Planning and Environmental Consultants

Environmental Impact Assessment Report (EIAR)

Cunlaghfadda Green Energy Project, Co. Mayo

Chapter 9 Water

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9.1 Introduction

9.1.1 Background and Objectives

Hydro-Environmental Services (HES) was engaged by MKO to carry out an assessment of the potential likely and significant effects of the Proposed Project on the water aspects (hydrology and hydrogeology) of the receiving environment.

The Proposed Project is described in full in Chapter 4 of this Environmental Impact Assessment Report (EIAR).

This chapter provides a baseline assessment of the environmental setting of the Site, as described in Chapter 4, in terms of hydrology and hydrogeology, and discusses the potential likely significant effects that the construction, operation and decommissioning of the Proposed Project will have. Where required, appropriate mitigation measures to avoid any identified significant effects to hydrology and hydrogeology are recommended and the residual effects of the Proposed Project post-mitigation are assessed.

For the purposes of this chapter, and consistent with Section 1.1.1, the following references are used when referring to aspects of the Proposed Project: the 'Proposed Wind Farm', the 'Proposed Grid Connection', the 'Proposed Project' (encompasses both the Proposed Wind Farm and the Proposed Grid Connection' and the 'Site' (as delineated by the EIAR Site Boundary).

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 EIAR was prepared by Michael Gill, Conor McGettigan and Nitesh Dalal.

Michael Gill (P. Geo., B.A.I., MSc, Dip. Geol., MIEI) is an Environmental Engineer/Hydrologist with over 24 years' environmental consultancy experience in Ireland. Michael has completed numerous hydrological and hydrogeological impact assessments of wind farms in Ireland. He has also managed EIAR assessments for infrastructure projects and private residential and commercial developments. In addition, he has substantial experience in wastewater engineering and site suitability assessments, contaminated land investigation and assessment, wetland hydrology/hydrogeology, water resource assessments, surface water drainage design and SUDs design, and surface water/groundwater interactions. For example, Michael has worked on the EIS/EIARs for Slievecallan Wind Farm, Cahermurphy (Phase I & II) Wind Farm, Carrownagowan Wind Farm, Garrane Green Energy Project and over 100 other wind farm related projects across the country.

Conor McGettigan (BSc, MSc) is an Environmental Scientist 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 routinely prepares the hydrology and hydrogeology chapters of environmental impact assessment reports for wind farm developments. Conor has worked on the EIARs for over 20 no. wind farms projects across the country, including Ballivor Wind Farm, Seskin Wind Farm, Lackareagh Wind Farm, Knockshanvo Wind Farm, Garrane Green Energy Project and Gannow Renewable Energy Development.

Nitesh Dalal (B.Tech, PG Dip., MSc) is an Environmental Scientist with over 7 years' experience in environmental consultancy and environmental management in India. Nitesh holds a M.Sc. in Environmental Science from University College Dublin (2024), a PG Diploma in Health, Safety and Environment from Annamalai University, India (2021) and B.Tech. in Environmental Engineering (2016) from Guru Gobind Singh Indraprastha University, India (2016). Nitesh has been involved in the preparation of the land, soils and geology chapters of environmental impact assessment reports for several renewable energy developments. Nitesh has worked on the EIARs for several wind farms projects across the country, including Gannow Renewable Energy Development and Littleton Wind Farm.

9.1.3 Scoping and Consultation

The scope for this chapter of the EIAR has also been informed by consultation with statutory consultees, bodies with environmental responsibility and other interested parties. This consultation process and the List of Consultees is outlined in Section 2.7 of this EIAR. Matters raised by Consultees in their responses with respect to the water environment are summarised in Table 9-1 below.

Table 9-1: Summary of Water Environment Related Scoping Responses

Consultee	Description	Addressed in Section
Uisce Éireann (UÉ)	• 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 / hydrogeological pathways between the Applicant's site and receiving waters should be identified as part of the report. • 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. • Any physical impact on Uisce Éireann assets – reservoir, drinking water source, treatment works, pipes, pumping stations, discharges outfalls etc. including any relocation of assets.	All UÉ surface and groundwater resources have been identified in Section 9.3 and the potential effects associated with the Proposed Project are detailed in Section 9.5.2.11. Mitigation measures for the protection of surface and groundwater quality have been prescribed in Section 9.5.
Office of Public Works (OPW)	• If any new culverts or bridges (or modifications to any existing culverts or bridges) are required to cross watercourses as part of the development or on proposed or existing access roads to serve or access the development, you should be aware that these require consent from the Commissioners of Public Works. This is	No new watercourse crossings are proposed

Consultee	Description	Addressed in Section
	a requirement of Section 50 of the Arterial Drainage Act of 1945 as amended. - We would recommend that a flood risk assessment be carried out with regard to the Proposed Project and its construction. This should consider all sources, pathways and receptors of flood risk. This should be carried out in accordance with the principles set out in the guideline document "The Planning System and Flood Risk Management" as published by the Minister for the Environment, Heritage and Local Government and the Office of Public Works. Please be aware that this is a separate issue from the requirement to obtain Section 50 consent as mentioned above	A flood risk assessment has been completed and is appended as Appendix 9-1.
Inland Fisheries Ireland (IFI)	- Drumady lake is the source for the Ballynew stream. Ballynew is a trout spawning channel and IFI have a fisheries development project planned for the lower section of it in 2023. The Water Framework Directive has classed the Ballynew stream (Robe-030) as of good ecological status, a status which must be maintained. - The proposed site crosses both the Meander River and Robe River catchments. The Meander River provides salmon and trout spawning and nursery habitat for the wider River Moy system. The Meander River forms part of the River Moy Special Area of Conservation which is designated for the protection of Atlantic salmon, white-clawed crayfish and lamprey species. This catchment has been allocated good ecological status and this status must be protected to comply with the Water Framework Directive. - A construction and operational phase water quality and habitat monitoring programme must be put in place. The monitoring of all surface flows during construction is essential and remote sensing equipment should be considered as a normal precaution and extended into the post construction phase. - Adequately sized aquatic buffer zones must be established along all watercourses. IFI recommends a minimum width of 15 metres from a minor watercourse to low-risk parts of the construction site with larger buffer zones required for more sensitive habitats and higher risk operations e.g., 50m from a turbine. - Groundwater vulnerability ranges from moderate to extreme across the site. The location of turbines and main construction works must avoid high groundwater vulnerability areas. - Assessment of the impacts on the hydrology of the site must be carried out particularly where excavations including excavations for road construction are being proposed. The natural hydrology of the proposed site has been modified to facilitate the extraction of peat. It is	A WFD Compliance Assessment has been completed for the Proposed Project (Appendix 9-4). Mitigation measures for the protection of all downstream watercourses and designated sites are prescribed in Section 9.5. Water quality monitoring program is detailed in the CEMP. The design phase included detailed constraints mapping which applied 50m buffers to rivers and streams and 100m buffers to lakes. Groundwater vulnerability is discussed in Section 9.3.11. There will be no diversion of water

Consultee	Description	Addressed in Section
	important that watercourses/drains are not interrupted or diverted in such a manner as to give rise to erosion. The proposed site crosses two catchments, there must be no diversion of waters from one catchment into another.	from one catchment to another. The hydrological regime will be maintained and there will be no alteration of baseline runoff rates.
Health Service Executive (HSE)	› All drinking water sources both surface and groundwater, that maybe affected by this development, must be identified. › The Environmental Health Service recommends that a walkover 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. Any impacts on surface water as a result of the construction of the underground cables should be identified and addressed in the EIAR.	All surface and groundwater resources have been identified in Section 9.3 and the potential effects associated with the Proposed Project are detailed in Section 9.5.2.11. The assessment presented in this chapter is conservative and assumes that all dwellings have private groundwater well (Section 9.5.2.10).
Geological Survey of Ireland (GSI)	› Potential for impact on groundwater resources as the Wind Farm Site is underlain by a Regionally Important Karstified (conduit) Aquifer with areas of Extreme and High groundwater vulnerability.	All surface and groundwater resources have been identified in Section 9.3.15 and the potential effects associated with the Proposed Project are detailed in Section 9.5.2.11.
National Parks and Wildlife Service (NPWS)	› The potential for indirect hydrological impacts on both the areas of high bog, and cut over bog, within the application site should be addressed in the EIAR. The proposed turbine bases, roads, and borrow pit, are located in areas of cut-over adjoining areas of high bog. There is potential to cause drainage effects which can indirectly impact on the adjoining areas of both cut-over and high bog and the vegetation communities thereon. Excavations, associated pumping, and the breeching of any impermeable layer may cause changes to the	Refer to Section 9.5.2.17 for the assessment of potential impacts on the remnant areas of high bog and cutover bog capable of regenerating.

Consultee	Description	Addressed in Section
	hydraulic gradients within the site which may affect vegetation communities, including those of any Annex I bog habitats that may occur, on either the cut-over and high bog areas. The Department wishes to emphasise the importance of connecting any hydrological analysis of impacts undertaken in the Hydrology and Hydrogeology chapter of the EIAR with the potential effects, if any, on the vegetation communities within the application site, particularly if the Annex I habitats Active Raised Bog or Degraded Raised Bog still capable of natural regeneration are determined to be present	

9.1.4 Relevant Legislation

The EIAR 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. 477/2011: European Communities (Birds and Natural Habitats) Regulations (as amended), 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 (as amended);
- 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(as amended), (S.I. No. 722/2003);
- S.I. No. 122/2010: European Communities (Assessment and Management of Flood Risks) Regulations (as amended), resulting from EU Directive 2007/60/EC;
- S.I. No. 684/2007: Waste Water Discharge (Authorisation) Regulations (as amended), 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,

9.1.5 Relevant Guidance

The Water chapter of this EIAR 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;
- European Commission (2017): EIA Guidance – EIA Report;
- 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 Methodology

9.2.1 Desk Study

A desk study of the Site and the water study area was completed in the spring of 2023 to collect all relevant hydrological and hydrogeological data. This initial desk study was completed prior to undertaking site walkover surveys and site investigations. The desk study was checked and updated, where necessary, in January 2026.

The desk study included consultation with the following data sources:

- Environmental Protection Agency Databases (www.epa.ie);
- Environmental Protection Agency's Hydrotool Database (www.catchments,.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 "catchments.ie" Map Viewer (www.catchments.ie) and all relevant River Basin Management Plans (RBMPs);

- Bedrock Geology 1:100,000 Scale Map Series, Geological Survey of Ireland (GSI, 1999);
- Geological Survey of Ireland - Groundwater Body Characterisation Reports;
- Groundwater Karst Features Viewer (www.gsi.ie);
- OPW Flood Mapping (www.floodmaps.ie);
- GSI Groundwater Flood Mapping (www.gsi.ie); and,
- Aerial Photography, 1:5000 and 6" base mapping.

9.2.2 Baseline Monitoring and Site Investigations

HES completed site inspections, walkover surveys, drainage mapping, and baseline monitoring/sampling at the Site as part of this EIAR. These site investigations comprised of walkover surveys and drainage mapping completed by HES on 14th June 2023, 3rd October 2023, 4th October 2023 and 5th October 2023 and 14th and 15th August 2024. Surface water sampling and field hydrochemistry was completed on 5th June and 19th August 2025 in the watercourses draining the Site.

In addition to the site investigations completed by HES, several additional site investigations have been completed at the Site to further inform this EIAR. These site investigations included peat probing investigations completed by MKO in 2023 and 2025 and by Fehily Timoney (FT) in 2024. Ground Investigations Ireland (GII) also completed 2 no. phases of site investigations in 2023 and 2024 which comprised of the excavation of 28 no. trial pits and the drilling of 1 no. rotary core hole at the Site.

In summary, all site investigations to address the Hydrology and Hydrogeology chapter of the EIAR are as follows:

- Detailed walkover surveys and hydrological mapping of the Site and the surrounding area were undertaken whereby water flow directions and drainage patterns were recorded;
- A total of 262 no. peat probes have been completed at the Site;
- Logging of subsoil exposures across the Site where mineral soils and peat profiles are exposed;
- GII excavated a total of 19 no. trial pits at the Site in October 2023 under the supervision of HES;
- GII completed additional site investigations comprising 9 no. trial pits and 1 no. rotary core boreholes, on the 14th and 15th August 2024, under the supervision of HES;
- Field hydrochemistry measurements (electrical conductivity, pH, dissolved oxygen and temperature) and surface water flow measurements were taken to determine the origin and nature of surface water flows surrounding the Site during 2 no. monitoring rounds (9th June and 19th August 2025);
- A total of 8 no. surface water grab samples were taken to determine the baseline water quality of the primary surface waters originating from the Site during the 2 no. monitoring rounds (5th June and 19th August 2025); and,
- A groundwater sample was taken at a local well on 19th August 2025 to determine the baseline groundwater quality of the local area.

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 quality (i.e. negative, positive or neutral), significance, extent, context, probability, duration, frequency and reversibility. The descriptors used in this environmental impact assessment are those set out in the EPA (2022) Glossary of effects as shown in Section 1.6.2 of Chapter 1 of this EIAR.

In addition, the sensitivity of the water environment receptors was assessed on completion of the desk study and baseline study. Levels of importance which are defined in Table 9-2 and Table 9-3 for hydrogeology are used to assess the potential effect that the Proposed Project may have 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. 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.

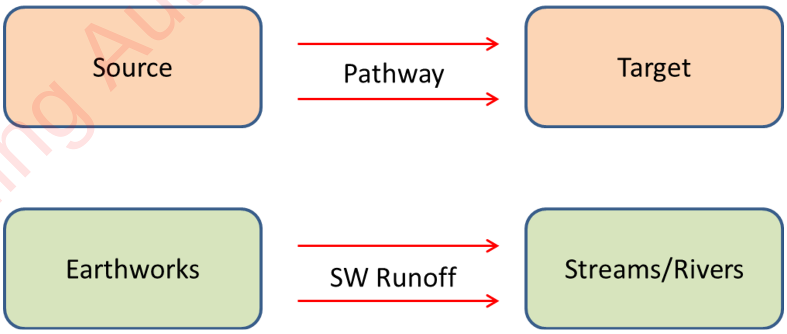
Table 9-3: Estimation of Importance of Hydrogeology Criteria (NRA, 2008)

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.

Importance	Criteria	Typical Example
Very High	Attribute has a high quality or value on a regional or national scale	Regionally Important Aquifer with multiple wellfields. 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 below, bottom as an example) as a result of the Proposed Project.



Where potential effects are identified, the classification of impacts in the assessment follows the descriptors provided in the Glossary of Impacts contained in the following guidance documents produced by the Environmental Protection Agency (EPA) (May 2022): *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports.*

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 EIAR. 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.

The description process clearly and consistently identifies the key aspects of any potential impact source, namely its character, magnitude, duration, likelihood and whether it is of a direct or indirect nature.

The assessment of effects is Step No. 6 of 7 in the EIAR process. In order to provide an understanding of the stepwise impact assessment process applied below (Section 9.5), a summary guide is presented below, which defines the steps (Steps 6a to 6g) taken in each element of the impact assessment process. The guide also provides definitions and descriptions of the assessment process and shows how the source-pathway-target model and the EPA, 2022 impact descriptors are combined.

Using this defined approach, this impact assessment process is then applied to all construction, operation and decommissioning activities which have the potential to generate a source of significant adverse impact on the hydrological and hydrogeological (including water quality) environments.

Table 9-4: Impact Assessment Process Steps

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

9.2.5 Limitations and Difficulties Encountered

No limitations or difficulties were encountered during the preparation of this chapter of the EIAR.

9.2.6 Study Area

The Water Study Area for the hydrological and hydrogeological impact assessment is defined by the regional surface water catchments and groundwater bodies within which the Site is located.

A regional hydrology map showing WFD surface water catchments and sub-catchments is included Figure 9-1. The relevant surface water catchments within which the Site is located are detailed in Section 9.3.3. In addition, the bedrock aquifers and groundwater bodies which underlie the Site are detailed in Section 9.3.9.

Any accommodation works completed along the TDR will be minor and the areas of proposed accommodation works are detailed in Chapter 4, Section 4.6.2. For the purposes of a conservative impact assessment, the potential effects of the TDR accommodation works on hydrology and hydrogeology are assessed in Section 9.5.2.14.

9.3 Receiving Environment

9.3.1 Site Description and Topography

The Site is located within a rural setting in south Co. Mayo, approximately 5.3 kilometres (km) to the northwest of the town of Claremorris. The town of Castlebar is located approximately 16 km north-west of the Site.

The Site comprises a mix of agricultural land, peat bogs and private forestry. The Site predominantly consists of cut peat bogs separated by elevated ridges comprising agricultural pastures. An area of inland marsh land is located to the east of the Site surrounding Drumady Lough that defines the south eastern boundary of the Site. Agricultural pastures dominate the wider environ with some smaller areas of coniferous forestry in the east and more pockets of peat land areas mapped to the south. Isolated dwellings and farm buildings reside along the numerous local roads in the vicinity of the Site.

The N60 National Road runs north-south approximately 2 km to the east. The R331 Regional Road runs northeast-southwest, approximately 5 km from the southern boundary of the Site. Existing access is via the local L15053 road to the south and the local L5536 road to the north. There are several existing forestry/ agricultural tracks within the Site.

Ground elevations within the Site are relatively flat and low-lying, ranging from approximately 60mOD (metres above Ordnance Datum) to 70mOD. The topography slopes very gently in an easterly direction towards Drumady Lough. In places topography has been modified through previous peat extraction activities and associated drainage.

9.3.2 Water Balance

Long term Annual Average Rainfall (AAR) and evaporation data was sourced from Met Éireann (www.met.ie).

The closest rainfall station to the Site is at Claremorris, located ~6.5km to the southeast of the Site. The long-term AAR at Claremorris station is ~1,143mm/year. The available date from Claremorris is presented in Table 9-5.

Met Éireann also provide a grid of AAR for the entire country for the period of 1991 to 2020. Based on these more site-specific modelled rainfall values, the AAR in the vicinity of the Site ranges from 1,292 to 1,298mm/year. The conservative AAR at the Site is taken to be 1,298mm/yr (this is considered to be the most accurate estimate of AAR from the available sources).

Table 9-5: Local Average long-term Rainfall Data (Claremorris) (mm)

Station: Claremorris (X-Coord: 134,500, Y-Coord: 273,900)												
Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec	Total
121	83	96	62	78	72	63	97	104	126	119	124	1,143
Location: Approx. Centre of Site (X-Coord: 129,000; Y-Coord: 278,000)												
Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec	Total
140	115	100	79	79	81	92	102	96	126	144	145	1,298

The closest synoptic[1] station where the average potential evaporation (PE) is recorded is also at Claremorris. The long-term average PE for this station is 407.5mm/year. This value is used as a best estimate of the PE at the Site. Actual Evaporation (AE) at the Site is estimated as 387mm/year (which is 0.95 × PE).

The effective rainfall (ER) represents the water available for runoff and groundwater recharge. The ER for the site is calculated as follows:

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

= 1,298 mm/year – 387mm/year

ER = 911mm/year

Groundwater recharge and runoff coefficient estimates are available from the GSI (www.gsi.ie). Within the Site groundwater recharge coefficients range from 4% to 60%. The areas of the Site with low groundwater recharge rates correspond with the areas mapped to be overlain by peat, whilst the areas mapped by the GSI as having higher recharge rates correspond with the areas mapped to be overlain by well drained mineral soils.

Based on site specific data, groundwater recharge rates are considered to be low (10%) across the majority of the Site due to the coverage of peat and the presence of a high density of surface water drainage features. Conservative annual recharge (10%) and runoff (90%) rates are estimated to be ~91mm/yr and 820mm/yr respectively. This means that the hydrology of much of the Site is characterised by high surface water runoff rates and relatively low groundwater recharge rates.

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 a 1.5˚C world, average winter and summer precipitation rates are projected to be 5.36mm/day and 3.10mm/day respectively in Co. Mayo. Meanwhile, in a 4˚C world, the average winter and summer precipitation rates in Co. Mayo are projected to be 6.08mm/day and 2.86mm/day respectively.

In addition to average rainfall data, extreme value rainfall depths are available from Met Éireann. A summary of various return periods and duration rainfall depths for the Site are presented in Table 9-6.

Table 9-6: Return Period Rainfall depths (mm) for the Site

	Return Period (Years)			
Storm Duration	1	5	30	100
5 mins	3.7	6.1	10.2	14.1
15 mins	6.0	10.0	16.8	23.2
30 mins	7.8	12.7	21.0	28.6
1 hour	10.2	16.3	26.3	35.4
6 hours	20.2	30.7	47	61.3
12 hours	26.4	39.2	58.9	75.8
24 hours	34.4	50.1	73.8	93.7

[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.

Return Period (Years)				
Storm Duration	1	5	30	100
2 days	43.7	60.6	84.9	104.5

9.3.3 Regional and Local Hydrology

Regionally, the Site lies at the boundary between 2 no. WFD surface water catchments. The north and south of the Site are mapped in the Moy and Killala Bay Catchment within Hydrometric Area 34. This catchment includes the area drained by the River Moy and all streams entering the tidal water in Killala Bay, between Benwee Head and Lenadoon Point, and has a total area of 2,345km^2 (EPA, 2024). Meanwhile, the centre of the Site is located in the Corrib Catchment within Hydrometric Area 30. This catchment includes the areas drained by the River Corrib and all stream entering the tidal water between Renmore Point and Nimmo's Pier, Galway. The Corrib Catchment has a total area of 3,112km^2. Both of these surface water catchments are located in the Western River Basin District.

Within the Corrib Catchment, the Site is mapped in the Robe River sub-catchment (Robe_SC_010) and the Robe_030 WFD river sub-basin. Within this river sub-basin there are no EPA mapped watercourses within the Site. The nearest EPA mapped watercourse to this area of the Site is a small 1st order stream which outfalls from the south of Drumady Lough. It is noted that Drumady Lough is not recognized as a lake waterbody in the Water Framework Directive (WFD) mapping available on www.catchments.ie (note that this may be due to its limited hydrological significance in terms of the wider catchment as features below a certain threshold are not always delineated as individual waterbodies by the WFD). Drumady Lough itself is located outside of the Site boundary, immediately to the east and 240m from the closest turbine (T4). Local 6" base maps identify 2 no. small streams to discharge into the northern section of Drumady Lough, one of which drains the area of the Site (refer to Figure 9-2). The stream which outfalls from the lake, flows to the south and discharges into the River Robe (EPA Code: 30R01) ~5.6km to the south of the Site. The River Robe flows to the southwest past Hollymount and Ballinrobe before it discharges into Lough Mask ~14.5km to the southwest of the Site.

Within the Moy and Killala Bay Catchment, the Site is mapped in the Castlebar River sub-catchment (Castlebar_SC_020) and 2 no. WFD river sub-basins. The south of the Site is mapped in the Meander_010 WFD river sub-basin whilst the north is mapped in the Tullymore (Mayo)_010 WFD river sub-basin. Within the Meander_010 WFD river sub-basin Lough Nambrackkeagh is situated directly to the south of the Site. Lough Nambrackkeagh is not recognized as a Lake waterbody by the WFD but is identified on local base maps. The Meander River (EPA Code: 34M05) outflows from Lough Nambrackkeagh, initially flowing to the south before veering to the northwest and discharging into the Manulla River (EPA Code: 34M01) ~5.5km to the northwest of the Site. A small section of the Meander River is located in the southeast of the Site, downstream of Lough Nambrackkeagh, approximately 372m southwest of T5. The Manulla River continues north and drains into the Castlebar River (EPA Code: 34C01) ~16.6km northwest of the Site. From this point the Castlebar River feeds into the Toormore and Clydagh Rivers respectively, meandering further north (~10km) to discharge into Lough Cullin.

The northern portion of the Site resides within the Tullymore (Mayo)_010 WFD river sub basin. Within this river sub-basin there are no EPA mapped watercourses within the Site. The Tullymore Stream is located ~5km northwest of the Site and flows to the north into the Little Strade River. Inspection of local base maps revel the presence of some hydrological features which drain this section of the Site and flow to the north and discharge into Lough Fark, located ~700m to the north of the Site.

A regional hydrology map showing the WFD catchments and sub-catchments is included as Figure 9-1. A local hydrology map for the Site, shown as Figure 9-2 below, presents the WFD river sub-basins.

Refer to Table 9-7 below for a summary of the hydrological setting of the Proposed Project infrastructure.

It is noted that the TDR works will require the extension of a culvert along an existing stream adjacent to the L1506. These works are proposed within the Robe River sub-catchment (Robe_SC_010) and the Robe_030 WFD river sub-basin. The proposed culvert extension is on a stream which does not form part of the EPA blueline database but was recorded during site walkover surveys of the TDR. This unmapped stream discharges into the Temp Stream (EPA Code: 30A92) which discharges into the River Robe ~3km to the south of the proposed works location.

Table 9-7: Key Proposed Project Infrastructure and WFD Setting

<table>
<tr><th>Proposed Project Infrastructure</th><th>Nearest Mapped Watercourse</th><th>WFD River Sub-Basin</th><th>WFD Sub-Catchment</th><th>WFD Catchment</th></tr>
<tr><td>T2, T3, T4, T5, T6, hardstands and access tracks peat and spoil management areas, woodland planting</td><td>Stream which drains into Drumady Lough

Drumady Lough is ~230m southeast of T4</td><td>Robe_030</td><td>Robe_SC _010</td><td>Corrib</td></tr>
<tr><td>Borrow Pit, T1, hardstands and access tracks, peat and spoil management areas, construction compound, Marsh Fritillary habitat enhancement areas</td><td>Meander River which outfalls from Lough Nambrackkeagh

Lough Nambrackkeagh is ~550m east of the proposed Borrow Pit</td><td>Meander _010</td><td rowspan="2">Castlebar_ SC_020</td><td rowspan="2">Moy and Killala Bay</td></tr>
<tr><td>Proposed Grid Connection infrastructure, met mast, T7, hardstands and access tracks, peat and spoil management areas, woodland planting</td><td>Drains which flow to the north towards Lough Fark

Lough Fark is ~740m northwest of the proposed northern end mast</td><td>Tullymore (Mayo)_010</td></tr>
<tr><td colspan="5">TDR Accommodation Works</td></tr>
<tr><td>Extension to an existing culvert along the TDR</td><td>Culvert is proposed along a stream adjacent to the L1506. This stream is not included on EPA mapping. This stream discharges into the Temp Stream.</td><td>Robe_030</td><td>Robe_SC _010</td><td>Corrib</td></tr>
</table>

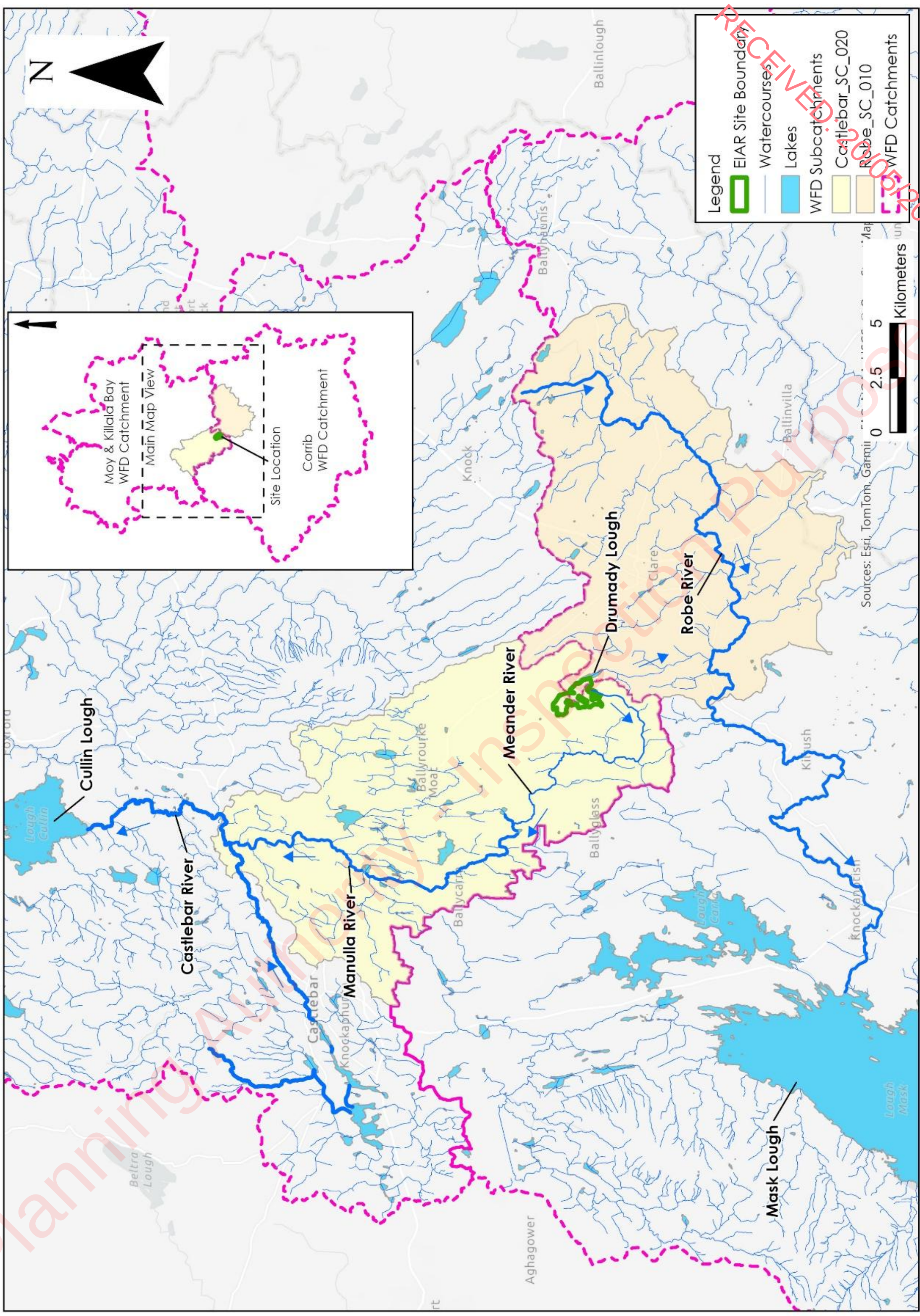


Figure 9-1: Regional Hydrology Map

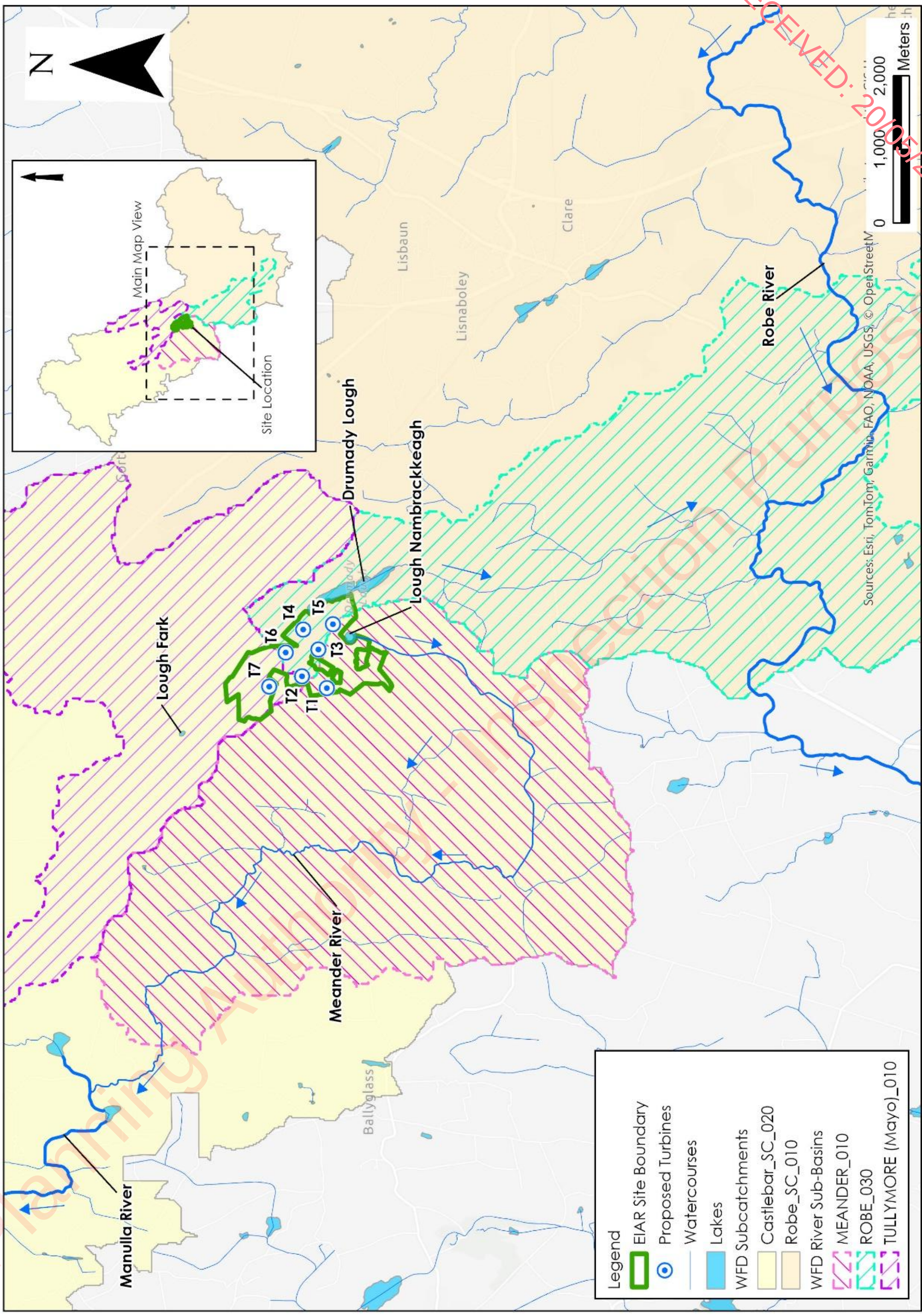


Figure 9-2: Local Hydrology Map

9.3.4 Surface Water Flows

There are no OPW gauging stations located in the immediate vicinity of the Site. The closest gauging station downstream of the Site in the Corrib Catchment for which continuous flow measurements are available is located on the River Robe at Foxhill (Station Code: 30005). Here the 95%ile flow is estimated to be 0.677m^3/s. This means that 95% of the time the flow in the River Robe at this location is equal to or exceed 0.677m^3/s (677l/s). This station is located ~10km southwest of the Site. Within the Moy and Killala Bay Catchment there are no OPW gauging stations on the Meander River. The closest gauging station for which flow data is available is located on the Manulla River at Gneeve Bridge, located ~12.8km to the northwest of the Site. The 95%ile flow at this station is 0.273m^3/s.

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 Site.

Figure 9-3 and Figure 9-4 below present the estimated flow duration curves for each of the consulted Hydrotool Nodes downstream of the Site in the Corrib and Moy and Killala Bay surface water catchments.

A 95%ile flow relates to the flow which will be exceeded within the river 95% of the time. For example, the 95%ile flow at Node 30_692, located on the stream which outfalls from Drumady Lough, is estimated to be 0.015m^3/s (15l/s). This indicates that 95% of the time, the flow at this location is estimated to be at or above 15l/s. The 95%ile flow on this stream immediately upstream of its confluence with the River Robe is estimated to be 0.03m^3/s. There is a significant increase in flow volumes in the River Robe, with the 95%ile flow downstream of this confluence estimated to be 0.234m^3/s. Further downstream, the 95%ile flow in the River Robe, upstream of the Mask Lake is estimated to be 0.796m^3/s (796l/s).

Within the Moy and Killala Bay Catchment, Hydrotool Nodes were consulted along the Meander, Manulla and Castlebar rivers. The closest EPA Node to the Site is located on the Meander River downstream of Lough Nambrackkeagh. The 95%ile flow at this location is estimated to be 0.014m^3/s. Flows increase progressively downstream due to the increasing catchment size of the respective water bodies.

The increasing flow volumes downstream of the Site decreases the potential of watercourses distant from the Site to be impacted by the Proposed Project. However, the Proposed Project does not in any way rely upon the dilution or assimilation capacity of any downstream watercourse. The mitigation measures prescribed in Section 9.5 ensure the protection of all watercourses downstream of the Site.

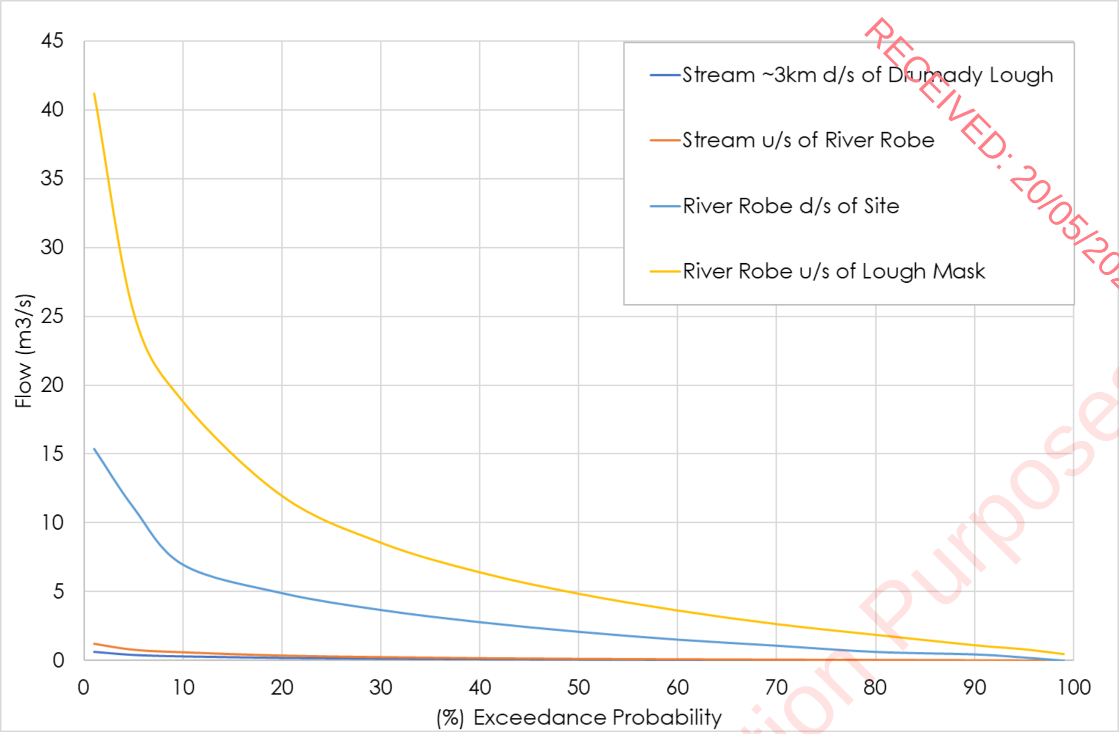


Figure 9-3: EPA Hydrotool Node Flow Duration Curve (Corrib WFD Catchment)

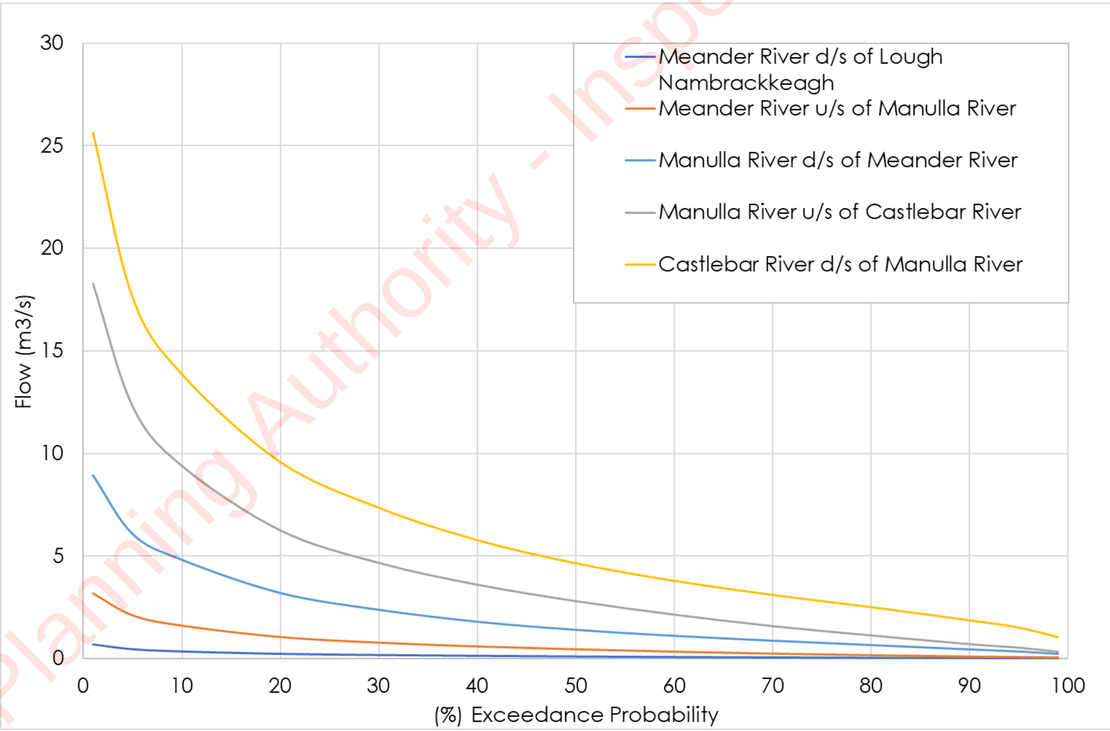


Figure 9-4: EPA Hydrotool Node Flow Duration Curve (Moy and Killala Bay WFD Catchment)

2 no. rounds of surface water flow monitoring were completed (2 rounds at 4 no. locations) on the main watercourses and drainage features within the Site (refer to Table 9-8). The measured flows depended on the nature of the waterbody being monitored. SW3 and SW4 were located on internal site drains with very low flows recorded. The greatest flows were recorded on the Meander River at SW2. The

surface water flow monitoring locations are the same as the surface water sampling locations shown on Figure 9-7.

Table 9-8: Surface Water Flow Monitoring

Location	Hydrological Feature	Flow (l/sec) 05/06/2025	Flow (l/sec) 19/08/2025
SW1	Unnamed Stream	~25	~20
SW2	Meander River	~20	~20
SW3	Internal Site Drain	~5	~3
SW4	Internal Site Drain	~4	~4

9.3.5 Site Drainage

As stated above, the central section of the Site drains towards Drumady Lough situated immediately to the southeast. A mixture of peat and agricultural drainage systems direct drainage towards this lake. A stream outfalls from this lake and flows to the south into the River Robe. The southern section of the Site drains towards the Meander River. This area is predominantly comprised of a peat drainage network that directs surface run off towards Lough Nambrackkeagh which is the source of the EPA mapped Meander River. The north of the Site is also drained by a network of manmade drainage features which direct water to the north towards Lough Fark.

An existing drainage map for the Site is shown as Figure 9-6. The drainage map was created using OSI mapped watercourses, aerial photography, field mapping and lidar data. Lidar data allows detailed mapping on the topographic contours of the Site, thereby identifying all the linear drainage features at the Site that are greater than 150m in length. Based on this assessment the main drainage pathways at the Site are shown and the connectivity (i.e., pathways and outlet points) of these drains with the downstream EPA mapped streams/rivers can be clearly illustrated.

In places the natural drainage is further facilitated by a network of manmade drains. The nature of these manmade drains depends on the local land use and comprise of agricultural field drains or forestry drains. Drains are also present in the peat areas where turbary cutting has been taking place.

The forestry plantations within the Site are generally drained by a network of mound drains which typically run perpendicular to the topographic contours of the Site 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 15m and 2m respectively. Interceptor drains are generally located up-gradient (cut-off drains) and down-gradient of forestry plantations. A schematic of a typical standard forestry drainage network and one which is representative of the Site drainage network is shown as Figure 9-5. 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.

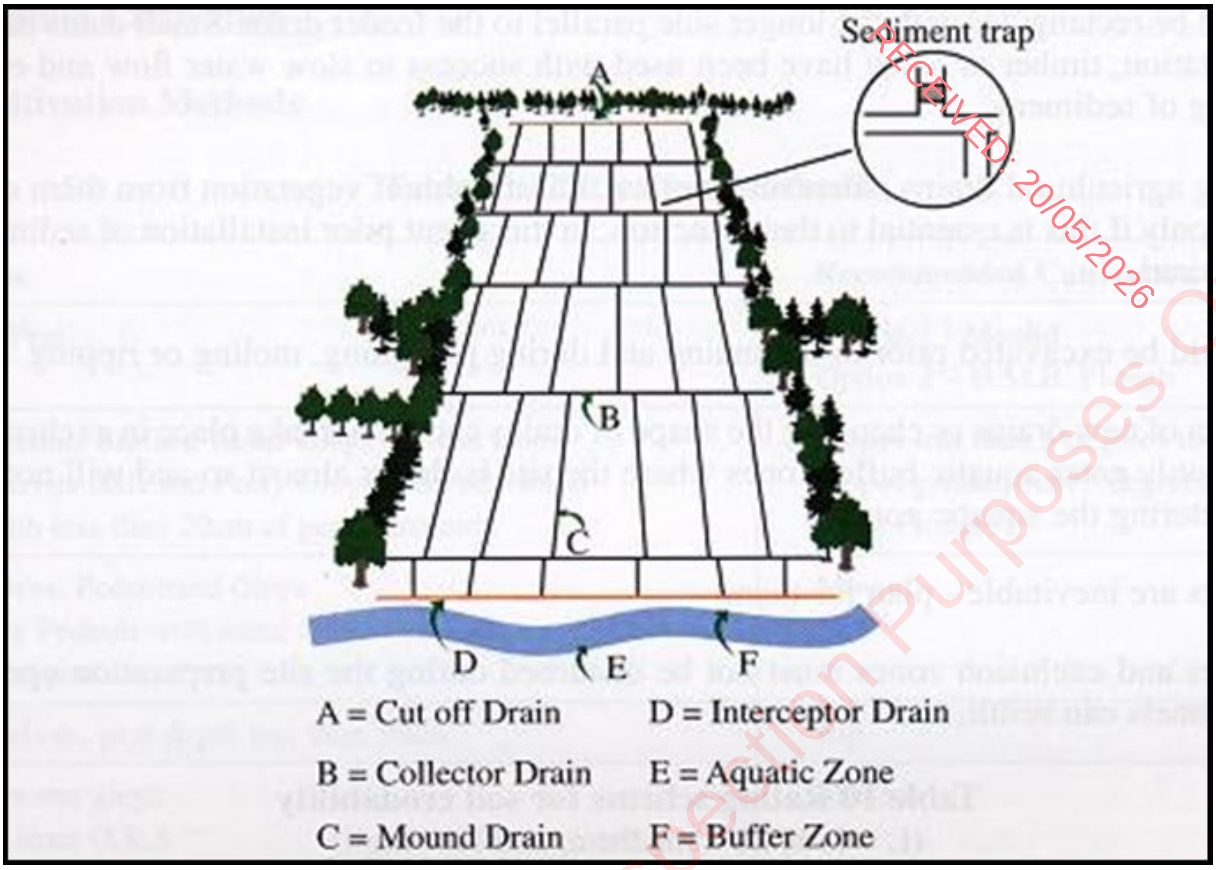


Figure 9-5: Schematic of Existing Forestry Drainage

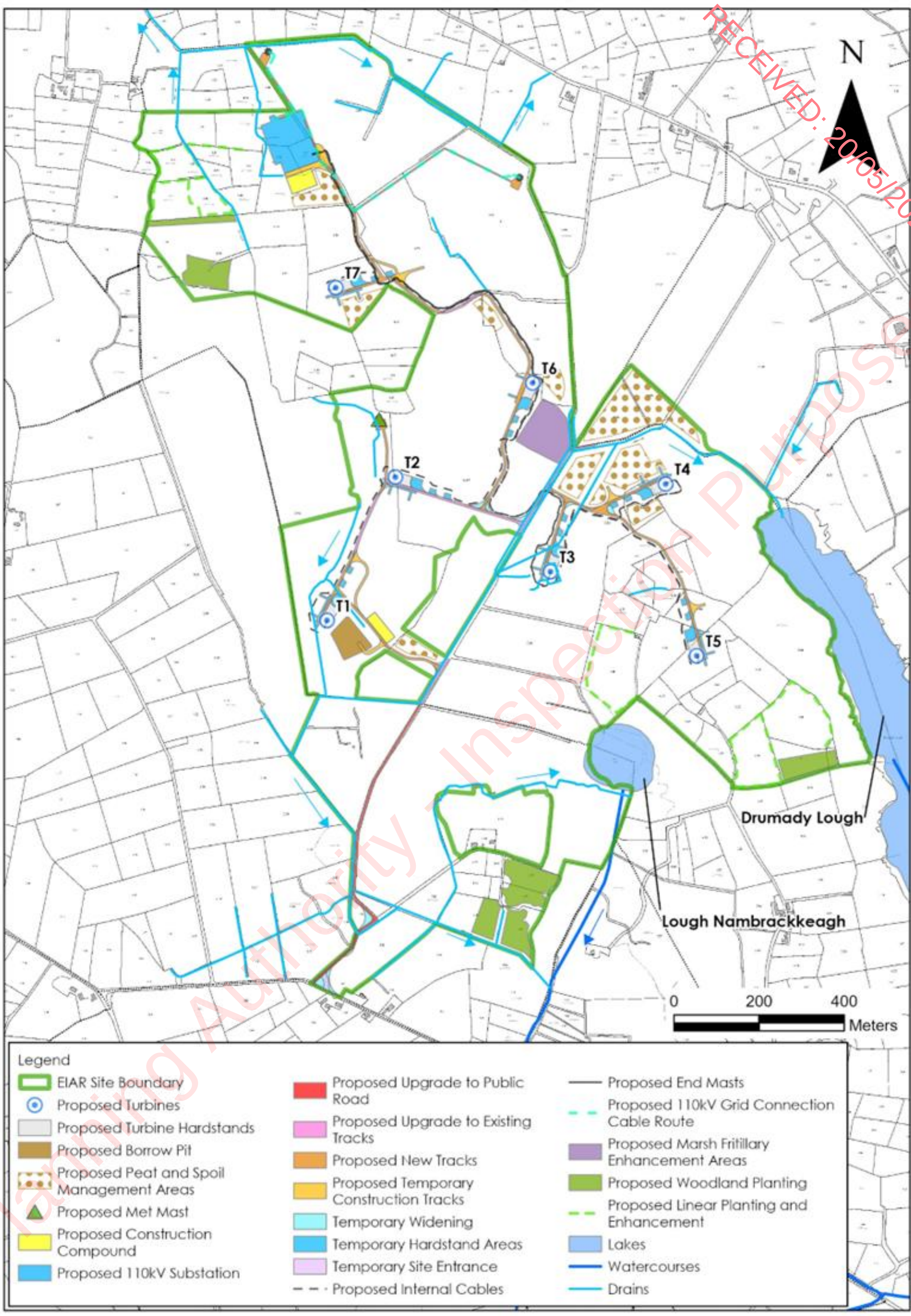


Figure 9-6: Site Drainage Map

9.3.6 Baseline Assessment of Site Runoff

This section undertakes a long-term water balance assessment and surface water runoff assessment for the baseline conditions at the Site.

The rainfall depths used in this water balance, are long term modelled averages taken from Met Eireann's grid of rainfall data for the country (refer to Table 9-5 above). Please note the long-term averages are not used in the design of the sustainable drainage system for the Proposed Project. The extreme rainfall depths shown in Table 9-4 above will be the basis of the Proposed Project drainage hydraulic design.

The water balance calculations are carried out for the month with the highest average recorded rainfall minus evapotranspiration, for the current baseline site conditions (Table 9-9). It represents, therefore, the long-term average wettest monthly scenario in terms of volumes of surface water runoff from the site pre-wind farm development. The surface water runoff co-efficient for the Site is estimated to be 90% based on the predominant peat coverage with some areas of well-draining mineral soils. Site walkover surveys support the conclusion that there are high rates of surface water runoff with a high density of surface water drainage features recorded throughout the Site.

The highest modelled AAR for the Site occurred in the month of December at 145mm. The average monthly evapotranspiration for the synoptic station at Claremorris in October was -1.4mm/yr. The water balance volumes presented in Table 9-9 and Table 9-10 indicates that a conservative estimate of surface water runoff for the Site during the highest rainfall month is 215,716m^3/month or 6,959m^3/day for the Site where runoff is at 90%.

Table 9-9: Water Balance and Baseline Runoff Estimates for Wettest Month (December)

Water Balance Component	Depth (m)
Estimated Average December Rainfall (R)	0.145
Average December Potential Evapotranspiration (PE)	0.000
(AE = PE x 0.95)	0.000
Effective Rainfall October (ER = R - AE)	0.145
Recharge (10% of ER)	0.0145
Runoff (90% of ER)	0.1305

Table 9-10: Baseline Runoff for the Site

Site Area (ha)	Baseline Runoff (90%) per Wettest month (m^3)	Baseline Runoff (96%) per day (m^3) in wettest month
165.3	215,716	6,959

9.3.7 Summary Flood Risk Assessment

This section is a summary of the Flood Risk Assessment (FRA) undertaken for the Proposed Project. The full FRA report is attached Appendix 9-1.

To identify those areas as being at risk of flooding, OPW's River Flood Extents Map, the National Indicative Fluvial Mapping, Past Flood Event Mapping (www.floodinfo.ie) and historical mapping (i.e. 6" and 25" base maps) were consulted.

Identifiable map text on local available historical 6" or 25" mapping for the area does not identify any lands that are "liable to flood" within the Site. The closest lands identified as liable to flooding are located along the southern boundary of Drumady Lough and to the south of Lough Fark. Lands ~1.3k to the west of the Site are also noted to be liable to flood.

The OPW National Flood Hazard Maps have no records of any recurring or historic flood incidences within the Site (www.floodinfo.ie). The closest mapped historic flood event is at Barnagreggaun (Flood ID: 4751) located ~2km northeast of the Site in a low-lying area, south of the N60. Another past flood event is mapped at Gowel Mayo (Flood ID: 655) located ~2km southwest of the Site.

The GSI's Winter 2015/2016 surface water flood map shows areas of fluvial and pluvial flooding during the Winter 2015/2016 flood event, which was the largest recorded flood event in many areas. This flood map does not record any mapped flood areas within the Site. Historic surface water flood zones are mapped in the immediate vicinity of Drumady Lough but do not extend any significant distance from the lake nor do the mapped flood zones encroach upon the Site. Flood zones are also mapped around Lough Fark, ~440m to the north of the Site.

Catchment- based Flood Risk Assessment and Management (CFRAM) mapping has not been completed for the area of the Site.

National Indicative Flood Mapping (NIFM) does not record any fluvial flood zones within the Site. The closest modelled fluvial flood zones are located along the Meander River to the west of the Site. These flood zones are ~1.6km west of the Site. NIFM fluvial flood zones are also mapped along the stream which outfalls from Drumady Lough. These flood zones are ~4km downstream of the Site.

Fluvial flood modelling has also been completed to consider future climate scenarios where the potential effects of climate change can increase rainfall. The NIFM Mid-Range Future Scenario models flood extents based on a 20% increase in rainfall. Similarly, the NIFM High-End Future Scenario models flood extents based on a 30% increase in rainfall. Both of these modelled flood extents show similar flood zones to the Present-Day Scenario discussed above. Therefore, flood zones at the Site are unlikely to be significantly impacted by future climate change.

There are no historic or predictive groundwater flood zones within the Site. The closest predictive groundwater flood zones are located ~1.4km to the west of the Site.

The Site is located ~39km inland and there is no risk of coastal flooding.

The Site is located in Flood Zone C (less than 0.1% annual probability of fluvial flooding) and is considered to be at low risk of flooding.

9.3.8 Surface Water Quality

9.3.8.1 EPA Biological Water Quality Monitoring

Biological Q-rating data for EPA monitoring points on the Meander and Robe rivers from 2022 to 2024 are shown in Table 9-11 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 0-1 (Poor) to 4-5 (Good/High).

Within the Corrib Catchment, the closest EPA monitoring station downstream of the Site is located on the River Robe at a bridge northeast of Hollybrook House. The River Robe achieved a Good Q-status at this station in 2024. Further downstream at Hollymount Bridge the River Robe was assigned a Moderate Q-status in 2024. The Q-status improved further downstream at Atkins Bridge to High Q-status.

Within the Moy and Killala Bay Catchment, the closest EPA monitoring station downstream of the Site for which recent data is available is located on the Meander River at a bridge northwest of Rathnacreeva. The Meander River achieved a High Q-status at this location in 2022. Further downstream the Manulla and Castlebar rivers achieved Good Q-status in recent monitoring rounds. Meanwhile, the Little Strade River downstream of the Site via the Tullymore (Mayo)_010 WFD river sub-basin achieved High Q-status in 2022 at a bridge northwest of Sraheens.

A map of local EPA monitoring stations is included as Figure 9-7.

Table 9-11: EPA Water Quality Monitoring Q-Rating Values

Watercourse	Location and Station ID	Year	Easting	Northing	EPA Q-Rating Status
Corrib Catchment					
River Robe	Br E of Hollybrook House (RS30R010310)	2024	128313	272068	4 (Good)
River Robe	Hollymount Bridge (RS30R010400)	2024	125978	268613	3-4 (Moderate)
River Robe	Akit Bridge (RS30R010600)	2024	119458	264943	4-5 (High)
Moy and Killala Bay Catchment					
Meander River	Br N.N.W. of Rathnacreeva (RS34M050400)	2022	123482	280086	4-5 (High)
Manulla River	Bridge at Ballycarra (RS34M010200)	2022	119965	284278	4 (Good)
Manulla River	Manulla Bridge (RS34M010300)	2022	121300	288600	4 (Good)
Manulla River	Bridge u/s Castlebar River (RS34M010500)	2022	121937	293360	4 (Good)
Castlebar River	Br 1 km W. of Ballyvary (RS34C010400)	2022	123360	294478	4 (Good)
Little (Strade) River	Bridge NW Sraheens (RS34L020300)	2022	127630	291066	4-5 (High)

9.3.8.2 HES Surface Water Quality Monitoring

Field hydrochemistry measurements of unstable parameters, electrical conductivity (µS/cm), pH (pH units) and temperature (°C) along with turbidity (NTU) were taken at 4 no. surface water sampling locations over 2 no. monitoring rounds completed on 5th June and 19th August 2025. The sampling on the 5th June was completed during a relatively dry period whilst the sampling on 19th August was preceded by heavy rainfall. The results of the field hydrochemistry are listed in Table 9-12 below. The monitoring locations are shown in Figure 9-7.

The surface water samples indicate a neutral to basic type surface water, with pH ranging from 7.03 to 8.09. Dissolved oxygen ranges from 4.9 to 10.4mg/l, with specific electrical conductivity ranging from 376 to 738µS/cm. Turbidity ranged from 1.29 to 7.45NTU.

Table 9-12: Field Parameters - Surface Water Chemistry Measurements (05/06/2025 and 19/08/2025)

Location ID	Temp °C	DO (mg/l)	SPC (µS/cm)	pH	Turbidity (NTU)
SW1	15.2 – 18.1	6.84 – 10.4	477 – 494	7.58 – 8.09	1.29 – 3.18
SW2	13.4 – 15.9	5.97 – 8.57	382 – 594	7.36 – 7.79	4.16 – 4.35
SW3	15.4 – 16.3	8.11 – 8.71	376 – 587	7.06 – 7.41	4.71 – 6.42
SW4	13.1 – 14.3	4.9 – 8.01	452 - 738	7.03 – 7.5	2.09 – 7.45

Surface water grab samples were also taken at these locations for laboratory analysis on 2 no. occasions (5th June and 19th August 2025l). Results of the laboratory analysis are shown alongside relevant water quality regulations in Table 9-11 below. The laboratory reports are attached as Appendix 9-2.

Suspended solid concentrations were below the limit of detection (5mg/l) of the laboratory in 5 of the 8 no. samples. All suspended solid concentrations were well below the S.I 293/1988 threshold limit of 25 mg/l in all samples.

Ammonia concentrations found to be of 'High' status with regards to the threshold of ≤0.04mg/l, as detailed in S.I. 272/2009, during both sampling rounds at SW1 and SW4. Ammonia concentrations exceeded this 'Good' status threshold at SW2 and SW3.

Biological Oxygen Demand (BOD) concentrations exceeded the 'Good' status threshold of ≤1.5mg/l (S.I. 272/2009) in all samples taken.

Ortho-phosphate concentrations were below the limit of detection of the laboratory (0.02mg/l) in 7 of the 8 no. samples. These samples achieved 'High' status with regard to ortho-phosphate concentrations (≤0.025mg/l). There was one exceedance at SW2.

Nitrate concentrations were below the limit of detection of the laboratory in all samples. Chloride concentrations ranged from 16.3 to 19.7mg/l.

The high concentrations of ammonia and BOD recorded in the samples may be due to agricultural runoff and/or the drainage of the peatlands and the subsequent oxygenation of the organic matter.

Table 9-13: Summary Laboratory Surface Water Quality Data (05/06/2025 and 19/08/2025)

Location ID	Suspended Solids (mg/l)	BOD_5 (mg/l)	Orthophosphate (mg/l)	Nitrate (mg/l NO_3)	Ammonia (mg/l)	Chloride (mg/l)
EQS	≤25([2])	≤ 1.3 to ≤ 1.5([3])	-≤ 0.035 to ≤0.025([2])	-	-≤0.065 to ≤ 0.04([2])	-
SW1	<5	<2 - 2	<0.02	<5	<0.02 – 0.02	18.0 - 18.1
SW2	<5	3 - <5	0.02 - 0.07	<5	0.08 - 2.22	16.6 – 19.7
SW3	<5 - 6	3 - <5	<0.02	<5	2.13 - 2.23	16.3 - 16.6
SW4	8 - <13	2 - <5	<0.02	<5	0.02 – 0.03	17.4 - 19.3

(+) S.I. No. 293/1988: European Communities (Quality of Salmonid Waters) Regulations, 1988.
(*) S.I. No. 272/2009: European Communities Environmental Objectives (Surface Waters) Regulations 2009.

[2] *S.I. No. 293/1988: European Communities (Quality of Salmonid Waters) Regulations*
[3] *S.I. No. 272/2009: European Communities Environmental Objectives (Surface Waters) Regulations 2009 (as amended by S.I. No. 296/2009; S.I. No. 386/2015; S.I. No. 327/2012; and S.I. No. 77/2019 and giving effect to Directive 2008/105/EC on environmental quality standards in the field of water policy and Directive 2000/60/EC establishing a framework for Community action in the field of water policy).*

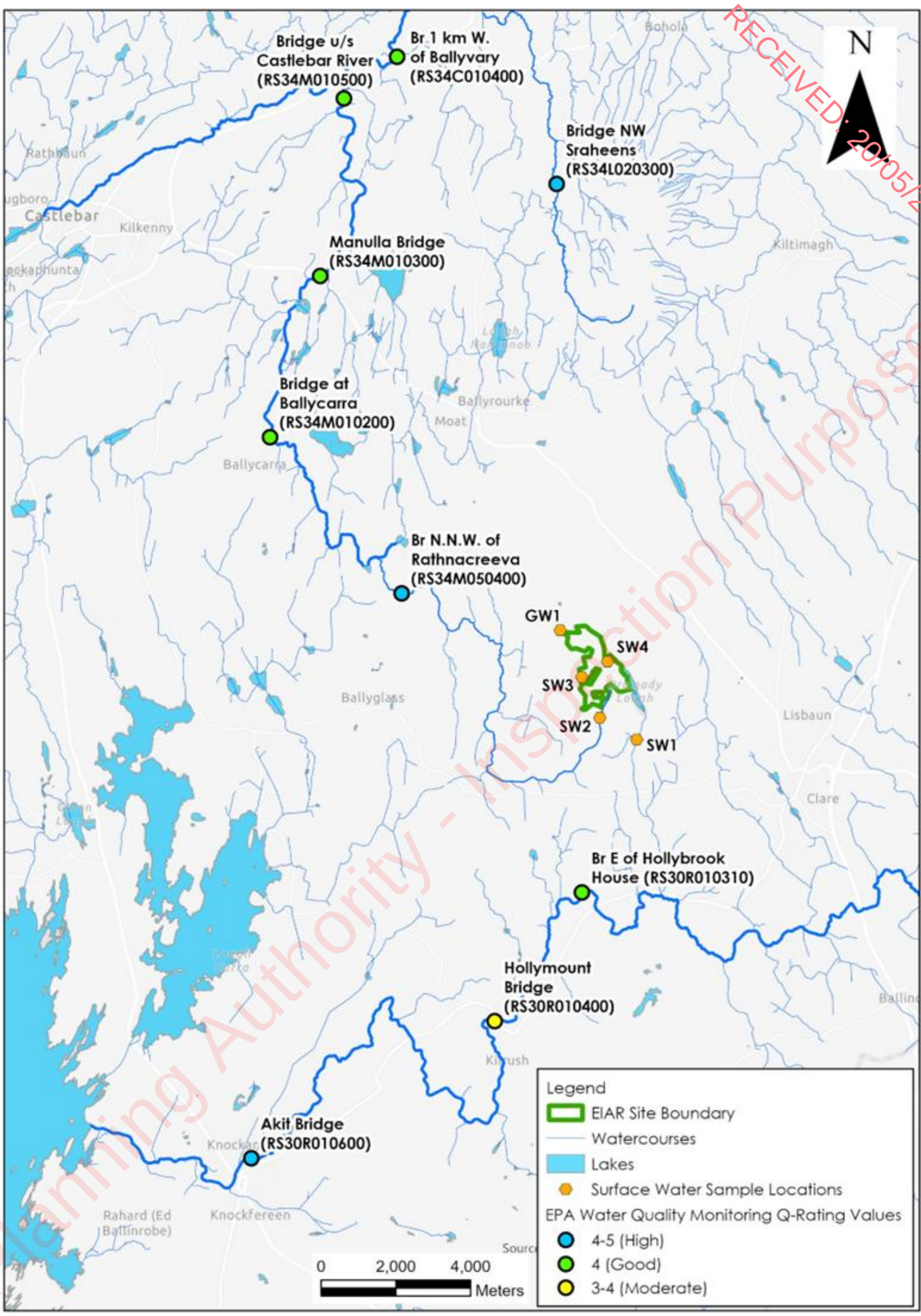


Figure 9-7: EPA Monitoring Stations and HES Sampling Locations

9.3.9 Hydrogeology

9.3.9.1 Regional Hydrogeology

The GSI map the Site to be underlain by the Dinantian Pure Bedded Limestones (www.gsi.ie). These rocks are classified by the GSI as a Regionally Important Aquifer - Karstified (conduit). Please refer to Chapter 8 for a detailed description of the bedrock geological formations mapped to underlie the Site. A bedrock aquifer map is shown as Figure 9-8.

The Site is mapped to be underlain by 2 no. Groundwater Bodies (GWBs). The north and south of the Site are underlain by the Swinford GWB (IE_WE_G_0033) whilst the central section of the Site is underlain by the Cong Robe GWB (IE_WE_G_0019). The boundaries of these GWBs in the area of the Site is the same as the boundaries of the regional surface water catchments.

The GSI's Initial Characterisation Report for the Cong-Robe GWB (GSI, 2004) states that this GWB occupies the area between Claremorris and Cong. The area is principally drained by the River Robe and its tributaries, however the present-day drainage network has been changed significantly by arterial drainage that took place early in the nineteenth century. Much of the current stream network is a storm runoff system and is inactive during summer months. Prior to artificial drainage, streams sank underground via turlough sinks. Within the GWB, a surface water catchment has been shown to be bypassed by groundwater flowing beneath surface water channels and across surface water catchment divides. Tracer tests have shown that flow lines exist that do not relate to the expected flow lines inferred from water table maps. A large number of karst features are present, particularly in the southwestern part of the GWB. In the area of Hollymount, turloughs are particularly prevalent. The GWB is composed primarily of karstified limestone (Rkc). Transmissivity is variable while storativity is low. Groundwater flows through a network of solutionally enlarged bedding planes, fissures and conduits. Recharge occurs via losing streams, point and diffuse mechanisms. Despite the presence of peat and till, point recharge to the underlying aquifer occurs by means of swallow holes and collapse features/dolines. Most of the groundwater flow occurs in the upper epikarstic layer and in a zone of interconnected solutionally enlarge bedding planes and fissures, generally extending to a depth of 50 m below ground. In general, the degree of interconnection in karstic systems is high and they support regional scale flow systems. The main discharges are to the rivers, large springs, Lough Mask and Lough Corrib. In winter, groundwater discharges to the many turloughs and transmitted via the artificial channels that were installed to alleviate flooding. There is a high degree of interaction between surface water and groundwater. There are a number of terrestrial ecosystems which have varying dependence on groundwater (GSI, 2004).

The GSI's Initial Characterisation Report for the Swinford GWB (GSI, 2004) states that this GWB occupies an area stretching from Knock to Castlebar to Swinford. The aquifer is a Regionally important karstified aquifer (Rkc). Several karst features are recorded, and these include turloughs, caves and swallow holes but this is thought to only represent a fraction of the existing karst features. Transmissivities are expected to variable, ranging from 1 to greater than 2000 m^2/d while storativity is in the range of 1-2%. Most groundwater flux is likely to be in the upper part of the aquifer. The presence of blanket peat/cutover peat is unexpected over the karstified limestone. It may be due to the presence of low permeability till. The groundwater is unconfined but may become locally confined beneath thick, low permeability subsoil. Recharge occurs via point and diffuse mechanisms. Despite the presence of peat and till, point recharge to the underlying aquifer occurs by means of swallow holes and enclosed depressions. The main discharges are to the small springs, streams, rivers and lakes. The stream density is relatively high, probably due to the subsoils overlying the GWB (GSI, 2004).

9.3.9.2 Site Hydrogeology

The hydrogeological regime at the Site has been characterised by detailed walkover surveys, drainage mapping, peat probing (262 no.), trial pit excavations (28 no.) and the drilling of 1 no. borehole. The site investigations are presented in detail in Chapter 8 and are summarised here for completeness:

- The Site is typically overlain by peat and mineral soils with small occurrences of made ground.
- Where present the peat depth is relatively shallow, with an average depth of 1.2m and 91% of peat probes encountering peat depths less than 1. A small number of localised readings recorded peat depths between 3.5 and 6.1m.
- The peat, and where peat is absent the mineral topsoil, was typically found to be underlain by slightly sandy, gravelly clays and silts.
- These cohesive subsoils were found to be underlain by granular subsoils comprising of clayey, sandy, subangular to subrounded, fine to coarse gravel with cobbles and boulders or locally, a clayey, gravelly, fine to coarse sand.
- Laboratory PSD analysis of recovered soil samples showed that many of the soil samples had a high percentage component of fines (clays and silts).
- Shallow groundwater was encountered in 15 of the 28no. trial pits excavated at the Site at depths of 0.6 to 3.2mbgl. 10 of these were described on the logs as medium ingresses of groundwater, with 2 no. fast inflows recorded and 3 no. slow/minor seepages of groundwater.
- No bedrock was encountered in any of the trial pit excavations which extended to depths of 3.3mbgl.
- Bedrock was encountered at a depth of 10.6mbgl at the location of the proposed borrow pit. The bedrock was described as medium strong to strong, thinly to thickly bedded, light grey, fine grained limestone with clay infill. The rock was noted to be slightly to moderately weathered.

The site investigations indicate that the Site is underlain predominantly by peat and low permeability till deposits. These deposits protect the underlying regional bedrock groundwater system, preventing significant rates of groundwater recharge within the Site. This is supported by observations made during the site walkover surveys whereby a high density of surface water drainage features were recorded on site. Furthermore, no karst features were recorded during walkover surveys, and no significant karst was encountered in the borehole at the proposed borrow pit location.

Therefore, the hydrogeological regime at the Site is characterised by high rates of surface water runoff and low rates of groundwater recharge.

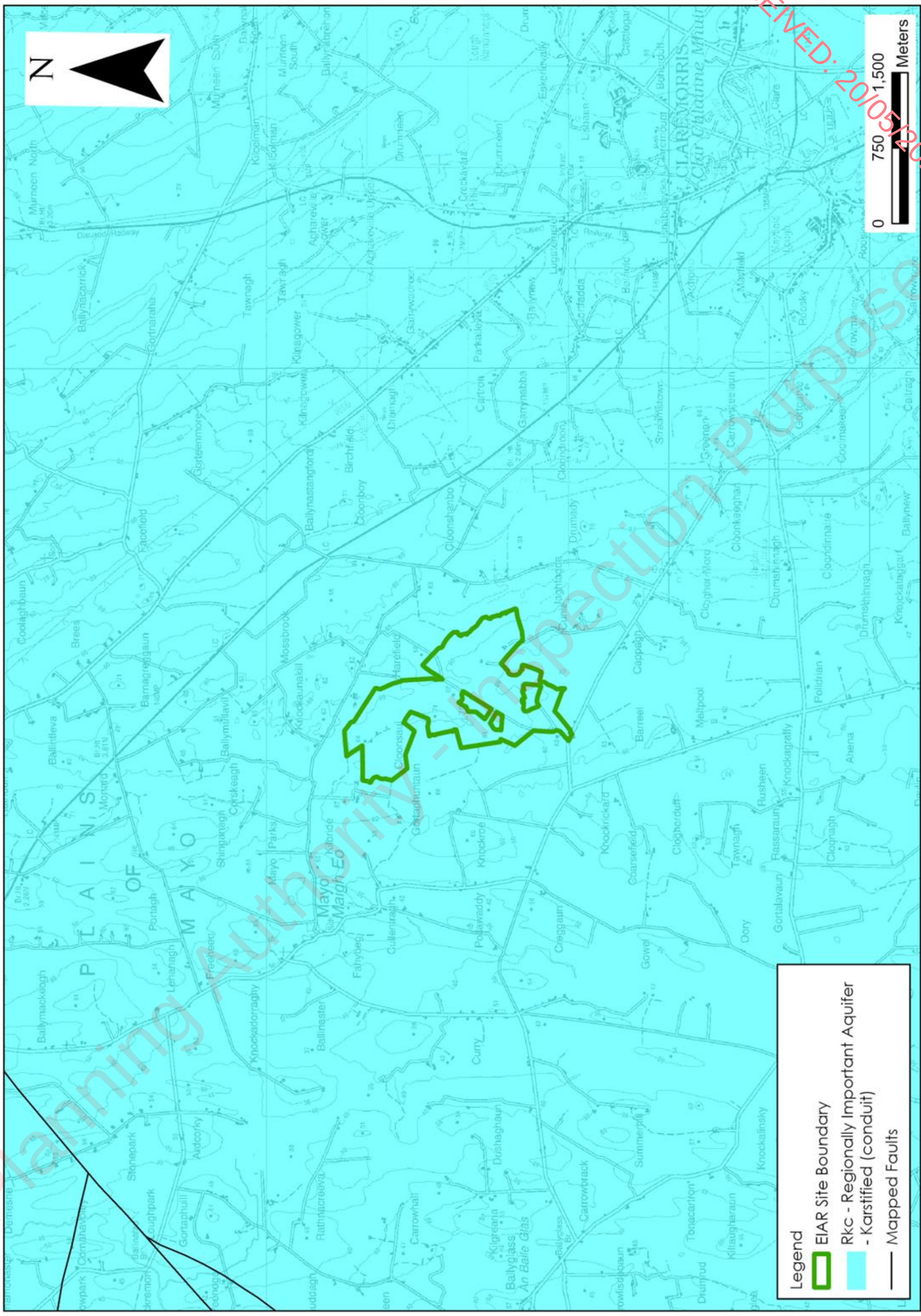


Figure 9-8: Bedrock Aquifer Map

9.3.10 Karst Features

According to the GSI Groundwater Resources mapping (www.gsi.ie) the bedrock underlying the Site is a Regionally Important Aquifer – Karstified (conduit).

However, the GSI karst features database (www.gsi.ie) does not record the presence of any karst features within the Site. The closest mapped karst features are a turlough and 2 no. swallow holes mapped ~2.5km southwest of T2. Although the GSI have recorded numerous karstic features in the wider area. Large clusters of enclosed depressions are mapped approximately 1km to the north, approximately 2.7km to the east and approximately 4.2km west of the Site. Other than enclosed depressions, which seem to be the dominant karst feature in this area, a turlough is situated approximately 3.8km northwest of the Site and a borehole with karst is mapped approximately 2.7km to the west.

No karst features were recorded during the walkover surveys of the Site or during the intrusive site investigations.

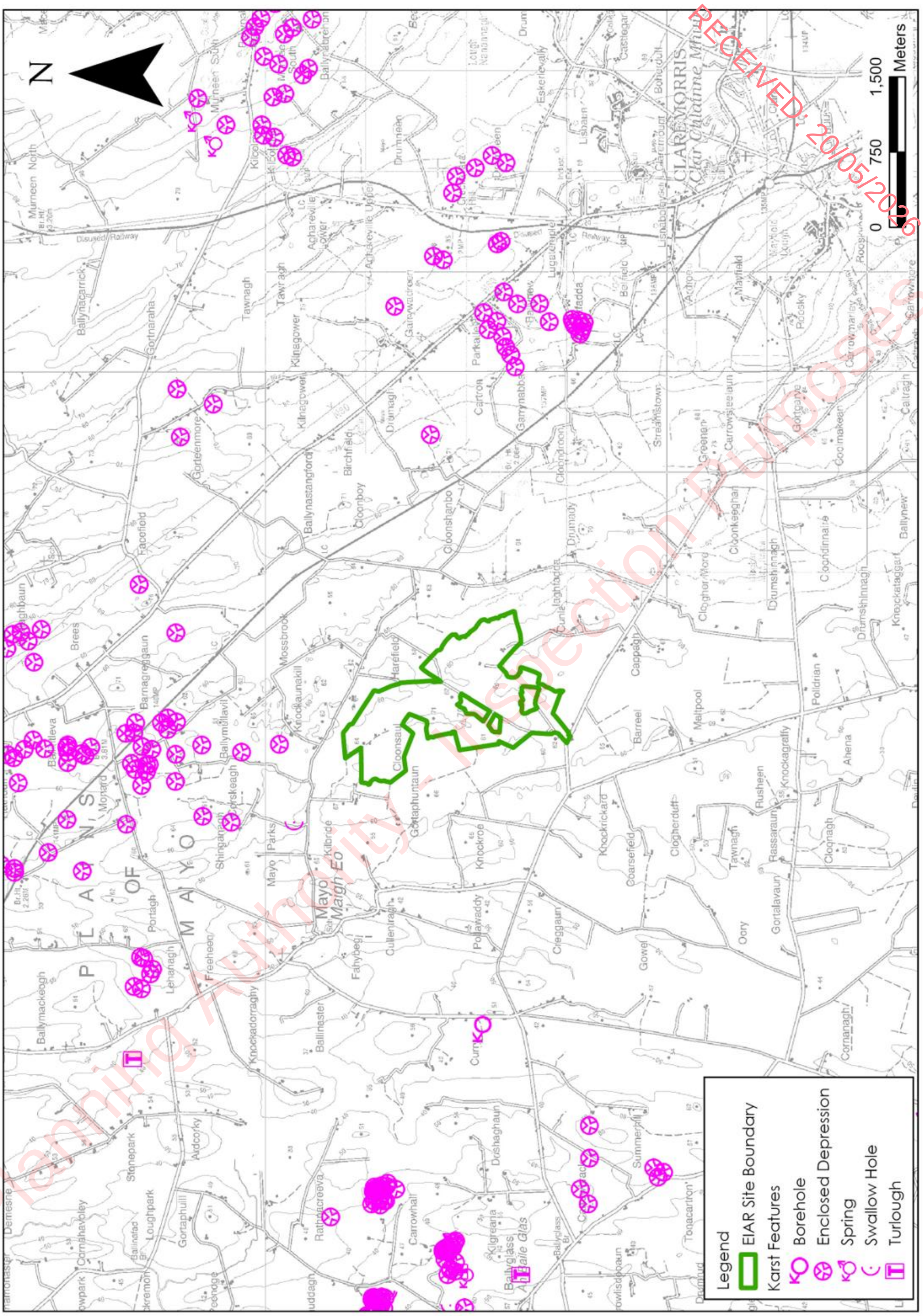


Figure 9-9: Local Karst Features

9.3.11 Groundwater Vulnerability

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 GSI mapped vulnerability rating of the bedrock aquifer at the majority of the Site ranges between “Moderate” to “High” with a small portion mapped as “Low”. This reflects the variable soils/subsoils across the Site with the area of peat having low to moderate groundwater vulnerability. The areas of mineral soils have moderate to high groundwater vulnerability.

Meanwhile, a small area of ‘Extreme’ vulnerability is mapped at the location of the proposed borrow pit. This corresponds with the GSI mapped occurrence of a small area of karstified bedrock outcrop or subcrop in this area. It is important to note that site investigations have revealed the depth to rock as being 10.6mbgl in this area, with the limestone bedrock overlain by a thickness of gravels, clays and sands.

The site investigations and walkover surveys indicate that there are low groundwater recharge rates at the Site, with the local soils/subsoils providing protection to the underlying regional groundwater system. Therefore, surface water bodies such as drains and streams/rivers are more vulnerable (to contamination from human activities) than groundwater across much of the Site, although localised areas may have higher rates of groundwater recharge.

Table 9-14: Groundwater Vulnerability and Subsoil Permeability and Thickness (Groundwater Protection Schemes Report, 1999)

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.

9.3.12 Groundwater Hydrochemistry

The GSI’s Characterisation Report for the Cong Robe GWB (GSI, 2004) states that the groundwater will have a calcium bicarbonate (CaHCO3) signature. The report presents data from the Lissatava Group Water Scheme (GWS) (spring) and the Ballindine Public Water Supply (PWS) (spring) and this data is summarised in Table 9-15.

Table 9-15: Hydrochemistry Data for the Cong-Robe GWB (GSI, 2004)

Parameter	Lissatava GWS (n=13)		Ballindine PWS (n=15)	
	Range	Median	Range	Median
Alkalinity (mg/l as $CaCO_3$)	106 – 416	340	100 – 380	332

Total Hardness (mg/l)	122 – 452	376 (very hard)	126 – 400	368
Conductivity (µS/cm)	612 – 822	730	640 – 752	724

The GSI's Characterisation Report for the Swinford GWB (GSI, 2004) states that the groundwater will have a calcium bicarbonate (CaHCO3) signature. The report presents data from the Swinford PWS and the Ballyvary PWS and this data is summarised in Table 9-16. Alkalinity, electrical conductivity and hardness are high.

Table 9-16: Hydrochemistry Data for the Swinford GWB (GSI, 2004)

Parameter	Swinford (n=12)		Ballyvary (n=14)	
	Range	Median	Range	Median
Alkalinity (mg/l $CaCO_3$)	130 – 256	173	112 – 376	336
Total Hardness (mg/l $CaCO_3$)	142 – 272	204	122 – 444	356
Conductivity (µS/cm)	311 – 532	424	456 – 768	716

Groundwater sampling was completed at a local groundwater well on 19th August 2025. The well (GW1) is shown on Figure 9-7 above and is located ~450m west of the proposed onsite 110kV substation and is mapped within the Swinford GWB. GW1is located in close proximity to the Site, and downgradient from the substation. Mapping from the GSI (www.gsi.ie) indicates that the entire Site is underlain by a Regionally Important Karst Aquifer. However, no karst features have been recorded at the Site and there is no shallow bedrock. Site investigations have shown that the bedrock is overlain by a substantial thickness of overburden. No bedrock was encountered in any of the trial pit excavations and bedrock was encountered at a depth of 10.6mbgl at the proposed borrow pit locations (full details on the geological profile of the Site are provided in Chapter 8). The presence of peat and low permeability soils/subsoils have created a low groundwater vulnerability environment at the Site. The local peat/soils/subsoils at the Site protect the underlying groundwater system. The local hydrogeological regime is characterised by low rates of groundwater recharge and high rates of surface water runoff, evidenced by the high density of surface water features (drains and lakes) in the local area. In addition, the proposed works are shallow and localised, with limited potential to interact with the underlying regional groundwater system. Given the geological setting of the Site and the separation distance from receptors (i.e. private groundwater wells), GW1 is considered to provide an adequate representation of the baseline groundwater conditions in the local area. Groundwater is not a primary sensitive receptor and the potential for effects will be low. Additional monitoring at other well locations was not considered to be necessary. Nevertheless, the impact assessment presented in Section 9.5.2.10 is conservative and assumes that all local dwellings have a groundwater well supply.

The field chemistry data for GW1, taken with a calibrated YSI ProDSS, are presented in Table 9-17.

Table 9-17: Summary of field chemistry from GW1

Location	Date	Temp (˚C)	DO (mg/L)	EC (µS/cm)	pH [H+]
GW1	19/08/2025	16.3	9.48	342	7.47

The laboratory data of the samples recovered from GW01 indicates that the water is typically of an acceptable chemical quality relative to the Groundwater Regulations (S.I 9 of 2010). Ammonia, nitrite and nitrate were below the limit of detection of the laboratory. Ortho-phosphate concentrations (0.02mg/l) were below the EQS threshold outlined in the Groundwater Regulations. No hydrocarbons were recorded in the sample. No elevated concentrations of heavy metals were recorded. Summary results are presented in Table 9-18 whilst the full laboratory reports are included in Appendix 9-3.

Table 9-18: Groundwater Sampling Laboratory Results (19/08/2025)

Parameter	EQS	Sample ID
		GW1
Ammonia (mg/l as N)		<0.01
Nitrite – N (mg/l)	0.5*/0.1^{+}	<0.01
Ortho-phosphate (mg/l)	0.035*	0.02
Nitrate – NO_3 (mg/l)	37.5^{+}	<4.4
Chloride (mg/l)	24*/250^{+}	20.8
BOD (mg/l)		1.1
Iron (µg/L)	200*$^{+}$	<5
Magnesium (mg/L)	50*	3.05
Manganese (mg/L)	50*$^{+}$	<0.001
TDS (mg/L)	-	205
Sulphate (mg/L)	187.5*/250^{+}	44.2
TPH (C6-C40)		<0.1

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

9.3.13 Water Framework Directive Water Body Status & Objectives

The River Basin Management Plan was adopted in 2018 and has amalgamated all previous river basin districts into one national river basin management district. The Water Action Plan 2024 is Ireland's third River Basin Management Plan, and it outlines the measures the Government and other sectors are taking to improve water quality in Ireland's groundwater, rivers, lakes, estuarine and coastal waters, and provides sustainable management of our water resources. The Water Action Plan 2024 enhances and builds upon the work of the first and second-cycle plans. The Water Action Plan objectives, which have been integrated into the design of the Proposed Project, include the following:

- Ensure full compliance with relevant EU legislation
- Prevent deterioration.
- Meet the water standards and objectives for designated protected areas.
- Protect high-status waters.
- Implement targeted actions and pilot schemes in focus sub-catchments aimed at (i) targeting water bodies close to meeting their objective and (ii) addressing more complex issues that will build knowledge for future cycles.

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.

Strict mitigation measures (refer to Section 9.5.2) in relation to maintaining a high quality of surface water runoff from the development and groundwater protection will ensure that the status of both surface water and groundwater bodies in the vicinity of the Site will be at least maintained (see below for WFD water body status and objectives) regardless of their existing status.

9.3.13.1 Groundwater Body Status

Local Groundwater Body (GWB) status information is available from www.catchments.ie and the available information is summarised in Table 9-19.

The Swinford and Cong Robe GWBs achieved 'Good' status in the 3 no. most recent WFD cycles. The Swinford GWB is 'not at risk' whilst the Cong Robe GWB is deemed to be 'at risk' of failing to meet its WFD objectives. This GWB is under significant pressure from anthropogenic and agricultural activities.

Table 9-19: Summary WFD Groundwater Body Information

Groundwater Body	Status 2013-2018	Status 2016-2021	Status 2019-2024	3rd Cycle Risk Status	WFD Pressures
Swinford	Good	Good	Good	Not at risk	None
Cong-Robe	Good	Good	Good	At risk	Anthropogenic and agriculture

9.3.13.2 Surface Water Body Status

A summary of the WFD status and risk result for Surface Water Bodies (SWBs) downstream of the Site are shown in Table 9-20. The overall status is based on the ecological, chemical and quantitative status of each SWB.

Within the Moy and Killala Bay Catchment, the Meander_010 SWB achieved a 'High' status in the latest WFD cycle (2019-2024). This was an improvement on the 'Good' status which this SWB achieved previously. Further downstream the Manulla River (Manulla_020, _030 and _040 SWBs) achieved 'Good' status. The Castlebar_030 SWB is also of 'Good' status. The Tullymore (Mayo)_010 SWB achieved 'High' status in the latest 2 no. WFD cycles while the Manulla_010 SWB is of 'Poor status'. The risk status of these SWBs is generally not at risk or under review. However, the Manulla_010. Manulla_030 and Castlebar_030 SWBs are at risk of failing to meet their respective WFD objectives.

Within the Corrib Catchment, the Robe_030 SWB in the vicinity of the Site achieved 'Good' status in the latest WFD cycle. Further downstream the Robe_040 and Robe_050 SWBs achieved 'Moderate' and 'Poor' status respectively. The Robe_060 SWB and Lough Mask both achieved 'Good' status. In terms of risk status, the Robe_050, Robe_060 and Lough Mask are listed as being at risk. The significant pressures that have been identified are listed in Table 9-20.

A detailed WFD Compliance Assessment is provided in Appendix 9-4. Section 3 of Appendix 9-4 presents a WFD screening assessment and identifies those SWBs which are carried through into the WFD Compliance Assessment. The SWBs included in the WFD Compliance Assessment include the Meander_010, Manulla_020, Manulla_030, Tullymore(Mayo)_010 and Manulla_010 SWBs in the Moy and Killala Bay Catchment and the Robe_030, Robe_040 and Robe_050 SWBs in the Corrib Catchment. The reasoning for the inclusion of these SWBs, and the omission of other SWBs, is detailed in Table E of Appendix 9-4.

Table 9-20: Summary WFD Surface Waterbody Information

SWB	Overall Status 2013-2018	Overall Status 2016-2021	Overall Status 2019-2024	Risk Status 3rd Cycle	Pressures
Moy & Killala Catchment					
Meander_010	Good	Good	High	Not at risk	None
Manulla_020	Good	Moderate	Good	Review	None
Manulla_030	Poor	Moderate	Good	At risk	Hydromorphology & industry
Manulla_040	Moderate	Good	Good	Not at risk	None
Castlebar_030	Moderate	Moderate	Good	At risk	Hydromorphology
Castlebar_040	Good	Good	Good	Not at risk	None
Lough Cullin	Moderate	Moderate	Moderate	At risk	Agriculture & invasive species
Tullymore (Mayo)_010	Poor	High	High	Review	None
Manulla_010	Poor	Poor	Poor	At risk	Agriculture
Corrib Catchment					
Robe_030	Moderate	Good	Good	Not at risk	None
Robe_040	Moderate	Good	Moderate	Review	None
Robe_050	Moderate	Moderate	Poor	At risk	Hydromorphology
Robe_060	Good	Moderate	Good	At risk	Agriculture
Lough Mask	Good	Good	Good	At risk	Agriculture, domestic wastewater & invasive species

9.3.14 Designated Sites and Habitats

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). A designated site map for the area is shown as Figure 9-9. Connectivity to these designated sites is discussed further in the Natura Impact Statement which has been prepared for the Proposed Project.

The Site is not located within any designated conservation site, however there are downstream hydrological connections with some of the Natura 2000 sites in the region as described below and also summarised in Table 9-21.

As stated in the preceding sections, the hydrological regime at the Site is typically characterised by high rates of surface water runoff and relatively low rates of groundwater recharge, although some local areas with higher recharge may occur in areas with well-draining soils and permeable (granular) subsoils. However, due to the predominance of peat and low permeability till across the Site, water will generally leave the Site as surface water, rather than as groundwater flows, and will enter the River Robe and the Meander River downstream of the Site. This is the primary pathway for connectivity with downstream designated sites.

Within the Moy and Killala Bay Catchment The nearest downstream designated site to the Site is the River Moy SAC (Site Code: 002298) located ~1.95km to the west. This SAC is hydrologically connected to the Site via the Meander River. The length of the hydrological flowpath between the Site and the SAC is ~4.6km. The River Moy SAC follows the course of the Meander, Manulla and Castlebar rivers and further encompasses Lough Cullin downstream of the Site. Lough Cullin itself is also mapped as part of the Lough Conn and Lough Cullin SPA (004228).

Within the Corrib Catchment, the closest downstream designated sites via the River Robe are the Lough Carra/Mask Complex SAC (Site Code: 001774) and Lough Mask SPA (Site Code: 004062). The length of the hydrological flowpath between the Site and Lough Mask is >38km.

There are several groundwater dependent SAC's and pNHA's within 10km of the Site. These groundwater dependent designated sites include the Mountpleasant School Turlough pNHA, Slishmeen Turlough pNHA, Balla Turlough SAC/pNHA and Carrowkeel Turlough SAC/pNHA. These groundwater dependent designated sites are located in excess of 5km from the Site. Given the local nature of the hydrogeological regime at the Site (high rates of surface water runoff and low rates of groundwater recharge) there is limited potential for effects on these designated sites at this distance. Given the underlying GSI mapped Regionally Important Karst Aquifer there remains a low potential for groundwater flows in the underlying bedrock to bypass the Meander River and other surface water features and migrate towards these receptors. However, based on site investigation data (no karst features at the Site, no shallow bedrock, bedrock is protected by a thick layer of overburden) such connectivity is considered to be very limited.

Other designated sites within 10km of the Site are listed in Table 9-21.

Table 9-21: Summary of Distances and Connectivity to Designated Sites

Designated Site	Distance from Site	Hydrological connectivity to Designated/European Sites	Groundwater connectivity to Designated / European Sites
River Moy SAC (Site Code: 002298)	1.7km to the west	Yes, there is surface water drainage from the Site towards the	Yes, an indirect connection exists whereby shallow groundwater flow at the Site

Designated Site	Distance from Site	Hydrological connectivity to Designated/European Sites	Groundwater connectivity to Designated / European Sites
		SAC via the Meander River	will be towards the local rivers including the Meander River
Lough Conn and Lough Cullin SPA (Site Code: 004228)	21.8km to the north	Yes, there is surface water drainage from the Site towards the SPA via the Meander, Manulla and Castlebar rivers.	Yes, an indirect connection exists whereby shallow groundwater flow at the Site will be towards the local rivers including the Meander River
Lough Conn and Lough Cullin pNHA (Site Code: 000519)	22.5km to the north	Yes, there is surface water drainage from the Site towards the SPA via the Meander, Manulla and Castlebar rivers.	Yes, an indirect connection exists whereby shallow groundwater flow at the Site will be towards the local rivers including the Meander River
Mountpleasant School Turlough pNHA (Site Code: 001472)	4.6km to the west	No, there is no hydrological connectivity to the pNHA	Low potential for connectivity via preferential groundwater flowpaths in the underlying karst bedrock. Based on site-specific data such a pathway is unlikely to occur.
Lough Manan pNHA (Site Code: 001533)	7.4km to the west	No, there is no hydrological connectivity to the pNHA	Low potential for connectivity via preferential groundwater flowpaths in the underlying karst bedrock. Based on site-specific data such a pathway is unlikely to occur.
Cloonboorhy Lough pNHA (Site Code: 001486)	8.8km to the west	No, there is no hydrological connectivity to the pNHA	Low potential for connectivity via preferential groundwater flowpaths in the underlying karst bedrock. Based on site-specific data such a pathway is unlikely to occur.
Slishmeen Turlough pNHA (Site Code: 0011559)	5.0km to the west	No, there is no hydrological connectivity to the pNHA	Low potential for connectivity via preferential groundwater flowpaths in the underlying karst bedrock. Based on site-specific data such a pathway is unlikely to occur.
Balla Turlough SAC & pNHA (Site Code: 000463)	4.7km to the northwest	No, there is no hydrological connectivity to the SAC/ pNHA	Low potential for connectivity via preferential groundwater flowpaths in the underlying karst bedrock. Based on site-specific data such a pathway is unlikely to occur.
Carrowkeel Turlough SAC & pNHA (Site Code: 000475)	8km to the south	No, there is no hydrological	Low potential for connectivity via preferential groundwater flowpaths in the underlying

Designated Site	Distance from Site	Hydrological connectivity to Designated/European Sites	Groundwater connectivity to Designated / European Sites
		connectivity to the SAC/ pNHA	karst bedrock. Based on site-specific data such a pathway is unlikely to occur.
Towerhill House SAC (Site Code: 002179)	7.2km to the west	No, there is no hydrological connectivity to the SAC	Low potential for connectivity via preferential groundwater flowpaths in the underlying karst bedrock. Based on site-specific data such a pathway is unlikely to occur.
Lough Carra/Mask Complex SAC/pNHA (Site Code: 001774)	8.9km to the west	Yes, there is surface water drainage from the Site towards the SAC via the River Robe	Yes, an indirect connection exists whereby groundwater flow at the Site will be towards the local rivers including the River Robe. Low potential for connectivity via preferential groundwater flowpaths in the underlying karst bedrock. Based on site-specific data such a pathway is unlikely to occur.
Lough Mask SPA (Site Code: 004062)	16.7km to the southwest	Yes, there is surface water drainage from the Site towards the SPA via the River Robe	Yes, an indirect connection exists whereby groundwater flow at the Site will be towards the local rivers including the River Robe. Low potential for connectivity via preferential groundwater flowpaths in the underlying karst bedrock. Based on site-specific data such a pathway is unlikely to occur.
Lough Carra SPA (Site Code: 004051)	9.0km to the west	No. the River Robe discharges into Lough Mask downstream of Lough Carra.	Low potential for connectivity via preferential groundwater flowpaths in the underlying karst bedrock. Based on site-specific data such a pathway is unlikely to occur.

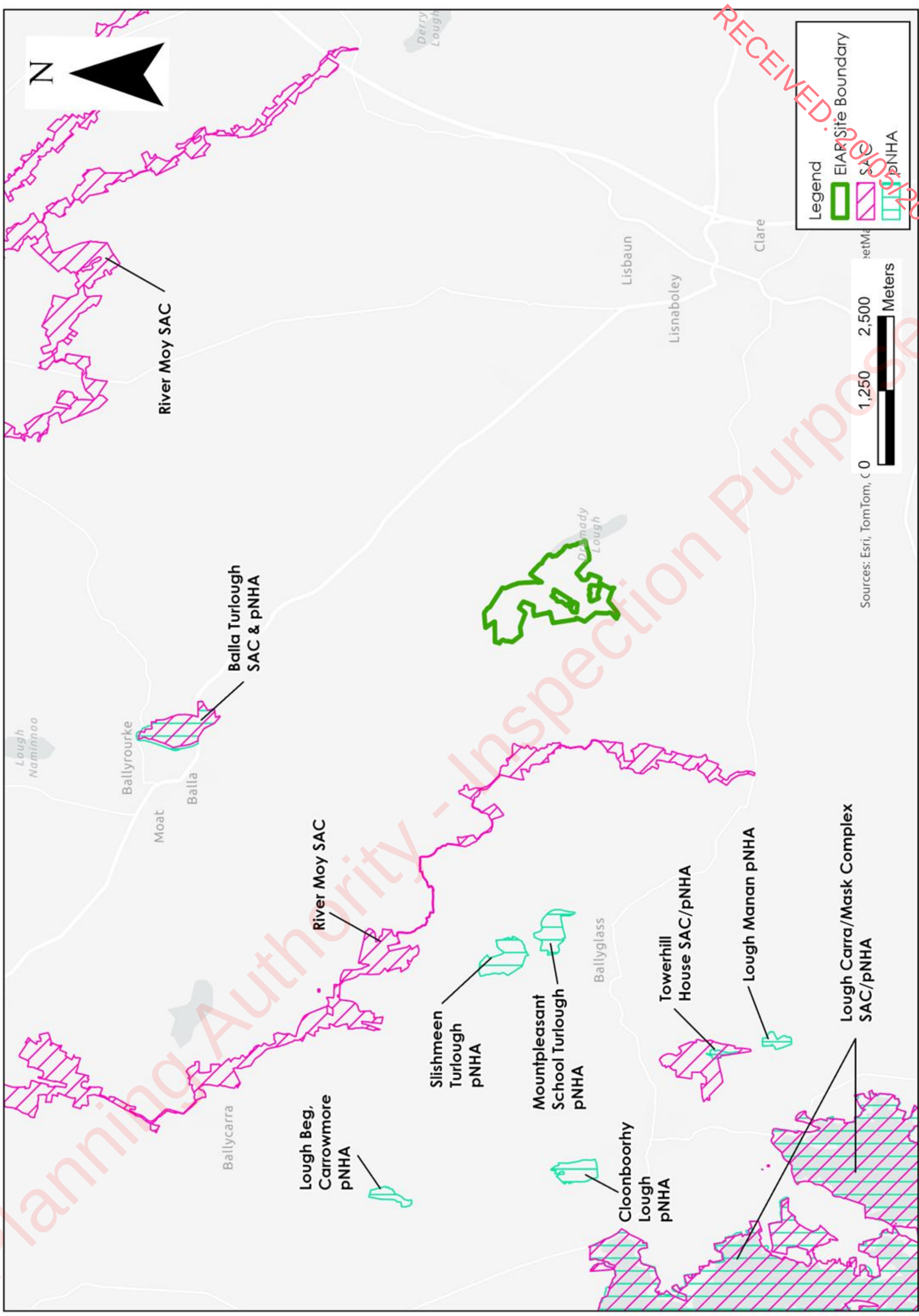


Figure 9-10: Designated Site Map

9.3.15 Water Resources

9.3.15.1 Surface Water Resources

There are no surface water Drinking Water Protected Areas (DWPAs) located in the immediate vicinity of the Site.

Within the Moy and Killala Bay Catchment, there are no DWPA downstream of the Site. Lough Conn DWPA is located upstream of Lough Cullin, discharging into the Lough Culin from the north. There is no hydrological connection between the Site and Lough Conn DWPA.

Within the Corrib Catchment, the Lough Mask DWPA is located downstream of the Site via the River Robe. The length of the hydrological flowpath is >38km.

An information request was submitted to Uisce Éireann for the location of all Uisce Éireann surface abstraction locations within 5km of the Site. A 5km distance was considered to be appropriate given the increasing flow volumes in the watercourses downstream of the Site (i.e. the Meander and Robe rivers – refer to Section 9.3.4). The increasing flow volumes in these rivers provide a significant dilution capacity. Note that the impact assessment presented in Section 9.5.2.12 does not rely on the assimilation/dilution capacity of any downstream watercourse. The mitigation measures prescribed in this chapter are designed to protect all watercourses, including those in the immediate vicinity of the works, irrespective of flows or the receiving water capacity.

2 no. UÉ abstraction locations were identified downstream of the Site within the Moy and Killala Bay Catchment as follows:

- An abstraction associated with the Cullentra scheme is located along the tributary of the Meander River in the townland of Cullentragh, located ~1.5km to the west of the Site. The tributary stream referred to by the EPA as the Gortnagusetaul Stream originates ~1.6km from the Site. There are no hydrological connections from the Site to this stream.
- An abstraction associated with the Rathnacreeva scheme is located along the Meander River ~3.5km west of the Site. There is a hydrological connection from the Site to this river via manmade drainage features. The length of the hydrological flowpath between the Site and this abstraction point is >11km (this is the length between the point where the Meander River is closest to proposed infrastructure and the abstraction location).

9.3.15.2 Groundwater Resources

There are no mapped groundwater source protection areas for Public Water Supplies (PWS) or Group Water Schemes (GWS) in the Site or in the surrounding lands.

The closest GSI mapped source protection area to the Site is associated with the Pollavaddy GWS, located ~5.1km to the north. The GSI map shows the presence of a well with a locational accuracy of 50m within this source protection area. According to the well database this borehole is associated with the Balla GWS.

The source protection areas associated with the Kilcolman Facefield GWS and the Loughanemon Barnacarroll GWS are mapped ~5.45km and ~6km to the east of the Site respectively. The potential for impacts on these GWS's is unlikely due to the separation distance from the Site. Furthermore, groundwater at the Site will generally flow towards the rivers and lakes such as the Robe and Meander rivers at a local scale, to the west and south, and towards Lough Mask and Lough Cullin at a regional scale.

The nearest PWS is the Kilmaine PWS. The associated source protection area is located ~16km to the south of the Site. There is no potential for this PWS to be impacted by the Proposed Project due to the large separation distance. Furthermore, groundwater will flow towards Lough Mask and Lough Cullin.

A search of private well locations (accuracy of 1-50m only) was undertaken using the GSI well database (www.gsi.ie). No such wells were identified within the Site. A spring is mapped ~1.5km to the west of the Site in the townland of Gortaphuntaun. This spring is associated with the Mayo Abbey GWS, with a daily abstraction of 29m^3/day.

It is accepted that the GSI database does not include all potential water wells. As such, and in order to be conservative, for the purposes of assessment, as completed in Section 9.5.2.10, we assume that there is a groundwater well source at each Sensitive Receptor location as identified in Chapter 5 of this EIAR: Population & Human Health.

An information request was submitted to Uisce Éireann for the location of all Uisce Éireann groundwater abstraction locations within 5km of the Site. A 5km screening distance was considered to be appropriate given the local hydrogeological regime at the Site which is characterised by high rates of surface water runoff and low rates of groundwater recharge. Whilst the GSI map the Site to be underlain by a Regionally Important Karst Aquifer, site investigations have shown that no shallow bedrock or karst features are present at the Site, the bedrock is protected by thick overburden deposits and there is a high density of surface water drains. Therefore, surface water is considered to be the main sensitive receptor.

3 no. UÉ abstractions within 5km of the Site are from groundwater resources:

- An abstraction associated with the Knockaunakill Mayo Abbey scheme is located ~830m to the east of the Site in the townland of Mossbrook.
- An abstraction associated with the Kilcolman Facefield scheme is located ~4.45km to the east of the Site and corresponds with the western boundary of the source protection area as mapped by the GSI.
- An abstraction associated with the Nestor scheme is located ~4.5km to the northwest of the Site.

The EPA abstraction register was also consulted and no additional abstractions were identified.

A map of local groundwater wells and source protection areas is included as Figure 9-11 below.

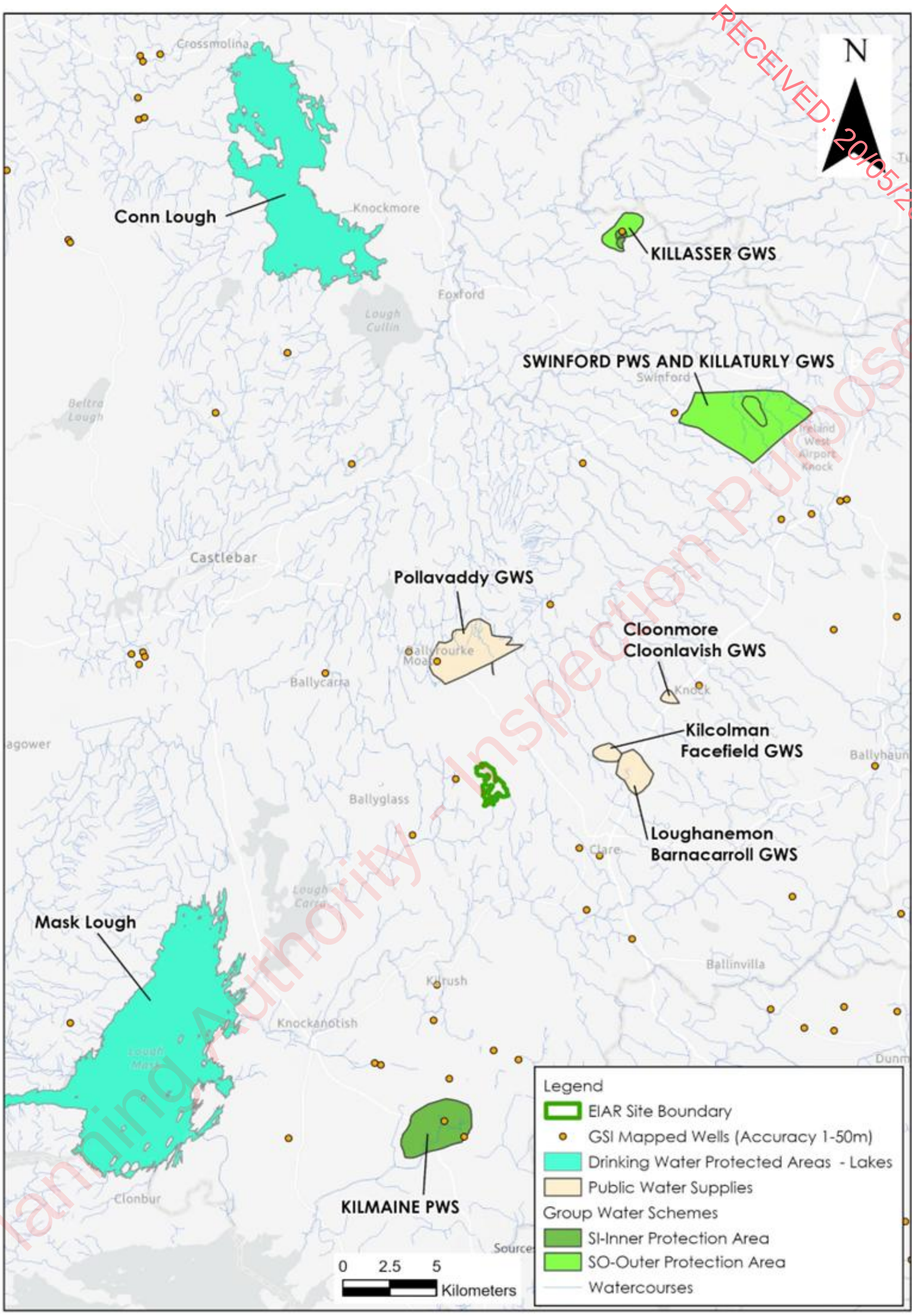


Figure 9-11: Water Supply Map

9.3.16 Receptor Sensitivity

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

Due to the nature of wind farm developments (and associated grid connections, TDR works and habitat enhancement), being near surface construction activities, impacts on groundwater are generally negligible and surface water is generally the main sensitive receptor assessed during impact assessments. The primary risks to groundwater at the Site would be from cementitious materials, hydrocarbon spillage and leakages. Some of these (cementitious materials, hydrocarbon spillage and leakages, suspended sediment entrainment) are common potential impacts on all construction sites (such as road works and industrial sites). All potential contamination sources are to be carefully managed at the Site during the construction, operational and decommissioning phases of the Proposed Project and mitigation measures are proposed below to deal with these potential effects.

The local hydrogeological regime indicates a reduced potential for effects on local groundwater receptors. Site investigations have confirmed the absence of karst features and shallow bedrock at the Site. The bedrock is protected by thick overburden deposits (>10m) which will restrict groundwater recharge. The following groundwater receptors are identified for impact assessment, included for the purposes of a conservative assessment:

- The Regionally Important Karstic Bedrock Aquifer underlying the Site. This aquifer can be considered as being of Very High Importance (refer to Table 9-3);
- The WFD status of the GWBs underlying the Site (i.e. Swinford and Cong-Robe GWBs);
- The Mayo Abbey GWS, the Nestor Scheme, the Knockaunakill Mayo Abbey scheme, the Kilcolman Facefield GWS, the Loughanemon Barnacarroll GWS; and,
- Local private groundwater abstractions in the lands surrounding the Site.

Surface waters are the main sensitive receptors associated with the Proposed Project, due to the local hydrological regime which is characterised by high runoff rates and relatively low rates of groundwater recharge. The primary potential contamination downstream surface waters are via elevated concentrations of suspended solids and nutrient enrichment.

The quantification of flow volumes presented in Section 9.3.4 indicates that the watercourses in the immediate vicinity of the Site will be most susceptible to potential effects. Further downstream, the watercourses will be less susceptible to potential effects due to increasing flow volumes which provide a greater dilution effect. However, the Proposed Project does not in any way rely upon the dilution/assimilation capacity of any downstream watercourse. The mitigation measures prescribed in Section 9.5 will ensure the protection of all watercourses downstream of the Site.

The following surface water receptors are identified for impact assessment:

- The lake watercourses in close proximity to the Site including Drumady Lough, Lough Nambrackkeagh and Lough Fark;
- The Robe, Meander and Manulla rivers and associated tributaries. These rivers can be considered to be of High to Very High Importance (refer to Table 9-2) based on their assigned Q-ratings (Q4);
- The Cullentra and Rathnacreeva abstractions along the Meander River; and,
- The WFD status of all SWBs downstream of the Proposed Project.

The Lough Mask DWPA has been screened out of the impact assessment due to its distant location from the Site.

In terms of designated sites, those designated sites which are hydrologically connected with the Site will be included in the impact assessment. These include:

- The River Moy SAC which is in close proximity and downstream of the Site (the length of the hydrological flowpath from the Site to the SAC is ~4.6km).

Within the Corrib Catchment, the Lough Carra/Mask Complex SAC/pNHA and the Lough Mask SPA have been screened out due to the length of the hydrological flowpath between the Site and Lough Mask (>38km). Furthermore, within the Moy and Killala Bay Catchment, the Lough Conn and Lough Cullin SPA and the Lough Conn and Lough Cullin pNHA are screened out due to the length of the hydrological flowpath (>44km). There is no potential for significant effects on these designated sites due to their distance from the Site.

Given that the GSI map the bedrock underlying the Site as a Regionally Important Karst Aquifer the groundwater dependent designated sites within 5km of the Site have been included in the impact assessment. As stated previously, with respect to groundwater sources (refer to Section 9.3.15.2), a screening distance of 5km was considered to be appropriate given the local hydrogeological regime at the Site which is characterised by high rates of surface water runoff and low rates of groundwater recharge. Whilst the GSI map the Site to be underlain by a Regionally Important Karst Aquifer, site investigations have shown that no shallow bedrock or karst features are present at the Site, the bedrock is protected by thick overburden deposits and there is a high density of surface water drains. The designated sites within 5km of the Site include Mountpleasant School Turlough pNHA and Balla Turlough SAC/pNHA. As detailed in Table 9-21 several designated sites are located just outside of this 5km zone and within 7.4km of the Site (Slishmeen Turlough pNHA, Lough Manan pNHA and Carrowkeel Turlough SAC/pNHA). These designated sites have also been included for the purposes of an ultra-conservative impact assessment. Note that the Towerhill House SAC has not been included in the impact assessment as it has no water dependent qualifying interests. Other groundwater dependent designated sites have been screened out due to their distant location from the Site.

All other designated sites are screened out of the impact assessment due to the lack of hydrological/hydrogeological connection to the Proposed Project or the significant distance between the Site and these designated sites.

9.4 Characteristics of the Proposed Project

The Proposed Project is described in full in Chapter 4.

The main characteristics of the Proposed Project that could affect the hydrological and hydrogeological environment comprise the following:

- The opening of the proposed onsite borrow pit which will supply materials for the construction of the Proposed Project. This has the potential to impact surface and groundwater quality.
- Establishment of the construction compounds (1 adjacent to the proposed borrow pit and a second adjacent to the 110kV onsite substation) within the Site, and the emplacement of the construction compounds. Runoff from these construction areas have the potential to effect surface water quality.
- Construction of the new proposed internal site access tracks (c.3.7km), temporary construction tracks (615m) and the upgrade of existing access tracks (c.1km) and upgrade of the public road (c.772m) have the potential to impact on surface water quality.
- Construction of the crane hardstand areas and turbine assemblage areas and temporary hardstand areas will utilise ground bearing foundations. This will involve the sourcing of material from proposed onsite borrow pit. Construction of these areas has the potential to impact on surface water quality.
- Construction of the onsite 110kV substation will be completed with a ground bearing foundation. Wastewater effluent will be collected in an underground concrete holding tank and periodically emptied by a licenced contractor for the operational phase of the Proposed Project. Construction of the onsite substation and associated parking area has the potential to effect surface water quality.
- Construction of the foundations for the 7 no. proposed turbines. Volumes of peat and spoil generated by construction of turbines and associated foundations and hardstanding areas is estimated to be 19,800m^3 and 26,000m^3 respectively. The movement of large volumes of peat and spoil have the potential to effect surface water quality.
- Based on the site-investigation data it is likely that gravity foundations will be required at all of the turbine foundations. Construction of the proposed turbine foundations will require large volumes of concrete which will be sourced from local concrete batching plants / quarries. Concrete could affect surface water and groundwater quality.
- Cabling between turbine locations and the onsite substation will involve the excavation of a shallow trench (approximately 1.2m deep), placement of ducting and backfilling with aggregate, lean-mix concrete, and excavated material, as appropriate (depending on the location of the cable trench). These works have the potential to impact on surface water quality.
- Construction of the Proposed Grid Connection including 2 no. loop-in end masts, removal of polesets and underground electrical cabling between the proposed onsite 110kV substation and the loop in connection to the existing overhead line will involve the excavation of foundations for the 2 no. end masts, a trench for cabling, placement of ducting and backfilling with lean-mix concrete and compacted engineered fill. These works have the potential to impact on surface water quality.
- Settlement ponds where constructed will be volume neutral, i.e. all material excavated will be used to form side bunds and landscaping around the ponds. There will be no excess material from settlement pond construction. The material will also be reinstated during decommissioning.
- Grey water will be supplied by rainwater harvesting and water tankered to site where required. Where a groundwater well option may be required, this will be installed adjacent to the substation, and it will be drilled and installed in accordance with the Institute of Geologists Ireland, Guide for Drilling Wells for Private Water Supplies (IGI, 2007). Alternatively, bottled water will also be used for potable supply.

- Storage of excavated peat and spoil within the proposed peat and spoil management areas within the Site has the potential to impact surface water quality.
- 0.7ha of coniferous forestry will be felled to accommodate infrastructure. While this work will be done with Forestry Service licences and approvals, the works could result in soil/subsoils erosion. All forestry replanting will occur outside of the hydrological catchments within which the Site is located. In addition, 2.5ha of scrub and mosaics of scrub will be permanently lost due to the Proposed Project.
- The Proposed Biodiversity Management and Enhancement works include (i) the enhancement and management of ~1.16ha of Molinia Meadow for Marsh Fritillary, the planting of ~3.5ha of native broadleaved woodland and planting and enhancement of 2.5km of linear vegetation, this consisting of treeline and hedgerow. These works have the potential to impact downstream surface water quality.

9.4.1 Proposed Drainage Management

Runoff control and drainage management are key elements in terms of mitigation against impacts on surface water bodies. Two distinct methods will be employed to manage drainage water within the Site. The first method involves 'keeping clean water clean' by avoiding disturbance to existing drainage features, minimising any works in or around artificial drainage features, and diverting clean surface water flow around excavations, construction areas and temporary storage areas. The second method involves collecting any drainage waters from works areas within the Site that might carry silt or sediment, and nutrients, to route them towards new proposed silt traps and settlement ponds (or stilling ponds) prior to controlled diffuse release into the existing drainage network. There will be no discharge of untreated or unattenuated water to the existing hydrological features (forestry and agricultural drains or natural watercourses).

During the construction phase, all runoff from works areas (i.e. dirty water) will be slowed down and treated to a high quality prior to being released. A schematic of the Site drainage management is shown as 9-12 below. A detailed drainage plan showing the layout of the proposed drainage design elements is shown in Appendix 4-4 of the EIAR.

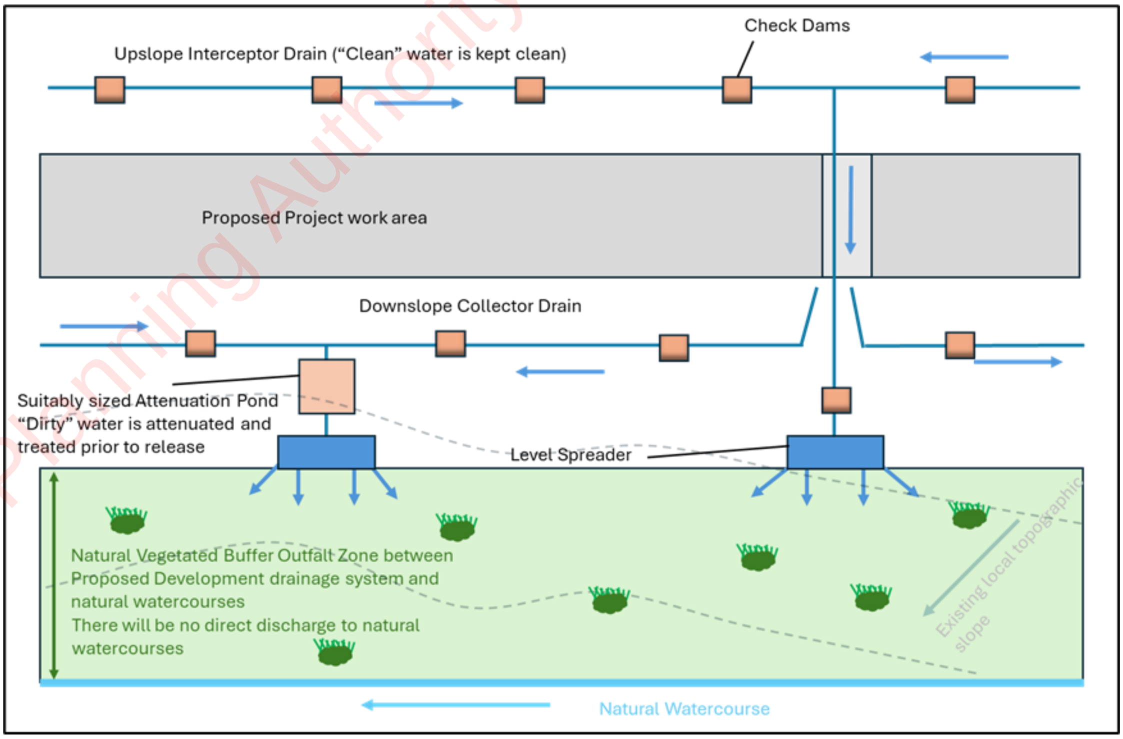


Figure 9-12: Schematic of the Site Drainage Management

9.4.2 Proposed Project Interaction with Existing Drainage Network

In relation to hydrological constraints, the only EPA mapped watercourse within the Site is the Meander River downstream of Lough Nambrackkeagh. A self-imposed 50m buffer has been applied to this watercourse. This buffer zone is considered to be best-practice and the implementation of this buffer takes a precautionary approach to the protection of local water quality. Drumady Lough and Lough Nambrackkeagh are also located in close proximity to the Site and a self-imposed buffer zone of 100m has been put in place for these lakes (Note that some works are proposed within the delineated 100m lake buffer zone and additional mitigation measures are prescribed in Section 9.5.2.3 for these works). These buffer zones are considered to be best-practice, providing an additional safeguard for the protection of water quality. 10m buffers were applied to manmade forestry, peat and agricultural drains where possible. However, these manmade drains are not considered a significant hydrological constraint and are not of ecological significance due to their artificial nature.

The general design approach to wind farm layouts is to utilise and integrate with the existing drainage infrastructure where possible whether it be existing access roads or the existing forestry / peat / agricultural drainage network. Utilising the existing infrastructure means that there will be less of a requirement for new construction/excavations which have the potential to impact on downstream watercourses in terms of suspended solid input in runoff (unless managed appropriately). The existing forestry and agricultural drains have no major ecological or hydrological value and can be readily integrated into the Proposed Project drainage scheme.

In order to integrate the Proposed Project drainage with the existing drainage (as per the drainage plans included in Appendix 4-4) the following design approach has been implemented:

- Lidar data and available aerial photography was used to map in detail the existing farm, peatland and forestry drainage at the Site and how the proposed infrastructure will interact with these existing manmade and natural drainage patterns;
- The Proposed Project footprint was divided up into drainage catchments (based on topography, outfall locations, catchment size) and we have calculated stormwater runoff rates for each catchment based on the 10-year return period rainfall event. These flows are used to design settlement ponds for each drainage catchment;
- Cut-off (interceptors drains) are included to locally re-route existing farm and forestry drains where required;
- The proposed construction phase settlement ponds are designed for 11hr and 24hr retention times used to settle out medium silt (0.006mm) and fine silt (0.004mm) respectively (EPA, 2006)[4]; and,
- The proposed locations of temporary drainage measures that will be installed prior to construction of the Proposed Project commencing are identified on the drainage drawings included as Appendix 4-4 of Chapter 4.

[4] *Environmental Protection Agency (2006): Environmental Management in the Extractive Industry (Non-Schedule Minerals);*

9.5 Likely Significant Effects and Associated Mitigation Measures

9.5.1 Do -Nothing Scenario

If the Proposed Project was not developed, the Site will continue to function as it does at present, with no changes made to the current land-use of small scale private forestry, agricultural land and turbary peat cutting. Landuse would remain unchanged from its present condition. The existing agricultural activities (grassland management) will continue in conjunction with the Proposed Project use of the Site. In terms of hydrology, the existing surface water drainage regime would continue to function and may be extended in places.

The effect of this is considered neutral in the context of the EIAR. If the Proposed Project were not to proceed, the opportunity to capture an even greater part of County Mayo's valuable renewable energy resource would be lost, as would the opportunity to further contribute to meeting Government and EU targets for the production and consumption of electricity from renewable resources and the reduction of greenhouse gas emissions. The opportunity to generate local employment and investment and to diversify the local economy would also be lost.

Furthermore, the opportunity to create the new proposed areas of native woodland and enhanced habitats for Marsh Fritillary within the Site would be lost. Please see Appendix 6-4 Biodiversity Management and Enhancement Plan for details.

In the Do Nothing Scenario, there may be a slight increase in average annual rainfall at the Site as a result of climate change. On the basis of the positive environmental effects arising from the Proposed Project, the do–nothing scenario was not the chosen option.

9.5.2 Construction Phase - Likely Significant Effects and Mitigation Measures

The likely effects of the Proposed Project and mitigation measures that will be put in place to eliminate or reduce them are shown below. The assessment considers the Proposed Project as a whole i.e. both the Proposed Wind Farm and the Proposed Grid Connection. Where this is required to be assessed separately, this is noted in the text. The potential effects from the accommodation works along the TDR are assessed in Section 9.5.2.14.

9.5.2.1 Potential Effects from Tree Felling/Removal

A total of 0.7ha of coniferous forestry will have to be permanently felled within and around the footprint of the proposed infrastructure. Approximately 1,256 linear metres of hedgerows and treeline will also be permanently removed to facilitate the Proposed Project. In addition, approximately 2.5ha of scrub and mosaics of scrub will be permanently lost to facilitate the Proposed Project.

Felling of coniferous plantations required as part of the Proposed Project will be the subject of a Felling Licence application to the Forest Service, in accordance with the Forestry Act 2014 and the Forestry Regulations 2017 (SI 191/2017) and as per the Forest Service's policy on granting felling licenses for wind farm developments.

Potential effects during tree felling occurs mainly 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.

These effects have the potential to affect the water quality and fish stocks of downstream water bodies.

Pathways: Drainage and surface water discharge routes.

Receptors: Surface watercourses (Robe, Meander and Manulla rivers and associated tributaries), local lake water bodies (Drumady Lough, Lough Nambrackkeagh and Lough Fark) and associated water dependant ecosystems downstream of the Site.

Pre-Mitigation Potential Effect: Indirect, negative, significant, temporary, likely effect on surface watercourse and associated water-dependent ecosystems. Therefore, in the absence of mitigation measures, there will be the potential for significant effects on downstream surface waters and associated water-dependent ecosystems.

Proposed Mitigation Measures:

Tree felling operations will conform to current best practice Forest Service regulations, policies and strategic guidance documents as well as Coillte and Department of Agriculture, Food and the Marine (DAFM) guidance documents, including the specific guidelines listed below, to ensure that felling, planting and other forestry operations result in minimal potential negative effects to the receiving environment.

- Forestry Standards Manual (Forest Service, 2015);
- Forest Protection Guidelines (Forest Service, 2002);
- Forest Operations and Water Protection Guidelines (Coillte, 2013);
- Forestry and Water Quality Guidelines (Forest Service, 2000b);
- Forestry and the Landscape Guidelines (Forest Service, 2000c);
- Forests and Water, Achieving Objectives under Ireland's River Basin Management Plan 2018-2021 (DAFM, 2018);
- Coillte Planting Guideline SOP; and,
- Code of Best Forest Practice (Forest Service, 2000).

Mitigation by Avoidance:

There is a requirement in the Forest Service Code of Practice and in the FSC Certification Standard for the installation of buffer zones adjacent to aquatic zones at planting stage. Minimum buffer zone widths recommended in the Forest Service (2000) guidance document "Forestry and Water Quality Guidelines" are shown in Table 9-22.

The setback distance from sensitive hydrological features means that adequate room is maintained for the proposed mitigation measures (discussed below) to be properly installed and operate effectively. The buffer/setback zone will:

- Avoid physical damage (river/stream banks and river/stream beds) to watercourses and the associated release of sediment;
- Avoid soil disturbance and compaction within close proximity to surface watercourses;

- Avoid the entry of suspended sediment from works into watercourses; and,
- Avoid the entry of suspended sediment from the 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.

Table 9-22: Minimum Buffer Zone Widths (Forest Service, 2000)

Average slope leading to the aquatic zone		Buffer zone width on either side of the aquatic zone	Buffer zone width for highly erodible soils
Moderate	(0 – 15%)	10 m	15 m
Steep	(15 – 30%)	15 m	20 m
Very steep	(>30%)	20 m	25 m

In addition to the application of buffer/setback zones, the following supplementary mitigation measures will be employed during felling works:

Mitigation by Design:

Mitigation measures which will reduce the risk of entrainment of suspended solids and nutrient release in surface watercourses comprise best practice methods which are set out as follows:

- Machine combinations (i.e. handheld or mechanical) will be chosen which are most suitable for ground conditions and which will minimise soils disturbance;
- All machinery will be operated by suitably qualified personnel;
- Checking and maintenance of access tracks and culverts will be on-going through any felling operation. Where possible, existing drains will not be disturbed during felling works;
- Machines will traverse the Site along specified access routes (referred to as racks);
- The location of racks will be chosen to avoid wet and potentially sensitive areas;
- Brash mats will be placed on the racks to support the vehicles on soft ground, reducing mineral soil disturbance and erosion and avoiding the formation of rutted areas, in which surface water ponding can occur. Brash mat renewal should take place when they become heavily used and worn. Provision should be made for brash mats along all routes off access tracks, to protect the soil from compaction and rutting. Where there is risk of severe erosion occurring, extraction will be suspended during periods of high rainfall;
- Silt fences will be installed at the outfalls of existing drains downstream of felling areas. No direct discharge of such drains to watercourses will occur. Sediment traps and silt fences will be installed in advance of any felling works and will provide surface water settlement for runoff from work areas and will prevent sediment from entering downstream watercourses. Accumulated sediment will be carefully disposed of at pre-selected spoil repository areas. Where possible, all new silt traps will be constructed on even ground and not on sloping ground;
- In areas particularly sensitive to erosion it will be necessary to install double or triple sediment traps and increase buffer zone width. These measures will be reviewed onsite during construction;
- Double silt fencing will also be put down slope of felling areas which are located in close proximity to streams and/or relevant watercourses;
- Drains and silt traps will be maintained throughout all felling works, ensuring that they are clear of sediment build-up and are not severely eroded;

- Timber will be stacked in dry areas, and outside watercourse buffer zones. Check dams and silt traps will be emplaced on the down gradient side of timber storage/processing sites;
- Works will be carried out during periods of no, or low rainfall, in order to minimise entrainment of exposed sediment in surface water runoff;
- All refuelling will be completed outside of the designated 50m hydrological buffer zones. Mobile bowser, drip kits, qualified personnel will be used where refuelling is required; and,
- Branches, logs or debris will not be allowed to build up in aquatic zones. All such material will be removed when harvesting operations have been completed, but care will be taken to avoid removing natural debris deflectors.

Silt Traps:

Silt traps will be strategically placed down-gradient within forestry drains near streams. The main purpose of the silt traps and drain blocking is to slow water flow, increase residence time, and allow settling of silt in a controlled manner.

Pre-emptive Site Drainage Management :

The works programme for the felling operations will also take account of weather forecasts and predicted rainfall in particular. Operations will be suspended or scaled back if heavy rain is forecast. The extent to which works will be scaled back or suspended will relate directly to the amount of rainfall forecast.

The following forecasting systems are available and will be used on a daily/weekly basis, as required, to allow site staff to direct proposed and planned construction activities:

- General Forecasts: Available on a national, regional and county level from the Met Éireann website (www.met.ie/forecasts). These provide general information on weather patterns including rainfall, wind speed and direction but do not provide any quantitative rainfall estimates;
- MeteoAlarm: Alerts to the possible occurrence of severe weather for the next 2 days. Less useful than general forecasts as only available on a provincial scale;
- 3-hour Rainfall Maps: Forecast quantitative rainfall amounts for the next 3 hours but does not account for possible heavy localised events;
- Rainfall Radar Images: Images covering the entire country are freely available from the Met Éireann website (www.met.ie/latest/rainfall_radar.asp). The images are a composite of radar data from Shannon and Dublin airports and give a picture of current rainfall extent and intensity. Images show a quantitative measure of recent rainfall. A 3-hour record is given and is updated every 15 minutes. Radar images are not predictive; and,
- Consultancy Service: Met Éireann provide a 24-hour telephone consultancy service. The forecaster will provide an interpretation of weather data and give the best available forecast for the area of interest.

Using the safe threshold rainfall values will allow planned works to be safely executed (from a water quality perspective) in the event of forecasting of an impending high rainfall intensity event.

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

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

Timing of Proposed Project Felling Works:

Felling will only be carried out during periods of no or low rainfall, and therefore minimum runoff rates. This will minimise the risk of entrainment of suspended sediment in surface water runoff, and transport via this pathway to surface watercourses.

Drain Inspection and Maintenance:

The following items will be carried out during pre-felling inspections and after:

- Communication with tree felling operatives in advance to determine whether any areas have been reported where there is unusual water logging or bogging of machines;
- Inspection of all areas reported as having unusual ground conditions;
- Inspection of main drainage ditches and outfalls. During pre-felling inspections the main drainage ditches will be identified. Ideally the pre-felling inspection will be carried out during rainfall;
- Following tree felling all main drains will be inspected to ensure that they are functioning;
- Extraction tracks within 10m of drains will be broken up and diversion channels created to ensure that water in the tracks spreads out over the adjoining ground;
- Culverts on drains exiting the site, if impeded by silt or debris, will be unblocked; and,
- All accumulated silt will be removed from drains and culverts, and silt traps, and this removed material will be deposited away from watercourses to ensure that it will not be carried back into the trap or stream during subsequent rainfall.

Surface Water Quality Monitoring:

Sampling will be completed before, during (if the operation is conducted over a protracted time) and after the felling activity. The 'before' sampling will be conducted within 4 weeks of the felling activity commencing, preferably in medium to high water flow conditions. The "during" sampling will be undertaken once a week or after rainfall events. The 'after' sampling will comprise as many samplings as necessary to demonstrate that water quality has returned to pre-activity status (i.e. where an impact has been shown - the mitigation measures prescribed above will reduce the likelihood and significance of any potential effects).

Details of the proposed surface water quality monitoring programme are outlined in the CEMP (refer to Appendix 4-5).

Criteria for the selection of water sampling points include the following:

- Avoid man-made ditches and drains, or watercourses that do not have year round flows, i.e. avoid ephemeral ditches, drains or watercourses;
- Select sampling points upstream and downstream of the forestry activities;
- It is advantageous if the upstream location is outside/above the forest in order to evaluate the effect of land-uses other than forestry;
- Downstream locations will be selected: one immediately below the forestry activity, the second at exit from the forest, and the third some distance from the second (this allows demonstration of no effect through dilution effect or contamination by other land-uses where effect increases at third downstream location relative to second downstream location); and,
- The above sampling strategy will be undertaken for all on-site sub-catchments streams where tree felling is proposed.

Also, daily surface water monitoring forms (for visual inspections and field chemistry measurements) will also be utilised at every works site near any watercourse. These will be taken daily and kept on site for record and inspection.

Post-Mitigation Residual Effect: Proven forestry best practice measures to mitigate the risk of releases of sediment have been proposed above and will break the pathway between the potential sources and the receptor. The residual effect will be a negative, imperceptible, indirect, temporary, likely effect on downstream water quality and aquatic habitats.

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

9.5.2.2 Potential Effects from Earthworks Resulting in Suspended Solids Entrainment in Surface Waters

Construction phase activities including access track construction, turbine foundation/hardstanding construction, temporary construction compound construction, met mast construction, substation construction, storage of peat and spoil in the designated peat and spoil management areas, the opening of the borrow pit, poleset removal and the underground cabling works will require varying degrees of earthworks resulting in excavation of soils and subsoils. It is estimated that a total of 94,200m^3 of peat and spoil will be excavated during the construction phase.

Potential sources of sediment-laden water include:

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

These activities can result in the release of suspended solids to surface water and could result in an increase in the suspended sediment load, resulting in increased turbidity which in turn could affect the water quality and fish stocks of downstream water bodies.

Potential effects on all watercourses downstream of the site could be significant if not mitigated against.

Pathways: Drainage and surface water discharge routes.

Receptors: Surface watercourses (Robe, Meander and Manulla rivers and associated tributaries), local lake water bodies (Drumady Lough, Lough Nambrackkeagh and Lough Fark) and associated water dependant ecosystems downstream of the Site.

Pre-Mitigation Potential Effect: Negative, significant, indirect, temporary, likely effect on downstream watercourses and water-dependent ecosystems. In the absence of mitigation measures, there will be the potential for significant effects on downstream surface waters and associated water-dependent ecosystems.

Proposed Mitigation Measures:

<u>Mitigation by Avoidance</u>

The key mitigation measure during the construction phase is the avoidance of sensitive hydrological features where possible, by application of suitable buffer zones. The design of the Proposed Project (Proposed Wind Farm and Proposed Grid Connection) has avoided the crossing of EPA mapped watercourses on site. There is one EPA mapped watercourse located within the Site, this being the

Meander River which at its nearest point is located c.372m southwest of T5. No works are proposed within the 50m hydrological buffer associated with this watercourse.

Drumady Lough and Nambrackkeagh Lough are located immediately adjacent to the Site, both of which are located at least 200m away from any proposed infrastructure. No works are proposed within the delineated 100m lake buffer with the exception of some treeline and hedgerow planting/ enhancement and native broadleaved woodland planting. These works within the 100m lake buffer zones do not pose a significant risk to the hydrological environment. Indeed, the presence of trees would protect water quality in the long-term by providing erosion interception and stability.

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

- Avoid physical damage (river/stream banks and river/stream beds) to watercourses and associated release of sediment;
- Avoid excavations within close proximity to surface watercourses;
- Avoid the entry of suspended sediment from earthworks into watercourses; and,
- Avoid 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 outside of the buffer zone.

Mitigation by Design:

- Source controls:
    - Interceptor drains, vee-drains, diversion drains, flume pipes, erosion and velocity control measures such as use of sand bags, oyster bags filled with gravel, filter fabrics, and other similar/equivalent or appropriate systems.
    - Small working areas, covering stockpiles, weathering off stockpiles, cessation of works in certain areas.
- In-Line controls:
    - Interceptor drains, vee-drains, oversized swales, erosion and velocity control measures such as check dams, sand bags, oyster bags, straw bales, flow limiters, weirs, baffles, silt bags, silt fences, sedimats, filter fabrics, 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, and proprietary settlement systems such as Siltbuster, and/or other similar/equivalent or appropriate systems.

It should be noted for this site that an extensive network of forestry and roadside drains already exists, and these will be integrated and enhanced as required and used within the wind farm development drainage system. The integration of the existing forestry drainage network and the Proposed Wind Farm network is relatively simple. The key elements being the upgrading and improvements to existing water treatment elements, such as in line controls and treatment systems, including silt traps, settlement ponds and buffered outfalls.

The main elements of interaction with existing drains will be as follows:

- Apart from interceptor drains, which will convey clean runoff water to the downstream drainage system, there will be no direct discharge (without treatment for sediment reduction, and attenuation for flow management) of runoff from the

Proposed Wind Farm drainage into the existing site drainage network. This will reduce the potential for any increased risk of downstream flooding or sediment transport/erosion;

- Silt traps will be placed in the existing drains upstream of any streams where construction works / tree felling is taking place, and these will be diverted into proposed interceptor drains, or culverted under/across the works area;
- Runoff from individual turbine hardstanding areas will not be discharged into the existing drain network but discharged locally at each turbine location through settlement ponds and buffered outfalls onto vegetated surfaces;
- Buffered outfalls which will be numerous over the site will promote percolation of drainage waters across vegetation and close to the point at which the additional runoff is generated, rather than direct discharge to the existing drains of the site; and,
- Drains running parallel to the existing roads requiring widening will be upgraded, widening will be targeted to the opposite side of the road. Velocity and silt control measures such as check dams, sand bags, oyster bags, straw bales, flow limiters, weirs, baffles, silt fences will be used during the upgrade construction works. Regular buffered outfalls will also be added to these drains to protect downstream surface waters.

Pre-commencement Temporary Drainage Works

Prior to the commencement of road upgrades (or new road/hardstand or turbine base installs) the following key temporary drainage measures will be installed:

- All existing dry forestry drains that intercept the proposed works area will be temporarily blocked down-gradient of the works using forestry check dams/silt traps;
- Clean water interceptor drains will be installed upgradient of the works areas;
- Check dams/silt fence arrangements (silt traps) will be placed in all existing forestry drains that have surface water flows and also along existing forestry roadside drains; and,
- A double silt fence perimeter will be placed down-slope of works areas that are located inside the watercourse 50m buffer zone.

These details are included in the drainage plans attached as Appendix 4-4.

Silt Fences:

Silt fences will be emplaced within drains down-gradient of all construction areas. Silt fences are effective at removing heavy settleable solids such as those present in the subsoils/sandstone tills that overlie the site. This will act to prevent entry to watercourses of sand and gravel sized sediment, released from excavation of mineral sub-soils of glacial and glacio-fluvial origin, and entrained in surface water runoff. Inspection and maintenance of these structures during construction phase is critical to their functioning to stated purpose. They will remain in place throughout the entire construction phase. Double silt fences will be placed within any drains down-gradient of all work areas, where required inside the 100m lake buffer zones.

Silt Bags:

Silt bags will be used where small to medium volumes of water need to be pumped from excavations. As water is pumped through the bag, the majority of the sediment is retained by the geotextile fabric allowing filtered water to pass through. Silt bags will be used with natural vegetation filters or Sediment entrapment mats, consisting of coir or jute matting, will be placed at the silt bag location to provide further treatment of the water outfall from the silt bag. Sedimats will be secured to the ground surface using stakes/pegs. The sedimat will extend to the full width of the outfall to ensure all water passes through this additional treatment measure.

Settlement Ponds:

The Proposed Project development footprint has been divided into drainage catchments (based on topography, outfall locations, catchment size) and stormwater runoff rates based on the 10-year return period rainfall event were calculated for each catchment. These flows were then used to design settlement ponds for each drainage catchment. The settlement ponds are designed for 11hr or 24hr retention times used to settle out medium silt (0.006mm) and fine silt (0.004mm) respectively (EPA, 2006)[5]. Settlement ponds at the borrow pit are designed to allow 24hr retention and settlement ponds along access roads and at turbine hardstands will have 11hr retention as there is additional in-line drainage controls proposed along access tracks and at hardstands.

Level Spreaders and Vegetation Filters:

The purpose of level spreaders is to release treated drainage flow in a diffuse manner, and to prevent the concentration of flows at any one location thereby avoiding erosion. Level spreaders are not intended to be a primary treatment component for development surface water runoff. They are a secondary measure that manage how water is released from the drainage system and designed to reduce the effect of the already-controlled flow of treated water. They are not stand alone but occur as part of a treatment train of systems that will reduce the velocity of runoff prior to be released at the level spreader. In the absence of level spreaders, the potential for ground erosion is significantly greater than not using them.

Vegetation filters are essentially end-of-line polishing filters that are located at the end of the treatment train. In fact, vegetation filters are ultimately a positive consequence of not discharging directly into watercourses which is one of the mitigation components of the drainage philosophy. This makes use of the natural vegetation of the Site to provide a polishing filter for the wind farm drainage prior to reaching the downstream watercourses.

Again, vegetation filters are not intended to be a single or primary treatment component for treatment of works area runoff. They are not stand alone but are intended as part of a treatment train of water quality improvement/control systems (i.e. source controls→check dams→silt traps→settlement ponds→level spreaders →silt fences→vegetation filters).

Water Treatment Train:

A final line of defence will be provided by a water treatment train such as a “Siltbuster”. If the discharge water from construction areas fails to be of a high quality during regular inspections, then a filtration treatment system (such as a ‘Siltbuster’ or similar equivalent treatment train (sequence of water treatment processes) will be used to filter and treat all surface discharge water collected in the dirty water drainage system. This will apply for all of the construction phase.

Pre-emptive Site Drainage Management

The works programme for the entire construction stage of the development will also take account of weather forecasts, and predicted rainfall in particular. Large excavations and movements of soil/subsoil or vegetation stripping will be suspended or scaled back if heavy rain is forecast. The extent to which works will be scaled back or suspended will relate directly to the amount of rainfall forecast.

The following forecasting systems are available and will be used on a daily basis at the site to direct proposed construction activities:

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[5] Environmental Management Guidelines - Environmental Management in the Extractive Industry (Non-Scheduled Minerals) (EPA, 2006).

- General Forecasts: Available on a national, regional and county level from the Met Eireann website (www.met.ie/forecasts). These provide general information on weather patterns including rainfall, wind speed and direction but do not provide any quantitative rainfall estimates;
- MeteoAlarm: Alerts to the possible occurrence of severe weather for the next 2 days. Less useful than general forecasts as only available on a provincial scale;
- 3-hour Rainfall Maps: Forecast quantitative rainfall amounts for the next 3 hours but does not account for possible heavy localised events;
- Rainfall Radar Images: Images covering the entire country are freely available from the Met Eireann website (www.met.ie/latest/rainfall_radar.asp). The images are a composite of radar data from Shannon and Dublin airports and give a picture of current rainfall extent and intensity. Images show a quantitative measure of recent rainfall. A 3-hour record is given and is updated every 15 minutes. Radar images are not predictive; and,
- Consultancy Service: Met Eireann provide a 24-hour telephone consultancy service. The forecaster will provide interpretation of weather data and give the best available forecast for the area of interest.

Using the safe threshold rainfall values will allow work to be safely controlled (from a water quality perspective) in the event of forecasting of an impending high rainfall intensity event.

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

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

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

- All active excavations will be secured and sealed off;
- Temporary or emergency drainage will be installed to prevent back-up of surface runoff; and,
- No works will be completed during heavy rainfall and for up to 24 hours after heavy events to ensure drainage systems are not overloaded.

Management of Runoff from the Peat and Spoil Management Areas:

It is proposed that excavated peat/subsoil (spoil) will be used to reinstate the proposed borrow pit, for landscaping throughout the Site and any excess spoil will be placed in the 10 no. peat and spoil management areas. All peat and spoil management areas are located outside the 50m stream/river buffer zone, with all peat and spoil management areas being located a minimum of 500m away from EPA mapped watercourses (refer to **Figure 9-9**). The closest is located ~540m northwest of the Meander River as it outflows from Lough Nambrackkeagh. Furthermore, no peat and spoil management areas are located within the delineated 100m lake buffer. The closest is ~230m to the west of Drumady Lough.

Proposed surface water quality protection measures regarding the peat and spoil management areas are as follows:

- Where applicable the vegetative topsoil layer of the peat and spoil management areas will be rolled back to facilitate placement of excavated spoil up to a maximum height of 1.2 to 1.5 metres, following which the vegetative-top soils layer will be reinstated;
- Where reinstatement is not possible, peat and spoil management areas will be sealed with a digger bucket and seeded as soon as possible to reduce sediment entrainment in runoff;
- An interceptor drain will be installed upslope of the identified peat and spoil management areas to divert any surface water away from these areas where necessary;

- Silt fences and double silt-fences will be emplaced down-gradient of the designated peat and spoil management areas and will remain in place throughout the entire construction phase, or until reseeding has been established to a sufficient level;
- Once the peat and spoil management area has been seeded and vegetation is established the risk to downstream surface water is significantly reduced.

Therefore, at each stage of the peat management development the above mitigation measures will be deployed to ensure protection of downstream water quality.

The peat and spoil management area settlement ponds have been designed to allow a 24hr retention time as per EPA guidance (2006) which is highest level of protection recommended by the EPA with regard to retention time.

Timing of Site Construction Works:

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

Monitoring:

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

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, will be removed. Checks will be carried out on a daily basis.

During the construction phase field testing and laboratory analysis of a range of parameters with relevant regulatory limits and EQSs will be undertaken for each primary watercourse, and specifically following heavy rainfall events (as per the CEMP included in Appendix 4-5 of this EIAR).

Allowance for Climate Change

Climate Change rainfall projections are typically for a mid-century (2050) timeline. The projected effects of climate change on rainfall are therefore modelled towards the end of the life cycle of the Proposed Project, as the turbines have a life span of 35 years. It is likely that the long-term effects of climate change on rainfall patterns will not be observed during the lifetime of the Proposed Wind Farm. As outlined in the above sections we have designed settlement ponds for a 1 in 10-year return flow. This approach is conservative given that the project will likely be built over a much shorter period (12-18 months), and therefore this in-built redundancy in the drainage design more than accounts for any potential short term climate change rainfall effects.

However, the settlement ponds are designed for 1 in 10 years flows with built in redundancy (+20%) to account for climate change effects on rainfall.

Post-Mitigation Residual Effect: Proven and effective measures to mitigate the risk of releases of sediment have been proposed above and will break the pathway between the potential sources and the receptor. The residual effect will be a negative, imperceptible, indirect, short term, likely effect on water quality, and water-dependant ecosystems downstream of the Site.

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

9.5.2.3 Potential Effects on Surface Water Quality from Excavation Dewatering

Some groundwater/surface water seepages will likely occur in turbine foundation excavations, substation compound excavations and sections of the internal cabling trenches, and this will create additional volumes of water to be treated by the runoff management system. Groundwater inflows will likely be small however larger volumes of water may occur where excavations encounter granular subsoils. Inflows will require management and treatment to reduce suspended sediments. No contaminated land was noted at the Site and therefore pollution issues arising from such sources will not occur.

Pathway: Overland flow and site drainage network.

Receptor: Surface watercourses (Robe, Meander and Manulla rivers and associated tributaries), local lake water bodies (Drumady Lough, Lough Nambrackkeagh and Lough Fark) and associated water dependant ecosystems downstream of the Site.

Pre-Mitigation Potential Effect: Indirect, negative, significant, temporary, unlikely effect on surface water quality and water-dependent ecosystems. In the absence of mitigation measures, there will be the potential for significant effects on downstream surface waters and associated water-dependent ecosystems due to the low volumes of groundwater inflow.

Proposed Mitigation Measures:

Management of groundwater seepages and subsequent treatment prior to discharge into the drainage network will be undertaken as follows:

- Appropriate interceptor drainage, to prevent upslope surface runoff from entering excavations will be put in place;
- If required, pumping of excavation inflows will prevent build-up of water in the excavation;
- The interceptor drainage will be discharged to the site constructed drainage system or onto natural vegetated surfaces and not directly to surface waters;
- The pumped water volumes will be discharged via volume and sediment attenuation ponds adjacent to excavation areas, or via specialist treatment systems such as a Siltbuster unit;
- The borrow pit settlement ponds have been designed to allow a 24hr retention time as per EPA guidance (2006) which is highest level of protection recommended by the EPA with regard to retention time;
- There will be no direct discharge to surface watercourses, and therefore no risk of hydraulic loading or contamination will occur;
- Daily monitoring of excavations by the Environmental Clerk of Works will occur during the construction phase. If high levels of seepage inflow occur, excavation work will immediately be stopped and a geotechnical assessment undertaken; and,
- A mobile 'Siltbuster' or similar equivalent specialist treatment system will be available on-site for emergencies in order to treat sediment polluted waters from settlement ponds or excavations should they occur. Siltbusters are mobile silt traps that can remove fine particles from water using a proven technology and hydraulic design in a rugged unit. The mobile units are specifically designed for use on construction-sites. They will be used as final line of defence if needed.

Post-Mitigation Residual Effect: Proven and effective measures to mitigate the risk of releases of sediment have been proposed above and will break the pathway between the potential sources and the receptor. The residual effect will be a negative, imperceptible, indirect, temporary, unlikely effect on local surface watercourses and associated water-dependent ecosystems.

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

9.5.2.4 Potential Effects on Groundwater Levels during Excavation Works

Dewatering of the borrow pit (as required) and other deep excavations (i.e. turbine bases) have the potential to impact on local groundwater levels and flows. However, temporary reductions in groundwater levels by short duration and transient dewatering works will be very localised and of small magnitude due to the nature and permeability of the local subsoil and bedrock geology. Groundwater level effects will not be significant due the local hydrogeological regime across much of the Site. Any effects will be temporary and will be contained where granular subsoils are encountered.

No groundwater level effects are predicted from the construction of the grid connection, access tracks, substation, compound, temporary construction tracks or met mast due to the shallow nature of the excavation (i.e. 0 -~1.2m).

Pathway: Groundwater flowpaths

Receptor: Groundwater levels within the underlying GWBs (Swinford GWB and Cong - Robe GWB).

Pre-Mitigation Potential Effect: Negative, direct, temporary, slight, unlikely effects on local groundwater levels within the bedrock aquifer at the Site. In the absence of mitigation measures, there will be no potential for significant effects on groundwater levels due to the relatively shallow nature of the excavations and the low permeability of the peat and the underlying cohesive clay and silt subsoils.

Mitigation Measures / Impact Assessment:

The proposed borrow pit is mapped to be located in a Regionally Important Karst Aquifer. Groundwater dewatering may be required as the excavation deepens. It is noted that no groundwater was encountered during the excavation of the 2 no. trial pits at the proposed borrow pit location which extended to depths of 2.3 and 2.7mbgl. Furthermore, no groundwater strikes were recorded during the drilling of the rotary core hole at the borrow pit location.

Direct rainfall and surface water runoff will be the main inflows that will require water volume and water quality management. For the avoidance of doubt, we would generally define dewatering as a requirement to temporarily 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. We consider that this example is very different in scale and operation from the proposed operation of a temporary shallow borrow pit. In order to explain this thoroughly we will outline our reasoning in a series of bullet points as follows:

- Firstly, the borrow pit area is located in an area of deep subsoils (10.6m in thickness);
- The borrow pit was selected based on the shallow depth of peat (generally less than 1m with a depth of 2.2 in the southwest), with the peat at this location being underlain by sand and gravel subsoils;
- No groundwater strikes were encountered during the site investigations at the proposed borrow pit location;
- The bedrock encountered during the drilling did not contain any water bearing features;

- No karst features were recorded at the proposed borrow pit location;
- The borrow pit is remote from any surface water streams and/or rivers; and,
- The maximum depth of the borrow pit is 6m which is a relatively shallow excavation and not comparable to a large bedrock quarry. There will be no excavation of bedrock.

Some temporary dewatering may be required where excavations encounter granular subsoils. However, any dewatering works will be temporary, and no significant or permanent excavations are proposed in this area of the Site. There will be no significant effect on groundwater quantity as the water will be returned to the aquifer once it has been treated via the Proposed Project drainage system.

Relevant environmental management guidelines from the EPA quarry 2006 guidance document – "Environmental Management in the Extractive Industry" in relation to groundwater issues will be implemented during the construction phase. Control of groundwater within the borrow pit may be required and measures will be determined as part of the ground investigation programme. The site investigations indicate that the volumes of water requiring treatment will not be significant.

Post Mitigation Residual Effect: Due to large topographic elevation and hydrogeology of the Site the potential for water level drawdown effects at receptor locations is considered negligible. The residual effect will be a negative, imperceptible, direct, short term, unlikely effect on groundwater levels.

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

9.5.2.5 Potential Effects from Leakages or Spillages 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.

The potential release of hydrocarbons can occur during the works within the Site.

Surface waters are the primary receptor due to the local hydrogeological regime (high rates of surface water runoff and restricted groundwater recharge). It is noted that many of the turbine foundations will be constructed within granular subsoils underlying the peat and cohesive clay and silt deposits. These deeper excavations have the potential to temporarily increase connectivity with the deeper underlying groundwater system, which is otherwise protected by the overlying low-permeability strata. However, such excavations will be localised, limited in spatial extent and duration, limiting the potential for effects on groundwater quality.

Pathway: Groundwater flowpaths and site drainage network.

Receptor: Surface watercourses (Robe, Meander and Manulla rivers and associated tributaries), local lake water bodies (Drumady Lough, Lough Nambrackkeagh and Lough Fark) and associated water dependant ecosystems downstream of the Site and local groundwater quality.

Pre-Mitigation Potential Effect:

Negative, indirect, slight, short-term, unlikely effect on local groundwater quality in the bedrock aquifer below the Site. In the absence of mitigation measures, there will be no potential for significant effects on local groundwater quality in the bedrock aquifer as the bedrock at the Site is protected by a thick layer of overburden deposits.

Indirect, negative, significant, short term, unlikely effect on surface water quality downstream of the Site. In the absence of mitigation measures, there will be the potential for significant effects on downstream surface waters and associated water-dependent ecosystems.

Proposed Mitigation Measures:

Mitigation measures proposed to avoid release of hydrocarbons are as follows:

- Wherever possible, vehicles will be refuelled off-site, particularly for regular road-going vehicles.
- All plant will be inspected and certified to ensure that they are leak free and in good working order prior to use at the Site.
- On-site refuelling of machinery will be carried out at designated refuelling areas at various locations throughout the Site.
- Heavy plant and machinery will be refuelled on-site by a fuel truck, with spill kits kept onboard, that will come to the Site as required on a scheduled and organised basis.
- Other refuelling will be carried out using mobile double skinned fuel bowser. The fuel bowser will be parked on a level area in the construction compound when not in use
- Only designated trained operatives will be authorised to refuel plant on-site;
- Refuelling or maintenance of machinery will not occur within the delineated hydrological buffer zones;
- Fuels stored on the Site will be minimised;
- Any diesel or fuel oils stored at the temporary construction compound will be bunded. The bund capacity will be sufficient to contain 110% of the storage tank's maximum capacity; and,
- An emergency plan for the construction phase to deal with accidental spillages will be contained within the Construction and Environmental Management Plan (Appendix 4-5). Spill kits will be available to deal with accidental spillages.

Post-Mitigation Residual Effects: Proven and effective measures to mitigate the risk of releases of hydrocarbons have been proposed above and will break the pathway between the potential source and each receptor. The residual effect will be a negative, imperceptible, indirect, short term, unlikely effect to local groundwater quality and a negative, imperceptible, indirect, short term, unlikely effect to surface water quality.

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

9.5.2.6 Potential Effects from Cement-Based Products

Concrete and other cement-based products are highly alkaline and corrosive and can have significant negative effects on water quality. They generate very fine, highly alkaline silt (pH 11.5) that can physically damage fish by burning their skin and blocking their gills. A pH range of $\geq 6 \leq 9$ is set in S.I. No. 293 of 1988 Quality of Salmonid Water Regulations, with artificial variations not in excess of ± 0.5 of a pH unit. Entry of cement-based products into the site drainage system, into surface water runoff, and hence to surface watercourses or directly into watercourses represents a risk to the aquatic environment. Peat ecosystems are dependent on low pH hydrochemistry. They are extremely sensitive to introduction of high pH alkaline waters into the system.

Batching of wet concrete at the Site and washing out of transport and placement machinery are the activities most likely to generate a risk of cement-based pollution. Placed concrete in foundations (turbine, met mast and substation foundations) and the use of lean mix concrete 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 effects are low.

Surface waters are the primary receptor due to the local hydrogeological regime (high rates of surface water runoff and restricted groundwater recharge). It is noted that many of the turbine foundations will be constructed within granular subsoils underlying the peat and cohesive clay and silt deposits. These deeper excavations have the potential to temporarily increase connectivity with the deeper underlying groundwater system, which is otherwise protected by the overlying low-permeability strata. However, such excavations will be localised, limited in spatial extent and duration, limiting the potential for effects on groundwater quality.

Pathway: Site drainage network and groundwater flowpaths.

Receptor: Surface watercourses (Robe, Meander and Manulla rivers and associated tributaries), local lake water bodies (Drumady Lough, Lough Nambrackkeagh and Lough Fark) and associated water dependant ecosystems downstream of the Site and local groundwater quality

Pre-Mitigation Potential Effect:

Negative, moderate, indirect, short-term, likely effect on surface water quality. In the absence of mitigation measures, there will be no potential for significant effects on local surface water quality due to the contained shuttering and the limited area of exposed concrete.

Negative, imperceptible, indirect, short-term, unlikely effect on groundwater quality. In the absence of mitigation measures, there will be no potential for significant effects on local groundwater quality due to the contained shuttering and the limited area of exposed concrete.

Proposed Mitigation Measures:

- No batching of wet-concrete products will occur on site. Ready-mixed supply of wet concrete products and where possible, emplacement of pre-cast elements, will take place;
- Where possible pre-cast elements for culverts and concrete works will be used;
- Where concrete is delivered on site, only the chute will be cleaned, using the smallest volume of water practicable. No discharge of cement contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed. Chute cleaning water will be undertaken at lined concrete washout ponds;
- Weather forecasting will be used to plan dry days for pouring concrete; and,
- The pour site will be kept free of standing water and plastic covers will be ready in case of sudden rainfall event; and,
- At proposed turbine foundations, sand blinding, DPM, and lean-mix blinding are used to vertically contain the concrete. While the concrete is contained laterally by temporary/permanent shuttering. The concrete cures within 72hrs.

Post-Mitigation Residual Effect: Proven and effective measures to mitigate the risk of releases of cement-based products or cement truck wash water have been proposed above and will break the pathway between the potential source and each receptor. The residual effect will be a negative, imperceptible, indirect, short term, unlikely effect on surface and groundwater quality.

Significance of the Effect: For the reasons outlined above, no significant effects on surface water quality or groundwater quality will occur.

9.5.2.7 Potential Effects from Wastewater

Release of effluent from on-site temporary wastewater treatment systems has the potential to effect on groundwater and surface water quality if site conditions are not suitable for an on-site percolation unit. Welfare facilities will be located at the proposed temporary construction compounds at the Site. Impacts on surface water quality could affect fish stocks and aquatic habitats.

Pathway: Groundwater flowpaths and site drainage network.

Receptor: Surface watercourses (Robe, Meander and Manulla rivers and associated tributaries), local lake water bodies (Drumady Lough, Lough Nambrackkeagh and Lough Fark) and associated water dependant ecosystems downstream of the Site and local groundwater quality.

Pre-mitigation Potential Effect: Negative, significant, indirect, temporary, unlikely effect to surface water quality. Negative, slight, indirect, temporary, unlikely effect on local groundwater quality. In the absence of mitigation measures, there will be the potential for significant effects on downstream surface water quality and no potential for significant effects on local groundwater quality due to the small volumes of wastewater to be generated at the Site.

Proposed Mitigation Measures:

- During the construction phase, a self-contained port-a-loo with an integrated waste holding tank will be used at each of the site construction compounds, maintained by the providing contractor, and removed from site on completion of the construction works;
- Water supply for the site office and other sanitation will be brought to site and removed after use from the site to be discharged at a suitable off-site treatment location; and,
- No water or wastewater will be sourced on the site, nor discharged to the Site.

Post-Mitigation Residual Effect: Proven and effective measures to mitigate the release of wastewater on Site have been proposed above and will break the pathway between the potential source and each receptor. The residual effect will be a negative, imperceptible, indirect, temporary, unlikely effect on surface water or groundwater quality.

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

9.5.2.8 Potential Effects from Morphological Changes to Surface Watercourses & Drainage Patterns within the Site

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

No new crossings of natural watercourse are required within the Site as part of the Proposed Project.

There are manmade agricultural, peat and forestry drains within the Site. However, these are not considered to be a significant constraint and can be rerouted around the Proposed Wind Farm infrastructure and/or integrated into the proposed drainage design. Several of these drains are deeply incised and will be culverted where access tracks are proposed.

Pathway: Site drainage network.

Receptor: Surface watercourses (Robe, Meander and Manulla rivers and associated tributaries), local lake water bodies (Drumady Lough, Lough Nambrackkeagh and Lough Fark) and associated water dependant ecosystems downstream of the Site.

Pre-Mitigation Potential Effect: Negative, imperceptible, direct, long-term, unlikely effect on surface water flows, local stream morphology and surface water quality. In the absence of mitigation measures, there will be no potential for significant effects due to the lack of any crossings over natural watercourses.

Proposed Mitigation Measures

In relation to the new proposed culverts and proposed culvert upgrades at field drain crossings, the culverts will be suitably sized for the expected peak flows in the relevant drain. All culverts will be installed with a minimum internal gradient of 1% (1 in 100). Smaller culverts will have a smooth internal surface. Larger culverts may have corrugated surfaces which will trap silt and contribute to the stream ecosystem. Depending on the management of water on the downstream side of the culvert, large stone may be used to interrupt the flow of water. This will help dissipate its energy and help prevent problems of erosion. Smaller drain crossings will simply consist of an appropriately sized pipe buried in the sub-base of the access track at the necessary invert level to ensure ponding or pooling does not occur above or below the culvert and water can continue to flow as necessary.

Post-Mitigation Residual Effect: With the application of the best practice mitigation outlined above, the residual effect will be a negative, imperceptible, direct, long term, unlikely effect on stream flows, stream morphology and surface water quality.

Significance of Effects: For the reasons outlined above, no significant effects on stream morphology or stream water quality will occur at crossing locations.

9.5.2.9 Potential Effect from the Use of Siltbuster

Siltbusters are regularly used to remove suspended sediments on construction sites by means of chemical dosing and sedimentation (i.e. use of coagulants and flocculants to accelerate the settlement process). The benefits of using enhanced settlement systems on downstream surface water quality are widely known and provide a positive effect. However, potential overdosing with chemical agents means there is a perceived risk of chemical carryover in post treatment water which could result in negative effects on downstream water quality.

Wind farm construction water (i.e. surface water runoff or pumped groundwater) has sometimes very fine particles, particularly clays and peat, with slow settling velocities which do not settle out efficiently, even in a lamella clarifier at normal flow rates. In these cases, chemical dosing can be used to aggregate the particles (i.e. force them to combine and become heavier), increasing the particle settling rate and cleaning the water via gravity separation techniques. Agents commonly used include poly aluminium chloride (PAC), aluminium sulphate, ferric iron and ferrous iron. These agents are commonly used in drinking water treatment plants. So, their use is widespread, and there is significant scientific knowledge around their use and control.

The benefits of using a Siltbuster system in emergency scenarios where all other water treatment systems have proven ineffective are considerable. An example of treatment capability of siltbuster systems from northwest Mayo is provided in Figure 9-12. This is a duration curve of downstream water quality data post siltbuster treatment. The system was setup so that any water not meeting discharge criteria was recycled back to the settlement ponds. The graph shows all data, and only 24 data points out of 1194 records were above 20 mg/L (i.e. recycling, and repeat treatment occurred at these times to ensure compliance at the discharge location).

Note that the Siltbuster system will not be used under normal conditions during the construction phase. The mitigation proposed to protect water quality is already outlined above in Section 9.5.2.2 and Section 9.5.2.4.

The use of Siltbuster is only proposed as an emergency back up in the event of failure of all other proposed water treatment mitigation measures, e.g. in the event of landslide failure. The Siltbuster system is a proven and effective method of water quality treatment during these events. Given the relatively flat topography of the Site, the risk of a landslide is considered to be low. Therefore, it is extremely unlikely that the Siltbuster system will be utilised.

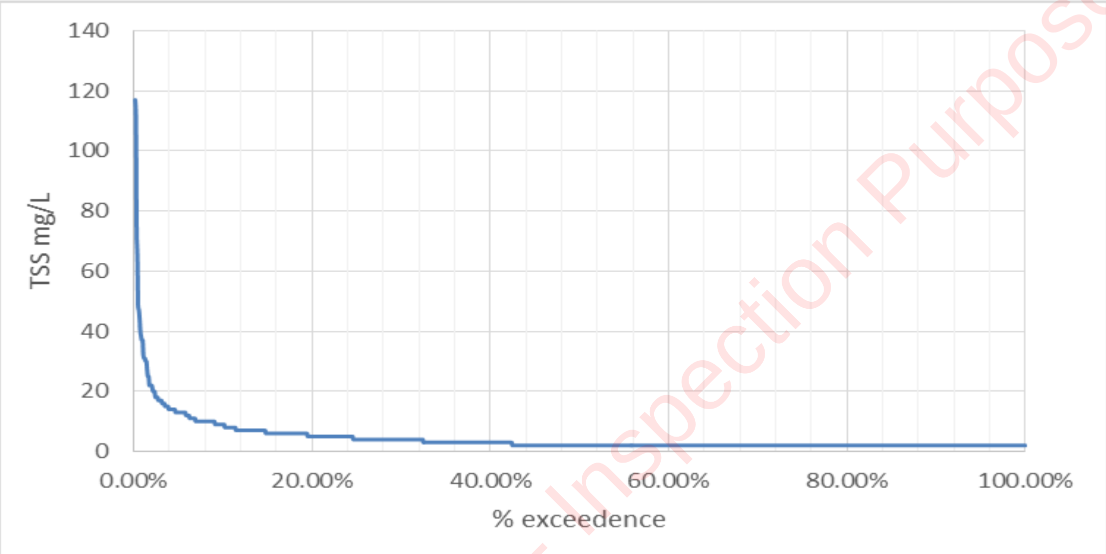

Figure 9-13: TSS treatment data using Siltbuster systems (with chemical dosing)

Pathways: Drainage and surface water discharge routes.

Receptors: Surface watercourses (Robe, Meander and Manulla rivers and associated tributaries), local lake water bodies (Drumady Lough, Lough Nambrackkeagh and Lough Fark) and associated water dependant ecosystems downstream of the Site.

Pre-Mitigation Potential Effects: Negative, slight, indirect, temporary, unlikely effect on downgradient water quality as a result of potential overdosing with chemical agents. In the absence of mitigation measures, there will be no potential for significant effects on downstream surface waters as the Siltbuster would only be used in emergency situations and would have an overall positive effect on downstream water quality in terms of reducing suspended solids concentrations.

Mitigation Measures:

Measures employed to prevent overdosing and potential chemical carryover:

- The siltbuster system comprises an electronic in-line dosing system which provides an accurate means of adding reagents, so overdosing cannot occur;
- Continued monitoring and water analysis of pre and post treated water by means of an inhouse lab and dedicated staff, means the correct amount of chemical is added by the dosing system;

- Dosing rates of chemical to initiate settlement is small, being in the order of 2-10 mg/L and the vast majority of the chemical is removed in the deposited sediment;
- Final effluent not meeting the discharge criteria is recycled and retreated, which has a secondary positive effect of reducing carryover; and,
- Use of biodegradable chemical agents can be used at very sensitive sites (i.e. adjacent to SACs).

Post Mitigation Residual Effects: With the implementation of the dosing technology and the continual monitoring of pre and post treatment water, the appropriate volume of chemical agent can be added to ensure that chemical carryover concentrations are present only in tiny trace amounts which will not cause any effects to receiving waters or associated aquatic ecology. The residual effect will be a negative, imperceptible, indirect, temporary, unlikely effect on downstream water quality.

Significance of Effects: For the reasons outlined above, no significant effects on the surface water quality will not occur. In fact, it is considered that the use of siltbuster systems has a significant positive effect in respect of protected surface water quality.

9.5.2.10 Potential Effects on Local Private Groundwater Well Supplies

The biggest risk to groundwater wells will be from groundwater contamination due to the accidental release of hydrocarbons and cement-based products as a result of construction activities within the Site.

No long term, permanent effects on groundwater levels / quantity will occur due to the lack of any proposed significant dewatering works, other than local temporary works required at turbine/substation foundations and for any excavations at the proposed borrow pit.

There are several public and group schemes that can be impacted by the Proposed Project. These are assessed separately in Section 9.5.3.4.

With regard to private wells, there are 52 no. dwellings within 1km of the proposed turbine locations. No dwelling is located within 640m of any proposed turbine. The closest dwelling is located 643m southeast of T1.

Due to the on-site location and shallow nature of the proposed works for the Proposed Grid Connection underground cabling route, no effects on private groundwater well supplies will occur.

Pathway: Groundwater flowpaths.

Receptor: Down-gradient groundwater supplies (private groundwater wells).

Pre-Mitigation Effect: Negative, imperceptible, indirect, long-term, unlikely effect on down gradient private water supplies. In the absence of mitigation measures, there will be no potential for significant effects on local private groundwater well supplies due to the separation distances and the local hydrogeological regime (lack of any karst features or shallow bedrock, the presence of thick overburden deposits which protect the bedrock and restrict groundwater recharge).

Mitigation Measures / Impact Assessment:

There is no potential for effects on local private groundwater well supplies for the following reasons:

- Whilst the bedrock at the Site is classified as a Regionally Important Karst Aquifer, within the Site it is protected by a substantial thickness of overburden;

- The nature of the overburden has been determined from comprehensive site investigations including trial pits (28 no.), peat probing (262 no,) and the drilling of a rotary core hole;
- The bedrock at the Site is typically overlain by low permeability peat and cohesive clay and silt subsoils. These soils/subsoils provide protection to the underlying bedrock aquifer and result in relatively high rates of surface water runoff in this area.
- No bedrock was encountered at any of the trial pit excavations – no shallow bedrock is present at the Site;
- Bedrock was only encountered in the rotary core hole drilled at the proposed borrow pit location at a depth of 10.6mbgl;
- No significant weathering or karst features were noted, with the bedrock in the rotary core hole being described as moderately strong to strong.
- No surface expressions of karst features were recorded during the extensive walkover surveys. The Site is typical of a peatland environment with high rates of surface water runoff.

- Therefore the hydrogeological regime at the Site is characterised by high rates of surface water runoff and low rates of groundwater recharges;
- The substantial thickness of overburden creates a low vulnerability hydrogeological setting, where the superficial layers act as a protective barrier and prevent recharge to the underlying karst system;
- The overburden limits direct entry of potential contaminants into the bedrock aquifer;
- Groundwater flow is expected to discharge into the local surface watercourses i.e. the existing site drainage network which discharges to the Meander and Robe rivers;
- No significant excavation dewatering will be required and there will be no potential for significant effects on local groundwater levels; and,
- Tried and tested, best practice mitigation measures for the protection of local groundwater quality have been proposed above with respect to suspended solids (Section 9.5.2.2), hydrocarbons (Section 9.5.2.5), cement-based products (Section 9.5.2.6) and wastewater (Section 9.5.2.7).

Post Mitigation Residual Effects: With the implementation of the prescribed mitigation measures the residual effect will be a negative, imperceptible, indirect, long-term, unlikely effect in terms of quality or quantity on local private groundwater abstractions.

Significance of Effects: For the reasons outlined above, no significant effects on existing groundwater supplies will occur.

9.5.2.11 Potential Effects on Public and Group Groundwater Supplies

As detailed in Section 9.3.15.2, the GWSs in the surrounding lands include the Pollavaddy/Balla GWS, the Mayo Abbey GWS, the Nestor Scheme, the Knockaunakill Mayo Abbey scheme, the Kilcolman Facefield GWS, the Loughanemon Barnacarroll GWS Kilcolman Facefield GWS, the Loughanemon Barnacarroll GWS and the Mayo Abbey GWS.

Any potential effects on local water quality or quantity could potentially effect these water supplies.

It is important to note that the Site does not overlap with the delineated source protection area of any GWS. Nevertheless, due to the GSI mapped Regionally Important Karst Aquifer which underlies the Site, these GWSs are included for the purposes of a conservative impact assessment.

Pathway: Site drainage network, surface water flowpaths and groundwater flowpaths.

Receptors: Pollavaddy/Balla GWS, the Mayo Abbey GWS, the Nestor Scheme, the Knockaunakill Mayo Abbey scheme, the Kilcolman Facefield GWS, the Loughanemon Barnacarroll GWS Kilcolman Facefield GWS, the Loughanemon Barnacarroll GWS and the Mayo Abbey GWS.

Pre-Mitigation Effect: Indirect, negative, moderate, short-term, likely effect on local and downgradient GWS. In the absence of mitigation measures, there will be no potential for significant effects on local and downgradient GWS due to the separation distances and the local hydrogeological regime (lack of any karst features or shallow bedrock, the presence of thick overburden deposits which protect the bedrock and restrict groundwater recharge).

Impact Assessment & Proposed Mitigation Measures:

The presence of local GWSs in the surrounding lands has been considered in the Proposed Project design, and as such all proposed mitigation and drainage design proposals were designed towards providing a “best in class” drainage management proposal for the Proposed Project considering the sensitive nature of the hydrogeological and hydrological environment.

Mayo Abbey GWS

No significant effects will occur on the Mayo Abbey GWS for the following reasons:

- The borehole associated with the Mayo Abbey GWS is located 1.5km to the west of the Site and ~1.57km from the nearest turbine (T7);
- The substantial thickness of overburden at the Site creates a low vulnerability hydrogeological setting, where the superficial layers act as a protective barrier and prevent recharge to the underlying karst system;
- The overburden limits direct entry of potential contaminants into the bedrock aquifer
- Several peat and farm drains are located in the intervening lands and will capture any local groundwater flows;
- Local groundwater at the Site will enter the local surface water drainage system and downstream watercourses;
- The mitigation measures described above in Section 9.5.2.1 (tree felling), Section 9.5.2.2 (suspended solids), Section 9.5.2.5 (hydrocarbons), Section 9.5.2.6 (cement-based products), Section 9.5.2.7 (wastewater) and Section 9.5.2.8 (morphological changes) will ensure the protection of water quality during the construction phase; and,
- The proposed drainage design will ensure that all construction phase water is attenuated and treated prior to discharge at greenfield runoff rates.

Knockaunakill Mayo Abbey UÉ Abstraction

No significant effects will occur on the Knockaunakill Mayo Abbey UÉ Abstraction for the following reasons:

- The UÉ borehole associated with the Knockaunakill Mayo Abbey scheme is located to the east of the Site, with groundwater flow at the Site being to the west and northwest towards Lough Mask and Lough Cullin and away from the abstraction;
- The UÉ borehole is located in excess of 1km from the closest proposed turbine location (T4);
- The substantial thickness of overburden at the Site creates a low vulnerability hydrogeological setting, where the superficial layers act as a protective barrier and prevent recharge to the underlying karst system;
- The overburden limits direct entry of potential contaminants into the bedrock aquifer,

- Mitigation measures for the protection of surface and groundwater water quality will be implemented during the construction phase; and,
- There will be no discharge of untreated or unattenuated water from the construction phase drainage system. All water will be treated and attenuated prior to release.

Pollavaddy/Balla GWS, Kilcolman Facefield GWS, the Loughanemon Barnacarroll GWS

No significant effects will occur on these GWSs for the following reasons:

- These GWSs are distant from the Site (>5km);
- No works are proposed within the delineated source protection areas associated with these GWSs;
- The substantial thickness of overburden at the Site creates a low vulnerability hydrogeological setting, where the superficial layers act as a protective barrier and prevent recharge to the underlying karst system;
- The overburden limits direct entry of potential contaminants into the bedrock aquifer,
- Mitigation measures for the protection of surface and groundwater water quality will be implemented during the construction phase; and,
- There will be no discharge of untreated or unattenuated water from the construction phase drainage system. All water will be treated and attenuated prior to release.

Nestor UÉ Abstraction

No significant effects will occur on the Nestor UÉ Abstraction for the following reasons:

- The Nestor Scheme is distant from the Site (~4.6km);
- The Meander River acts as a hydraulic barrier between the Site and this UÉ abstraction point;
- The substantial thickness of overburden at the Site creates a low vulnerability hydrogeological setting, where the superficial layers act as a protective barrier and prevent recharge to the underlying karst system;
- The overburden limits direct entry of potential contaminants into the bedrock aquifer,
- Mitigation measures for the protection of surface and groundwater water quality will be implemented during the construction phase; and,
- There will be no discharge of untreated or unattenuated water from the construction phase drainage system. All water will be treated and attenuated prior to release.

Post Mitigation Residual Effect: With the implementation of the prescribed mitigation measures the residual effect will be a negative, imperceptible, indirect, short term, unlikely effect on local group water supplies.

Significance of Effects: For the reasons outlined above, no significant effects will occur on local group water supplies.

9.5.2.12 Potential Effects on Surface Water Drinking Supplies

There are no surface water Drinking Water Protected Areas (DWPA) in close proximity to the Site.

There are 2 no. UÉ abstraction locations on the Meader River and one of its tributaries to the west of the Site. These are associated with the Rathnacreeva and Cullentra abstractions located ~3.5km and 1.5km to the west of the Site respectively.

Pathways: Surface water flowpaths, and groundwater flowpaths.

Receptors: Down-gradient water quality in the Rathnacreeva and Cullentra abstractions.

Pre-Mitigation Potential Effect: Negative, imperceptible, indirect, short term, unlikely effect on downstream UÉ abstractions. In the absence of mitigation measures there is no potential for significant effects due to the separation distances, local hydrogeological regime and increasing flow volumes in downstream watercourses).

Mitigation Measures / Impact Assessment:

Cullentra Uisce Éireann Abstraction

There is very limited potential for effects on the Cullentra Uisce Éireann Abstraction for the following reasons:

- The lack of any direct hydrological (surface water) connection between the Site and the Cullentra Uisce Éireann Abstraction;
- The only potential connectivity is via groundwater flowpaths in the underlying karst aquifers;
- The substantial thickness of overburden at the Site creates a low vulnerability hydrogeological setting, where the superficial layers act as a protective barrier and prevent recharge to the underlying karst system;
- The overburden limits direct entry of potential contaminants into the bedrock aquifer,
- Mitigation measures for the protection of surface and groundwater water quality will be implemented during the construction phase (refer to Sections 9.5.2.1 to 9.5.2.9 above); and,
- There will be no discharge of untreated or unattenuated water from the construction phase drainage system. All water will be treated and attenuated prior to release.

Rathnacreeva Uisce Éireann Abstraction

There is very limited potential for effects on the Rathnacreeva Uisce Éireann Abstraction for the following reasons:

- Lough Nambrackkeagh is located downstream of the Site and upstream of the abstraction point. This lake waterbody would act as a hydraulic buffer, limiting the potential for effects further downstream. Note that the Proposed Project does not in any way rely upon this lake for the protection of downstream surface water quality.
- The length of the hydrological flowpath between the Site and the abstraction is >11km;
- Strict, tried and tested-best practice mitigation measures have been prescribed in this EIAR for the protection of surface and groundwater quality at the Site (and upstream of Lough Nambrackkeagh);
- The proposed drainage regime will ensure that there will be no change to surface water runoff rates of groundwater recharge rates at the Site;
- Mitigation measures for the protection of surface and groundwater water quality will be implemented during the construction phase (refer to Sections 9.5.2.1 to 9.5.2.9 above); and,
- There will be no discharge of untreated or unattenuated water from the construction phase drainage system. All water will be treated and attenuated prior to release.

Post-Mitigation Residual Effects: For the reasons detailed above and with the implementation of the prescribed mitigation measures there will be no potential for residual effects on the downstream Uisce Éireann surface water abstractions.

Significance of Effects: For the reasons given above, no significant effects on surface water drinking supplies.

9.5.2.13 Potential Effects on Designated Sites

The Site is not located within any designated conservation site. However, as stated in Section 9.3.14 above, the River Moy SAC is located downstream and in close proximity to the Site. Any potential deterioration in surface or groundwater quality at the Site would have the potential to impact this SAC.

Furthermore, there are several groundwater dependent SACs and pNHAs located within 8km of the Site. These have been included for the purposes of a conservative impact assessment.

Pathway: Surface water flowpaths.

Receptor: Down-gradient water quality and designated sites (River Moy SAC) and local groundwater dependent designated site (Mountpleasant School Turlough pNHA, Slishmeen Turlough pNHA, Balla Turlough SAC/pNHA and Carrowkeel Turlough SAC/pNHA).

Pre-Mitigation Potential Effect: Indirect, negative, significant, short term, likely effect on the River Moy SAC. In the absence of mitigation measures there is the potential for significant effects due to the Site's proximity and hydrological connection to this SAC.

Indirect, negative, imperceptible, short term, unlikely effect on the Mountpleasant School Turlough pNHA, Slishmeen Turlough pNHA, Balla Turlough SAC/pNHA and Carrowkeel Turlough SAC/pNHA. In the absence of mitigation measures there is no potential for significant effects on the Mountpleasant School Turlough pNHA, Slishmeen Turlough pNHA, Balla Turlough SAC/pNHA and Carrowkeel Turlough SAC/pNHA due to the absence of any direct hydrological connection coupled with the local hydrogeological regime (lack of any karst features or shallow bedrock at the Site and the overlying subsoils which protect the underlying groundwater system).

Impact Assessment & Proposed Mitigation Measures:

<u>River Moy SAC</u>

There will be no significant effects on the River Moy SAC for the following reasons and with the implementation of the prescribed mitigation measures:

- No works associated with the Proposed Project are proposed within this SAC;
- Lough Nambrackkeagh is located downstream of the Site and upstream of the SAC. This lake waterbody would act as a hydraulic buffer, limiting the potential for effects further downstream. Note that the Proposed Project does not in any way rely upon this lake for the protection of downstream surface water quality.
- Strict, tried and tested-best practice mitigation measures have been prescribed in this EIAR for the protection of surface and groundwater quality at the Site (and upstream of Lough Nambrackkeagh);
- The proposed drainage regime will ensure that there will be no change to surface water runoff rates of groundwater recharge rates at the Site;
- The mitigation measures described above in Section 9.5.2.1 (tree felling), Section 9.5.2.2 (suspended solids), Section 9.5.2.5 (hydrocarbons), Section 9.5.2.6 (cement-

based products), Section 9.5.2.7 (wastewater) and Section 9.5.2.8 (morphological changes) will ensure the protection of water quality during the construction phase;
- The proposed drainage design will ensure that all construction phase water is attenuated and treated prior to discharge at greenfield runoff rates.

<u>Mountpleasant School Turlough pNHA and Slishmeen Turlough pNHA</u>

There will be no significant effects on the Mountpleasant School Turlough pNHA or the Slishmeen Turlough pNHA for the following reasons:

- These pNHAs are distant from the Site, located ~5km to the west;
- There is no direct hydrological connection between the Site and these pNHAs;
- The Meander River acts as a hydraulic barrier between the Site and these pNHAs;
- The only potential for effects is via groundwater recharge and deep groundwater flow in the bedrock aquifer, beneath the Meander River and discharge of groundwater into the turloughs;
- However, the Regionally Important Karst Aquifer at the Site is protected by a substantial thickness of overburden;
- This creates a low vulnerability hydrogeological setting whereby water at the Site enters local streams and rivers as surface water runoff rather than groundwater recharge;
- Furthermore, strict, tried and tested-best practice mitigation measures have been prescribed in this EIAR for the protection of surface and groundwater quality at the Site; (refer to Sections 9.5.2.1 to 9.5.2.9 above) and,
- The proposed drainage regime will ensure that there will be no change to surface water runoff rates or groundwater recharge rates at the Site.

<u>Balla Turlough SAC/pNHA</u>

There will be no significant effects on the Balla Turlough SAC/pNHA, for the following reasons:

- The SAC/pNHAs is distant from the Site, located ~5km to the northwest;
- There is no direct hydrological connection between the Site and this SAC/pNHA;
- The only potential for effects is via groundwater recharge and deep groundwater flow in the bedrock aquifer, beneath the Meander River and discharge of groundwater into the turlough;
- However, the Regionally Important Karst Aquifer at the Site is protected by a substantial thickness of overburden;
- This creates a low vulnerability hydrogeological setting whereby water at the Site enters local streams and rivers as surface water runoff rather than groundwater recharge;
- Furthermore, strict, tried and tested-best practice mitigation measures have been prescribed in this EIAR for the protection of surface and groundwater quality at the Site (refer to Sections 9.5.2.1 to 9.5.2.9 above); and,
- The proposed drainage regime will ensure that there will be no change to surface water runoff rates of groundwater recharge rates at the Site.

<u>Carrowkeel Turlough SAC/pNHA</u>

There will be no significant effects on the Carrowkeel Turlough SAC/pNHA, for the following reasons:

- This SAC/pNHA is distant from the Site, located ~7.4km to the south;
- There is no direct hydrological connection between the Site and this SAC/pNHA;

- The only potential for effects is via groundwater recharge and deep groundwater flow in the bedrock aquifer, beneath the River Robe and discharge of groundwater into the turlough;
- However, the Regionally Important Karst Aquifer at the Site is protected by a substantial thickness of overburden;
- This creates a low vulnerability hydrogeological setting whereby water at the Site enters local streams and rivers as surface water runoff rather than groundwater recharge;
- Furthermore, strict, tried and tested-best practice mitigation measures have been prescribed in this EIAR for the protection of surface and groundwater quality at the Site (refer to Sections 9.5.2.1 to 9.5.2.9 above); and,
- The proposed drainage regime will ensure that there will be no change to surface water runoff rates or groundwater recharge rates at the Site.

Post-Mitigation Residual Effect: With the implementation of the prescribed mitigation measures the residual effect will be a negative, imperceptible, indirect, short term, unlikely effect on the River Moy SAC. No potential for residual effects on local groundwater dependent designated sites.

Significance of Effects: No significant effects on designated sites will occur.

9.5.2.14 Potential Effects due to Turbine Delivery Route Works

Minor accommodation works will be required at various locations on the road network between the port of arrival in Galway and the Site. Works such as road widening are sometimes required along proposed turbine transport routes to accommodate the large turbine components and associated vehicles seeking to access wind farm sites. The proposed transport route for the Proposed Project, is shown on Figure 4-33 in Chapter 4. These areas and the proposed works are detailed in Chapter 4, Section 4.6.2.

No significant works are required along the TDR. To facilitate the transportation of turbine components off the L-55512 and onto the L-1519, minor accommodating works are required which involves temporary road widening and wall removal. A similar degree of works will be required on the L-1505, L1506 and L-5531 where temporary road widening and vegetation clearance and the extension of an existing culvert along a small stream will be required to provide the necessary clearance of the turbine delivery vehicle. Once the turbines have been delivered, these areas will be reseeded. All works are minor, temporary and have limited potential for effects.

Pathway: Surface water flowpaths.

Receptor: Down-gradient water quality.

Pre-Mitigation Potential Effect: Indirect, negative, slight, short term, likely effect. In the absence of mitigation measures there is no potential for significant effects due to the minor nature of the proposed accommodation works.

Proposed Mitigation Measures:

No significant effects will occur for the following reasons:

- All works are relatively minor and localised and cover very small areas;
- Excavation/earthworks will all be small scale; and,
- These works are distributed over a wide area.

Nevertheless, the "Pre-commencement Temporary Drainage Works" described in Section 9.5.2.2 will be employed at all the TDR works areas.

In relation to the extension of an existing culvert along a small stream along the L1506, the following mitigation measures will be implemented:

- The works will be carried out to the specification of the OPW's 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;
- The works will only be undertaken during low flow conditions and during a dry period between July and September (as required by IFI for in-stream works) to avoid the salmon spawning season and to have more favourable (dryer) ground conditions;
- During the works, the water will be isolated from the works area (e.g. by over pumping or temporary damming of the channel) to prevent the entrainment of suspended solids;
- Sediment and pollution control measures, including silt fencing, will be installed and maintained for the duration of the works;
- Pollution prevention measures will be implemented with respect to hydrocarbons (refer to Section 9.5.2.5) and cement-based products (Section 9.5.2.6);
- Pre-cast concrete units will be utilised;
- Water quality will be monitored upstream and downstream of the works to ensure there is no adverse effect. Works will be suspended in the event of any observed effect until corrective measures have been undertaken.

Post-Mitigation Residual Effects: Proven and effective measures to mitigate the risk of releases of sediment have been proposed above and will break the pathway between the potential sources and the receptor. The residual effect will be - Negative, imperceptible, indirect, short term, unlikely effect on down gradient rivers, water quality, and dependant ecosystems.

Significance of Effects: For the reasons outlined above, no significant effects will occur on surface waters.

9.5.2.15 Potential 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 new 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 Proposed Project are defined in Section 9.3.13.1 and Section 9.3.13.2 respectively.

A detailed WFD Compliance Assessment Report has been completed in combination with this EIAR Chapter and is included in Appendix 9-4.

Pathway: Surface water flowpaths.

Receptor: WFD status of downstream SWBs and underlying GWBs.

Pre-Mitigation Potential Effect: Indirect, negative, imperceptible, short term, likely effect on SWBs and GWBs. In the absence of mitigation measures, there will be no potential for significant effects on the WFD status of SWBs or GWBs.

Proposed Mitigation Measures:

Mitigation measures relating to the protection of surface water drainage regimes and surface water quality within the Site have been detailed in Section 9.5.2.1 (tree felling), Section 9.5.2.2 and 9.5.2.3 (suspended solids), Section 9.5.2.5 (hydrocarbons), Section 9.5.2.6 (cement-based products), Section 9.5.2.7 (wastewater) and Section 9.5.2.8 (morphological changes).

Similarly, mitigation measures for the protection of groundwater quantity and quality have been detailed in Section 9.5.2.4 (groundwater levels), Section 9.5.2.5 (hydrocarbons), Section 9.5.2.6 (cement-based products) and Section 9.5.2.7 (wastewater).

In summary that there will be no significant effects on GWB or SWB WFD status for the following reasons:

- The small footprint of the Proposed Project infrastructure in relation to the scale of the underlying GWBs (Robe-Cong GWB has a total area of ~440km^2 whilst the Swinford GWB has a total area of 564km^2);
- The Proposed Project does not involve any significant alteration of drainage patterns, therefore, the quantitative status of the receiving surface and groundwaters will remain unaltered;
- There will be no direct discharge from the Site to receiving waters; and,
- Mitigation measures for the protection of surface and groundwater water quality will be implemented during the construction phase of the Proposed Project to ensure that there is no deterioration in local or downstream water quality. These mitigation measures will ensure the qualitative status of the receiving water bodies remains unaltered by the Proposed Project.

Post Mitigation Residual Effects: Mitigation for the protection of surface and groundwater during the construction phase of the Proposed Project will ensure the qualitative and quantitative status of the receiving waters will not be significantly altered by the Proposed Project.

There will be no change in GWB or SWB status in the underlying GWB or downstream SWBs resulting from the Proposed Project. There will be no change in quantitative (volume) or qualitative (chemical) status, and the underlying GWB and downstream SWBs are protected from any potential deterioration.

No residual effect on Groundwater Body WFD status will occur.

No residual effect on Surface Water Body WFD status will occur.

Significance of Effects: For the reasons outlined above, no significant effects on WFD GWBs and SWBs status, risk or future objectives will occur as a result of the Proposed Project.

9.5.2.16 Potential Effects from Biodiversity Management and Enhancement

BMEP works are proposed to offset the loss of habitats within the Site and to further enhance the biodiversity of the Site. The proposed works include planting and enhancement of 2.5km of hedgerows and treeline, planting of 3.5ha of native broadleaved woodland and enhancement of 1.16ha of Molinia meadow habitat for marsh fritillary butterfly.

Some of these proposals will disturb local peat, soil and subsoil deposits and increase the likelihood of erosion of peat and subsoils and have the potential for the entrainment of suspended solids in runoff. However, due to the largely non-invasive nature of the works the potential for effects are limited. The works will have a long-term positive effect by providing stability to the soils and reducing potential erosion.

Pathway: Vehicle movement, restoration works, surface water and wind action.

Receptor: Local surface water quality.

Pre-Mitigation Potential Effect: Negative, direct, slight, temporary, likely effect on downstream surface water quality. In the absence of mitigation measures there will be no potential for significant effects due to the minor and largely non-invasive nature of the proposed BMEP works.

Proposed Mitigation Measures:

All proposed habitat management and enhancement works will be in accordance with the best practice Forest Service regulation, policies and strategic guidance documents as well as Coillte, DAFM and NatureScot guidance documents to ensure minimal potential negative effects on the local peat, soil and subsoil environment.

Given the nature of the restoration measures the following mitigation measures are proposed:

- Before any works are completed silt fences will be installed to limit the movement of entrained sediment in surface water runoff;
- Proposed off-track routes will be walked in advance of any machinery;
- All machinery operators will be experienced;
- The Site will be walked before a machine goes off-track;
- Bog mats will be used where the excavator is required to travel over wet ground; and,
- A low ground pressure excavator with wide tracks (1.9m or greater) will be used to reduce compaction of the peat and subsoils.

Post-Mitigation Residual Effect: With the implementation of mitigation measures outlined above the residual effect will be a negative, direct, imperceptible, temporary, unlikely effect on downstream surface water quality during the works. The long-term effect will be a positive, imperceptible, likely effect on downstream surface water quality.

Significance of Effects: For the reasons outlined above, and with the implementation of the listed mitigation measures, no significant effects will occur.

9.5.2.17 Potential Effects on Raised Bog and Degraded Raised Bog Capable of Regeneration

This section addresses the potential effects of the Proposed Project on areas of high bog and cut-over bog in response to the consultation received from Development Application Unit (DoHLGH, 9th March, 2026).

Construction phase activities at the Site have the potential to effect peatland habitats through the alteration of the local hydrogeological regime. Deep excavations can require temporary dewatering which would impact on water levels in the surrounding lands. Note that the wind farm infrastructure within the Site is proposed in areas of cutover bog and rough agricultural pastures which have already been subject to artificial drainage and the local hydrogeological regime in these areas has therefore already been altered from its original condition. These drainage modifications pre-date 1995 and are clearly visible on the 1995 aerial photograph of the area which is available to view on GeoHive (www.geohive.ie).

The impact assessment presented herein has been informed by consultation between the hydrological and ecological project teams. This assessment addresses the potential effects on several areas of interest which were identified by the ecologists. These areas are as follows:

- An area of uncut raised bog to the northeast of T1;

- A small area of remnant uncut raised bog to the east of T3;
- A mosaic of cutover bog with small areas of remnant uncut raised bog to the south of T3 and adjacent to the main access track through the Site; and,
- An area of species rich regenerating cutover bog to the northeast of T3 and in close proximity to the proposed internal cabling.

Pathway: Shallow ground water flowpaths.

Receptor: Peat water table in the remnant high bog and regenerating cutover bog.

Pre-Mitigation Potential Effect: Direct, negative, imperceptible, short-term, unlikely effect on peat water levels in the remnant high bog. With the absence of mitigation measures there would be no significant effect on peat water levels in the remnant high bog or regenerating cutover bog as the hydrological regime is already highly modified at the Site. The Proposed Wind Farm drainage infrastructure is consistent with the baseline environment having significantly modified drainage from its natural state.

Mitigation Measures / Impact Assessment:

No significant effects on the remnant uncut raised bog to the north of T1 will occur due to the following:

- Mitigation by avoidance – the Proposed Wind farm Layout has avoided ecologically sensitive areas and there are no proposed works within or immediately adjacent to the area of remnant high bog.
- The potential for effects is limited given the separation distance between the works areas and the remnant high bog (remnant high bog exists ~30m north of T1 and ~18m from the associated hardstand).
- The drainage in this areas is already heavily modified.
- Turbary peat cutting in the cutover bog areas, where T1 is proposed, has already impacted the peat water table around the margins of the remnant high bog. A ~1m high peat face bank exists around the perimeter of this high bog and water levels in the high bog adjacent to this peat face have already experienced local drawdown.
- A large drain is located between the Proposed Project location and the remnant high bog. This drain acts as a hydraulic barrier between the works area and the remnant high bog and is the primary control on water levels within the high bog.
- The presence of low permeability subsoils underlying the peat acts as a hydrogeological barrier, preventing groundwater recharge, essentially isolating the peat water table from the underlying regional groundwater system.
- Mitigation is provided in the EIAR to deal with typical construction phase groundwater quality hazards such as oils and fuels (refer to Section 9.5.2.5).
- No significant groundwater dewatering will be required due to the relatively shallow nature of the turbine base excavations (no piled turbine foundation are proposed).

No significant effects on the remnant uncut raised bog to the east of T3 will occur due to the following:

- Mitigation by avoidance – the Proposed Wind Farm layout has avoided ecological sensitive areas and there are no proposed works within or immediately adjacent to the area of remnant high bog.
- The potential for effects is limited given the separation distance between the works areas and the remnant high bog (remnant high bog exists ~28m from T3, ~16.5m from the associated hardstand and ~8.5m from the internal cabling).
- Turbary peat cutting in the cutover bog areas, where the T3 is proposed, has already impacted the peat water table around the margins of the remnant high bog. A high peat face bank, and deep drains, exists around the perimeter of this high bog and

water levels in the high bog adjacent to this peat face have already experienced local drawdown.
- The presence of low permeability subsoils underlying the peat acts as a hydrogeological barrier, preventing groundwater recharge, essentially isolating the peat water table from the underlying regional groundwater system.
- Mitigation is provided in the EIAR to deal with typical construction phase groundwater quality hazards such as oils and fuels (refer to Section 9.5.2.5).
- No significant groundwater dewatering will be required due to the relatively shallow nature of the turbine base excavations (no piled foundation are proposed).

No significant effects on the mosaic cutover bog with small areas of remnant uncut raised bog to the south of T3 and adjacent to the main access track through the Site will occur due to the following:

- The works proposed in this area of the Site are limited, comprising of widening of an existing access track.
- These works do not involve any significant or deep excavations or significant alteration of drainage patterns.
- Deep drains currently exist along the access track and act as a hydraulic barrier between the track and the cutover bog.
- This area has been subject to turbary peat cutting and is currently in a modified drainage state, reducing its sensitivity to further hydrological/hydrogeological changes.
- The presence of low permeability subsoils underlying the peat acts as a hydrogeological barrier, restricting groundwater recharge, essentially isolating the peat water table from the underlying regional groundwater system.
- Mitigation is provided in the to deal with typical construction phase groundwater quality hazards such as oils and fuels (refer to Section 9.5.2.5).
- No groundwater dewatering will be required due to the shallow nature of the works.

No significant effects on the species rich regenerating cutover bog to the northeast of T3 will occur due to the following:

- Mitigation by avoidance – the Proposed Wind Farm layout has avoided this ecologically sensitive area.
- The potential for effects is limited given the separation distance between the proposed work areas and this area of regenerating cutover. The infrastructure proposed in the vicinity of this area comprises of the internal cabling associated with T4 and T5 and a new access road (the cabling is the closest to the area of interest, situated ~5m to the north).
- These works do not involve any significant or deep excavations or significant alteration of drainage patterns.
- This area has been subject to turbary peat cutting and is currently in a modified drainage state, reducing its sensitivity to further hydrological/hydrogeological changes.
- The works associated with the internal cabling will not have the potential to significantly alter the local peat water table as the works are transient, shallow and minor in nature. The excavation of a shallow trench which will remain open for a very short-time period before it is reinstated and has very limited potential to result in any significant effects on the peat water table.
- Mitigation is provided in the EIAR to deal with typical construction phase groundwater quality hazards such as oils and fuels (refer to Section 9.5.2.5).

Post Mitigation Residual Effects: Construction activities pose a threat to peatlands habitats. However, the Site is a cutover peatland which exists in a heavily modified hydrological condition. The baseline environment includes deep drains and active peat cutting and this is the main control on water levels within the areas of remnant high bog and the regenerating cutover bog. Furthermore, due to the local hydrogeological regime (low permeability soils/subsoils) and the separation distance between the proposed work areas and the areas of remnant raised bog and regenerating cutover bog, the potential for effects on the peat water table in the remnant high bog is negligible. Furthermore, proven and effective measures to mitigate the risk of surface and groundwater contamination have been proposed. The residual effect is: Negative, imperceptible, indirect, short-term, unlikely effect on the areas of remnant raised bog and regenerating cutover bog.

Significance of Effects: For the reasons outlined above, and with the implementation of the above-listed mitigation measures, no significant effects on the areas of remnant raised bog and regenerating cutover bog will occur.

9.5.3 Operational Phase – Likely Significant Effects and Mitigation Measures

9.5.3.1 Potential Effects from the Replacement of Natural Surfaces 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 site and increase flood risk downstream of the Site. In reality, the access tracks will have a higher permeability than the underlying peat. However, it is conservatively assumed in this assessment that the proposed access tracks and hardstands are impermeable. The assessed footprint comprises turbine bases and hardstandings, access tracks, amenity links, site entrances, substation and temporary construction compounds. During storm rainfall events, additional runoff coupled with increased velocity of flow could increase hydraulic loading, resulting in erosion of watercourses and effect on aquatic ecosystems.

Pathway: Site drainage network.

Receptor: Surface watercourses (Robe, Meander and Manulla rivers and associated tributaries), local lake water bodies (Drumady Lough, Lough Nambrackkeagh and Lough Fark) and associated water dependant ecosystems downstream of the Site.

Pre-Mitigation Potential Effect: Negative, slight, indirect, permanent, likely effect on all downstream surface water bodies. In the absence of mitigation measures, there will be no potential for significant effects on local surface water quantity due to the small permanent footprint of the Proposed Project (5.5ha) with respect to the total Site area (165ha) and the baseline hydrological condition which is characterised by high rates of surface water runoff rates and restricted groundwater recharge.

Effects Assessment:

The emplacement of the permanent Proposed Project footprint (5.5ha), as described in Chapter 4 of the EIAR, (assuming emplacement of impermeable materials under a precautionary scenario) could result in an average total site increase in surface water runoff of approximately 319m^3/month. This increase is small given the scale of the Proposed Project footprint in comparison to the overall site area. Furthermore, baseline runoff rates are very high due to the presence of low permeability peat soils across much of the Site. Therefore, the replacement of natural surfaces with impermeable surfaces at the Proposed Project footprint will not result in any significant increase in runoff. The runoff during the operational phase, in the absence of drainage controls, represents only a 0.15% increase in runoff in comparison to the baseline runoff rates across the Site.

Table 9-23: Baseline Site Runoff vs Operational Phase Runoff

Site Baseline Runoff/month (m^3)	Baseline Runoff/day (m^3)	Permanent Hardstanding Area (m^2)	Hardstanding Area 100% Runoff (m^3)	Hardstanding Area 96% Runoff (m^3)	Net Increase/month (m^3)	Net Increase/day (m3)	% Increase from Baseline Conditions (m^3)
215,716	6,959	5,500	7,975	7,656	319	10.29	0.15%

The additional volume is low due to the fact that the runoff potential across the majority of the Site is naturally high. Also, the calculation assumes that all hardstanding areas will be impermeable which will not be the case as access tracks will be constructed of permeable stone aggregate. Furthermore, the assessment does not consider the existing roads and hardstand areas present across the Site. The increase in runoff from the Proposed Project will, therefore, be negligible. This is even before mitigation measures will be put in place.

Proposed Mitigation by Design:

The operational phase drainage system of the Site will be installed and constructed in conjunction with the track and hardstanding construction work as described below and as shown on the Drainage drawings submitted with this planning application (Appendix 4-4):

- Interceptor drains will be installed up-gradient of all proposed infrastructure to collect clean surface runoff, in order to minimise the amount of runoff reaching areas where suspended sediment could become entrained. It will then be directed to areas where it can be re-distributed over the ground by means of a level spreader;
- Swales/track side drains will be used to collect runoff from access tracks and turbine hardstanding areas of the site, likely to have entrained suspended sediment, and channel it to settlement ponds for sediment settling;
- On steep sections of access track transverse drains ('grips') will be constructed in the surface layer of the track to divert any runoff off the track into swales/track side drains;
- Check dams will be used along sections of access track drains to intercept silts at source. Check dams will be constructed from a 4/40mm non-friable crushed rock;
- Settlement ponds, emplaced downstream of track swale sections and at turbine locations, will 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 have been designed in consideration of the greenfield runoff rate.

As described above the proposed integration of the Proposed Project site drainage with the existing forestry drainage is a key component of the proposed drainage management within the Site. By integration we mean maintaining surface water flowpaths where they already exist, avoid creation of new or altered surface water flowpaths, and maintaining the drainage regime (i.e. normal flow) within each forestry compartment. Critically, there will be no alteration of the catchment size contributing to each of the main downstream watercourses. All wind farm drainage water captured within individual site sub-catchments will be attenuated and released within the same sub-catchments that it was captured.

Post-Mitigation Residual Effect: Proven and effective measures to attenuate runoff and mitigate the risk of flooding will be employed as part of the operational phase drainage system (i.e. interceptor drains, swales, check dams, settlement ponds). The residual effect will be a neutral, imperceptible 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 Proposed Project.

9.5.3.2 Potential Effects from Runoff Resulting in Contamination of Surface Waters

During the operational phase, the potential for silt-laden runoff is much reduced compared to the construction phase. In addition, all permanent drainage controls will be in place and the disturbance of ground and excavation works will be complete. Some minor maintenance works may be completed, such as maintenance of site entrances, internal roads, hardstand areas and amenity pathways. These works would be of a very minor scale and would be very infrequent. Potential sources of sediment laden water would only arise from surface water runoff from small areas where new material is added during maintenance works.

These minor activities could, however, result in the release of suspended solids to surface water and could result in an increase in the suspended sediment load, resulting in increased turbidity which in turn could affect the water quality of downstream water bodies. Potential effects could be significant if not mitigated.

During such maintenance works there is a small risk associated with the release of hydrocarbons from site vehicles, although it is not envisaged that any significant refuelling works will be undertaken on site during the operational phase.

Maintenance works will be contained within the Site.

Pathways: Drainage and surface water discharge routes.

Receptors: Surface watercourses (Robe, Meander and Manulla rivers and associated tributaries), local lake water bodies (Drumady Lough, Lough Nambrackkeagh and Lough Fark) and associated water dependant ecosystems downstream of the Site.

Pre-Mitigation Potential Effect: Negative, slight, indirect, temporary, unlikely effect on downstream surface water quality. In the absence of mitigation measures, there will be no potential for significant effects on local surface water quality due to the minor and non-invasive nature of the maintenance works.

Proposed Mitigation Measures:

Mitigation measures for sediment control are the same as those detailed above for the construction phase in Section 9.5.2.2.

With regards to hydrocarbons:

- Onsite re-fuelling of normal operational vehicles will not be carried out during the operational phase of the Proposed Project. These vehicles will be refuelled offsite;
- Fuels stored on site will be minimised and any hydrocarbons stored on-site will be bunded. The bund capacity will be sufficient to contain 110% of the storage tank's maximum capacity;
- The substation will be bunded appropriately to the volume of oils likely to be stored, and to prevent leakage of any associated chemicals and to groundwater or surface water. The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor;

- Oil in the turbine transformers will be fully bunded within the enclosed turbine and as such, there is no potential pathway to the water environment i.e. the pathway has been blocked;
- Any plant used during the operational phase will be regularly inspected for leaks and fit for purpose; and,
- Spill kits will be available to deal with accidental spillages.

Post-Mitigation Residual Effects: Proven and effective measures to mitigate the risk of releases of hydrocarbons have been proposed above and will break the pathway between the potential source and each receptor. The residual effect will be a negative, indirect, imperceptible, short term, unlikely effect on surface water quality and groundwater quality.

Significance of Effects: For the reasons outlined above, no significant effects on surface water or groundwater quality are anticipated during the operational phase of the Proposed Project.

9.5.3.3 Potential Effects from Water Supply at Substation

During the operational phase it is proposed to either harvest rainwater from the roofs of the control buildings at the substation or to install a groundwater well adjacent to the substation in accordance with the Institute of Geologists Ireland, Guide for Drilling Wells for Private Water Supplies (IGI, 2007). The well will be flush to the ground and covered with a standard manhole. An in-well pump will direct water to a water tank within the roof space of the control building.

The proposed groundwater well and associated extraction has the potential to effect local groundwater levels in the surrounding lands.

Pathway: Groundwater flowpaths.

Receptor: Groundwater levels.

Pre-Mitigation Potential Effect: Direct, negative, imperceptible, permanent, likely effect on local groundwater levels. In the absence of mitigation measures there will be no potential for significant effects due to the small volumes of water required during the operational phase.

Impact Assessment

The abstraction rate for the proposed groundwater well at the substation will be comparable to a domestic well, with a well supplying a single household typically abstracting less than $1m^3$/day. Due to the proposed extraction rate, no effects on local groundwater levels will occur.

For these reasons no mitigation measures are required.

Post-Mitigation Residual Effects: Due to the scale of the proposed groundwater well, the residual effect will be a direct, negative, imperceptible, permanent, likely effect on local groundwater levels.

Significance of Effects: For the reasons given above, and with the implementation of the above mitigation measures, no significant effects on groundwater levels will occur.

9.5.3.4 Potential Effects on WFD status and Objectives

There is no direct discharge from the Proposed Project to downstream receiving waters. Mitigation for the protection of surface water during the operational phase of the Proposed Project (as detailed in Section 9.5.3.1 to 9.5.3.3) will ensure the qualitative status of the receiving SWBs will not be altered by the Proposed Project.

Similarly, there is no direct discharge to groundwaters associated with the Proposed Project. Mitigation for the protection of groundwater during the operational phase of the Proposed Project will ensure that the qualitative status of the receiving GWB will not be altered by the Proposed Project.

A full assessment of the potential effects of the operational phase of the Proposed Project on the status of the receiving water bodies is included in WFD Compliance Assessment Report attached as Appendix 9-4.

9.5.3.5 Potential Effects on Public or Group Water Supplies

During the operational phase, there will be no potential for effects on any PWS or GWS.

There will be no direct discharge from the Proposed Project to downstream receiving waters during the operational phase. All Proposed Project site drainage measures will be in place. Mitigation for the protection of surface water during the operational phase (as detailed in Section 9.5.3.1 to 9.5.3.2) of the Proposed Project will ensure the qualitative status of the receiving SWBs will not be altered by the Proposed Project.

Similarly, there is no direct discharge to groundwaters associated with the Proposed Project. Mitigation for the protection of groundwater during the operational phase of the Proposed Project will ensure that the qualitative status of the underlying bedrock aquifers will not be altered by the Proposed Project.

There is no potential for effects on the GWSs in the vicinity and downstream of the Proposed Project.

9.5.4 Decommissioning Phase - Likely Significant Effects and Mitigation Measures

The proposed wind turbines as part of the Proposed Project are expected to have a lifespan of approximately 35 years. Following the end of their useful life, the equipment may be replaced with a new technology, subject to planning permission being obtained, or the Proposed Wind Farm may be decommissioned fully.

Upon decommissioning of the Proposed Wind Farm, the wind turbines and the meteorological mast would be disassembled in reverse order to how they were erected. All above ground turbine and mast components would be separated and removed off-site for recycling. Turbine and mast foundations would remain underground and would be covered with earth and allowed to revegetate. Leaving the foundations in-situ is considered a more environmentally prudent option, as to remove that volume of reinforced concrete from the ground could result in significant temporary environment disturbances such as noise, dust and/or vibration. Site access tracks will be used during the operational phase by farm machinery and will provide a useful means of extracting the forestry crop which exists on the Site and therefore will be retained post decommissioning to facilitate these activities.

The underground electrical cabling connecting the turbines to the proposed 110kV substation will be removed from the cable ducts. The cabling will be pulled from the cable ducts using a mechanical winch which will extract the cable and re-roll it on to a cable drum. This will be undertaken at the original cable jointing pits which will be excavated using a mechanical excavator and will be fully re-instated once the cables are removed. The cable ducting will be left in-situ as it is considered the most environmentally prudent option, avoiding unnecessary excavation and soil disturbance. The cable materials will be transferred to a suitable recycling or recovery facility.

The Proposed Grid Connection underground electrical cabling and proposed 110kV substation will remain in place as it will be part of the Electricity Grid under the ownership and control of ESB Networks and Eirgrid.

A Decommissioning Plan has been prepared (Appendix 4-6). The Decommissioning Plan will be updated prior to the end of the operational period in line with decommissioning methodologies that may exist at the time and will agree with the competent authority at that time. The potential for effects during the decommissioning phase of the Proposed Wind Farm has been fully assessed in the EIAR.

As noted in the Scottish Natural Heritage report (SNH) Research and Guidance on Restoration and Decommissioning of Onshore Wind Farms (SNH, 2013) reinstatement proposals for a wind farm are made approximately 30 years in advance, so within the lifespan of the Proposed Wind Farm, technological advances and preferred approaches to reinstatement are likely to change. According to the SNH guidance, it is therefore:

> *"best practice not to limit options too far in advance of actual decommissioning but to maintain informed flexibility until close to the end-of-life of the wind farm".*

The potential effects associated with decommissioning of the Proposed Project will be similar to those associated with construction but of a reduced magnitude, due to the reduced scale of the proposed decommissioning works in comparison to construction phase works. A description of the decommissioning works is contained in Chapter 4 of this EIAR and in the Decommissioning Plan (Appendix 4-6).

During decommissioning, it will be possible to reverse or at least reduce some of the potential effects caused during construction, and to a lesser extent operation, by rehabilitating constructed areas such as turbine bases and hard standing areas. This will be done by covering with vegetation to encourage vegetation growth and reduce run-off and sedimentation.

The site tracks will be kept and maintained following decommissioning of the infrastructure, as these will be utilised by ongoing forestry works and by other participating landowners.

The electrical cabling connecting the site infrastructure to the on-site substation will be removed, while the ducting itself will remain in-situ rather than excavating and removing it, as this is considered to have less of a potential environmental impact, in terms of soil exposure, and thus on the possibility of the generation of suspended sediment which could enter nearby watercourses.

The turbines will be removed by disassembling them in a reverse order to their erection. This will be completed using the same model cranes as used in their construction. They will then be transported off-site along their original delivery route. The disassembly and removal of the turbines will not have an effect on the hydrological/hydrogeological environment at the Site.

Other effects such as possible soil compaction and contamination by fuel leaks will remain but will be of reduced magnitude than the construction phase because of the smaller scale of the works and reduced volumes on-site.

Some of the effects will be avoided by leaving elements of the Proposed Project in place where appropriate. The onsite 110kV substation and electrical cabling will be retained as a permanent part of the national grid. Mitigation measures to avoid contamination by accidental fuel leakage and compaction of soil by on-site plant will be implemented as per the construction phase mitigation measures.

No significant effects on the hydrological and hydrogeological environment will occur during the decommissioning phase of the Proposed Project.

9.5.5 Risk of Major Accidents and Disasters

The main risk of Major Accidents and Disasters (MADs) at peatland sites is related to peat stability. A Geotechnical & Peat Stability Assessment (GPSA) has been completed for the Proposed Wind Farm (Appendix 8-1) and concludes that the risk of a stability issue is low provided that appropriate mitigation measures and best practices are followed.

Flooding can also result in downstream MADs. With the implementation of the Proposed Wind Farm drainage system, the increased flood risk associated with the Proposed Project is negligible/none.

Please see Chapter 16 Major Accidents and Natural Disasters for further information on MADs at the Site.

9.5.6 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 PWS or GWS within the Site. However, there are schemes and local private groundwater wells in the surrounding lands. The Proposed Project design and mitigation measures as per Section 9.5.2 and 9.5.3 ensure that the potential for effects on the hydrogeological environment will not be significant.

9.5.7 Assessment of Potential Cumulative Effects

This section presents an assessment of the potential cumulative effects associated with the Proposed Project and other developments (existing and/or proposed), plans and land uses on the hydrological and hydrogeological environment.

The main likelihood of cumulative effects is assessed to be associated with the surface water environment. Due to the presence of thick overburden deposits, comprising of peat and generally low permeability glacial tills, the underlying bedrock aquifer at the Site is protected and the local hydrogeological regime at the Site is characterized by high rates of surface water runoff and relatively low rates of groundwater recharge.

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

A cumulative hydrological and hydrogeological study area has been delineated as shown below in 9-14.

The hydrological cumulative study area is delineated as follows:

- A quantitative assessment was completed based on flow volumes obtained from the EPA HydroTool Nodes downstream of the Site in the Moy and Killala Bay Catchment. This assessment concludes that the due to dilution no hydrological cumulative effects will occur beyond EPA Hydrotool Node 34_3632 on the Manulla River near Belcarra. At this location the Manulla River has a total upstream catchment area of 108km^2. There will be no potential for cumulative effects beyond this cumulative study area due to increases in flow volumes (as the catchment area increases) and increasing distance from the Site.

- A further assessment has been completed within the Corrib Catchment. This assessment concludes that the due to dilution no hydrological cumulative effects will occur beyond EPA Hydrotool Node 30_2656 on the River Robe near Hollymount. At this location the River Robe has a total upstream catchment area of 184km^2. There will be no potential for cumulative effects beyond this cumulative study area due to increases in flow volumes (as the catchment area increases) and increasing distance from the Site.
- The Cong-Robe and Swinford GWBs underlying these areas have also been included for the purposes of a conservative cumulative impact assessment.

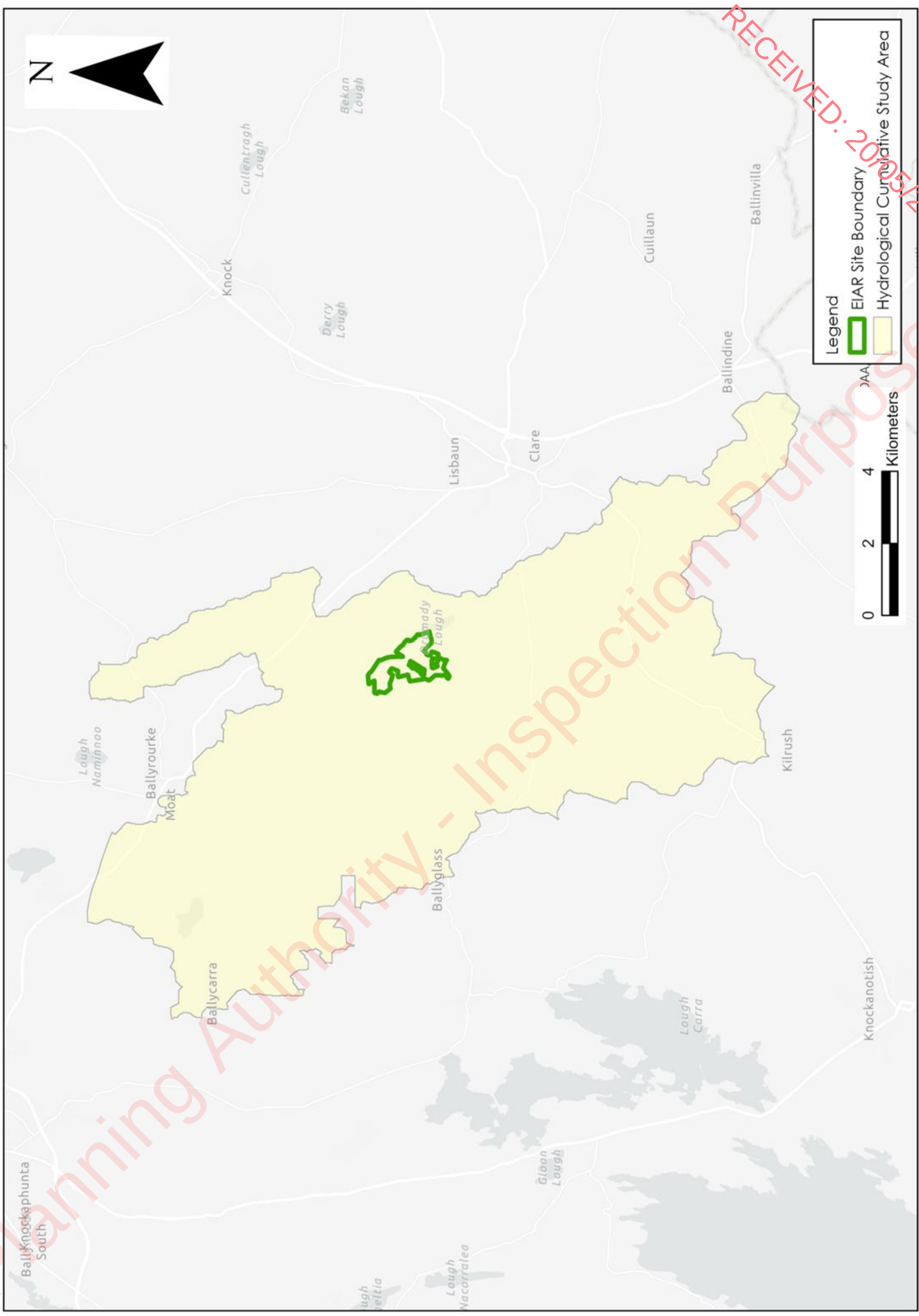

Figure 9-14: Hydrological Cumulative Study Area

9.5.7.1 Potential Cumulative Effects with Turbary Peat Cutting

Private peat cutting on turbary plots will likely continue at the Site. The construction phase of the Proposed Project may interact with these turbary activities and result in a deterioration of downstream surface water quality through the emissions of elevated concentrations of suspended solids and ammonia.

However, the areas of private peat cutting will be infinitely small, significantly limiting the potential for cumulative effects to arise with the Proposed Project. Nevertheless, the mitigation measures detailed in Section 9.5.2, 9.5.3 and 9.5.4 for the construction, operation and decommissioning phases of the Proposed Project 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.

9.5.7.2 Cumulative Effects with Agriculture

The delineated cumulative study area is a largely agricultural area.

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 effect on local and downstream surface water quality.

In an unmitigated scenario the Proposed Project 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 Section 9.5.2, 9.5.3 and 9.5.4 for the construction, operation and decommissioning phases of the Proposed Project 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 Forestry

The Site and the wider hydrological cumulative study area includes some forested areas.

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 cumulative study area, the potential cumulative effects on downstream water quality and quantity need to be assessed.

However, the mitigation measures detailed in Section 9.5.2, 9.5.3 and 9.5.4 for the construction, operation and decommissioning phases of the Proposed Project will ensure the protection of downstream surface water quality. Furthermore, it is unlikely that the construction phase of the Proposed Project, which will last 18-24 months, would overlap with felling operations on forestry blocks in close proximity to the Site (forestry rotations typically last 30-50 years).

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

9.5.7.4 Cumulative Effects with Other Wind Farm Developments

The closest wind farms to the Proposed Project are Mace Upper Wind Farm and Magheramore and Cloontooa Wind Farm located ~7.5 and ~10.5km to the east of the Site respectively. The Mace Upper Wind Farm is not mapped within the delineated cumulative study area. Meanwhile, the Magheramore and Cloontooa Wind Farm is located within the study area and drain to the River Robe. The greatest potential for effects would be if the construction phases of these developments were to overlap. However, these wind farms are already operational and the respective EIARs for these wind farms detailed mitigation measures for the protection of downstream water quality during operation and decommissioning. Furthermore, combined with the implementation of the detailed, tried and tested, mitigation measures prescribed in this EIAR , there will be no potential for cumulative effects with other wind farm developments.

9.5.7.5 Cumulative Effects with other Developments

A detailed cumulative assessment has been carried out for all planning applications (granted and awaiting decisions) within the cumulative assessment area for Site described above.

The planning applications identified within the study area are largely for new dwellings or renovations of existing dwellings, associated wastewater treatment systems as well as for the erection of farm buildings. The planning applications have been reviewed based on their type, scale and proximity to the Site. Based on the scale of the works, their proximity to the Site and the temporal period of likely works, no cumulative effects will occur as a result of the Proposed Project (construction, operation and decommissioning phases).

9.5.8 Post Consent Monitoring

Surface water quality monitoring will be completed as per the CEMP included in Appendix 4-5 of this EIAR.

9.6 EIA Classification Summary

Please see Table 9-24 below for a summary of all identified impacts for the Proposed Project relating to hydrology and hydrogeology.

Table 9-24: EIA Classification Summary

Topic	Pre-Mitigation Effect	Mitigation Section Reference	Residual Effect	Significance
Construction Phase				
Tree Felling	Indirect, negative, significant, temporary, likely	Section 9.5.2.1	Indirect, negative, imperceptible, temporary, likely	Not Significant
Earthworks Resulting in Suspended Solids Entrainment in Surface Waters	Negative, significant, indirect, temporary, likely	Section 9.5.2.2	Negative, imperceptible, indirect, short term, likely	Not Significant
Surface Water Quality from Excavation Dewatering	Indirect, negative, significant, temporary, unlikely	Section 9.5.2.3	Indirect, negative, imperceptible, temporary, unlikely	Not Significant
Groundwater Levels During Excavation Works	Negative, direct, temporary, slight, unlikely	Section 9.5.2.4	Negative, direct imperceptible, short term, unlikely	Not Significant
Leakages or Spillages of Hydrocarbons	**Local Groundwater Quality:** Negative, indirect, slight, short-term, unlikely **Surface Water Quality:** Negative, indirect, significant, short term, unlikely	Section 9.5.2.5	**Local Groundwater Quality:** Negative, indirect, imperceptible, short term, unlikely **Surface Water Quality:** Negative, indirect, imperceptible, short term, unlikely	Not Significant

Release of Cement-Based Products	**Local Groundwater Quality:** Negative, moderate, indirect, short-term, likely **Surface Water Quality:** Negative, imperceptible, indirect, short-term, unlikely	Section 9.5.2.6	**Local Groundwater Quality:** Negative, imperceptible, indirect, short term, unlikely **Surface Water Quality:** Negative, imperceptible, indirect, short term, unlikely	Not Significant
Wastewater	**Surface Water Quality:** Negative, significant, indirect, temporary, unlikely **Local Groundwater Quality:** Negative, slight, indirect, temporary, unlikely effect	Section 9.5.2.7	Negative, imperceptible, indirect, temporary, unlikely	Not Significant
Morphological Changes to Surface Watercourses & Drainage Patterns within the Site	Negative, imperceptible, direct, long-term, unlikely	Section 9.5.2.8	Negative, imperceptible, direct, long term, unlikely	Not Significant
Use of Siltbuster	Negative, slight, indirect, temporary, unlikely	Section 9.5.2.9	Negative, imperceptible, indirect, temporary, unlikely	Not Significant
Local Private Groundwater Well Supplies	Negative, imperceptible, indirect, long-term, unlikely	Section 9.5.2.10	Negative, imperceptible, indirect, long-term, unlikely	Not Significant

Public and Group Groundwater Supplies	Negative, moderate, indirect short-term, likely	Section 9.5.2.11	Negative, imperceptible, indirect, short term, unlikely	Not Significant
Surface Water Drinking Supplies	Negative, imperceptible, indirect, short term, unlikely	Section 9.5.2.12	No Residual effect	Not Significant
Designated Sites	**River Moy SAC:** Indirect, negative, significant, short term, likely **Mountpleasant School Turlough pNHA, Slishmeen Turlough pNHA, Balla Turlough SAC/pNHA and Carrowkeel Turlough SAC/pNHA:** Indirect, negative, imperceptible, short term, unlikely	Section 9.5.2.13	**River Moy SAC:** Indirect, negative, imperceptible, short term, unlikely **Mountpleasant School Turlough pNHA, Slishmeen Turlough pNHA, Balla Turlough SAC/pNHA and Carrowkeel Turlough SAC/pNHA:** No potential for residual effects	Not Significant
TDR Works	Indirect, negative, slight, short term, likely effect.	Section 9.5.2.14	Indirect, negative, imperceptible, short term, unlikely	Not Significant
WFD Status and Objectives	Indirect, negative, imperceptible, short term, likely	Section 9.5.2.15	No residual effects	Not Significant
Biodiversity Management and Enhancement	Negative, direct, slight, temporary, likely	Section 9.5.2.16	Negative, direct, imperceptible, temporary, unlikely	Not Significant

Raised Bog and Degraded Raised Bog Capable of Regeneration	Direct, negative, imperceptible, short-term, unlikely	Section 9.5.2.17	Negative, imperceptible, indirect, short-term, unlikely	Not Significant
Operational Phase				
Replacement of Natural Surface with Lower Permeability Surfaces	Negative, slight, indirect, permanent, likely	Section 9.5.3.1	Neutral, imperceptible, indirect, long term, likely	Not Significant
Runoff Resulting in Contamination of Surface Waters	Negative, slight, indirect, temporary, unlikely	Section 9.5.3.2	Negative, imperceptible, indirect, short term, unlikely	Not Significant
Water Supply at Substation	Direct, negative, imperceptible, permanent, likely	Section 9.5.3.3 – None Required	Direct, negative, imperceptible, permanent, likely	Not Significant
WFD Status and Objectives	No effect	N/A	No effect	Not significant
Public or Group Water Supplies	No effect	N/A	No effect	Not significant
Decommissioning Phase				
Water	The potential impacts associated with decommissioning of the Proposed Project will be similar to those associated with construction but of a reduced magnitude, due to the reduced scale of the proposed	N/A	N/A	Not Significant

	decommissioning works in comparison to construction phase works.			

APPENDIX 9-1

FLOOD RISK ASSESSMENT

APPENDIX 9-2

SURFACE WATER QUALITY LABORATORY REPORTS

APPENDIX 9-3

GROUNDWATER QUALITY LABORATORY REPORT

APPENDIX 9-4

WFD COMPLIANCE ASSESSMENT REPORT