use of leanmix concrete along the Grid Connection can also have minor local effects on groundwater quality over time. However, due to the contained shuttering that concrete pours are put in, and the limited surface area of exposed concrete, the anoxic conditions below ground, and the higher rate of wider groundwater recharge and flow relative to the small volumes of shallow groundwater that would come in contact with the cured concrete, the potential for impacts are low.

Pathway: Groundwater flowpaths and site drainage network.

Receptors: Surface watercourses in the vicinity and downstream of the Wind Farm Site including the Mourne Beg River and its tributaries (Mary Breen's Burn, Bunadowen River, Shruhanagarve Stream), the Glendergan River and the Lowerymore River and the associated water-dependant ecosystems. Groundwater quality in the underlying GWBs.

Mitigation Measures:

- Only ready-mixed concrete was used during the construction phase, with all concrete being delivered from local batching plants in sealed concrete delivery trucks.
- No on-site batching was carried out.
- When concrete was delivered to the Wind Farm Site, only the chute of the delivery truck was cleaned, using the smallest volume of water necessary, before leaving the Wind Farm Site.
- Water generated from washing the concrete lorry's chute was directed into a temporary lined impermeable containment area. Once evaporated, any remnants of concrete were disposed of along with other construction waste.
- Concrete trucks were not washed out on the Wind Farm Site but were directed back to their batching plant for washout.
- Site roads were constructed to a high standard to allow transport of the turbine components around the Wind Farm Site, and hence, concrete delivery trucks were able to access all areas where the concrete was needed.
- No concrete was transported around the Wind Farm Site in open trailers or dumpers to avoid spillage while in transport.
- All concrete used in the construction of turbine bases was pumped directly into the shuttered formwork from the delivery truck. If this was not practical, the concrete was pumped from the delivery truck into a hydraulic concrete pump or into the bucket of an excavator, which transferred the concrete to the location where it was needed.

Assessment of Effects: No spills of cement-based products were recorded during construction of the Existing Development.

Residual Effect: The potential for the release of cement-based products is a risk to surface water and groundwater quality, and also the aquatic quality of the surface water receptors. However, no spills were recorded on site. Proven and effective measures to mitigate the risk of releases of cement-based products were implemented and broke the pathway between the source and each receptor.

Any residual effects on surface or groundwater quality due to the cement-based products were therefore, at worst, a negative, indirect, imperceptible and short-term effect.

Significance of Effects: For the reasons outlined above, no significant effects on surface water or groundwater quality occurred.

9.5.2.10 Effects from Wastewater Disposal

Release of effluent from on-site temporary wastewater treatment systems has the potential to impact on groundwater and surface water quality if conditions are not suitable for an on-site percolation unit. Impacts on surface water quality could have affected fish stocks and aquatic habitats.

Pathway: Groundwater flowpaths and site drainage network.

Receptors: Surface watercourses in the vicinity and downstream of the Wind Farm Site including the Mourne Beg River and its tributaries (Mary Breen's Burn, Bunadowen River, Shruhanagarve Stream), the Glendergan River and the Lowerymore River and the associated water-dependant ecosystems. Groundwater quality in the underlying GWBs.

Mitigation Measures:

The mitigation measures implemented to avoid release of wastewater at the Wind Farm Site were as follows:

- A self-contained port-a-loo with an integrated waste holding tank was used for welfare facilities, maintained by the providing contractor;
- Welfare facilities were also present at the onsite substation (constructed as part of the Existing Development). Wastewater was stored in an underground tank and was removed by a licenced contractor;
- Wastewater treatment on-site has not been implemented; and,
- No water was sourced on-site or discharged on-site.

Assessment of Effects: No pollution incidents in relation to wastewater were recorded.

Residual Effects: The potential for contamination resulting from wastewater disposal is a risk to surface and groundwater quality. This is a risk common to all construction sites containing welfare facilities. Proven and effective measures to mitigate the release of wastewater on site were implemented and broke the pathway between the source and each receptor.

Any residual effects on surface or groundwater quality due to the wastewater were therefore, at worst, a negative, indirect, imperceptible and short-term effect.

Significance of Effects: For the reasons outlined above, no significant effects on surface water or groundwater quality occurred.

9.5.2.11 Effects from Works Along the Grid Connection

The Existing Development includes the underground cabling from the on-site 110kV substation within the Wind Farm Site to the N15 National Primary road which runs north to southwest for approximately 5km before turning onto the L2595 and continuing south in the townland of Cullionboy to the existing Clogher 110kV Substation.

The Grid Connection included works at a total of 14 no. watercourse crossings as detailed in Section 9.3.3.2 of this rEIAR. Works in close proximity to watercourses, in the absence of mitigation measures, would have had the potential to impact local surface water quality.

The following construction methods were used at crossing locations:

- **Piped Culvert Crossings over Culvert:**
  Watercourses were not directly impacted since no instream works or bridge/culvert alterations were proposed. Where sufficient cover existed above the culvert, the trench was excavated above the culvert, and the ducts were installed in the trefoil arrangement, passing over the sealed pipe without making contact with the watercourse.

- **Piped Culvert Crossing under the Culvert:**
  Where the culvert consisted of a socketed concrete or sealed plastic pipe and sufficient cover over the culvert did not exist to accommodate the cable trench, a trench was excavated beneath the culvert, and cable ducts were installed in the trefoil arrangement under the sealed pipe. If these duct installation methods could not be achieved or utilised, the ducts were installed by alternative means as set out in the following sections.

- **Flatbed Formation over Culverts:**
  Where cable ducts were to be installed over an existing culvert/bridge where sufficient cover could not be achieved by installing the ducts in a trefoil arrangement, the ducts were laid in a much shallower trench. The ducts were laid in this trench in a flatbed formation over the existing culvert/bridge and were encased in 6 mm thick steel galvanized plate with a 35N concrete surround as per ESB Networks specification. After the crossing over the culvert was achieved, the ducts resumed the trefoil arrangement within a standard trench.

  Where a bridge or culvert had insufficient deck cover to fully accommodate the required ducts, the ducts were laid in a flatbed formation partially within the existing road makeup. Where this option was employed, the ducts were also encased in steel with a concrete surround as per EirGrid and/or ESB Networks specifications. To achieve cover over these ducts and restore the carriageway of the road, it was sometimes necessary to locally raise the pavement level to fully cover the ducts. The increased road level was achieved by overlaying the existing pavement with a new wearing course as required. Any addition of a new pavement was tied back into the existing road pavement at grade. After the crossing over the culvert was achieved, the ducts resumed the trefoil arrangement within a standard trench.

- **Directional Drilling:**
  In cases where none of the above methods were appropriate, directional drilling was utilised. The directional drilling method of duct installation was carried out using a Vermeer D36 x 50 Directional Drill (approximately 22 tonnes) for the horizontal directional drilling at watercourse/culvert crossings listed above.

  The launch and reception pits were approximately 0.55 m wide, 2.5 m long, and 1.5 m deep. The pits were excavated with a suitably sized excavator. The drilling rig was securely anchored to the ground by means of anchor pins attached to the front of the machine. The drill head was then secured to the first drill rod, and the operator commenced drilling into the launch pit at a suitable angle to obtain the depths and pitch required for the line and level of the required profile. Drilling of the pilot bore continued with the addition of 3. m long drill rods, mechanically loaded and connected into position.

  During the drilling process, a mixture of a natural, inert, and fully biodegradable drilling fluid Clear Bore™ (environmentally friendly product, not toxic to aquatic organisms) and water was pumped through the centre of the drill rods to the reamer head. This mixture was forced into the void, enabling the annulus created to support the surrounding subsoil and prevent collapse of the reamed length. Depending on the prevalent ground conditions, it was sometimes necessary to repeat the drilling process by incrementally increasing the size of the reamers. When the reamer entered the launch pit, it was removed from the drill rods, which were then passed back up the bore to the reception pit. The next size reamer was attached to the drill rods, and the process was repeated until the required bore with the allowable tolerance was achieved.

The use of a natural, inert, and biodegradable drilling fluid such as Clear Bore™ was intended to negate any adverse effects arising from the use of other traditional polymer-based drilling fluids. It was used sparingly as part of the drilling operations, appropriately stored prior to use, and deployed in the required amounts to avoid surplus. In the event that any excess drilling fluid accumulated in the reception or drilling pits, it was contained and removed from the Wind Farm Site and Grid Connection Site in the same manner as other subsoil materials associated with the drilling process to an approved licensed waste facility. Backfilling of launch and reception pits was conducted in accordance with the normal specification for backfilling excavated trenches.

Pathways: Runoff and surface water flowpaths.

Receptors: All watercourses in the vicinity of the Grid Connection (Barrack Hill Stream, Lowerymore River, Friarsbush Stream, Millanalamphry River and other unnamed streams along the Grid Connection) and associated water-dependent ecosystems.

Mitigation Measures:

Prior to the commencement of cable trenching or crossing works the following key temporary drainage measures were installed:

- A double silt fence perimeter was placed along the road verge on the down-slope side of works areas that are located inside the watercourse 50m buffer zone;
- The following mitigation measures were implemented at Grid Connection underground cabling watercourse crossing works:
  - No stockpiling of construction materials occurred along the Grid Connection route;
  - No refuelling of machinery or overnight parking of machinery was permitted in these areas;
  - No concrete truck chute cleaning was permitted;
  - Works did not take place at periods of high rainfall;
  - Machinery deliveries were arranged using existing structures along the public road;
  - All machinery operations took place away from the stream and ditch banks, apart from where crossings occur. Although no instream works occurred;
  - Any excess construction material was immediately removed from the area and sent to a licenced waste facility or on-site borrow pits;
  - Spill kits were available in each item of plant required to complete the works; and,
  - Silt fencing was erected on ground sloping towards watercourses at the stream crossings if required.

Please note that mitigation measures for HDD are detailed in Section 9.5.2.12.

Assessment of Effects: No pollution incidents in relation to works along the Grid Connection occurred. Q-rating data does not record any deterioration in surface water quality along the Grid Connection.

Residual Effect: Proven and effective measures to mitigate the risk of releases of sediment were implemented and broke the pathway between the potential sources and the receptor.

Any residual effects on surface or groundwater quality due to the activities along the Grid Connection were therefore, at worst, a negative, direct, imperceptible and short-term effect.

Significance of Effects: For the reasons outlined above, no significant effects on surface water flows and surface water quality occurred.

9.5.2.12 Effects from Directional Drilling along Grid Connection

Horizontal Directional Drilling (HDD) was utilised at 3 no. locations along the Grid Connection (Lowerymore Bridge, Lower Keadew Bridge and Barnesmore Bridge). HDD was completed at these locations to prevent direct impacts on the watercourse. However, there would have been a risk of indirect impacts from sediment laden runoff during the launch pit and reception pit excavation works. There was also an unlikely risk of fracture blow out and contamination of the watercourse with drilling fluid.

Pathway: Surface water and groundwater flows.

Receptor: All watercourses in the vicinity of the Grid Connection (Barrack Hill Stream, Lowerymore River, Friarsbush Stream, Millanalamphry River and other unnamed streams along the Grid Connection) and associated water-dependent ecosystems.

Mitigation Measures:

- The crossing works areas were clearly marked out with fencing or flagging tape to avoid unnecessary disturbance;
- There was no storage of material / equipment or overnight parking of machinery inside the hydrological buffer zone;
- Before any ground works are undertaken, double silt fencing was placed upslope of the watercourse channels;
- Silt fencing was embedded into the local soils to ensure all site water is captured and filtered;
- The area around the batching, pumping and recycling plant was bunded using terram (as it will clog) and sandbags in order to contain any spillages;
- Drilling fluid returns were contained within a sealed tank / sump to prevent migration from the works area;
- Spills of drilling fluid were cleaned up immediately and contained in an adequately sized skip before been taken off-site;
- The discharge of water onto vegetated ground was via a silt bag which filtered any remaining sediment from the pumped water. The entire percolation area was enclosed by a perimeter of double silt fencing;
- Any sediment laden water from the works area was not discharged directly to a watercourse or drain;
- Works did not take place during periods of heavy rainfall and were scaled back or suspended when heavy rain was forecasted;
- Daily monitoring of the works area, the water treatment and pumping system and the percolation area was completed by a suitably qualified person during the construction phase. All necessary preventative measures were implemented to ensure no entrained sediment, or deleterious matter was discharged to the watercourse;
- On completion of the works, the ground surface disturbed during the site preparation works and at the entry and exit pits was carefully reinstated at the soonest opportunity to prevent soil erosion;
- The silt fencing upslope of the river was left in place and maintained until the disturbed ground had re-vegetated;
- ; and,
- All plant was checked for purpose of use prior to mobilisation at the watercourse crossing.

The use of a natural, inert, and biodegradable drilling fluid negated any adverse effects arising from the use of other traditional polymer-based drilling fluids. It was used sparingly as part of the drilling operations, appropriately stored prior to use, and deployed in the required amounts to avoid surplus. In the event that any excess drilling fluid accumulated in the reception or drilling pits, it was contained and removed from the Wind Farm Site and Grid Connection Site in the same manner as other subsoil materials associated with the drilling process to an approved licensed waste facility.

Assessment of Effects: No pollution incidents occurred at the HDD crossing locations.

Residual Effect: Due to the avoidance of instream works, the works being mainly carried out in the corridor of a public road along with the mitigation measures the residual effect was a negative, imperceptible, indirect, temporary, likely effect on surface water in the downstream watercourses.

Significance of Effects: For the reasons outlined above, no significant effects on surface water quality occurred.

9.5.2.13 Effects on Downstream Surface Watercourses from November 2020 Peat Slide

The November 2020 Peat Slide occurred during the construction of an access road to T7. It is estimated that the Peat Slide resulted in the movement of 86,240m^3 of material downslope (~45,500m^3 remained within the peat scar). The peat slide entered the Shruhanagarve Stream and had a significant effect on downstream surface water quality and the morphology of the Shruhanagarve Stream.

Pathway: Peat instability and surface water flows.

Receptor: Stream morphology in the Shruhanagarve Stream and surface water quality in the Shruhanagarve Stream, the Mourne Beg River further downstream and associated water dependent ecosystems.

Mitigation Measures:

It is important to note that the construction of the access road to T7 was completed in accordance with the Permitted Development design. This access road was subject to the detailed peat stability risk assessment completed as part of the baseline assessment of the Permitted Development.

As detailed in Section 9.3.7.4.2,sondes were installed on the main watercourses draining the Wind Farm Site, including MSe3 on the Shruhanagarve Stream. Continuous turbidity monitoring was in place at these locations and was being used as an early warning system of potential sediment input into receiving waters and allowed further investigations and remedial action to be undertaken if required. It is noted that no elevated NTU concentrations were recorded in the Shruhanagarve Stream in the days preceding the peat slide and that turbidity was at background concentrations. There was no indication from the available monitoring that a peat movement was imminent in this area. MSe3 was lost during the peat slide and was reinstated on 18th December 2020.

Following the Peat Slide, emergency response procedures were implemented in accordance with the 2019 CEMP. These emergency response procedures included the installation of barrage walls downslope of the peat slide to prevent further movement of peat. Reinstatement works were also completed in an attempt to restore the hydrological regime insofar as possible. The effects of the remedial works are assessed cumulatively with the Existing Development in Section 9.5.5.2.

Additional sondes (MSe5, MSe6 and MSe7) were also installed along the Mourne Beg River following the peat slide to provide additional data on turbidity concentrations downstream of the Shruhanagarve Stream.

Assessment of Effects (Surface Water Quality Effects): The November 2020 Peat Slide was an unforeseen major accident which had a significant effect on local and downstream surface water environment. EPA Biological Q-Rating monitoring recorded 'Bad' Q-status in the Shruhanagarve Stream in 2020. This status can be attributed to the Peat Slide. The Q-status of the Mourne Beg River downstream of the Shruhanagarve Stream was 'Moderate' Q-status (Q3-4) in 2020 whilst, upstream of the Shruhanagarve Stream the Mourne Beg River was of 'Good' Q-status (Q4). The change of Q-status downstream of the Wind Farm Site in the Mourne Beg River can also be attributed to the November 2020 peat slide.

However, the effects associated with the peat slide have been short-term (i.e. effects lasting 1 to 7 years).

Water quality monitoring in the aftermath of the peat slide in the Moune Beg River and showed that turbidity concentrations quickly returned to background levels. Whilst there was brief spikes in the daily average turbidity concentrations at MSe3 on 16th January 2021, 21st July 2021 and 8th December 2021. Short-term spikes in turbidity are common in peatland environments, particularly following periods of heavy rainfall. A review of the rainfall data has shown that many of these spikes were preceded by a period of intense precipitation.

Surface water grab sampling indicates that the November 2020 Peat Slide has a temporary effect on TSS concentrations in the Mourne Beg River and the River Derg.

EPA Biological Q-monitoring has recorded a subsequent improvement in Q-status in both the Shruhanagarve Stream (Q3 in 2023) and the Mourne Beg River (Q4 in 2022). Additional Biological Q-rating monitoring completed by Triturus Environmental Ltd has also recorded an improvement in Q-ratings in the Shruhanagarve Stream since the Peat Slide. Monitoring completed in July 2025 showed the Shruhanagarve Stream to be of 'Moderate' Q-status (Q-3-4). Whilst no baseline Q-data is available for the Shruhanagarve Stream it is very likely to have been the same as the other streams and rivers draining the Wind Farm Site including the Bunadowen River and Mary Burn's Breen. As detailed in **Table 9-9**, the EPA Q-ratings on these watercourses were found to be 'Moderate' Q-status in 2014 monitoring round completed by MKO as part of the baseline assessment for the Wind Farm. It is also noted that the Bunadowen River was of Poor Q-status in the 2013 monitoring round completed by the EPA. Therefore, it is assumed that the baseline, pre-November 2020, Q-status of the Shruhanagarve Stream was the same as the other local watercourses and was of 'Moderate' Q-status. Monitoring has shown that the Q-ratings in the Shruhanagarve Stream since the peat slide have since rebounded to this status.

Similarly, the most recent Q-status in the Mourne Beg River (2025) is now comparable to the pre-peat slide status which is assumed to be 'Good'. The effect on the Mourne Beg river can also be considered to be a short-term effect).

Assessment of Effects (Stream morphology): The peat slide entered the Shruhanagarve Stream and impacted the morphology of the stream for approximately 1,070 metres from the slip scar downstream. The reinstatement and restoration works, described in detail in Appendix 2-3 of this rEIAR, included re-designing the stream channel. The original channel, morphology, depth, sinuosity of the Shruhanagarve Stream was lost in some reaches following the peat slide.

However, the effected reaches of the Shruhanagarve had already been impacted by forestry activities on the Wind Farm Site and the morphology of the channel was poor. The reinstatement works, that were implemented following the Peat Slide, included re-designing the stream channel using a process driven design methodology to re-establish an appropriate channel morphology. Therefore, following the implementation of the remediation measures there has been no long term significant negative effect on stream morphology.

Residual Effect: With the implementation of the remedial works and the reinstatement works and following review of all available water quality and biological monitoring data, the water quality in the receiving watercourses have returned to pre November 2020 conditions.

A short-term significant negative effect occurred as a result of the November 2020 Peat Slide, however monitoring has shown that water quality has since returned to baseline / pre-construction levels.

The residual effect of the peat slide on surface water quality is considered to be at worst, a negative, significant, direct, short-term effect on downstream surface water quality in the Shruhanagarve Stream and the Mourne Beg River.

The remedial works that were undertaken to restore the Shruhanagarve successfully reinstated a stable channel in the effected reach. The residual effect on the morphology of the Shruhanagarve Stream is therefore considered to be a negative, moderate, direct, short term effect.

Significance of Effects: For the reasons outlined above, a significant effect on surface water quality and stream morphology occurred but these effects were short term and the there were no significant negative effects in the long term.

9.5.2.14 Effects from Emergency Works in Response to Peat Instability

Remedial works were completed following the November 2020 Peat Slide. The immediate response to the peat slide (emergency works) included the construction of 3 no barrage walls, as well as water and sediment management elements.

The remedial works included the following:

- The construction of Barrage Wall 1 to the northeast of T9 in the immediate aftermath of the peat slide (within 72hrs). The roadway to T9 was significantly raised in height to act as a dam in the aftermath of the Peat Slide.
- Construction of Barrage Wall 2 to the west of T9 in response to the significant risk of additional peat movement. This wall was constructed instream and was subsequently partially removed for the restoration of the stream.
- Construction of Barrage Wall 3 to the north of T7 was constructed to prevent the risk of further peat movement from the primary source of the peat slide. Constructed upslope of the partially completed road to T7.
- Removal of large volumes of peat which became impounded behind Barrage Wall 1 and the installation of a series of interceptor drains to divert clean water away from the peat in order to prevent re-mobilisation.

These remedial works involved works in close proximity to or within the stream channel. However, given the context within which the reinstatement works were completed (i.e. in the immediate aftermath of a significant Peat Slide), the remedial works themselves would have had very limited potential for negative effects on surface water quality in the Shruhanagarve Stream and downstream watercourses. The works were completed in order to limit the negative effects of the Peat Slide on downstream surface water quality by preventing the flow of liquefied peat into downstream watercourses. The works were also completed to prevent any further peat movements.

A minor Peat Slide also occurred upslope of T8 (refer to rEIAR Chapter 8 Section 8.3.8.2). As per the CEMP a berm was constructed adjacent to T8 as a stabilisation measure to avoid further movement of peat at this location.

Pathway: Overland flow and site drainage network.

Receptors: All watercourses in the vicinity and downgradient of the remedial works areas including the Shruhanagarve Stream and the Mourne Beg River and the associated water-dependant ecosystems.

Mitigation Measures:

The remedial works were completed in accordance with the emergency response procedures detailed in the 2019 CEMP for the Permitted Development (Appendix 4-3) under the supervision of on-site engineers (Ionic). The remedial works were carried out as follows:

- The berm was constructed in a manner which prevented water retention within the storage area. This was in order to prevent a build-up of hydrostatic pressure at the base of the berm at a varying rate across the footprint which could have effectively placed a point load at a specific location.
- Large rocks were placed with an 'open bond' periodically to allow water to pass through the berm in a controlled manner.
- The berm was inspected and signed off by competent personnel.

Assessment of Effects: The remedial works including the construction of the 3 no. barrage walls prevented further negative effects in the wake of the November 2020 Peat Slide. Significant volumes of peat were impounded behind Barrage Wall 1 and approximately 79% of flows entering the Shruhanagarve catchment upstream of Wall 1 were intercepted and diverted away from the impounded sediment. This prevented the re-mobilisation of the impounded sediment. The construction of the

Barrage Walls prevented further peat movements occurring which would have had a significant effects on downstream surface water quality.

The remedial measures successfully impounded peat behind Barrage Wall 1 and prevented it from entering the local surface water network.

The continuous turbidity monitoring in the Shruhanagarve Stream (MSe3) and the Mourne Beg River (MSe5, MSe6 and MSe7) found that the turbidity concentrations returned to baseline conditions relatively quickly with the exception of a few brief spikes linked to intense rainfall events (such spikes in turbidity are common in peatland environments).

Since the remedial works were only undertaken as an emergency response to the November 2020 Peat Slide it could be considered that they had a positive effect on downstream surface water quality by preventing further peat movements, and preventing liquified peat from entering downstream watercourses.

Residual Effect: The potential for additional peat movements, and further liquified peat to enter into watercourses, was a significant risk in the aftermath of the November 2020 Peat Slide. However, the remedial works completed in accordance with the CEMP restricted the flow of liquified peat into downstream watercourses and prevented further peat movements. These works therefore, prevented additional negative effects on the environment.

The residual effect at worst, a brief, imperceptible, negative effect and at best a long-term, positive, direct, moderate, effect on surface water quality.

Significance of the Effects: For the reasons outlined above, no significant effects on the downstream surface watercourses occurred.

9.5.2.15 Effects from Minor Peat Failures

In addition to the November 2020 Peat Slide, there were a number of smaller, more localised peat failures at the Wind Farm Site. These failures were small and remained within the boundary of the Wind Farm Site. These minor peat failures are detailed in Section 8.3.8.2 of this rEIAR. These failures did not have a direct impact on stream morphology. There was a potential for effects on downstream surface water quality. Any effects would have been brief. The effects associated with these minor peat failures were significantly less than the November 2020 Peat Slide.

Pathway: Peat instability and surface water flows.

Receptor: Surface water quality in the Bunadowen River, the Shruhanagarve Stream and the Mourne Beg River further downstream and associated water dependent ecosystems.

Assessment of Effects:

No significant increase in suspended solids entrainment was recorded in downstream surface watercourses as a result of the minor peat instabilities. Monitoring data indicates that there was no significant increase in suspended solids entrainment in local surface watercourses following these minor peat slides and instabilities. Monthly water quality sampling indicates that there has been no deterioration in water quality from the pre-construction condition. EPA monitoring data also indicates that, based on biological factors, that there has been no deterioration in water quality. Therefore, it can be concluded that the minor peat instabilities have not had a significant effect on downstream water quality.

Residual Effect: Minor peat instabilities had the potential to release suspended solids into downstream surface watercourses. However, any negative effects would have been brief and the available water quality data does not record any significant effects on downstream surface water quality as a result of the minor peat failures which occurred during the construction phase. Any residual effects on surface water quality due to the minor peat failures were therefore, at worst, a negative, indirect, imperceptible and a brief effect.

Significance of the Effects: For the reasons outlined above, no significant effects on the downstream surface watercourses occurred.

9.5.2.16 Effects on Surface Water Abstractions

Uisce Éireann abstracts surface water from the Bunadowen River and pumps it to Lough Mourne Reservoir. The Existing Development (refer to **Table 9-6**) is located in the catchment of the Bunadowen River. Any deterioration in surface water quality associated with the Existing Development could have had a negative effect on the Lough Mourne drinking water supply.

The Grid Connection is also located in close proximity (~370m) from Lough Cullionboy DWPA.

Pathway: Surface water flowpaths.

Receptor: Lough Cullionboy DWPA and Lough Mourne supply.

Mitigation Measures:

Mitigation measures relating to the protection of surface water quality and quantity were implemented during the construction of the Existing Development.

- The mitigation measures implemented in relation to the entrainment of suspended solids are detailed in Sections 9.5.2.1 and 9.5.2.3 and 9.5.2.6;
- The implemented mitigation measures with respect to hydrocarbons are detailed in Section 9.5.2.8; and,
- The implemented mitigation measures with respect to wastewater contamination are detailed in Section 9.5.2.10.

Assessment of Effects:

Lough Mourne: No significant increase in suspended solids entrainment was recorded in the Bunadowen River. No pollution events occurred during the construction phase. Daily monitoring of the Bunadowen River by the project ECOW found no evidence of gross siltation. Monthly water quality sampling indicates that there has been no deterioration in water quality from the pre-construction condition. EPA monitoring data indicates that, based on biological factors, that there has been no deterioration in water quality.

Lough Cullionboy DWPA: The works along the Grid Connection were shallow, transient and minor in nature. These works were comparable to roadworks which are completed across the country. The Grid Connection is also located a significant distance (~370m) distance from the DWPA and no direct hydrological connections exist between the Grid Connection and DWPA. Furthermore any shallow groundwater flow in the area of the Grid Connection closest to the DWPA (i.e. in the vicinity of Clogher 110kV Substation) will flow to the north and discharge into Lough Craig which is downstream of Lough Cullionboy. Therefore, there was very limited potential for effects even in the absence of mitigation. No effects were reported during the construction phase.

Residual Effect: Construction activities posed a threat to downstream surface water abstractions hydrologically linked with the Existing Development. Proven and effective measures to mitigate the risk of surface water contamination have been implemented and broke the pathway between the source and the downstream receptor. These mitigation measures ensured that surface water runoff from the Wind Farm Site was equivalent to baseline conditions. Therefore there was no significant impact on downstream surface water quality and/or surface water abstractions.

The residual effect is a negative, imperceptible, indirect, short–term effect on water quality.

Significance of Effects: No significant effects on downstream surface water abstractions occurred.

9.5.2.17 Effects on Hydrologically Connected Designated Sites

The Existing Development drains to the Mourne Beg River and the Derg River (within Northern Ireland) which also forms part of the River Foyle and Tributaries ASSI and SAC designated site. Croagh Bog ASSI (ASSI378) is located downstream of the Wind Farm Site and along the lower reaches of the Shruhanagarve Stream. A small area in the northwest of the Wind Farm Site is drained by the Lowerymore River which drains to Lough Eske which is a designated SAC. The Grid Connection also drains to this SAC. Furthermore, an area in the northwest of the Wind Farm Site, and directly downstream of the Mary Breen's Burn, forms part of the Croaghonagh Bog SAC/pNHA.

Effects on water quality and the water-dependent aspects of these designated could have been significant in the absence of mitigation.

There was no potential to impact any other designated site.

Pathway: Surface water flowpaths.

Receptor: Down-gradient water quality and designated sites.

Mitigation Measures:

Mitigation measures relating to the protection of surface water quality and quantity were implemented during the construction of the Existing Development.

- The mitigation measures implemented in relation to the entrainment of suspended solids are detailed in Sections 9.5.2.1, 9.5.2.3 and 9.5.2.6;
- The implemented mitigation measures with respect to hydrocarbons are detailed in Section 9.5.2.8; and,
- The implemented mitigation measures with respect to wastewater contamination are detailed in Section 9.5.2.10.

Assessment of Effects:

River Finn SAC

This designated site is located downstream of the Wind Farm Site on the Mourne Beg River. With the implementation of the best practice mitigation measures during the construction phase prior to the November 2020 Peat Slide there would have been no significant effects on this designated site. However, the Peat Slide entered the Shruhangarve Stream which provided a direct hydrological connection to this designated site and resulted in short-term significant negative effects associated with liquified peat entering the watercourse and travelling downstream. However, the emergency response measures, the remedial works, channel reinstatement works and slip scar rehabilitation works have reduced the magnitude and duration of the effects on downstream watercourses. Biological monitoring shows that the Mourne Beg River has returned to baseline conditions. Therefore the negative effects on this designated site would have been short term in duration. The Existing Development has not had any long-term effect on the qualifying interests or conservation objectives of the SAC.

River Foyle and Tributaries ASSI and SAC

This designated site is located downstream of the Wind Farm Site on the Mourne Beg and Glendergan rivers. With the implementation of the best practice mitigation measures during the construction phase there were predominantly no significant effects on this designated site. However, the November 2020 Peat Slide entered the Shruhanagarve Stream which provided a direct hydrological connection to this designated site and resulted in short-term significant negative effects associated with liquified peat entering the watercourse and travelling downstream. However, the emergency response measures, the remedial works, channel reinstatement works and slip scar rehabilitation works have reduced the magnitude and duration of the effects on downstream watercourses. Biological monitoring shows that the Mourne Beg River has returned to baseline conditions. Therefore the negative effects on this designated site would have been short term in duration. The Existing Development has not had any long-term effect on the qualifying interests or conservation objectives of the SAC.

Croaghonagh Bog SAC/pNHA

This designated site is located downstream of the Wind Farm Site and a section of the Grid Connection via the Mary Breen's Burn. No deterioration in downstream surface water quality occurred as a result of the Existing Development within the Mary Breen's Burn. Similarly, no spills or pollution incidents occurred which could have impacted local groundwater quality. No significant effects occurred on this designated site.

Cashelnavean Bog NHA

A small section (~580m) of the Grid Connection overlaps with this designated site along the N15. The NHA is located to the north of this national road, which is upgradient of the Grid Connection, with topography in this area sloping steeply to the south. All works in this area took place downgradient of the NHA and in the carriageway of the existing road network, limiting the potential for effects. Nevertheless, tried and tested mitigation measures for the protection of surface and groundwater quality were implemented during the works along the Grid Connection. No spills or pollution incidents occurred which could have impacted local groundwater quality. No significant effects occurred on this designated site.

Lough Eske SAC

This designated site is located downstream of the Grid Connection along the Lowerymore River. The potential for effects would have been limited due to the minor and transient nature of the works. These works are similar to roadworks completed across the country. No pollution events were recorded along the Grid Connection. No significant effects occurred on this designated site.

Croagh Bog ASSI

Croagh Bog ASSI (ASSI378) is located downstream of the Wind Farm Site and along the lower reaches of the Shruhangarve Stream. With the implementation of the best practice mitigation measures during the construction phase prior to the November 2020 Peat Slide there would have been no significant effects on this designated site. However, the Peat Slide entered the Shruhangarve Stream which provided a direct hydrological connection to this designated site and resulted in short-term significant negative effects associated with liquified peat entering the watercourse and travelling downstream. However, the emergency response measures, the remedial works, channel reinstatement works and slip scar rehabilitation works have reduced the magnitude and duration of the effects on downstream watercourses. Biological monitoring shows that the Mourne Beg River has returned to baseline conditions. Therefore the negative effects on this designated site would have been short term in duration. As stated in the supporting remedial Natura Impact Statement (rNIS), such effects were short term and did not undermine the integrity of these European Sites as defined by their conservation objectives. The rNIS concludes, '*it can be objectively concluded that the Existing Development, individually or in-combination with other plans or projects, has not and will not adversely affect the integrity of any European Site.*'

Residual Effect:

The residual effect is considered to be, at worst, a negative, indirect, significant and short-term effect on the River Foyle and Tributaries ASSI and SAC.

The residual effects on the Lough Eske SAC and the Croaghonagh Bog SAC/pNHA would have been at worst, negative, imperceptible, indirect, short-term effects.

Significance of Effects: The assessment presented above demonstrates that there has been no long-term significant effect on any EU or Nationally Designated Site.

9.5.2.18 Effects on WFD Status and Objectives

The EU Water Framework Directive (2000/60/EC) requires that all member states protect and improve water quality in all waters, with the aim of achieving good status by 2027 at the latest. Any development must ensure that this fundamental requirement of the Directive is not compromised.

The WFD status for GWBs and SWBs underlying and downstream of the Existing Development are defined in Section 9.3.11.1 and Section 9.3.11.2 respectively.

A detailed WFD Compliance Assessment Report has been completed in combination with this rEIAR Chapter and is included Appendix 9-3.

Pathway: Surface water flowpaths.

Receptor: WFD status of downstream surface water bodies and underlying GWBs.

Mitigation Measures:

Mitigation measures relating to the protection of surface water quality and quantity were implemented during the construction of the Existing Development.

- The mitigation measures implemented in relation to the entrainment of suspended solids are detailed in Sections 9.5.2.1, 9.5.2.3 and 9.5.2.6;
- The implemented mitigation measures with respect to hydrocarbons are detailed in Section 9.5.2.8; and,
- The implemented mitigation measures with respect to wastewater contamination are detailed in Section 9.5.2.10.

Similarly, mitigation measures for the protection of groundwater quantity and quality have been detailed above:

- The mitigation measures implemented with respect to groundwater levels are detailed in Section 9.5.2.7.
- The implemented mitigation measures with respect to hydrocarbons are detailed in Section 9.5.2.8; and,
- The implemented mitigation measures with respect to wastewater contamination are detailed in Section 9.5.2.10.

Assessment of Effects: No deterioration in downstream surface water quality occurred as a result of the Existing Development. Similarly, no spills or pollution incidents occurred which could have impacted local groundwater quality. No significant effects occurred with respect to groundwater levels due to the local hydrogeological regime.

Residual Effects: The implementation of the mitigation measures for the protection of surface and groundwater during the construction phase of the Existing Development ensured the qualitative and quantitative status of the receiving waters was not altered by the Existing Development.

Therefore, there was no change in GWB or SWB status in the underlying GWB or downstream SWBs resulting from the Existing Development. There was no change in quantitative (volume) or qualitative (chemical) status, and the underlying GWB and downstream SWBs were protected from any potential deterioration.

The residual effect on Groundwater Body WFD status is assessed as being imperceptible and not significant.

The residual effect on Surface Water Body WD status is assessed as being imperceptible and not significant.

Significance of Effects: For the reasons outlined above, no significant effects on WFD Groundwater Bodies and Surface Water Bodies status, risk or future objectives occurred as a result of the Existing Development.

9.5.2.19 Effects on Local Private Groundwater Well Supplies

The biggest risk to groundwater wells would have been due to groundwater contamination associated with any accidental release of hydrocarbons and cement-based products as a result of construction activities within the Wind Farm Site and Grid Connection Site.

No effects are groundwater levels / quantity occurred due to the elevated nature of the Wind Farm Site and the low permeability of the underlying bedrock aquifer. Furthermore, no effects would have occurred along the Grid Connection due to the shallow depth of the excavations in the carriageway of the pre-existing road network. No significant dewatering works was required.

There are no downgradient public or group scheme groundwater supplies which may have been impacted by the Existing Development.

An assessment of private wells within 1km of the Wind Farm Site has been completed, following the assumption that all dwellings are likely to have a private groundwater well. A number of private dwelling houses were identified downgradient of the Wind Farm Site along the Corgary Road. There are 4 no. houses (three inhabited, one derelict) located within one kilometre of the proposed turbine locations. The closest occupiable dwelling is a holiday cottage located 750 metres northwest of the nearest proposed turbine location. The potential for effects at this distance are negligible given the local hydrogeological regime which is characterized by low rates of groundwater recharge and high rates of runoff as a result of the low permeability subsoils and the Poor Bedrock Aquifer. Groundwater flowpaths are short and will discharge locally into nearby surface water features.

Pathway: Groundwater flowpaths.

Receptor: Down-gradient groundwater supplies (groundwater wells)

Mitigation Measures:

Mitigation measures for the protection of groundwater quantity and quality have been detailed above:

- The mitigation measures implemented with respect to groundwater levels are detailed in Section 9.5.2.7.
- The implemented mitigation measures with respect to hydrocarbons are detailed in Section 9.5.2.8; and,
- The implemented mitigation measures with respect to wastewater contamination are detailed in Section 9.5.2.10.

Assessment of Effects: The Wind Farm Site is underlain by an aquifer of low permeability and groundwater flowpaths are typically short (<300m). Consequently, groundwater flows emerge as springs/baseflow along streams and leave the Wind Farm Site as surface water flows and not groundwater flows. Therefore, the potential to effect local wells (whether they are located downslope or not) is very low as groundwater flowpaths between the Existing Development infrastructure locations and potential receptors typically do not exist due to the large setback distance (>1km). Furthermore, no effects have been reported with respect to local groundwater well supplies.

Residual Effects: For the reasons outlined in the impact assessment above (separation distances, and prevailing geology, topography and groundwater flow directions), the residual effects on local groundwater well supplies are assessed as being imperceptible and not significant.

Significance of Effects: For the reasons outlined above, no significant effects on existing groundwater supplies occurred as a result of the Existing Development.

9.5.2.20 Effects from the Replacement of Natural Surface with Lower Permeability Surfaces

Progressive replacement of the peat or vegetated surface with impermeable surfaces could potentially result in an increase in the proportion of surface water runoff reaching the surface water drainage network. This could potentially increase runoff from the Wind Farm Site and increase flood risk downstream of the development. In reality, the access roads have a higher permeability than the underlying peat. However, it is conservatively assumed in this assessment that the access roads and hardstands are impermeable. The assessed footprint of the Existing Development relates to wind farm roads and hardstand areas, peat storage and containment measures, borrow pits, environmental and water quality mitigation measures, and ancillary works. During storm rainfall events, additional runoff coupled with increased velocity of flow could increase hydraulic loading, resulting in erosion of watercourses and impact on aquatic ecosystems.

Pathway: Site drainage network.

Receptor: Surface watercourses in the vicinity and downstream of the Wind Farm Site including the Mourne Beg River and its tributaries (Mary Breen's Burn, Bunadowen River, Shruhanagarve stream), the Glendergan and the Lowerymore River and the associated water-dependant ecosystems.

Pre-Mitigation Potential Effect: Negative, moderate, direct, permanent, likely effect on all downstream surface water bodies.

Mitigation Measures and Assessment of Effects:

<u>Mitigation by Design</u>:

The drainage system of the Existing Development has been installed and constructed in conjunction with and in accordance with the Permitted Development drainage system as follows:

- Interceptor drains have been installed up-gradient of the Existing Development infrastructure to collect clean surface runoff, in order to minimise the amount of runoff reaching areas where suspended sediment could become entrained. This water is then be directed to areas where it can be re-distributed over the ground by means of a level spreader;
- Swales/road side drains were installed to collect runoff from access roads and turbine hardstanding areas of the Wind Farm Site that are likely to have entrained suspended sediment, and channel it to settlement ponds for sediment settling;
- Check dams are used along sections of access road drains to intercept silts at source. Check dams are constructed from a 4/40mm non-friable crushed rock;
- Settlement ponds, emplaced downstream of road swale sections and at turbine hardstand locations, buffer volumes of runoff discharging from the drainage system during periods of high rainfall, by retaining water until the storm hydrograph has receded, thus reducing the hydraulic loading to watercourses; and,
- Settlement ponds are designed in consideration of the greenfield runoff rate.

Assessment of Effects:

The emplacement of the Existing Development footprint (32.6 ha), as described in Chapter 4 of this rEIAR, (assuming emplacement of impermeable materials across the footprint of the Existing Development as a worst-case scenario) could result in an average total site increase in surface water runoff of approximately 2,994m^3/month. This represents a potential increase of approximately 0.13% in the average daily/monthly volume of runoff from the Wind Farm Site in comparison to the baseline pre-development runoff conditions **(Table 9-20)**. This is a very small increase in average runoff and results from the naturally high surface water runoff rates and the relatively small area of the Existing Development, the footprint representing 3.7% of the Wind Farm Site area of 892ha.

Table 9-20: Baseline Site Runoff V Development Runoff

Site Baseline Runoff/wettest month (m^3)	Baseline Runoff/day (m^3)	Existing Development Footprint (m^2)	Hardstanding Area 100% Runoff/month (m^3)	Hardstanding Area 96% Runoff/month (m^3)	Net Increase/month (m^3)	Net Increase/day (m3)	% Increase from Baseline Conditions across Wind Farm Site (m^3)
2,200,742	70,991	291,300	74,864	71,869	2,994	96.6	0.13%

The additional volume is low due to the fact that the runoff potential from the Wind Farm Site is naturally high (96%). Also, the calculation assumes that all hardstanding areas are impermeable which is not the case as access tracks were constructed of permeable stone aggregate. Furthermore the calculation is conservative as it assumes that all of the development footprint is hardstand areas and does not account for peat cells or existing access road which were upgraded. Runoff in these areas is the same as the baseline runoff rates. The increase in runoff from the Existing Development is, therefore, negligible. This is even before mitigation measures (drainage controls) were put in place.

Residual Effect: Direct, negative, neutral, long term, likely effect. Proven and effective measures to attenuate runoff and mitigate the risk of flooding are employed. The residual effect is - Neutral, indirect, long term, likely effect on down gradient streams/rivers.

Significance of Effects: No significant effects on downstream flood risk will occur during the operational phase of the Existing Development.

9.5.3 Risk of Major Accidents and Disasters

The main risk of Major Accidents and Disasters at peatland sites is related to peat stability.

A significant peat movement occurred at the Wind Farm Site on 12th November 2020 which resulted in short-term significant negative effects on the water environment as detailed in the retrospective impact assessment detailed above.

Comprehensive peat stability assessments were completed by FT and Ionic following the November 2020 Peat Slide. The Ionic assessment (Ionic, 2021), which was based on a quantum of site-specific data, concluded that the "the overall site is currently stable" based upon this detailed assessment carried out along all roads, hardstandings, borrow pits, peat storage areas and peat stabilisation areas. Furthermore, AFRY completed a site inspection in October 2023 and concluded that all infrastructure, including the Existing Development, are stable (AFRY, 2023). Given the results of the peat stability assessments and the prescribed mitigation measures, the risk of a future Peat Slide occurring due to the construction of the Existing Development is low.

Flooding can also result in downstream Major Accidents and Disasters. However, due to the small scale of the Existing Development footprint and with the implementation of the mitigation measures, the increased flood risk associated with the Existing Development is low.

9.5.4 Assessment of Potential Health Effects

Potential health effects arise mainly through the potential for surface and groundwater contamination which may have negative effects on public and private water supplies. There are no mapped public or group water scheme groundwater protection zones in the area of the Wind Farm Site and Grid Connection Site. Furthermore, no private wells are located in close proximity to the Existing Development. Notwithstanding this, the Existing Development design and mitigation measures ensure that the potential for effects on the hydrogeological have not been and will not be significant.

The Lough Mourne surface water abstraction is located within the Wind Farm Site and the assessment of effects is presented in Section 9.5.2.15 above. Notwithstanding this, the site design and mitigation measures have ensured that no significant effects have or will occur on the water environment.

Flooding of property can cause inundation with contaminated flood water. Flood waters can carry waterborne disease and contamination/effluent. Exposure to such flood waters can cause temporary health issues. A detailed Flood Risk Assessment (Appendix 9-1) has also shown that the risk of the Existing Development contributing to downstream flooding is very low, as the long-term plan for the Wind Farm Site is to retain and slow down drainage water within the existing site. On-site drainage control measures will ensure no downstream increase in flood risk.

9.5.5 Cumulative Effects - Existing Development

This section presents an assessment of the cumulative effects associated with the construction phase of the Existing Development and other developments, existing and/or proposed at the time of construction, on the hydrological and hydrogeological environment.

The main likelihood of cumulative effects is considered to relate to the hydrological environment (surface water) rather than the hydrogeological (groundwater) environment. Due to the hydrogeological setting of the Wind Farm Site (i.e. low permeability peat overlying a Poor Bedrock Aquifer) and the near surface nature of construction activities associated with the Existing Development, cumulative effects with regard groundwater quality or quantity arising from the Existing Development are assessed as unlikely.

The cumulative hydrological study area includes:

- The catchment of the Mourne Beg River downstream as far as its confluence with the River Derg;
- The catchment of the Glendergan River downstream as far as its confluence with the River Derg; and,
- The Lowerymore River downstream as far as Lough Eske.

There was no potential for cumulative effects beyond this cumulative hydrological study area due to increases in flow volumes in the River Derg, the large volumes of water within Lough Eske and the increasing distance from the Wind Farm Site and Grid Connection Site.

The main likelihood of cumulative effects occurred during the construction of the Existing Development. Construction of the Existing Development commenced in November 2019. The majority (>90%) of construction activity associated with construction of wind farm infrastructure took place during a 12-month period from November 2019 to November 2020, with works along the substation and Grid Connection continuing until early 2021. Some construction works recommenced in Q3 of 2022 for a period of 6 weeks. There was also the potential for cumulative effects associated with the November 2020 Peat Slide.

There was no potential for significant cumulative effects associated with the works along the Grid Connection due to the minor, localised, temporary and transient nature of these works. Any potential effects on surface water or, groundwater would have been limited in spatial extent and duration. The Grid Connection works are comparable in scale and nature to roadworks undertaken across the country. Standard mitigation measures were implemented during the construction of the Grid Connection. Given the limited footprint of the works, their temporary duration, the absence of any significant effects on river hydromorphology (refer to Section 9.5.2.11 and 9.5.2.12), and the implementation of mitigation measures, there was no potential for the Grid Connection works to interact with other developments which would have resulted in significant cumulative effects on the water environment.

9.5.5.1 Cumulative Effects with Forestry

The Wind Farm Site is located in an area of coniferous forestry. The most common water quality problem arising from forestry relate to the release of sediment and nutrients to the aquatic environment, and impacts from acidification. Forestry may also give rise to modified stream flow regimes caused by associated changes in land drainage.

Due to the close proximity of the Existing Development to forested areas and given that they drain to the same watercourses as the Existing Development, there was potential for cumulative effects on downstream surface water quality to occur.

However, the continuous turbidity monitoring did not record any significant increase in suspended solids entrainment in downstream watercourses during the construction of the Existing Development. Additionally, the monthly water quality sampling indicates that there has been no deterioration in the water quality of downstream watercourses from the pre-construction phase. Biological monitoring also indicates that there has been no deterioration in downstream water quality.

Therefore, based on the large dataset of water quality data, it can be concluded that there was no significant cumulative effect associated with the commercial forestry activities.

9.5.5.2 Cumulative Effects with Peat Slide Remediation Works

Restoration works were carried out to the Shruhanagarve Stream and the Peat Slide slip scar in response to a notice issued by Donegal County Council (DCC) dated 17th November issued under Section 12 (1) of the Local Government (Water Pollution) Acts, relating to the discharge of peat, sediment, and heavily soiled water from the Wind Farm Site to the Shruhanagarve Stream and Mourne Beg River.

These works included the following:

- The removal of fallen trees and debris to aid revegetation;
- Manual seeding of slip scar with native grass and sedge species
- Live stakes were installed on both sides of an existing drainage channel to provide stability through the establishment of fast growing native willows; and,
- Manual planting with native bare root saplings.
- Removal of blockages from stream channel,
- In areas where the channel as poorly defined, a new channel was constructed through a combination of excavation and reconstruction of lost stream banks using vegetated geogrids.
- Installation of grade control and rock drop structures as necessary
- Installation of coir matting on banks to aid revegetation and provide temporary erosion protection.

There was limited potential for the reinstatement works to result in significant effects on downstream surface water quality due to the context within which the works were being completed (i.e. in the immediate aftermath of a significant Peat Slide). Furthermore, the implementation of best practice reinstatement methods and practices ensured that there was no significant negative effects. The residual effect has been a positive, moderate, short-term, indirect effect on downstream surface water quality.

Since the effect of the remediation works has been positive there is no potential for negative cumulative effects with the Existing Development.

9.5.5.3 Other Developments

Due to the remedial nature of this rEIAR and cumulative assessment, a search of local planning applications dated from 2016-2026 was completed within the hydrological study area. The period from 2016-2026 was chosen to include any potential developments which may have occurred during the construction phase of the Existing Development.

The planning applications identified within the hydrological study area and listed in Appendix 2-1 of this rEIAR relate to one-off housing developments and associated domestic water treatment systems. These developments are small scale and localised in nature. No significant effects on water quality or flows (surface water or groundwater) would result from such developments. Therefore, there were no hydrological cumulative effects with respect to the Existing Development.

9.5.6 Assessment of Potential In-Cumulation Effects

This section addresses the potential cumulative effects of the Existing Development combined with the Prospective Development (i.e. the Subject Development), and assesses the effects of the Subject Development on the hydrological and hydrogeological environment. An assessment of the In-Cumulation effects of the Subject Development are presented in **Table 9-21** below.

As detailed in this chapter, with the implementation of the prescribed mitigation measures the Existing Development did not result in any long-term significant effects on the hydrological and hydrogeological environment. A short-term significant effect occurred as a result of the November 2020 Peat Slide but water quality data shows that the impacted watercourses have since returned to pre-baseline levels.

The supporting EIAR concludes that the Prospective Development, with the implementation of the prescribed mitigation measures, will not result in any significant effects on the hydrological and hydrogeological environment. Therefore, there is no potential for significant In-Cumulation effects from the Subject Development.

Table 9-21: Assessment of Potential In-Cumulation Effects of the Subject Development

Assessment Heading	Existing Development	Prospective Development	Subject Development
Effects from Earthworks	The rEIAR concluded that the residual effect on surface water quality was at worst, a negative, indirect, imperceptible and temporary effect. There were no significant effects.	With the implementation of the prescribed mitigation measures, the residual effect will be a negative, imperceptible, indirect, temporary, unlikely effect on downstream water quality and aquatic habitats. There will be no significant effects.	The effects on surface water quality from both the Prospective Development and the Existing Development are considered to be not significant. There is no potential for significant In-Cumulation effects from the Subject Development.
Effects from Tree Felling	The rEIAR concluded that the residual effect on surface water quality was, at worst, a negative, indirect, imperceptible and temporary effect. There were no significant effects.	With the implementation of the prescribed mitigation measures, the residual effect will be a negative, imperceptible, indirect, temporary, likely effect on downstream watercourses and associated water-dependent ecosystems. There will be no significant effects.	The effects on surface water quality from both the Prospective Development and the Existing Development are considered to be not significant. There is no potential for significant In-Cumulation effects from the Subject Development.
Effects from Excavation Dewatering	The rEIAR concluded that the residual effect on surface water quality was, worst, a negative, indirect, imperceptible and brief effect. There were no significant effects.	With the implementation of the prescribed mitigation measures, the residual effect will be a negative, imperceptible, indirect, short term, unlikely effect on local surface watercourses and associated water-dependent ecosystems. There will be no significant effects.	The effects on surface water quality from both the Prospective Development and the Existing Development are considered to be not significant. There is no potential for significant In-Cumulation effects from the Subject Development.
Effects on Groundwater Levels	The rEIAR concluded that the residual effect on groundwater levels was, at worst, a localised, short term, imperceptible, and of negative effect. There were no significant effects.	With the implementation of the prescribed mitigation measures, the residual effect will be an imperceptible, direct, temporary, unlikely effects on local groundwater levels. There will be no significant effects.	The effects on groundwater levels from both the Prospective Development and the Existing Development are considered to be not significant. There is no potential for significant In-Cumulation effects from the Subject Development.

Assessment Heading	Existing Development	Prospective Development	Subject Development
Effects from Contamination due to Hydrocarbons	The rEIAR concluded that the residual effect on surface or groundwater quality was, at worst, a negative, indirect, imperceptible and short-term effect. There were no significant effects.	With the implementation of the prescribed mitigation measures, the residual effect will be a negative, imperceptible, indirect, short term, unlikely effect on local groundwater quality, and a negative, imperceptible, indirect, short term, unlikely effect on surface water quality. There will be no significant effects.	The effects on surface water and groundwater quality from both the Prospective Development and the Existing Development are considered to be not significant. There is no potential for significant In-Cumulation effects from the Subject Development.
Effects from Contamination due to Wastewater	The rEIAR concluded that the residual effect on surface or groundwater quality surface or groundwater quality was, at worst, a negative, indirect, imperceptible and short-term effect. There were no significant effects.	With the implementation of the prescribed mitigation measures, the residual effect will be a negative, imperceptible, indirect, temporary, unlikely effect on surface water or groundwater quality. There will be no significant effects.	The effects on surface water and groundwater quality from both the Prospective Development and the Existing Development are considered to be not significant. There is no potential for significant In-Cumulation effects from the Subject Development.
Effects from contamination due to cement-based products	The rEIAR concluded that the residual effect on surface or groundwater quality was, at worst, a negative, indirect, imperceptible and short-term effect. There were no significant effects.	With the implementation of the prescribed mitigation measures, the residual effect will be a negative, imperceptible, indirect, short term, unlikely effect on surface and groundwater quality. There will be no significant effects.	The effects on surface water and groundwater quality from both the Prospective Development and the Existing Development are considered to be not significant. There is no potential for significant In-Cumulation effects from the Subject Development.
Effects on Watercourse Morphology	The rEIAR concluded that the residual effect due to the construction or upgrade of watercourse crossings was, at worst, a negative, indirect, imperceptible and brief effect. There were no significant effects.	With the implementation of the prescribed mitigation measures, the residual effect will be a negative, imperceptible, direct, long-term, unlikely effect on downstream water quality and aquatic habitats. There will be no significant effects.	The effects on watercourse morphology from both the Prospective Development and the Existing Development are considered to be not significant. There is no potential for significant In-Cumulation effects from the Subject Development.

Assessment Heading	Existing Development	Prospective Development	Subject Development
Effects from the Use of Siltbuster	Siltbuster was not used as part of the Existing Development.	With the implementation of the prescribed mitigation measures, the residual effect will be a negative, imperceptible, indirect, temporary, unlikely effect on downstream water quality. There will be no significant effects.	The effects on surface water quality from both the Prospective Development and the Existing Development are considered to be not significant. There is no potential for significant In-Cumulation effects from the Subject Development.
Effects on Designated Sites	The rEIAR concluded that the residual effect was, at worst, a negative, indirect, significant and short-term effect. Short-term significant effects occurred due to the November 2020 Peat Slide.	With the implementation of the prescribed mitigation measures, the residual effect will be a negative, imperceptible, indirect, short-term, unlikely effect on downstream designated sites. There will be no significant effects.	The effects on downstream designated sites from the Prospective Development will not significant. The Existing Development resulted in short-term significant effects due to the November 2020 Peat Slide and water quality has since returned to baseline levels. There is no potential for significant In-Cumulation effects from the Subject Development.
Effects on Lough Mourne Abstraction	The rEIAR concluded that the residual effect was a negative, imperceptible, indirect, short–term effect on water quality. There were no significant effects.	With the implementation of the prescribed mitigation measures, the residual effect will be a negative, slight, indirect, short-term, unlikely effect on the Lough Mourne Supply. There will be no significant effects.	The effects on the Lough Mourne abstraction from both the Prospective Development and the Existing Development are considered to be not significant. There is no potential for significant In-Cumulation effects from the Subject Development.
Effects on Local Private Wells	The rEIAR concluded that there were no residual effects on local private groundwater wells. There were no significant effects.	With the implementation of the prescribed mitigation measures, there will be no residual effects on local groundwater well supplies. There will be no significant effects.	The effects on local private groundwater wells from both the Prospective Development and the Existing Development are considered to be not significant. There is no potential for significant In-Cumulation effects from the Subject Development.

Assessment Heading	Existing Development	Prospective Development	Subject Development
Effects on WFD Status and Objectives	The rEIAR concluded that there were no residual effects on WFD status and objectives. There were no significant effects.	With the implementation of the prescribed mitigation measures, there will be no residual effect on SWB or GWB status. There will be no significant effects.	The effects on WFD status from both the Prospective Development and the Existing Development are considered to be not significant. There is no potential for significant In-Cumulation effects from the Subject Development.
Effects due to Biodiversity Enhancement	No biodiversity enhancement was completed as part of the Existing Development.	With the implementation of the prescribed mitigation measures, the residual effect will be a negative, indirect, slight to moderate, likely short-term effect on downstream water quality and a positive, indirect, moderate, likely, long-term effect on downstream water quality. There will be no significant effects.	The effects on surface water quality from both the Prospective Development is considered to be not significant. There is no potential for significant In-Cumulation effects from the Subject Development.
Effects due to Blasting	The rEIAR concluded that there were no residual effects on local groundwater quality. There were no significant effects.	With the implementation of the prescribed mitigation measures, the residual effect will be a negative, indirect, imperceptible, long-term, likely effect on groundwater quality. There will be no significant effects.	The effects on groundwater quality from both the Prospective Development and the Existing Development are considered to be not significant. There is no potential for significant In-Cumulation effects from the Subject Development.
Effects due to November 2020 Peat Slide and Emergency Works	The rEIAR concluded that the residual effect on surface water quality was, at worst, a negative, direct, significant and short-term effect. The residual effect on stream morphology was, at worst, a negative, significant, direct, short-term effect. Short-term significant effects occurred due to the November 2020 Peat Slide.	Not applicable. The PSRA (FT, 2026) for the Prospective Development concluded that the Site is appropriate for the development and that with the implementation of the prescribed mitigation measures the risk of peat instability is low. There will be no significant effects.	The Existing Development resulted in short-term significant effects due to the November 2020 Peat Slide and water quality has since returned to baseline levels. There is no potential for significant In-Cumulation effects from the Subject Development.

Assessment Heading	Existing Development	Prospective Development	Subject Development
	Meanwhile, the emergency response works had a long-term, positive, direct effect on surface water quality.		

9.5.7 Cumulative Effects - Subject Development

This section assesses the potential for cumulative effects between the Subject Development (Existing Development and the Prospective Development) on the water environment. The study area for this assessment is the same as that described in Section 9.5.5 above.

9.5.7.1 Cumulative Effects with Forestry

The Site of the Subject Development and the wider hydrological cumulative study area includes coniferous forestry plantations.

The most common water quality problems arising from forestry relate to the release of sediment and nutrients to the aquatic environment and impacts from acidification. Forestry felling may also give rise to modified stream flow regimes caused by associated land drainage.

Given the occurrence of several forestry blocks within the Site of the Subject Development and in the surrounding lands, and given that they drain to the Mourne Beg, Glendergan an Lowerymore rivers, the potential cumulative effects on downstream water quality and quantity need to be assessed.

However, the mitigation measures detailed above for the Existing Development (in this rEIAR) and the mitigation measures prescribed in the EIAR for the Prospective Development will ensure the protection of downstream surface water quality.

For these reasons it is considered that there will not be a significant cumulative effect associated with commercial forestry activities.

9.5.7.2 Cumulative Effects with Agriculture

The delineated cumulative study areas contained agricultural lands at lower elevations downstream of the Site of the Subject Development within the catchments of the Mourne Beg, Glendergan and Lowerymore rivers.

Agriculture is the largest pressure on water quality in Ireland. Agricultural practices such as the movement of soil and the addition of fertilizers and pesticides can lead to nutrient losses and the entrainment of suspended solids in local surface watercourses. This can have a negative impact on local and downstream surface water quality.

The Subject Development would have the potential to interact with these agricultural activities and contribute to a deterioration of downstream surface water quality through the emissions of elevated concentrations of suspended solids and ammonia.

However, the mitigation measures detailed in this rEIAR and the EIAR will ensure the protection of downstream surface water quality.

For these reasons outlined above we consider that there will not be a significant cumulative effect associated with agricultural activities.

9.5.7.3 Cumulative Effects with Turbary Peat Cutting

The delineated cumulative study areas contained peatlands within the catchments of the Mourne Beg, Glendergan and Lowerymore rivers. There may be small private peat cutting activities in some of these peatland areas.

As part of the assessment, consideration was given to the potential for interactions between turbary activities and the Subject Development. In the absence of appropriate controls and mitigation measures, such activities have the potential to contribute to localised increase in suspended solids in receiving waters.

However, the areas of private peat cutting will be infinitely small, significantly limiting the potential for cumulative effects to arise with the Subject Development. Nevertheless, the mitigation measures detailed in this rEIAR and the EIAR will ensure the protection of downstream surface water quality.

For these reasons outlined above we consider that there will not be a significant cumulative effect associated with turbary activities.

9.5.7.4 Cumulative Effects with Other Wind Farm Developments

A total of 10 no. existing, permitted and/or proposed wind farms have been identified within the cumulative hydrological study area.

- The existing Seegroan Wind Farm (9 no. turbines);
- The existing Tievenamenta Wind Farm (15 no. turbines);
- The existing Crighshane Wind Farm (14 no. turbines);
- The existing Church Hill Wind Farm (8 no. turbines) and a permitted additional turbine at Church Hill Wind Farm;
- The permitted repowering of Barnesmore Wind Farm (13 no. turbines);
- The existing Gronan Wind Farm (4 no. turbines);
- The proposed Meenakeeran Wind Farm (4 no. turbines);
- The proposed Meenamullan Wind Farm (6 no. turbines);
- The proposed Pullyteam Wind Farm (6 no. turbines); and,
- The existing Slieveglass Wind Farm (3 no. turbines).

The greatest potential for cumulative effects to occur would be if the construction phase of the proposed wind farms and the Subject Development overlapped. However, even in an unmitigated scenario, the potential for cumulative effects is limited as the majority of works associated with the Subject Development have already been completed. The EIAR chapter for the Prospective Development demonstrates that with the implementation of the prescribed mitigation measures there will be no significant effects on the surface or groundwater environments.

Furthermore, the EIARs for the above proposed wind farm developments will detail potential hydrological and hydrogeological issues relating to the construction, operation and decommissioning phases of these developments and propose a suite of best practice mitigation measures designed to ensure that the developments do not in any way have a negative effect on downstream surface water quality and quantity.

Therefore, with the implementation of the proposed mitigation measures (both for the Subject Development and for the other wind farms) there will be no cumulative effects associated with the Subject Development and other wind farms within the cumulative study area.

9.5.7.5 Cumulative Effects with other Non-Wind Farm Related Developments

A review of other developments, projects and plans within the cumulative study area has been completed. The Site of the Subject Development is located in a largely rural area and the proposed developments largely comprise of farm and agricultural buildings and houses/dwellings.

Furthermore, the potential for the Subject Development to result in significant cumulative effects is limited as the majority of the works have already been completed as part of the Existing Development. This rEIAR demonstrates that there has been no long-term significant effects on the hydrological or hydrogeological environments. The EIAR for the Prospective Development prescribes tried and tested mitigation measures for the protection of the surface and groundwater environment. With the implementation of these measures there is no potential for significant cumulative effects.

9.5.8 Monitoring

Water quality monitoring is ongoing at the Site. The ongoing monitoring comprises of monthly grab sampling as detailed in Table 9-11. The EIAR for the Prospective Development details monitoring to be completed in the future.

9.6 Transboundary Effects

This section addresses the potential transboundary effects of the Existing Development on the hydrological and hydrogeological environment. An assessment of the potential transboundary effects are presented in **Table 9-22** below.

There was no potential for transboundary effects associated with works at the Grid Connection Site as this area is drained by the Lowerymore River which discharges into Lough Eske.

The only potential for transboundary effects relates to surface water quality at the Wind Farm Site. Groundwater flowpaths are short and all shallow groundwater leaves the Wind Farm Site as surface water runoff in the local streams and rivers. Therefore, there was no potential for transboundary effects on groundwater. Surface water quality was the main sensitive receptor at the Wind Farm Site and enters the Mourne Beg River which flows to the east and into Northern Ireland.

As detailed in this chapter, with the implementation of the mitigation measures the Existing Development did not result in any significant long-term effects on the hydrological and hydrogeological environment. The mitigation measures implemented during the construction phase ensured that there was no transboundary effects associated with construction earthworks, tree felling, excavation dewatering, peat and spoil management, activities at the borrow pits, or the use of hydrocarbons, wastewater or cement-based products at the Wind Farm Site.

A short-term significant negative effect occurred as a result of the November 2020 Peat Slide, however monitoring has shown that water quality has since returned to baseline / pre-construction levels. Therefore, the only significant transboundary effects were of a short duration and were associated with the November 2020 Peat Slide.

Furthermore, the EIAR completed for the Prospective Development demonstrates that, with the implementation of the prescribed mitigation measures, there will be no transboundary effects. Therefore, the Subject Development will not result in any significant transboundary effects.

Table 9-22: Assessment of Potential Transboundary Effects of the Existing Development

Assessment Heading	Existing Development	Transboundary Effects
Effects from Construction Earthworks	The remedial impact assessment presented in Section 9.5.2.1 above concludes that the residual effect was at worst, a negative, indirect, imperceptible and temporary effect.	There was no potential for significant Transboundary Effects on surface water quality as a result of the Existing Development.
Effects from Tree Felling	The remedial impact assessment presented in Section 9.5.2.2 above concludes that the residual effect was at worst, a negative, indirect, imperceptible and temporary effect.	There was no potential for significant Transboundary Effects on surface water quality as a result of the Existing Development.
Effects from Peat and Spoil Management	The remedial impact assessment presented in Section 9.5.2.3 concludes that the residual effect was at worst, a negative, indirect, imperceptible and temporary effect.	There was no potential for significant Transboundary Effects on surface water quality as a result of the Existing Development.
Effects from activities at the Borrow Pits	The remedial impact assessment presented in Section 9.5.2.4 concludes that the residual effect was at worst, a negative, indirect, imperceptible and temporary effect.	There was no potential for significant Transboundary Effects on surface water quality as a result of the Existing Development.
Effects from Morphological Changes to Watercourses	The remedial impact assessment presented in Section 9.5.2.5 concludes that the residual effect was at worst, a negative, indirect, imperceptible and brief effect.	There was no potential for significant Transboundary Effects on surface water quality as a result of the Existing Development.
Effects from Excavation Dewatering	The remedial impact assessment presented in Section 9.5.2.6 concludes that the residual effect was at worst, localised, short term, imperceptible, and of negative effect.	There was no potential for significant Transboundary Effects on surface water quality as a result of the Existing Development.
Effects from Hydrocarbons	The remedial impact assessment presented in Section 9.5.2.8 concludes that the residual effect was at worst, a negative, indirect, imperceptible and short-term effect.	There was no potential for significant Transboundary Effects on surface water quality as a result of the Existing Development.
Effects from Cement-Based Products	The remedial impact assessment presented in Section 9.5.2.9 concludes that the residual effect was at worst, a negative, indirect, imperceptible and short-term effect.	There was no potential for significant Transboundary Effects on surface water quality as a result of the Existing Development.

Assessment Heading	Existing Development	Transboundary Effects
Effects from Wastewater	The remedial impact assessment presented in Section 9.5.2.10 concludes that the residual effect was at worst, a negative, indirect, imperceptible and short-term effect.	There was no potential for significant Transboundary Effects on surface water quality as a result of the Existing Development.
Effects from November 2020 Peat Slide	The remedial impact assessment presented in Section 9.5.2.13 concludes that the residual effect was at worst, a negative, significant, direct, short-term effect.	There was the potential for short-term significant Transboundary Effects.
Effects from Emergency Response Works	The remedial impact assessment presented in Section 9.5.2.14 concludes that the residual effect was at worst, a brief, imperceptible, negative effect and at best a long-term, positive, direct, moderate, effect on surface water quality.	There was no potential for significant Transboundary Effects on surface water quality as a result of the Existing Development.