APPENDIX 9-4

WATER FRAMEWORK DIRECTIVE ASSESSMENT REPORT

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WATER FRAMEWORK DIRECTIVE ASSESSMENT
BALLYDERMOT WIND FARM, CO. OFFALY & CO. KILDARE

FINAL REPORT

Prepared for:

BORD NA MONA POWERGEN LTD

Prepared by:

HYDRO-ENVIRONMENTAL SERVICES

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1. INTRODUCTION

1.1 BACKGROUND

Hydro-Environmental Services (HES) were requested by MKO, on behalf of Bord na Móna Powergen Ltd, to complete a Water Framework Directive (WFD) Compliance Assessment for the Proposed Ballydermot Wind Farm (i.e. the Proposed Project).

The Proposed Project is described in full in Chapter 4 of this Environmental Impact Assessment Report (EIAR). The Proposed Project encompasses the Proposed Wind Farm and the Proposed Grid Connection, including the Proposed Onsite Substation and Proposed Offsite Substation. The Project Site relates to the Planning Application Boundary, as delineated in red, which identifies the area in which the Applicant is applying for planning permissions.

As detailed in Section 1.1.1 in EIAR Chapter 1 Introduction, for the purposes of this WFD Compliance Assessment, the various project components are described and assessed using the following references: 'Proposed Project', 'Proposed Enhancement Areas', 'Proposed Construction Haul Routes', 'Proposed Turbine Delivery Route', 'Project Site', 'Proposed Wind Farm', 'Proposed Turbines', 'Proposed Grid Connection', 'Proposed Onsite Substation' and 'Proposed Offsite Substation'. This report uses the 'Proposed Wind Farm site' reference which refers to the part of the Allen Bog Group within which the Proposed Project is located.

The purpose of this WFD Compliance Assessment is to determine whether any specific components or activities associated with the Proposed Project will compromise WFD objectives or cause a deterioration in the status of any surface water or groundwater body and/or jeopardise the attainment of good surface water or groundwater status. This assessment will determine the water bodies with the potential to be impacted, describe the proposed mitigation measures and determine if the project is in compliance with the objectives of the WFD.

This WFD Compliance Assessment is intended to supplement the EIAR submitted as part of the Proposed Project planning application.

This report has been compiled using the following data sources:

- Environmental Protection Agency database (www.epa.ie);
- Observations and drainage mapping recorded during various Proposed Project site visits as described in Section 9.2.3 of the EIAR; and,
- Surface Water Quality sampling as described in Section 9.3.8 of the EIAR.

For consistency with Chapter 9 of this EIAR, this report uses the Water Study Area as described in Section 9.2.5 of the EIAR.

1.2 STATEMENT OF AUTHORITY

Hydro-Environmental Services (HES) are a specialist geological, hydrological, hydrogeological and environmental practice that 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. We routinely complete impact assessments for hydrology and hydrogeology for a large variety of project types including wind farms.

This WFD assessment was prepared by Nitesh Dalal, Conor McGettigan and Michael Gill.

Nitesh Dalal (B.Tech, PG Dip., MSc) is an Environmental Scientist with over 7 years' experience in environmental consultancy and environmental management in India and 1 year of environmental consultancy experience in Ireland. 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).

Conor McGettigan (BSc, MSc) is an Environmental Scientist with over 6 years' experience in environmental consultancy in Ireland. Conor holds an M.Sc. in Applied Environmental Science (2020) and a B.Sc. in Geology (2016) from University College Dublin. Conor has prepared the Land, Soils and Geology and Hydrology and Hydrogeology Chapters for numerous wind farm EIAR projects. Conor also routinely completes WFD compliance Assessments for a wide variety of projects including wind farms, quarries and proposed residential developments.

Michael Gill (BA, BAI, Dip Geol., MSc, MIEI) is an Environmental Engineer and Hydrogeologist with over 22 years' environmental consultancy experience in Ireland. Michael has completed numerous hydrological and hydrogeological impact assessments of wind farms and renewable projects in Ireland, as well as accompanying Flood Risk Assessments. He has substantial experience in surface water drainage design and SUDs design and surface water/groundwater interactions. For example, Michael has worked on the EIS for Oweninny WF, Cloncreen WF, and Yellow River WF, and over 100 other wind farm-related projects.

1.3 WATER FRAMEWORK DIRECTIVE

The EU Water Framework Directive (2000/60/EC), as amended by Directives 2008/105/EC, 2013/39/EU, 2014/101/EU and 2026/805/EU ("**WFD**"), was established to ensure the protection of the water environment. The Directive was transposed in Ireland by the European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003).

The WFD 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 WFD is not compromised.

The WFD is implemented through the River Basin Management Plans (RBMP) which comprises a six-yearly cycle of planning, action and review. The RBMP includes identifying river basin districts, water bodies, protected areas and any pressures or risks, monitoring and setting environmental objectives. In Ireland the first RBMP covered the period from 2010 to 2015 with the second cycle plan covering the period from 2018 to 2021, and the third cycle covers the period from 2022 to 2027[1]. The RBMPs are forward looking.

The Water Action Plan 2024 is Ireland's 3rd River Basin Management Plan (2022 - 2027). The objectives of the Water Action Plan 2024 have been integrated into the design of the Proposed Project and include:

- Ensure full compliance with relevant EU legislation;
- Prevent deterioration;
- Meet the water standards and objectives for designated protected areas;
- Protect high-status waters; and,
- Implement targeted action 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.

[1] *The WFD RBMP cycles are forward looking plans, so 2009-2015 (1st Cycle), 2016-2021 (2nd Cycle), and 2022-2027 (3rd Cycle) are the plans and they use status from the previous 6 years.*
The EPA updates status every three years, but they also complete an additional assessment mid-RBMP cycle. The mid-cycle status does not get reported to the Commission.
The linkage between the two is that the 2nd Cycle plan uses the 2009-2015 status, the 3rd Cycle plan uses the 2016-2021 status. The 2013-2018 status was not used in the RBMP and the 2019-2024 status will not be used in the next RBMP.

Our understanding of these objectives is that water bodies, 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.

As discussed in Section 2.2 below, there are some Heavily Modified Water Bodies (HMWBs) in the vicinity of the Project Site, associated with the Grand Canal. According to the Water Action Plan 2004 HMWBs are bodies of water which have been substantially changed in physical character as a result of alterations by human activity for the purposes of a specified use. In this context, physical alterations mean changes to the hydromorphology of the water body, for example, the size, slope, form, shape and function of a riverbed and its banks, and its flow or water level regime. The specified uses include water storage and regulation for drinking supply and power generation, navigation, flood protection, drainage for protection of agricultural lands, and urban development.

HMWBs have a WFD environmental objective of Good Ecological Potential (GEP) rather than Good Ecological Status (GES). The designation means that a realistic objective is set that acknowledges that the water body has been physically altered for a specified use that society requires to continue. HMWBs cannot achieve GES due to their alterations, and so must be considered in a different way to an unmodified water body. Therefore, the target GEP objective allows for the fact that the hydromorphology of the water body has been modified to facilitate the specified use.

2. WATERBODY IDENTIFICATION AND CLASSIFICATION

2.1 INTRODUCTION

This section identifies those surface waterbodies (SWBs) and groundwater bodies (GWBs) with potential to be affected by the Proposed Project and reviews any available WFD information.

2.2 SURFACE WATERBODY IDENTIFICATION

2.2.1 Proposed Wind Farm

Within the Water Study Area the vast majority of the Proposed Wind Farm site is located in the River Barrow surface water catchment within Hydrometric Area 14 of the South-Eastern River Basin District. A small area in the north of the Ticknevin Bog located in the River Boyne surface water catchment within Hydrometric Area 07 of the Eastern River Basin District.

Regionally, within the River Barrow surface water catchment, the Proposed Wind Farm site is located in 3 no. river sub-catchments. The majority of the Proposed Wind Farm site is located within the Figile_SC_010 river sub-catchment, the southwest is located within the Figile_SC_020 river sub-catchment and the south/southeast is located within the Slate_SC_010 river sub-catchment.

Within the Figile_SC_010 river sub-catchment, the Proposed Wind Farm site is mapped in 3 no. WFD river sub-basins: the Abbeylough_010, Figile_020 and Figile_030 WFD river sub-basins.

- Within the Abbeylough_010 WFD river sub-basin, the Abbeylough Stream (Abbeylough_010 SWB) flows to the west along the northern boundary of Derrybrennan Bog where it discharges into the Figile River (Figile_020 SWB).
- Within the Figile_020 WFD river sub-basin, the Figile_020 SWB flows to the west, between Glashabaun South and Glashabaun North bogs. A tributary of the Figile River, referred to by the EPA as the Lullymore East Stream is mapped to flow to the west from the western boundary of Lodge Bog. This stream dissects the northern sections of Lullymore and Lullybeg bogs and forms the boundary between Blackriver Bog to the west and Glashabaun South Bog to the east before it discharges into the Figile River. A smaller stream, referred to by the EPA as the Lullybeg Stream, flows around the eastern, southern and western perimeter of Lullybeg Bog before it discharges into the Lullymore East Stream. Another stream, assigned the same name on the EPA database, flows from south to north through the western section of Blackriver Bog before it discharges into the Figile River. All watercourses within this sub-basin form part of the Figile_020 SWB.
- Within the Figile_030 WFD river sub-basin, the Figile_030 SWB flows to the northwest, separating Codd 1 in the south from Codd 2 in the north. A small tributary of the Figile River, the Clonbrown Stream is mapped to flow to the north along the eastern boundary of Ballydermot North Bog before it discharges into the Figile River close to the east of Codd 1 Bog. The EPA also map a stream referred to as the Cloncant Stream to flow to the southwest, dissecting Codd 2 Bog before discharging into the Figile River. Further north, Ticknevin Bog is drained by 2 unnamed no. streams which merge at its southern boundary to form the Codd Stream. The Codd Stream flows to the south, along the northwestern boundary of Glashabaun North before it flows to the west and discharges into the Ballyleakin Stream. This stream discharges into the Figile River to the northwest of Codd 1 Bog. All watercourses within this sub-basin form part of the Figile_030 SWB.

Within the Figile_SC_020 river sub-catchment, the Proposed Wind Farm site is mapped within the Figile_050 WFD river sub-basin. Within this WFD river sub-basin Figile River is mapped to flow to the south ~1.6km west of the Proposed Wind Farm site. Several streams are mapped to

originate at the western boundary of the Proposed Wind Farm site. The Clonbulloge Stream to the west of Ballydermot North Bog and the Ballygarrett Stream to the west of Ballydermot South Bog. These streams merge just upstream of their confluence with the Figile River and form part of the Figile_050 SWB.

Within the Slate_SC_010 river sub-catchment, the Proposed Wind Farm site is mapped within the Slate_050 and Slate_060 WFD river sub-basins. Within the Slate_050 WFD river sub-basin, the Killinagh Upper Stream is mapped to flow along the southeastern boundary of Lodge Bog before it discharges into the Slate River. A second tributary of the Slate River is mapped to originate at the western boundary of Lodge Bog, referred to by the EPA as the Drumsru Stream. The Slate River flows to the southwest, ~80m from the south of Lodge Bog. Within the Slate_060 WFD river sub-basin, the Slate River is located ~1km south of Barnaran Bog. There are no watercourses mapped in the immediate vicinity of the Proposed Wind Farm site within this WFD river sub-basin.

Further downstream, the Slate River (Slate_060 SWB) flows through Rathangan and confluences with the Figile River (Figile_080 SWB) ~6.6km southwest of the Proposed Wind Farm site. The Figile River continues to flow to the south before it discharges into the River Barrow (Barrow_090 SWB) to the north of Monasterevin.

Within the River Boyne surface water catchment, the Proposed Wind Farm site is located within the Boyne_SC_010 river sub-catchment and the Boyne_010 WFD river sub-basin. The Clonkeen Stream, which forms part of the Boyne_010 SWB, is mapped to flow along the northern boundary of Ticknevin Bog before it flows to the northwest and discharges into the River Boyne ~2km north of the Proposed Wind Farm site. The River Boyne continues to flow to the northwest before it veers to the northeast close to its confluence with the Yellow River (~7km northwest of the Proposed Wind Farm site).

The Grand Canal HMWB is also located in close proximity to the Proposed Wind Farm site. The Grand Canal Main Line (Boyne) HMWB is located to the north of Ticknevin Bog whilst the Grand Canal Main Line East (Barrow) HMWB is located to the east and the Grand Canal Barrow Line HMWB is to the south of the Proposed Wind Farm site (and to the south of the Slate River).

The TDR accommodation works are located in the Figile_010 and Figile_020 river sub-catchments and the Figile_030 and Figile_040 WFD river sub-basins. Some TDR accommodation works along the R402 are also located in the Lower Shannon Catchment (Hydrometric Area 25A), the Tullamore_SC_010 river sub-catchment and the Tullamore_020 WFD river sub-basin. The TDR accommodation works are generally distant from any EPA mapped watercourses and outside of the 50 hydrological buffer zones. However, a works area along the L1003 is located ~30m southeast of the Figile_040 SWB.

Table A presents the catchment area of each waterbody downstream of the Project Site. The Abbeylough_010 SWB in the vicinity of the Proposed Wind Farm has the smallest catchment area of 11.21km^2. The catchment area for the waterbodies increases progressively downstream as more tributaries discharge into the Figile, Slate and Barrow rivers. For example, the Barrow_110 SWB downstream of Monasterevin has a total catchment area of 1,118.27km^2.

In addition, **Table A** presents the area of the Proposed Wind Farm site which drains to each waterbody and presents this area as a percentage of the total catchment area for that waterbody. This helps identify those surface waterbodies which are most susceptible to potential impacts from the Proposed Project. For example, the Proposed Wind Farm site is 56.70% of the total catchment area of the Figile_030 SWB but only 3.29% of the total catchment draining to the Barrow River near Athy (Barrow_130 SWB). Therefore, those SWBs which are located in close proximity to the site are more susceptible to water quality impacts as a result of activities associated with the proposed wind farm development at Ballydermot. The potential for the Proposed Project to impact a waterbody decreases further downstream due to the increasing catchment area to the surface waterbody and resulting increase in

flow volumes. Note that the Proposed Project does not rely in any way upon the dilution or assimilative capacity provided by any watercourse. The mitigation measures prescribed in Section 0 will ensure the protection of all SWBs.

Figure A below is a local hydrology map of the area.

Table A: Catchment Area Downstream of Proposed Wind Farm site

WFD River Sub-Basin	Total Catchment Area (km²)	Area of Proposed Wind Farm site draining to Waterbody (km²)	Proposed Wind Farm site as % Area of Catchment
Barrow River Catchment			
Abbeylough	11.21	2.20	19.63
Figile_020	45.22	22.20	49.09
Figile_030	74.43	42.20	56.70
Figile_040	246.75	40.20	16.29
Figile_050	260.78	42.80	16.41
Figile_060	291.54	42.80	14.68
Figile_070	301.84	42.80	14.18
Slate_050	140.07	3.21	2.29
Slate_060	173.93	10.24	5.89
Slate_070	215.45	10.24	4.75
Figile_080	622.66	53.04	8.52
Barrow_090	1058.73	53.04	5.01
Barrow_100	1094.39	53.04	4.85
Barrow_110	1118.27	53.04	4.74
Barrow_120	1558.89	53.04	3.40
Barrow_130	1614.25	53.04	3.29
Boyne River Catchment			
Boyne_010	47.01	0.62	1.2
Boyne_020	69.13	0.62	0.9

2.2.1.1 Site Drainage

Due to the historic peat extraction activities within the Allen Bog Group, the bogs at the Proposed Wind Farm site have been artificially drained in order to lower the peat water table. Drainage ditches were first inserted into the upper surface of each of the bogs prior to the commencement of peat extraction.

Currently surface water (or runoff water) is drained via a network of field drains typically spaced at 15 to 20m intervals, piped drains, main drains, headland drains, and silt ponds. Much of the Proposed Wind Farm site is drained by gravity however there are 10 no. existing pumps located around the bogs. These include pumping stations in each of the following bogs; Ticknevin Bog, (P37/010), Glashabaun North Bog (P37/008),Codd 1 Bog (P37/012), Ballydermot South (P37/011) and Blackriver Bog (P37/007). Several of these locations contain more than 1 pump. Pumping stations have also been decommissioned at Lodge (P37-013) and Codd 1 (P37-014). Following peat extraction activities, drainage by gravity in these areas of the Proposed Wind Farm site was no longer feasible as the water level in the surrounding streams were higher than the water level within the bogs. The field drains discharge to main drains which flow via gravity, or are pumped, towards the perimeter of the site where they discharge to larger headland drains. These headland drains eventually discharge to large silt (settlement) ponds. The silt ponds are used to trap sediment and prevent elevated levels of suspended sediment arising in effluent from the drained peatland. Treated surface water is then discharged at outfall points where the effluent flows into off-site drainage channels which in turn discharge into the local stream and river network.

Drainage of the bogs which comprise the Proposed Wind Farm site, include Lodge Bog within which the Proposed Onsite Substation is located, is currently operating under licence from the EPA (P0503-01). The drainage system has been operating in accordance with this existing Integrated Pollution Control (IPC) licence, with all drainage water from the bogs being discharged via an appropriately designed silt pond treatment arrangement.

A detailed hydrological audit of flowpaths from each bog to its eventual discharge point at the regional catchment scale was completed for each of the bogs comprising the Proposed Wind Farm site. The drainage system is summarised in Chapter 9 of the EIAR.

Importantly, the artificial drainage system means that drainage has been modified and drainage may not in all cases be directed to the closest SWB. There are a total of 26 no. surface water discharge locations across the bogs comprising the Proposed Wind Farm site. Despite some of the Proposed Wind Farm site being mapped in the River Boyne catchment, there are no surface water outfalls within this area of the bog.

The discharge locations are situated downstream of settlement ponds, with the treated and attenuated water from the bog drainage system being discharged to outfall drains which in turn discharge to local watercourses. The vast majority of the bogs discharge directly into the Figile River or smaller tributary streams which in turn discharge into the Figile River. Meanwhile, the drainage from a section of Lodge Bog discharges into a local stream which is a tributary of the Slate River. All surface waters from the Proposed Wind Farm site eventually end up in the Figile River, and the River Barrow further downstream.

2.2.2 Proposed Grid Connection

Regionally the vast majority of the Proposed Grid Connection underground cabling route and the Proposed Onsite Substation are located in the River Barrow surface water catchment. A small area in the east of the Proposed Grid Connection, including the Proposed Offsite Substation, is located in the Liffey and Dublin Bay surface water catchment within Hydrometric Area 09 of the Eastern River Basin District.

Regionally, within the River Barrow surface water catchment, the majority of the Proposed Grid Connection is located in Slate_SC_010 river sub-catchment with a very small area in the west mapped within the Figile_SC_010 river sub-catchment. Within the River Liffey and Dublin bay surface water catchment, the Proposed Grid Connection is located in Liffey_SC_050 river sub-catchment.

Within the Slate_SC_010 river sub-catchment, the Proposed Grid Connection is mapped in 5 no. WFD river sub-basins: the Slate_010, Slate_020, Slate_030, Slate_040 and Slate_050 WFD river sub-basins. There are a total of 11 no. crossings over watercourses within this sub-catchment (7 no. crossings over EPA mapped watercourses, 1 no. crossing under the Grand Canal and 3 no. crossings over unmapped watercourses). The crossings are listed in Section 9.3.3.2 of the EIAR and **Table B** below with respect to the receiving SWBs.

Within the Figile_SC_010 river sub-catchment, the Proposed Grid Connection underground cabling route is mapped in Figile_020 WFD river sub-basin. There are no crossings over EPA mapped watercourses within this WFD river sub-basin.

Within the Liffey_SC_050 river sub-catchment, the Proposed Grid Connection underground cabling route and the Proposed Offsite Substation are mapped within the Awillyinish Stream_010 WFD river sub-basin. There are no crossings proposed over EPA mapped watercourses within this sub-catchment.

Table B: Catchment Area Downstream of Proposed Grid Connection

WFD River Sub-Basin	Total Catchment Area (km²)	Length of Grid Connection Draining to Waterbody (km)	No. Watercourse Crossings
Barrow River Catchment			
Slate_010	11.66	~3.8	3
Slate_020	19.86	~4.96	4
Slate_030	34.9	~6.21	0
Slate_040	49.95	~7.75	2
Slate_050	140.07	~11.08	2
Slate_060	173.93	~11.08	0
Slate_070	215.45	~11.08	0
Liffey and Dublin Bay Catchment			
Awillyinish Stream_010	28.14	~1.8	0
Liffey_100	534.51	~1.76	0

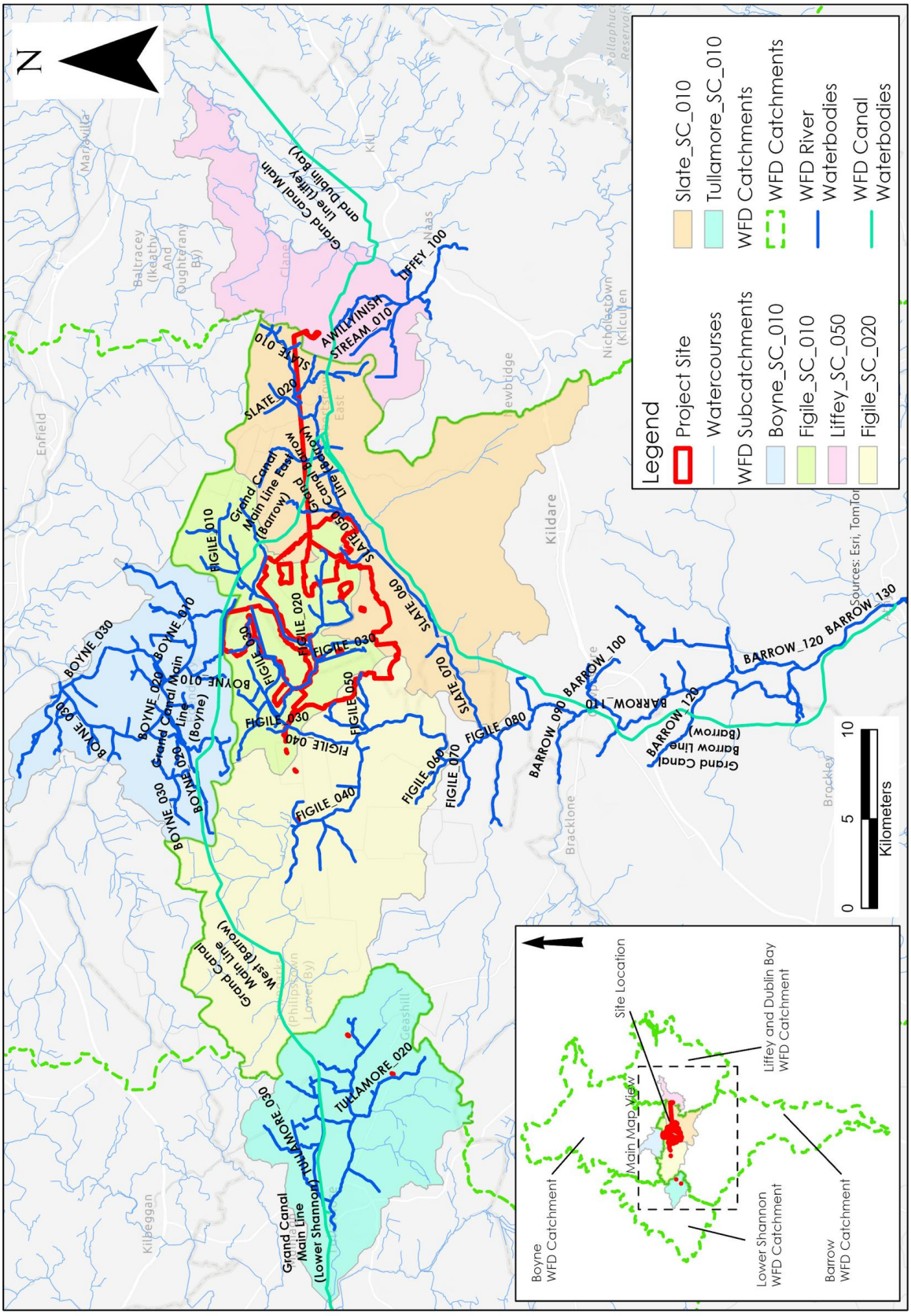


Figure A: Local Hydrology Map

2.3 SURFACE WATER BODY CLASSIFICATION

A summary of the WFD status and risk result for Surface Water Bodies (SWBs) in the Water Study Area are shown in **Table C**. The overall status is based on the ecological, chemical and quantitative status of each SWB.

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

Within the Figile_SC_010 river sub-catchment, the status of the Abbeylough_010 SWB improved from "Poor" (2013-2018) to "Moderate" status (2016-2021 and 2019-2024). The status of the Figile_010 SWB was "Poor" in all WFD cycles. The Figile_020 and Figile_030 SWBs have remained at "Moderate" status across all WFD cycles. These SWBs are 'at risk' of failing to achieve their respective WFD objectives. Peat drainage and extraction is identified as significant pressure on the Abbeylough_010, Figile_020 and Figile_030 SWBs. Hydromorphology, industry, urban wastewater and peat drainage and extraction are identified as the significant pressures on the Figile_010 SWB.

Within the Figile_SC_020 river sub-catchment, the status of Figile_040 SWB has declined from "Moderate" (2013-2018 and 2016-2021) to "Poor" (2019-2024). The Figile_050 SWB declined from "Good" (2013-2018) to "Poor" (2016-2021 and 2019-2024) status whilst the status of the Figile_060 SWB was "Good" in all WFD cycles. The Figile_040 and the Figile_050 SWBs are 'at risk' of failing to meet their respective WFD objectives while the Figile_060 SWB is 'not at risk'. Peat drainage and extraction is identified significant pressure on Figile_040 SWB. Agriculture and peat drainage and extraction are identified as the significant pressures on the Figile_050 SWB (www.catchments.ie).

Within the Slate_SC_010 river sub-catchment, the Slate_050 to 070 SWBs achieved "Moderate" status in the 3 no. latest WFD cycles and are 'at risk' of failing to achieve their respective WFD objectives. Hydromorphology and peat drainage and extraction are identified as the significant pressures on the Slate_050 SWB, urban run-off is the identified significant pressure on the Slate_060 SWB and agriculture, hydromorphology, urban wastewater and peat drainage and extraction are the identified significant pressures on the Slate_070 SWB.

Within the Boyne_SC_010 river sub-catchment, the status of the Boyne_010 SWB declined from "Moderate" to "Poor" status in the latest cycle. The status of the Boyne_020 SWB declined from "Moderate" (2013-2018) to "Poor" (2016-2021) before it improved to "Moderate" in the latest cycle (2019-2024). The status of the Boyne_030 SWB improved from "Moderate" (2013-2018) to "Good" (2016-2021 and 2019-2024). The Boyne_010 and Boyne_020 SWBs are 'at risk' of failing to achieve their WFD objectives while the Boyne_030 SWB is 'not at risk'. Domestic wastewater, hydromorphology and peat drainage and extraction are identified significant pressures on the Boyne_010 SWB. Agriculture, hydromorphology and urban run-off are identified significant pressures on the Boyne_020 SWB.

As stated above some of the TDR accommodation works are located in the Tullamore_020 river sub-basin. This SWB has been of "Poor" status in the last 3 no. monitoring cycles and is "at risk" of failing to meet its WFD objectives.

In terms of Heavily Modified Waterbodies (HMWBs) in the vicinity of the Proposed Wind Farm site, the Grand Canal Main Line (Boyne), Grand Canal Main Line East (Barrow) and the Grand Canal Barrow Line all achieved Good Ecological Potential in the three recent WFD cycles. The Grand Canal Main Line (Boyne) and the Grand Canal Main Line East (Barrow) are 'not at risk' whilst the risk status of the Grand Canal Barrow Line is 'under review'.

The SWB status for the 2019-2024 WFD cycle are shown on **Figure B.**

Table C: Summary WFD Information for River Water Bodies

SWB	Overall Status 2010-2015	Overall Status 2013-2018	Overall Status 2016-2021	Overall Status 2019-2024	Risk Status 3rd Cycle	Pressures
Barrow River Catchment						
Abbeylough_010	Unassigned	Poor	Moderate	Moderate	At risk	Extractive industry (peat)
Figile_020	Moderate	Moderate	Moderate	Moderate	At risk	Extractive industry (peat)
Figile_030	Moderate	Moderate	Moderate	Moderate	At risk	Extractive industry (peat)
Figile_040	Moderate	Moderate	Moderate	Poor	At risk	Extractive industry (peat)
Figile_050	Good	Good	Poor	Poor	At risk	Extractive industry (peat) & agriculture
Figile_060	Good	Good	Good	Good	Not at risk	None
Figile_070	Unassigned	Unassigned	Good	Good	Under Review	None
Figile_080	Unassigned	Moderate	Good	Good	Under Review	None
Slate_010	Unassigned	Moderate	Poor	Poor	At Risk	Urban run-off, hydromorphology & extractive industry (peat)
Slate_020	Poor	Poor	Poor	Poor	At Risk	Urban wastewater & agriculture
Slate_030	Unassigned	Poor	Poor	Poor	At Risk	Forestry & agriculture
Slate_040	Poor	Poor	Poor	Poor	At Risk	Extractive industry (peat)
Slate_050	Moderate	Moderate	Moderate	Moderate	At risk	Extractive industry (peat) & hydromorphology
Slate_060	Moderate	Moderate	Moderate	Moderate	At risk	Urban run-off
Slate_070	Good	Moderate	Moderate	Moderate	At risk	Extractive industry (peat), urban wastewater, agriculture & hydromorphology
Grand Canal Main Line East (Barrow)	Unassigned	Good	Good	Good	Not at risk	None
Barrow_090	Poor	Poor	Poor	Poor	At risk	Urban run-off, hydromorphology & invasive species
Barrow_100	Unassigned	Moderate	Moderate	Moderate	At risk	Urban run-off, hydromorphology & urban wastewater
Barrow_110	Good	Good	Good	Good	Not at risk	None
Boyne River Catchment						
Boyne_010	Moderate	Moderate	Moderate	Poor	At risk	Domestic wastewater, extractive industry (peat) & river hydromorphology

Boyne_020	Moderate	Moderate	Poor	Moderate	At risk	Hydromorphology, urban runoff & agriculture
Liffey and Dublin Bay Catchment						
Awillyinish Stream_010	Unassigned	Unassigned	Moderate	Moderate	Under Review	None
Liffey_100	Moderate	Moderate	Good	Good	Not at risk	None
Lower Shannon Catchment						
Tullamore_020	Moderate	Poor	Poor	Poor	At risk	Agricultural, industry & extractive industry
Heavily Modified Waterbodies						
Grand Canal Main Line (Boyne)	Good Ecological Potential	Good Ecological Potential	Good Ecological Potential	Good Ecological Potential	Not at risk	None
Grand Canal Main Line East (Barrow)	Unassigned	Good Ecological Potential	Good Ecological Potential	Good Ecological Potential	Not at risk	None
Grand Canal Barrow Line	Good Ecological Potential	Good Ecological Potential	Good Ecological Potential	Good Ecological Potential	Under review	None

2.4 GROUNDWATER BODY IDENTIFICATION

2.4.1 Proposed Wind Farm

According to data from the GSI database and bedrock geology series (www.gsi.ie), the west of the Proposed Wind Farm site is underlain by a Locally Important Aquifer (Bedrock which is Moderately Productive only in Local Zones), which consists of Dinantian Upper Impure Limestones. Towards the centre of the Proposed Wind Farm site the Dinantian Pure Bedded Limestones are classified as a Regionally Important Aquifer – Karstified – diffuse. Meanwhile, the eastern section of the Proposed Wind Farm site is underlain by a Locally Important Aquifer (Bedrock which is Moderately Productive only in Local Zones), which consists of Dinantian Pure Bedded Limestones and Dinantian Lower Impure Limestones.

The WFD map 4 no. GWBs to underlie the Proposed Wind Farm site. The Trim GWB (IE_EA_G_002) underlies Ticknevin Bog in the north while the Cushina GWB (IE_SE_G_048) underlies the northwest of the Proposed Wind Farm site. The centre of the Proposed Wind Farm site is underlain by the Bagenalstown Upper GWB (IE_SE_G_153) while the eastern section is underlain by the Kildare GWB (IE_SE_G_077).

The TDR accommodation work areas are underlain by the Rhode and Geashill GWBs.

2.4.2 Proposed Grid Connection

The majority of the Proposed Grid Connection underground cabling route is underlain by a Locally important Aquifer – Bedrock which is Moderately Productive only in local zones comprising of Dinantian Lower Impure Limestones, Dinantian Pure Bedded Limestones and Dinantian Pure Unbedded Limestones. Meanwhile, near Allenwood village the Proposed Grid Connection underground cabling route is underlain by a Locally Important Aquifer – Karstified comprising of Dinantian Pure Bedded Limestones. To the east of Allenwood the route passes over a Locally Important Gravel Aquifer, with the GSI noting that this aquifer is buried beneath the peat.

The WFD map 2 no. GWBs underlying the Proposed Grid Connection. The western section, including the Proposed Onsite Substation, is underlain by the Kildare GWB while the eastern section (~3.6km), and the Offsite Substation, is underlain by the Dublin GWB (IE_EA_G_008).

The GWB status for the 2019-2024 WFD cycle are shown on **Figure B.**

2.5 GROUNDWATER BODY CLASSIFICATION

The GWBs are assigned a status based on the assessment of groundwater chemical and quantitative figures.

All GWBs underlying the Project Site achieved 'Good' status in latest three WFD cycles (2013-2018, 2016-2021 and 2019-2024). The Cushina, Bagenalstown, Rhode and Geashill and Kildare GWBs have been deemed to be "not at risk" of failing to meet their respective WFD objectives. The Trim GWB is "at risk" whilst the risk status of the Dublin GWB is currently under review. No significant pressures have been identified to be impacting upon the Cushina, Bagenalstown, Kildare, Rhode, Geashill or Dublin GWBs. The Trim GWB is listed to be under significant pressure from agriculture, anthropogenic and domestic wastewater.

Table D: Summary WFD Information for Groundwater Bodies

GWB	Overall Status 2010-2015	Overall Status 2013-2018	Overall Status 2016-2021	Overall Status 2019-2024	Risk Status 3rd Cycle	Pressures
Cushina	Good	Good	Good	Good	Not at risk	None
Bagenalstown Upper	Good	Good	Good	Good	Not at risk	None
Kildare	Good	Good	Good	Good	Not at risk	None
Trim	Good	Good	Good	Good	At risk	Agriculture, Anthropogenic and Domestic Waste water
Dublin	Good	Good	Good	Good	Under review	None
Rhode	Good	Good	Good	Good	Not at risk	None
Geashill	Good	Good	Good	Good	Not at risk	None

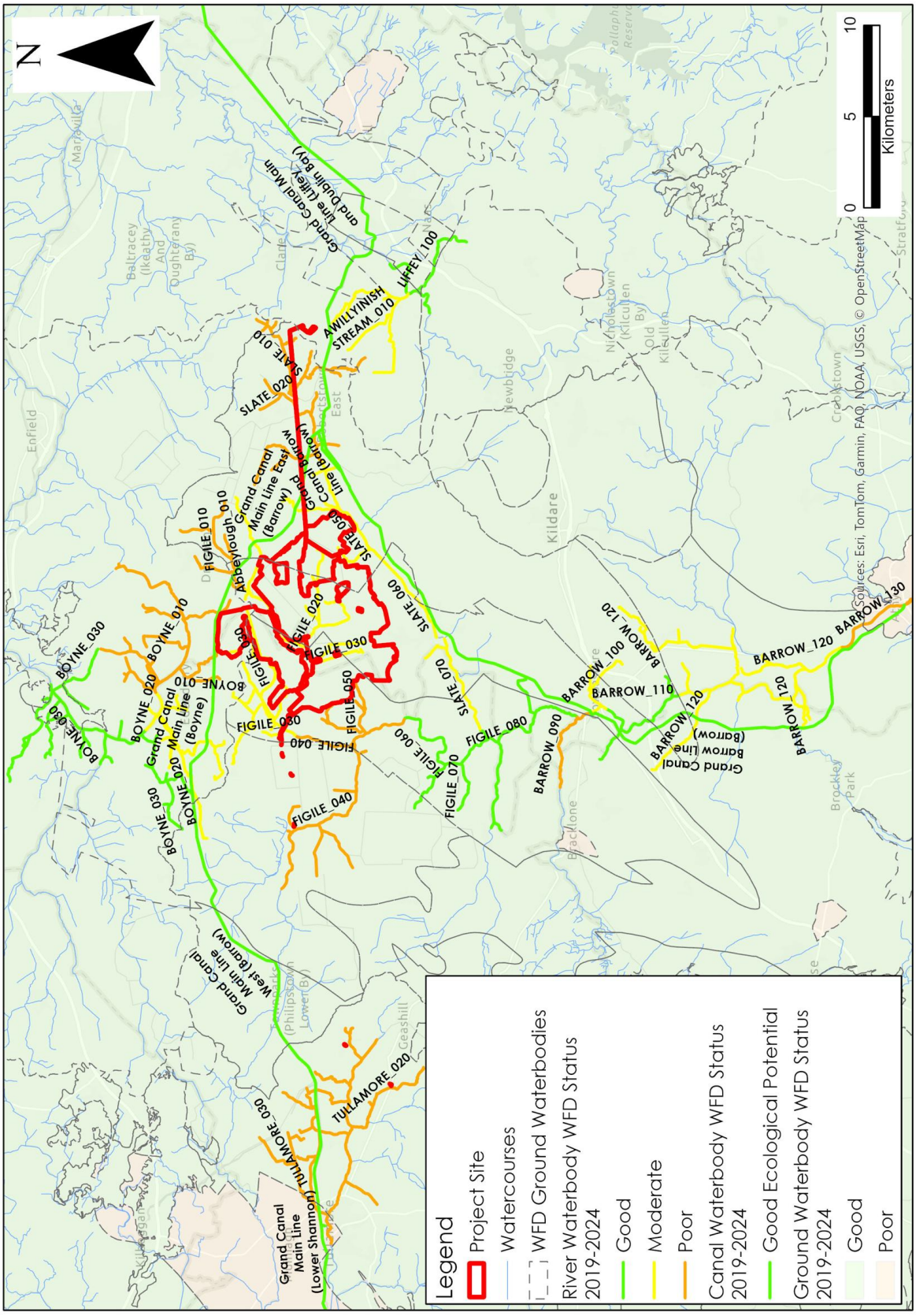


Figure B: WFD Groundwater and Surface Waterbody Status (2019-2024)

2.6 ZONE OF INFLUENCE

The potential Zone of Influence (ZOI) for the Proposed Project is limited to the following SWBs and GWBs:

- River waterbodies: Abbelylough_010, Figile_020 to Figile_080, Slate_010 to Slate_070, Barrow_090 to Barrow_130, Boyne_010 to Boyne_020, Awillyinish Stream_010, Liffey_100 and Tullamore_020 SWBs;
- GWBs: Cushina, Bagenlstown Upper, Kildare, Trim, Dublin, Rhode and Geashill GWBs; and,
- Canal: Grand Canal Maine Line East (Barrow).

2.7 PROTECTED AREA IDENTIFICATION

The WFD requires that activities are also in compliance with other relevant legislation, as considered below. Nature conservation designations, bathing waters, Nutrient Sensitive Areas (NSA's), shellfish protected areas and Drinking Water Protected Area's (DWPA) within the vicinity of the Project Site are considered at as part of the assessment.

2.7.1 Nature Conservation Designations

Within the Republic of Ireland designated sites include National Heritage Areas (NHAs), Proposed National Heritage Areas (pNHAs), candidate Special Areas of Conservation (SAC) and Special Protection Areas (SPAs).

Proposed Wind Farm

The closest designated site to the Proposed Wind Farm site is the Long Derries, Edenderry SAC and pNHA (Site Code: 000925). The Long Derries, Edenderry SAC/pNHA is located in the lands between Glashabaun North and Ticknevin bogs. This SAC/pNHA is located outside of the Proposed Wind Farm site and no infrastructure associated with the Proposed Wind Farm is located within the SAC. T29 and T31 are the closest proposed turbines to the SAC/pNHA, located ~295m and ~424m from the SAC/pNHA boundary respectively. Ticknevin Bog outfalls to the EPA named Codd Stream which flows through this SAC, therefore providing a direct hydrological connection between the Proposed Wind Farm site and the SAC/pNHA.

The Grand Canal pNHA (Site Code: 002104) is mapped adjacent to the north of the Ticknevin Bog. The Proposed Wind Farm site does not encroach upon the mapped extent of this pNHA. The Canal is located above and is hydraulically isolated from the EPA mapped Clonkeen Stream which flows to the north of Ticknevin Bog.

The River Barrow and River Nore SAC (Site Code: 002162) is located ~9.8km southwest of the Proposed Wind Farm site. This SAC is located downstream and downgradient of the Proposed Wind Farm site (on the lower reaches of the Figile River upstream of the River Barrow). The length of the hydrological flowpath between the Proposed Wind Farm site and the SAC is ~20km.

The River Boyne and River Blackwater SAC (Site Code: 002299) and SPA (Site Code: 004232) is located ~14km to the north of the Proposed Wind Farm site. This SAC/SPA is downstream of the Proposed Wind Farm site along the River Boyne. The length of the hydrological flowpath between the boundary of the Proposed Wind Farm site and the SAC/SPA is ~22km. However, it is noted that there is no surface water outfall from Ticknevin Bog within this catchment. All water from Ticknevin Bog is directed to the south and discharges via several settlement ponds to the Codd Stream, a tributary of the Figile River.

Other designated sites within 10km of the Proposed Wind Farm site are as follows:

- Carbury Bog NHA (Site Code: 001388), approx. 4.2km to the north of Ticknevin Bog. This NHA is located upstream and upgradient of the Proposed Wind Farm site;
- Ballina Bog (Site Code: 000390), approx. 9.9km north of Ticknevin Bog. There is no hydrological connection between the Proposed Wind Farm site and this pNHA;
- Black Castle Bog NHA Site Code: 000570), approx. 6.2km northwest of Ticknevin Bog. There is no hydrological connection between the Proposed Wind Farm site and this NHA;
- Hodgestown Bog NHA Site Code: 001393), approx. 7.8km east of Derrybrennan Bog. There is no hydrological connection between the Proposed Wind Farm site and this NHA;
- Ballynafagh Lake SAC and pNHA (Site Code: 001387), approx. 9.4km east of Killina Bog. This SAC and pNHA is located upstream and upgradient of the Proposed Wind Farm site;
- Ballynafagh Bog SAC and pNHA (Site Code: 000391), approx. 8.1km east of Lodge Bog. This SAC and pNHA is located upstream and upgradient of the Proposed Wind Farm site;
- Mouds Bog SAC and pNHA (Site Code: 002331), approx. 5.9km southeast of Lodge Bog. There is no hydrological connection between the Proposed Wind Farm site and this SAC and pNHA;
- Pollardstown Fen SAC and pNHA (Site Code: 000396), approx. 7.6km south of Lodge Bog. This SAC and pNHA is located upstream and upgradient of the Proposed Wind Farm site; and,
- Curragh (Kildare) pNHA (Site Code: 000392), approx. 8.5km southeast of Lodge Bog. There is no hydrological connection between the Proposed Wind Farm site and this SAC and pNHA.

There are no designated sites mapped in the vicinity of the proposed TDR accommodation works.

Proposed Grid Connection

The Proposed Grid Connection underground cabling route is mapped to cross the Grand Canal pNHA to the west of Allenwood along the R414. The proposed crossing is located ~200m west of the existing crossing at Shee Bridge.

Further to the east a small section of the Proposed Grid Connection underground cabling route is mapped to cross the Ballynafagh Lake SAC (Site Code: 001387). An existing road bridge crossing, along the R403, over the Blackwood Feeder, which connect Ballynafagh Lake to the Grand Canal, already exists at this location.

The Proposed Grid Connection underground cabling route is also mapped ~145m to the south of Ballynafagh Bog SAC/pNHA (Site Code: 000391).

Hodgestown Bog NHA (Site Code: 001393) exists ~2km to the north of the Proposed Grid Connection underground cabling route. There are no hydrological connections between the Proposed Grid Connection and this NHA.

There are no other designated sites within 5km of the Proposed Grid Connection.

2.7.2 Bathing Waters

Bathing waters are those designated under the Bathing Water Directive (76/160/EEC) or the later revised Bathing Water Directive (2006/7/EC).

There are no designated bathing waters in the vicinity of the Project Site.

2.7.3 Nutrient Sensitive Areas

Nutrient Sensitive Areas (NSA) comprise Nitrate Vulnerable Zones and polluted waters designated under the Nitrates Directive (91/676/EEC) and areas designated as sensitive areas under the Urban Wastewater Treatment Directive (UWWTD)(91/271/EEC). Sensitive areas under the UWWTD are water bodies affected by eutrophication associated with elevated nitrate concentrations and act as an indication that action is required to prevent further pollution caused by nutrients.

There are no NSAs in the immediate vicinity of the Project Site. The Barrow_090 to Barrow_130 SWBs are listed as an NSA.

2.7.4 Shellfish Waters

The Shellfish Waters Directive (2006/113/EC) aims to protect or improve shellfish waters in order to support shellfish life and growth.

There are no designated shellfish protected areas in the vicinity of the Project Site.

2.7.5 Drinking Water

There are no surface water DWPAs in the vicinity of the Project Site. The Barrow_130 SWB is the closest DWPA downstream of the Proposed Wind Farm site which is listed as a DWPA. The Liffey_150 SWB is the closest DWPA downstream of the Proposed Grid Connection.

There are multiple GSI Public Supply Source Protection Areas and Group Scheme Preliminary Source Protection Areas in the vicinity of the Proposed Project. These are detailed in Section 9.3.15.1 of the EIAR and in **Table E** below.

Table E: Water Supply Schemes in the vicinity of the Proposed Project

Name of DWPA	GWB	Distance Between Source Protection Area and the Project Site
Clonbulloge PWS	Cushina	~0.5km west of the Proposed Wind Farm site
Ballykilleen NFWGS	Cushina / Trim	~2.2km west of the Proposed Wind Farm site
Bracknagh Rech	Bagenalstown Upper	~0.6km south of the Proposed Wind Farm site
Edenderry PWS	Trim	~2.4km northwest of the Proposed Wind Farm site
Roberstown PWS	Kildare / Dublin	~5.8km east of the Proposed Wind Farm site and ~0.9km south of the Proposed Grid Connection
Rathangan PWS	Bagenalstown Upper / Kildare	~3.3km south of the Proposed Wind Farm site

3. WFD RECEPTOR SCREENING

3.1 SURFACE WATER BODIES

With consideration for the construction, operational and decommissioning phases of the Proposed Project, it is considered that all sections of the Figile (Figile_020 to _080 SWBs) and Slate rivers (Slate_010 to _070 SWBs) including the Abbeylough Stream and the Grand Canal East waterbodies, are carried through into the WFD Compliance Assessment. These SWBs have been included for further assessment due to their proximal location to the proposed works. The proposed works must not in any way result in a deterioration in the status of these SWBS and/or prevent them from meeting the biological and chemical characteristics for good status in the future.

Downstream of its confluence with the Figile River, the River Barrow has been screened out due to its distant location (>10km) from the proposed works and the increased volume of water within this SWB. As outlined in **Table A** above, the area of the Proposed Wind Farm site draining to downstream waterbodies as a percentage of the total catchment area for that waterbody decreases progressively downstream. The Proposed Wind Farm comprises a very small percentage of the total catchment area to River Barrow. The proposed works have no potential to cause a deterioration in the status of these screened out SWBs and/or jeopardise their attainment of good surface water status.

The Boyne_010 SWB has been included for the purposes of a conservative impact assessment. However, there is limited potential for effects as there is no outfall from the bogs comprising the Proposed Wind Farm to the River Boyne or any of its tributaries.

Within the Liffey and Dublin Bay Catchment, the Awillyinish Stream_010 has been included due to the proposed works within this WFD river sub-basin.

The Liffey_100 SWB has been screened out due to its distant location and the increasing volumes of water within the Liffey River. The proposed works have no potential to cause a deterioration in the status of these screened out SWBs and/or jeopardise their attainment of good surface water status.

The Tullamore_020 SWB has been screened in for the purposes of a conservative assessment. However, due to the minor nature of the TDR accommodation works which are similar to roadworks being completed across the country, these works have very limited potential to cause a deterioration in the status of these screened out SWBs and/or jeopardise their attainment of good surface water status.

3.2 GROUNDWATER BODIES

With respect to GWBs, the Trim, Bagenalstown Upper, Cushina, Kildare and Dublin GWBs are carried through to the WFD Compliance Assessment due to their location directly underlying the Proposed Wind Farm site and the Proposed Grid Connection.

The Rhode and Geashill GWBs have been screened out of the assessment due to the minor nature of the TDR accommodation works which are similar to roadworks being completed across the country. These works have no potential to cause a deterioration in the status of these GWBs and/or jeopardise their attainment of good status.

3.3 PROTECTED AREAS

In terms of designated sites, the Long Derries, Edenderry SAC/pNHA, the Grand Canal pNHA, the Ballynafagh Lake SAC and Ballynafagh Bog SAC are included due to their proximal location to the Proposed Project. The River Barrow and River Nore SAC is also included in the

impact assessment given the hydrological connectivity which exists between the Project Site and this SAC via the Figile and Slate rivers. All other designated sites have been screened out of the impact assessment given their distant location and the lack of hydrological or hydrogeological connectivity with the Project Site.

The River Boyne and River Blackwater SAC/SPA is screened out of the impact assessment due to its distance from the Project Site and the lack of any surface water emission points from the bogs within the catchment to the River Boyne. Any shallow groundwater flow within the bog will be intercepted by the existing bog surface water drainage network and will be directed to the Figile River sub-catchment. The Proposed Grid Connection is not mapped in the River Boyne catchment.

The surface water abstractions associated with the Barrow_130 and the Liffey_150 DWPAs have been screened out of the impact assessment due to their distant location from the Project Site. There is no potential for the Proposed Project to impact these surface water abstractions which are located ~35km and ~15km downstream respectively.

The groundwater abstractions included in the assessment are the Ballykilleen and Bracknagh GWSs and the Clonbullogue, Robertstown, Edenderry and Rathangan PWSs. These are assessed in the assessment of the overall impacts on the associated GWBs.

3.4 WFD RECEPTOR SCREENING SUMMARY

A summary of WFD Screening discussed above is shown in **Table F**.

Table F: Screening of WFD water bodies located within the study area

Type	WFD Classification	Waterbody Name/ID	Inclusion in Assessment	Justification
Surface Water Body	Barrow River Catchment			
	River	Abbeylough_010	**Yes**	The Proposed Wind Farm site, including 1 no. turbine, is mapped within the Abbeylough_010 river sub-basin. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
		Figile_020	**Yes**	The Proposed Wind Farm site, including 16 no. turbines and the Proposed Onsite Substation, is mapped within the Figile_020 river sub-basin. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
		Figile_030	**Yes**	The Proposed Wind Farm site, including 19 no. turbines, is mapped within the Figile_030 river sub-basin. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
		Figile_040	**Yes**	The Figile_040 SWB is located proximally to the Proposed Wind Farm site (<1km) and directly downstream of the Figile_030 SWB. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
		Figile_050	**Yes**	The Proposed Wind Farm site, including 2 no. turbines, is mapped within the Figile_050 river sub-basin. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
		Figile_060	**Yes**	The Figile_060 SWB is located proximally to the Proposed Wind Farm site (~2.3km) and directly downstream of the Figile_050 SWB. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
		Figile_070	**Yes**	The Figile_070 SWB is located proximally to the Proposed Wind Farm site (~6km) and directly downstream of the Figile_060 SWB. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
		Figile_080	**Yes**	The Figile_080 SWB is located proximally to the Proposed Wind Farm site (~1.4km) and directly downstream of the Figile_070 SWB. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
		Slate_010	**Yes**	The Proposed Grid Connection is mapped within the Slate_010 river sub-basin. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
		Slate_020	**Yes**	The Proposed Grid Connection is mapped within the Slate_020 river sub-basin. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
		Slate_030	**Yes**	The Proposed Grid Connection is mapped within the Slate_030 river sub-basin. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
		Slate_040	**Yes**	The Proposed Grid Connection is mapped within the Slate_040 river sub-basin. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
		Slate_050	**Yes**	The Proposed Grid Connection and some the Proposed Wind Farm site are mapped within the Slate_050 river sub-basin. An assessment is required to consider the potential impacts of the Proposed Project on this SWB

		Slate_060	**Yes**	The Proposed Wind Farm site, including 8 no. turbines, is mapped within the Slate_060 river sub-basin. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
		Slate_070	**Yes**	The Slate_070 SWB is located proximally to the Proposed Wind Farm site (~1.4km) and directly downstream of the Figile_050 SWB. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
	Canal	Grand Canal Main Line East (Barrow)	**Yes**	The Proposed Grid Connection is mapped to cross the Grand Canal Main Line East waterbody within the Slate_050 river sub-basin. An assessment is required to consider the potential impacts of the Proposed Project on this SWB
	River	Barrow_090	No	The Barrow_090 SWB has been screened out due to its distant location from the Proposed Project (~10.5km) and the increasing volumes of water within the Barrow River.
		Barrow_100	No	The Barrow_100 SWB has been screened out due to its distant location from the Proposed Project (~11km) and the increasing volumes of water within the Barrow River.
		Barrow_110	No	The Barrow_110 SWB has been screened out due to its distant location from the Proposed Project (~11.5km) and the increasing volumes of water within the Barrow River.
	Boyne River Catchment			
	River	Boyne_010	No	The Boyne_010 SWB has been included for the purposes of a conservative assessment. However there are no outfalls from the Proposed Wind Farm site within this catchment.
		Boyne_020	No	The Boyne_020 SWB has been screened out due to the absence of any surface water outfalls from the Proposed Wind Farm site within this catchment.
	Liffey and Dublin Bay Catchment			
	River	Awillyinish Stream_010	**Yes**	The Proposed Grid Connection, including the Proposed Offsite Substation, is mapped within the Awillyinish Stream_010 river sub-basin
		Liffey_100	No	The Liffey_100 SWB has been screened out due to its distant location from the Proposed Project and the increasing volumes of water within the Liffey River.
	Lower Shannon Catchment			
	River	Tullamore_020	**Yes**	The Tullamore_020 SWB has been screened in due to the proposed TDR accommodation works within this catchment.
Groundwater Bodies				
Groundwater Body	Groundwater	Cushina	**Yes**	The Proposed Wind Farm, including 14 no. turbines, is mapped to overlie the Cushina GWB. An assessment is required to consider the potential impacts of the Proposed Project on this GWB.
		Bagenalstown Upper	**Yes**	The Proposed Wind Farm, including 30 no. turbines, is mapped to overlie the Bagenalstown Upper GWB. An assessment is required to consider the potential impacts of the Proposed Project on this GWB.
		Kildare	**Yes**	The Proposed Wind Farm, including 1 no. turbine, and the Proposed Grid Connection are mapped to overlie the Kildare GWB. An assessment is required to consider the potential impacts of the Proposed Project on this GWB.
		Trim	**Yes**	The Proposed Wind Farm, including 3 no. turbines, is mapped to overlie the Trim GWB. An assessment is required to consider the potential impacts of the Proposed Project on this GWB.
		Dublin	**Yes**	The Proposed Grid Connection is mapped to overlie the Dublin GWB. An assessment is required

				to consider the potential impacts of the Proposed Project on this GWB.
		Geashill	No	Given the minor and localised nature of the proposed TDR accommodation works, and the limited depth and extent of excavation anticipated, the works are not expected to result in significant interaction with the underlying groundwater regime. Therefore, the Geashill GWB has been screened out of the assessment.
		Rhode	No	Given the minor and localised nature of the proposed TDR accommodation works, and the limited depth and extent of excavation anticipated, the works are not expected to result in significant interaction with the underlying groundwater regime. Therefore, the Rhode GWB has been screened out of the assessment.
Protected Areas				
Protected Areas	SAC	The Long Derries, Edenderry	**Yes**	Due to the proximity of this SAC to the Proposed Wind Farm site and the fact that it is hydrologically connected to it, it will be brought through into the WFD Compliance Assessment.
	pNHA	Grand Canal pNHA	**Yes**	The Proposed Grid Connection crosses the Grand Canal pNHA. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
	pNHA	Carbury Bog NHA	No	The Carbury Bog NHA has been screened out due to its location upstream and upgradient of the Proposed Wind Farm site. The Proposed Project have no potential to impact the status of this NHA.
	NHA	Ballina Bog pNHA	No	The Ballina Bog pNHA has been screened out due to lack of hydrological connection between this pNHA and the Proposed Project. The Proposed Project have no potential to impact the status of this pNHA.
	NHA	Black Castle Bog NHA	No	The Black Castle Bog NHA has been screened out due to lack of hydrological connection between this NHA and the Proposed Project. The Proposed Project have no potential to impact the status of this NHA.
	SAC and pNHA	Hodgestown Bog NHA	No	The Hodgestown Bog NHA has been screened out due to lack of hydrological connection between this NHA and the Proposed Project. The Proposed Project have no potential to impact the status of this NHA.
	SAC and pNHA	Ballynafagh Lake SAC and pNHA	**Yes**	The Proposed Grid Connection crosses the Ballynafagh Lake SAC. An assessment is required to consider the potential impacts of the Proposed Project on this SAC.
	SAC and pNHA	Ballynafagh Bog SAC and pNHA	**Yes**	The Ballynafagh Bog SAC and pNHA has been included in the assessment due to its proximity to the Proposed Grid Connection.
	SAC and pNHA	Mouds Bog SAC and pNHA	No	The Mouds Bog SAC and pNHA has been screened out due to lack of hydrological connection between this SAC and pNHA and the Proposed Project. The Proposed Project have no potential to impact the status of this SAC and pNHA.
	SAC and pNHA	Pollardstown Fen SAC and pNHA	No	The Pollardstown Fen SAC and pNHA has been screened out due to its location upstream and upgradient of the Proposed Project. The Proposed Project have no potential to impact the status of this SAC and pNHA.
	pNHA	Curragh	No	The Curragh (Kildare) pNHA has been screened out due to lack of hydrological connection

		(Kildare) pNHA		between this pNHA and the Proposed Project. The Proposed Project have no potential to impact the status of this pNHA.
	SAC	River Barrow and River Nore SAC	**Yes**	The River Barrow and River Nore SAC is also included in the impact assessment given the hydrological connectivity which exists between the Project Site and this SAC via the Figile and Slate rivers.
Drinking Water	DWPA	Barrow_130	No	The Barrow_130 DWPA has been screened out due to its distant location from the Proposed Project (~35km) and the increasing volumes of water within the Barrow River.
	DWPA	Liffey_150	No	The Liffey_150 DWPA has been screened out due to its distant location from the Proposed Project (~15km) and the increasing volumes of water within the Barrow River.

4. SCOPING OF WATERBODY ELEMENTS

4.1 SWB SCOPING

The Proposed Project has the potential to interact with downstream SWBs through:

- Earthworks and the entrainment of suspended solids in surface water runoff;
- Potential contamination from hydrocarbons and cement-based products during construction;
- Potential contamination from wastewater;
- Potential surface water quality effects during works at watercourse crossings (at the Proposed Wind Farm and the Proposed Grid Connection); and,
- Changes in downstream surface water flow volumes due to the Proposed Project footprint.

Accordingly, the WFD quality elements scoped into the assessment are summarised in **Table G**.

Table G: SWB Quality Element Scoping

WFD Quality Element	Scoped In / Out	Justification
Hydromorphology	**Scoped In**	Works at watercourse crossings have the potential to alter local flow conditions in receiving surface waters.
Physico-Chemical Quality	**Scoped In**	Construction and operational activities have the potential to affect suspended solids, nutrients and hydrocarbons.
Biological Quality Elements	**Scoped In**	Biological receptors are dependent upon maintenance of hydromorphological and physico-chemical conditions.
Priority Substances / Specific Pollutants	**Scoped In**	Potential accidental release of hydrocarbons during construction and operation.
Protected Areas	**Scoped In**	Hydrologically connected downstream designated sites require consideration.
Fish Migration / Fish Passage	**Scoped In**	Watercourse crossings and culverts are proposed.
Estuarine Processes	Scoped Out	The Project Site is inland and a significant distance from any estuarine waterbody.
Coastal Waterbody Processes	Scoped Out	The Project Site is inland and a significant distance from any coastal waterbody.

4.2 GWB SCOPING

Those water body quality elements taken forward into the WFD Compliance Assessment for the Proposed Project are included in **Table H**.

Table H: Scoping of Groundwater Quality Elements

WFD Quality Element	Scoped in/Out	Justification
Saline (or Other) Intrusions Test Quantitative Test	Scoped out	The Project Site is inland and a significant distance from any coastal waterbody, and does not include any permanent or significant dewatering.
Impact of Groundwater on Surface Water Ecological/Quantitative Status Test	Scoped out	Due to the local hydrological regime at the Proposed Wind Farm site (short groundwater flowpaths and discharge into local surface water drainage network within or at the perimeter of the bog) and the shallow nature of the works associated with the Proposed Grid Connection.

Groundwater Dependent Ecosystems Quantitative Test	**Scoped In**	There are Groundwater Dependent Ecosystems located within the Proposed Wind Farm site.
Water Balance Test	**Scoped In**	The Proposed Project includes abstraction of groundwater at both the Proposed Onsite Substation and the Proposed Offsite Substation.
Saline (or Other) Intrusions Test Chemical Test	Scoped out	The Project Site is inland and a significant distance from any coastal waterbody, and does not include any permanent or significant dewatering.
Impact of Groundwater on Surface Water Ecological/Chemical Status Test	**Scoped in**	As outlined in the SWB scoping above
Groundwater Dependent Ecosystems Ecological/Chemical Status test	**Scoped out**	There are Groundwater Dependent Ecosystems located within the Proposed Wind Farm site.
Drinking Water Protected Area Test	**Scoped in**	There are several GWS and PWS in the vicinity of the Proposed Project.
General Chemical Assessment Test	**Scoped in**	No potential for contamination to the groundwater body or aquifer as a result of the Proposed Project.

5. WFD COMPLIANCE ASSESSMENT

5.1 PROPOSALS

The Proposed Project will comprise 46 no. wind turbines, 19 no. turbines will have a blade tip height of 200 metres (m) above the top of the foundation and 27 no. turbines will have a blade tip height of 220 metres (m) above the top of the foundation, the Proposed Onsite Substation, and Proposed Offsite Substation, and associated works, including a total of 13.1km of underground electrical grid cabling and 0.12km of OHL (comprising 0.06km of OHL loop-in from the Proposed Offsite Substation to the existing Maynooth-Dunstown 220kV OHL) to connect to the national grid, internal access roads and hardstand areas, temporary construction compounds, ecological and ornithological enhancement, amenity track and all ancillary works and apparatus.

A full description of the Proposed Project is detailed in Chapter 4 of the EIAR.

5.2 POTENTIAL EFFECTS

5.2.1 Construction Phase (Unmitigated)

5.2.1.1 Potential Surface Water Quality Effects from the Proposed Wind Farm

Construction phase activities including site levelling/construction and building turbine foundation excavation will require earthworks resulting in removal of vegetation cover and excavation of peat, soil and subsoils. The main risk will be from surface water runoff from bare soil/peat, peat and spoil areas and drainage dewatering during construction works.

Hydrocarbons and cement-based compounds will be used during the construction phase. Accidental spillage during refuelling of construction plant with petroleum hydrocarbons is a significant pollution risk to surface waters at all construction sites. 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 the death of aquatic organisms.

Release of effluent from wastewater treatment systems also has the potential to impact on surface waters if site conditions are not suitable for an on-site percolation unit. There are 10 no. construction compounds proposed.

Construction phase activities can result in the release of suspended solids and pollutants in runoff water and could result in an increase in the suspended sediment load, resulting in increased turbidity, increased pH and contamination which in turn could affect the water quality and fish stocks of downstream water bodies such as the Figile and Slate rivers. The SWBs likely to be most impacted by these activities include the Abbeylough_010, Figile_020, Figile_030, Slate_050 and Slate_060 SWBs which receive surface water discharge from the Proposed Wind Farm site. Further downstream the potential for water quality effects will decrease due to the increasing volume of water within the respective SWBs. There is limited potential for effects on the Tullamore_020 SWB due to the minor nature of the proposed TDR accommodation works proposed in this area.

A summary of potential status change to SWBs arising from surface water quality impacts from earthworks during the construction phase of the Proposed Wind Farm in the unmitigated scenario are outlined in **Table I**.

Table I: Potential Surface Water Quality Effects (Proposed Wind Farm) during Construction Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Abbeylough_010	IE_SE_14A010840	Moderate	Poor
Figile_020	IE_SE_14F010100	Moderate	Poor
Figile_030	IE_SE_14F010200	Moderate	Poor
Figile_040	IE_SE_14F010300	Poor	Bad
Figile_050	IE_SE_14F010400	Poor	Bad
Figile_060	IE_SE_14F010500	Good	Good
Figile_070	IE_SE_14F010510	Good	Good
Figile_080	IE_SE_14F010600	Good	Good
Slate_050	IE_SE_14S010100	Moderate	Poor
Slate_060	IE_SE_14S010210	Moderate	Poor
Slate_070	IE_SE_14S010300	Moderate	Moderate
Tullamore_020	IE_SH_25T030100	Poor	Poor

5.2.1.2 Potential Surface Water Quality Effects (Proposed Grid Connection)

Based on the WFD mapping, and site surveys, there will be a requirement for 11 no. watercourse crossings along the Proposed Grid Connection underground cabling route, all located within the Barrow River Catchment. Due to the proximity of watercourses to these works areas there is the potential for qualitative effects. The construction of the Proposed Onsite Substation and Proposed Offsite Substation also have the potential to impact downstream surface water quality.

Construction activities therefore have the potential to adversely impact the status of these SWBs. However, the works will be of short-duration, minor and transient in nature which limits the potential for significant effects.

A summary of potential status change to SWBs arising from surface water quality impacts from earthworks during the construction phase of the Proposed Wind Farm in the unmitigated scenario are outlined in **Table I**.

Table J: Potential Surface Water Quality Effects (Proposed Grid Connection) during Construction Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Slate_010	IE_SE_14S010000	Poor	Poor
Slate_020	IE_SE_14S010020	Poor	Poor
Slate_030	IE_SE_14S010036	Poor	Poor
Slate_040	IE_SE_14S010050	Poor	Poor
Slate_050	IE_SE_14S010100	Moderate	Moderate
Slate_060	IE_SE_14S010210	Moderate	Moderate
Slate_070	IE_SE_14S010300	Moderate	Moderate
Figile_080	IE_SE_14F010600	Good	Good
Grand Canal Main Line East (Barrow)	IE_14_AWB_GCMLE	Good	Good
Awillyinish Stream_010	IE_EA_09A020300	Moderate	Moderate

5.2.1.3 Potential Groundwater Quality Effects (Proposed Project)

Accidental spillage during refuelling of construction plant with petroleum hydrocarbons is a major pollution risk to groundwater. The accumulation of small spills of fuels and lubricants during routine plant use can also be a pollution risk. Chemicals such as cement-based compounds also pose a threat to the groundwater environment. Runoff from concrete works can impact on groundwater quality.

These sources of contamination have the potential to impact on groundwater quality in the underlying groundwater body.

A summary of potential status change to GWBs arising from potential groundwater quality impacts during the construction phase of the Proposed Project in the unmitigated scenario are outlined in **Table K**.

Table K: Potential Groundwater Quality Effects (Proposed Project) during Construction Phase (Unmitigated)

GWB	WFD Code	Current Status	Assessed Potential Status Change
Cushina	IE_SE_G_048	Good	Good
Bagenalstown Upper	IE_SE_G_153	Good	Good
Kildare	IE_SE_G_077	Good	Good
Trim	IE_EA_G_002	Good	Good
Dublin	IE_EA_G_008	Good	Good

5.2.2 Operational Phase (Unmitigated)

Potential effects associated with the operational phase of the Proposed Project will be much reduced in comparison to the construction phase. Any effects will occur at the Proposed Wind Farm site and at the Proposed Offsite Substation and will be associated with minor maintenance works.

No maintenance works will be required along the Proposed Grid Connection underground cabling route and therefore there is no potential to impact on the status of downstream SWBs or underlying GWBs.

5.2.2.1 Potential Surface Water Quantity Effects

Progressive replacement of the soil, 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 Project Site and increase flood risk downstream. In reality, the access roads will have a higher permeability than the underlying peat.

During storm rainfall events, additional runoff coupled with increased velocity of flow could increase hydraulic loading, resulting in erosion of watercourses and causing hydromorphological effects. However, the footprint of the Proposed Project represents ~3% of the Project Site and therefore there is limited potential for effects. Furthermore, the baseline environment is characterised by high rates of surface water runoff.

A summary of potential status change to SWBs arising from increased runoff during the operation phase of the Proposed Project in the unmitigated scenario are outlined in **Table L**.

Table L: Potential Effects on Surface Water Flows (Proposed Wind Farm) during Operational Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Abbeylough_010	IE_SE_14A010840	Moderate	Moderate
Figile_020	IE_SE_14F010100	Moderate	Moderate
Figile_030	IE_SE_14F010200	Moderate	Moderate
Figile_040	IE_SE_14F010300	Poor	Poor
Figile_050	IE_SE_14F010400	Poor	Poor
Figile_060	IE_SE_14F010500	Good	Good
Figile_070	IE_SE_14F010510	Good	Good
Figile_080	IE_SE_14F010600	Good	Good
Slate_050	IE_SE_14S010100	Moderate	Moderate
Slate_060	IE_SE_14S010210	Moderate	Moderate
Slate_070	IE_SE_14S010300	Moderate	Moderate
Awillyinish Stream_010	IE_EA_09A020300	Moderate	Moderate

5.2.2.2 Potential Surface Water Quality Effects

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 and hardstand areas. 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

A summary of potential status change to SWBs arising from surface water quality impacts during the operation phase of the Proposed Project in the unmitigated scenario are outlined in **Table M**.

Table M: Potential Surface Water Quality Effects (Proposed Wind Farm) during Operational Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Abbeylough_010	IE_SE_14A010840	Moderate	Moderate
Figile_020	IE_SE_14F010100	Moderate	Moderate
Figile_030	IE_SE_14F010200	Moderate	Moderate
Figile_040	IE_SE_14F010300	Poor	Poor
Figile_050	IE_SE_14F010400	Poor	Poor
Figile_060	IE_SE_14F010500	Good	Good
Figile_070	IE_SE_14F010510	Good	Good
Figile_080	IE_SE_14F010600	Good	Good
Slate_050	IE_SE_14S010100	Moderate	Moderate
Slate_060	IE_SE_14S010210	Moderate	Moderate
Slate_070	IE_SE_14S010300	Moderate	Moderate

5.2.2.3 Potential Groundwater Quality/Quantity Effects

The risks to groundwater quality are the same as those described in **Section 5.2.1.3** but of a lesser extent than during the construction phase due to the limited activity with only minor maintenance required during the operational phase. The

The proposed groundwater wells at the Proposed Onsite Substation and the Proposed Offsite Substation have the potential to effect local groundwater levels in the surrounding lands. However, the potential for quantitative effects is limited as the abstraction rate for the proposed groundwater wells will be comparable to a domestic well, with a well supplying a single household typically abstracting less than 1m^3/day.

A summary of potential status change to GWBs arising from groundwater quality/quantity impacts during the operation phase of the Proposed Project in the unmitigated scenario are outlined in **Table N**.

Table N: Potential Groundwater Quality/Quantity Effects during Operational Phase (Unmitigated)

GWB	WFD Code	Current Status	Assessed Potential Status Change
Cushina	IE_SE_G_048	Good	Good
Bagenalstown Upper	IE_SE_G_153	Good	Good
Kildare	IE_SE_G_077	Good	Good
Trim	IE_EA_G_002	Good	Good

5.2.3 Potential Effects on Protected Areas

The surface water connections from the Proposed Wind Farm site could potentially transfer poor quality surface water that may affect the conservation objectives of the River Barrow and River Nore SAC. However, the potential for effects is limited given the length of the hydrological flowpath between the Proposed Wind Farm site and the SAC (~19km).

Ticknevin Bog drains to the south and outfalls to a stream which flows through the Long Derries, Edenderry SAC/pNHA. The SAC is designated for orchid-rich dry calcareous grassland, which is not a hydrologically sensitive habitat. This habitat occurs on glaciofluvial sands and gravels adjacent to the peatland, rather than on the peatland itself. The SAC site synopsis (NPWS, 2013) specifically refers to the presence of "good quality dry, calcareous grassland" and an "interesting gravel pit flora", indicating that the conservation interests of the SAC are associated with mineral substrates (i.e. sand and gravels) rather than peat.

There is limited potential for effects on the Grand Canal pNHA, Ballynafagh Lake SAC or Ballynafagh Bog SAC due to the temporary, minor and transient nature of the proposed works along the Proposed Grid Connection underground cabling route.

5.3 MITIGATION MEASURES

In order to mitigate against the potential negative effects on surface and groundwater quality, quantity and flow patterns, mitigation measures will be implemented during the construction and operational phases of the Proposed Project. These are outlined below.

5.3.1 Construction Phase

5.3.1.1 Mitigation Measures to Protect Surface Water Quality During Earthworks

There is an extensive network of drains already existing at the Proposed Wind Farm site. The existing drainage infrastructure is operating in accordance with IPC licence requirements, with environmental monitoring and silt control measures being implemented. The existing drainage system at the Proposed Wind Farm site will be maintained and expanded locally as required for use within the Proposed Wind Farm drainage system. The key elements are the upgrading and improvements to water treatment elements, such as in-line controls and treatment systems, including proposed silt traps and settlement ponds.

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

- Interceptor drains will convey clean runoff water around works areas to the existing downstream drainage system (field drains and main drains). Where required,

interceptor drains will be installed in advance of any construction works commencing. This will ensure that clean water is kept clear by diverting surface water flow around excavations, construction areas and temporary storage areas. Where possible (depending on orientation), existing field drains can be used as interceptors drains;

- Collector drains will be used to intercept and collect runoff from construction areas (from turbine base/hardstand areas, construction compounds, and the substation). During the construction phase temporary settlement ponds will be used to attenuate and treat runoff from the construction areas (from turbine base/hardstand areas, construction compounds, and the Proposed Onsite Substation) and treated water will then discharge into existing field drains and main drains. Temporary settlement ponds will be removed at the end of the construction phase (end of high risk period), and wind farm runoff will discharge into existing field drains and main drains;
- During the construction phase, temporary silt traps (silt fences) will be used as an additional water protection measure around the existing bog drainage network, particularly where works are proposed within 50m of a natural watercourse. The silt fences will be placed in the existing drains downstream of construction works, and the associated construction area run-off water will be diverted into proposed interceptor drains, or culverted under/across the works area;
- During the construction phase, dewatering silt bags will also be used as required. They can be used downgradient of Proposed Turbine bases, where temporary pumping is required. Discharge from dewatering silt bags will flow into settlement ponds and treated water from settlement ponds will outfall to existing field drains and main drains;
- Within the proposed site layout the majority of access roads will be constructed using the floated technique. Depending on intermediate topography, a collector drain (dirty water system as described above) may be used during the construction phase, or over the edge (OTE) drainage will occur. Over the edge drainage allows runoff from access tracks to flow into local field drains and be managed via the existing site drainage system. OTE drainage will only occur where topography allows, and it is only proposed in areas of low risk and remote from outfall locations (at least 150m from bog outfall locations. Silt traps and check dams will be installed in field drains downstream of OTE drainage areas, and these will provide attenuation and treatment of dirty water; and,
- Culverts will be required where site roads and proposed hardstands cross the main bog drainage networks. These will be installed with a minimum gradient to reduce the entrainment of suspended solids. All culverts will be inspected regularly and maintained where appropriate. Culverts will remain in-situ during the operational phase of the Proposed Project.

Water Treatment Train

If the discharge water from construction areas fails to be of a high quality, 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.

Silt Fences:

Silt fences will be emplaced within drains down-gradient of all construction areas. Silt fences are effective at removing heavy settleable solids. This will act to prevent entry to the existing drainage network 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. Regular 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.

Silt Bags:

Silt bags will be used where small to medium volumes of water need to be pumped from excavations (e.g. the proposed underpass locations). As water is pumped through the bag, most of the sediment is retained by the geotextile fabric allowing filtered water to pass through.

Pre-emptive Site Drainage Management:
The works programme for the construction phase of the project will also take account of weather forecasts and predicted rainfall in particular. Large excavations and movements of peat/subsoil or peat 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.

Management of Runoff from Peat and Spoil Areas:
All excavated peat and overburden will be placed/spread alongside the excavations for the infrastructure elements. Excavated peat and spoil will be transported immediately on excavation to designated peat and spoil areas alongside the hardstands and access roads or used for landscaping. During the initial placement of peat and spoil, silt fences, straw bales and biodegradable geogrids will be used to control surface water runoff from the storage areas as required. Interceptor and collector drains will be used at storage areas. 'Siltbuster' treatment trains will be employed if previous treatment is not to a high quality.

Proposed Drainage and Water Quality Monitoring
An inspection and maintenance plan for the onsite drainage system will be prepared in advance of commencement of any works and will be included in the CEMP. 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.

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

During the construction phase field testing (visual, supplemented with pH, electrical conductivity, temperature, dissolved oxygen and turbidity monitoring), sampling 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 (i.e. weekly, monthly and event-based). The data will be processed and analysed and works will cease if elevated turbidity concentrations are recorded. In this event, all upstream silt traps and drainage routes will be inspected to identify the cause of the elevated turbidity levels. Works will not recommence until any issues have been resolved and the turbidity concentrations have returned to background concentrations.

Works within the Hydrological Buffer Zone
The following additional mitigation measures will also be implemented:

- Double or triple silt fences will be placed downgradient of all work locations within the hydrological buffer zones;
- All works will be completed during the dry weather periods and works will be postponed in the event of rainfall; and,
- The hedgerow separating the small hydrological feature to the southwest of the Proposed Offsite Substation will be retained. This feature is not shown on the EPA databases but was recorded during site surveys. The features was described as being heavily vegetated and with a low flow. Retaining the hedgerow will acts as an additional protection measure to this features.

5.3.1.2 Mitigation Measures to Protect Surface Water Quality During Excavation Dewatering

Management of excavation seepages and subsequent treatment prior to discharge into the drainage network will be undertaken for excavation works across the Project Site 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 the build-up of groundwater in the excavation;
- The interceptor drainage will be discharged to the existing drainage system or onto the natural vegetated surface within the Project Site and not directly into any natural watercourse;
- 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;
- There will be no direct discharge to the existing bog drainage network (without attenuation and treatment), and therefore no risk of hydraulic loading or contamination will occur; and,
- Daily monitoring of excavations and the water treatment system by a suitably qualified person (EcoW) will occur during the construction phase. If high levels of seepage inflow occur, excavation work will immediately be stopped, and a geotechnical assessment will be undertaken.

5.3.1.3 Mitigation Measures to Protect Against Release of Hydrocarbons

- Refuelling and maintenance of construction vehicles and plant will, where practicable, be undertaken off-site at controlled, designated fuelling facilities. Where refuelling or maintenance is required on-site, it will be undertaken at designated areas in accordance with the Construction Environmental Management Plan (CEMP) and appropriate pollution prevention procedures;
- On-site re-fuelling will be undertaken using a double skinned bowser or a refuelling truck with spill kits kept onboard;
- Only designated trained operatives will be authorised to refuel plant on-site;
- Taps, nozzles or valves associated with refuelling equipment will be fitted with a lock system;
- All fuel storage areas will be bunded appropriately for the duration of the construction phase. All bunded areas will be fitted with a storm drainage system and an appropriate oil interceptor. Ancillary equipment such as hoses, pipes will be contained within the bunded area;
- Fuel and oil stores including tanks and drums will be regularly inspected by the appointed ECoW for leaks and signs of damage;
- The Proposed Onsite Substation and the Proposed Offsite Substation will be bunded appropriately to the volume of oils likely to be stored and to prevent leakage of any associated chemicals to groundwater or surface water. The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor;
- The plant used during construction will be regularly inspected for leaks and fitness for purpose; and,
- An emergency response plan for the construction phase to deal with accidental spillages is contained within the CEMP (which is contained in Appendix 4-5).

5.3.1.4 Mitigation Measures to Prevent Release of Cement-Based Products

Best practice methods for cement-based compounds includes:

- No batching of wet-cement products on-site is proposed. Ready-mixed concrete will be delivered to site and where possible, pre-cast elements will be used;
- Where possible pre-cast elements for culverts and concrete works will be used;
- No washing out of the main body of any plant used in concrete transport or concreting operations will be allowed on-site;

- Where concrete is delivered on site, only the concrete truck chute will be cleaned, using the smallest volume of water possible. 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 isolated in temporary lined wash-out pits located near Site compounds. These temporary lined wash-out pits will be removed from the site their utility is no longer required or at the end of the construction phase;
- Any washing out of concrete pumping plant will also be into the temporary lined wash-out pits;
- Weather forecasts will be used to plan dry days for pouring concrete; and,
- Construction contractors will ensure each concrete pour site is free of standing water and plastic covers will be available in case of a sudden rainfall event.

5.3.1.5 Mitigation Measures to Prevent Release of Wastewater

The best practice methods for wastewater management at the proposed on-site construction compound during the construction phase include:

- 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 the Project Site and removed after use from the Project Site by a licensed waste contractor; and,
- No water or wastewater will be sourced on the Project Site, nor discharged at the Project Site.

5.3.1.6 Mitigation Measures for Piled Foundations

The proposed mitigation measures designed for the protection of downstream surface water quality and groundwater quality within the peat bog will be implemented at all construction work areas.

- Mitigation measures for sediment control are detailed in Section 5.3.1.1 and 5.3.1.2;
- Mitigation measures for the control of hydrocarbons during construction works are detailed in Section 5.3.1.3; and,
- Mitigation measures for the control of cement-based products during construction works are detailed in Section 5.3.1.4.

Proposed mitigation measures relative to piling works will comprise:

- Where driven piles are used, they will have a cross section without re-entrant angles;
- Strict QA/QC procedures for piling works will be followed;
- Piles will be kept vertical during piling works; and,
- Where required bentonite seal will be used to prevent upward/downward movement of surface water/groundwater.

5.3.1.7 Mitigation Measures to Prevent Morphological Changes to Surface Watercourses at the Project Site

The Proposed Wind Farm design has been optimised to utilise the existing infrastructure (i.e. existing site roads) where practicable. Of the 15 no. watercourse crossing locations, a number are existing crossings which reduces the nature of the works required. The crossings comprise

of proposed new crossings, upgrade to existing crossing and the replacement of existing crossings. The proposed crossing types include clear-span bridges, bottomless culverts and appropriately sized culverts.

Mitigation measures for the crossings are detailed below:

- Clear-span bridge crossings will be designed to span the watercourse without disturbance to the watercourse bed and with abutments located outside the channel where practicable. No in-stream excavation works will be required for the clear-span crossings;
- Where bottomless culverts are proposed, the natural watercourse bed will be retained through the crossing where practicable. Construction will be undertaken from outside the watercourse channel and appropriate measures will be implemented to prevent the mobilisation of sediment into the watercourse;
- Where box culverts or pipes are proposed, the crossing will be suitably sized for the expected peak flows and designed to maintain hydraulic conveyance. Any works required within or immediately adjacent to the watercourse will be undertaken in accordance with the relevant OPW and IFI requirements and appropriate sediment and pollution control measures will be implemented;
- Existing crossings requiring upgrading or replacement will be constructed in a manner that minimises disturbance to the existing watercourse and its banks. Where existing structures are to be removed, works will be undertaken in accordance with the approved construction methodology and appropriate measures will be implemented to prevent sediment mobilisation;
- All proposed new and upgraded crossings will be designed to maintain existing watercourse flow conveyance and to avoid creating a restriction to flow or increasing flood risk upstream or downstream of the crossing;
- All guidance / mitigation measures required by the OPW and/or the Inland Fisheries Ireland (IFI) is incorporated into the design of the proposed crossings;
- All drainage measures will be installed in advance of the works;
- Plant and equipment will not be permitted to track across the watercourse;
- Access to the opposite side of the watercourse for excavation and foundation installation will require the installation of a temporary pre-cast concrete or metal bridge;
- As a further precaution, near stream construction work will only be carried out during the period permitted by IFI for in-stream works according to the IFI (2016) guidance document "Guidelines on protection of fisheries during construction works in and adjacent to waters", i.e., July to September inclusive. This time period coincides with the period of lowest expected rainfall, and therefore minimum runoff rates. This will minimise the risk of entrainment of suspended sediment in surface water runoff, and transport via this pathway to surface watercourses (any deviation from this will be done in discussion with the IFI);
- Where works are necessary inside the 50m buffer double row silt fences will be emplaced immediately down-gradient of the construction area for the duration of the construction phase;
- All new river/stream crossings will be designed in accordance with OPW guidelines/requirements on applying for a Section 50 consent;
- Existing crossings requiring upgrading or replacement will be constructed in a manner that minimises disturbance to the existing watercourse and its banks. Where existing structures are to be removed, works will be undertaken in accordance with the approved construction methodology and appropriate measures will be implemented to prevent sediment mobilisation; and,
- All proposed new and upgraded crossings will be designed to maintain existing watercourse flow conveyance and to avoid creating a restriction to flow or increasing flood risk upstream or downstream of the crossing.

The watercourse crossings will be constructed to the specifications of the OPW bridge design guidelines 'Construction, Replacement or Alteration of Bridges and Culverts - A Guide to Applying for Consent under Section 50 of the Arterial Drainage Act, 1945', and in consultation

with Inland Fisheries Ireland. Abutments will be constructed from precast units combined with in-situ foundations, placed within an acceptable backfill material.

Confirmatory inspections of the proposed new watercourse crossing location will be carried out by the Project Civil/Structural Engineer and the Project Hydrologist prior to the construction of the crossing.

All new proposed culverts and proposed culvert upgrades at field drain crossings required for the Proposed Wind Farm will be suitably sized for the expected peak flows in the watercourse. All culverts will be inspected regularly to ensure they are not blocked by debris, vegetation or any other material that may impede conveyance.

5.3.1.8 Mitigation Measures to Protect Water Quality Along the Proposed Grid Connection

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

- A double silt fence perimeter will be placed along the road verge on the down-slope side of works areas that are located inside the watercourse 50m buffer zone;
- The following mitigation measures are proposed for the Proposed Grid Connection crossing works:
    - No stockpiling of construction materials will take place along the grid route;
    - No refuelling of machinery or overnight parking of machinery is permitted in this area;
    - No concrete truck chute cleaning is permitted in this area;
    - Works will not take place at periods of high rainfall, and will be scaled back or suspended if heavy rain is forecast;
    - Local road drainage, culverts and manholes will be temporarily blocked during the works;
    - Machinery deliveries will be arranged using existing structures along the public road;
    - All machinery operations will take place away from the stream and ditch banks, apart from where crossings occur. Although no instream works are proposed or will occur;
    - Any excess construction material will be immediately removed from the area and sent to a licenced waste facility;
    - Spill kits will be available in each item of plant required to complete the works; and,
    - Silt fencing will be erected on ground sloping towards watercourses at the stream crossings if required.

5.3.1.9 Mitigation Measures for Directional Drilling

- Although no in-stream works are proposed, the drilling works will only be done over 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;
- The crossing works area will be clearly marked out with fencing or flagging tape to avoid unnecessary disturbance;
- There will be no storage of material / equipment or overnight parking of machinery inside the 15m buffer zone;
- Before any ground works are undertaken, double silt fencing will be placed upslope of the Grand Canal;
- Additional silt fencing or straw bales (pinned down firmly with stakes) will be placed across any natural surface depressions / channels that slope towards the watercourse;

- Silt fencing will be embedded into the local soils to ensure all site water is captured and filtered;
- The area around the bentonite batching, pumping and recycling plant will be bunded using terram (as it will clog) and sandbags in order to contain any spillages and prevent the migration of drilling fluids from the works area;
- Drilling fluid returns will be contained within a sealed tank / sump to prevent migration from the works area;
- Spills of drilling fluid will be clean up immediately and stored in an adequately sized skip before been taken off-site;
- If rainfall events occur during the works, there will be a requirement to collect and treat small volumes of surface water from areas of disturbed ground (i.e. soil and subsoil exposures created during site preparation works);
- This will be completed using a shallow swale and sump down slope of the disturbed ground; and water will be pumped to a proposed percolation area at least 50m from the Grand Canal;
- The discharge of water onto vegetated ground at the percolation area will be via a silt bag which will filter any remaining sediment from the pumped water. The entire percolation area will be enclosed by a perimeter of double silt fencing;
- Any sediment laden water from the works area will not be discharged directly to the Grand Canal;
- Works will not take place during periods of heavy rainfall and will be scaled back or suspended if heavy rain is forecasted;
- Daily monitoring of the compound works area, the water treatment and pumping system and the percolation area will be completed by a suitably qualified person during the construction phase. All necessary preventative measures will be implemented to ensure no entrained sediment, or deleterious matter is discharged to the Grand Canal;
- If high levels of silt or other contamination is noted in the pumped water or the treatment systems, all construction works will be stopped. No works will recommence until the issue is resolved and the cause of the elevated source is remedied;
- On completion of the works, the ground surface disturbed during the site preparation works and at the entry and exit pits will be carefully reinstated and re-seeded at the earliest opportunity to prevent soil erosion;
- The silt fencing upslope of the Grand Canal will be left in place and maintained until the disturbed ground has re-vegetated;
- There will be no batching or storage of cement allowed at the watercourse crossing;
- There will be no refuelling allowed within 100m of the Grand Canal; and,
- All plant will be checked for purpose of use prior to mobilisation at the canal crossing.

Fracture Blow-out (Frac-out) Prevention and Contingency Plan:

- The drilling fluid/bentonite will be non-toxic and naturally biodegradable (i.e., Clear Bore Drilling Fluid or similar will be used);
- The area around the drilling fluid batching, pumping and recycling plants will be bunded using terram and/or sandbags to contain any potential spillage;
- One or more lines of silt fencing will be placed between the works area and the adjacent river;
- Spills of drilling fluid will be cleaned up immediately and transported off-site for disposal at a licensed facility;
- Adequately sized skips will be used where temporary storage of arisings are required;
- The drilling process / pressure will be constantly monitored to detect any possible leaks or breakouts into the surrounding geology or local watercourse;

- This will be gauged by observation and by monitoring the pumping rates and pressures. If any signs of breakout occur then drilling will be immediately stopped;
- Any frac-out material will be contained and removed off-site;
- The drilling location will be reviewed, before re-commencing with a higher viscosity drilling fluid mix; and,
- If the risk of further frac-out is high, a new drilling alignment will be sought at the crossing location.

5.3.1.10 Mitigation Measures for Use of Siltbuster

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, suitably qualified 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 will be recycled and retreated, which has a secondary positive effect of reducing carryover; and,
- The use of biodegradable chemical agents will be implemented at very sensitive sites (i.e. adjacent to SACs).

5.3.1.11 Mitigation Measures for Tree Felling and Vegetation Removal

Tree felling operations will conform to current best practice Forest Service regulations, policies and strategic guidance documents as well as Coillte and DAFM guidance documents.

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 roads and culverts will be on-going through any felling operation. No tracking of vehicle through watercourses will occur, as vehicles will use road infrastructure and existing watercourse crossing points. Where possible, existing drains will not be disturbed during felling works;
- Machines will traverse the Site along specified off-road 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 off-road routes, 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 peat and spoil 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 on Site 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;
- Refuelling or maintenance of machinery will not occur within 50m of an aquatic zone or within 20m of any other hydrological feature. 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.

5.3.1.12 Mitigation to Protect Surface Water Quality During Fluvial Flooding

Despite the low likelihood of a fluvial flood event occurring during the construction of the Proposed Wind Farm, weather/rainfall events of those magnitudes likely to generate significant rainfall which would in turn cause fluvial flooding would be forecastable.

An emergency response system has been developed for the construction phase of the Proposed Project to respond to high rainfall events which may result in fluvial flooding.

A potential high intensity rainfall event would likely to be identified 3-5 days in advance, with more accurate forecasts of severity within 24-48 hours of occurrence. Preparations for a flood event would begin from the initial indications that there may be a high rainfall event. This would allow time for the preparation and the implementation of additional emergency mitigation measures.

As above, the first point of mitigation is ongoing monitoring of weather forecasts and weather warning. The project EM (Environmental Manager) or the site ECoW will be responsible for monitoring weather forecasts during the construction phase. There will be a 24-hour advance meteorological forecasting (Met Eireann download) linked to a trigger-response system. When a pre-determined rainfall trigger levels is exceeded (e.g., sustained rainfall (any foreseen rainfall event longer than 4 hour duration) and/or any yellow or greater rainfall warning (>25mm/hour) issued by Met Eireann), planned responses will be undertaken.

Cessation of all construction works until the storm event, including the storm runoff has passed. All construction works will cease during storm events such as yellow warning rainfall events. Following heavy rainfall events, and before construction works recommence, the Project Site will be inspected and corrective measures implemented to ensure safe working conditions e.g. dewatering of standing water in open excavations, etc.

Exposed soils/peat (exposed temporary stockpiles) will be covered with plastic sheeting during all relatively heavy rainfall events and during periods where works have temporarily ceased before completion at a particular area (e.g., overnight and weekends).

With regards to the fluvial flood zones at the Proposed Wind Farm site, a managed retreat from the fluvial flood zones will be implemented in the event of a high intensity rainfall event and/or weather warning related to rainfall. This will include the following:

- Any areas where soil/subsoil is exposed at the surface will be compacted firmly with a digger bucket of a suitably sized excavator.
- Open trenches will be backfilled and compacted.

- Existing sediment control measures will be removed, as these may be washed away and deposited elsewhere by the floodwaters.
- Site access tracks will be scraps and any excess soft material will be removed from the flood zones.
- All plant, machinery and equipment will be removed from the flood zones.

5.3.1.13 Mitigation Measures from Biodiversity Enhancement

No specific mitigation measures are required in relation to the proposed peatland restoration or flooded areas for whooper swan biodiversity enhancement works. The proposed works will have a positive effect on bog hydrology/hydrogeology.

All felling and vegetation removal works undertaken in accordance with the mitigation measures prescribed in Section 5.3.1.11.

Slow release fertilisers will be used to reduce nutrient losses through leaching and surface runoff by releasing nutrients gradually in line with vegetation requirements. There will be no application of fertilizers within the hydrological buffer zones.

5.3.1.14 Mitigation Measures Associated with Amenity Proposals

Detailed mitigation measures for sediment control are outlined in Section 9.5.2.1. and detailed mitigation measures for control of hydrocarbons during construction works are outlined in Section 5.3.1.3. No additional mitigation measures are required due to the small scale nature of the proposed amenity works.

5.3.1.15 Mitigation Measures for Protected Areas

The potential for material to enter the downstream protected areas is negligible as mitigation controls as described above will be implemented. These measures include the use of silt fences, silt traps and check dams. Emphasis will also be placed on prevention of hydrocarbon releases to local watercourses.

It can be concluded that with best practice methods adhered to during the construction of the Proposed Project, the potential for the project to impact upon the qualifying interests of designated sites is not significant.

5.3.2 Operational Phase

5.3.2.1 Mitigation Measures to Prevent Increased Site Runoff

As the part of the Proposed Project drainage design, it is proposed that runoff from the proposed infrastructure will be collected locally in new proposed silt traps, settlement ponds and vegetated buffer areas prior to release into the existing drainage network.

The operational phase drainage system of the Proposed Project will be installed and constructed in conjunction with the road and hardstanding construction work as described below:

- Interceptor drains will be installed up-gradient of all 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/road side drains will be used to collect runoff from access tracks, turbine hardstanding areas and substation compound areas which may contain entrained suspended sediment, and channel it to settlement ponds for sediment settling;
- Transverse drains ('grips') will be constructed, where appropriate, in the surface layer of access tracks to divert any runoff into swales/track side drains;

- Check dams will be used along sections of access tracks drains to intercept silts at source. Check dams will be constructed from a 40mm non-friable crushed rock or similar;
- Settlement ponds, emplaced downstream of track swale sections, turbine locations and the selected substation option, 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 will be designed in accordance the greenfield runoff rate requirements.

5.3.2.2 Mitigation Measures to Protect Surface Water Quality

The mitigation measures to protect against poor quality runoff during the operational phase of the Proposed Project are the same as those outlines in **Section 5.3.1** above.

Mitigation measures for oils and fuels during the operational phase of the Proposed Project are the same as those outlines in **Section 5.3.1.3** above.

5.3.2.3 Mitigation Measures to Protect Groundwater Quality

It is proposed to manage wastewater from the staff welfare facilities in the control buildings by means of a sealed storage tank, with all wastewater being tankered off site by permitted waste collector to wastewater treatment plants. Mitigation for hydrocarbons will also be implemented as detailed in **Section 5.3.1.3**.

The concrete in turbine bases sets within 3 days of concrete pour. Therefore, the concrete foundations will be fully cured prior to commencement of the operational phase. The limited potential for interaction between the cured concrete and groundwater, together with the prevailing groundwater conditions and dilution within the wider groundwater system, means that any potential effects on groundwater quality are considered imperceptible.

5.3.2.4 Mitigation Measures to Protect Groundwater Quantity

The abstraction rate for the proposed groundwater wells at the Proposed Onsite Substation and the Proposed Offsite Substation will be comparable to a domestic well, with a well supplying a single household typically abstracting less than 1m^3/day. The wells are proposed in locally important aquifers which are moderately productive only in local zones. The aquifer at the Proposed Offsite Substation forms part of the Dublin GWB which is comprised of poorly productive bedrock and groundwater flow will be concentrated in the upper weathered zone of the aquifer. The aquifer at the Proposed Onsite Substation forms part of the Kildare GWB which is also characterised by poorly productive bedrock. Therefore due to the nature of the underlying bedrock aquifers and the proposed abstraction rates, no effects on local groundwater levels will occur. There are no groundwater receptors or groundwater well supplies in the vicinity of the Proposed Onsite Substation or the Proposed Offsite Substation.

5.3.2.5 Mitigation Measures for Protected Areas

The mitigation measures to protect against poor quality runoff during the operational phase of the Proposed Project are the same as those outlined above.

Mitigation measures for oils and fuels during the operational phase of the Proposed Project are the same as those outlined in **Section 5.3.1.3**.

It can be concluded that with best practice methods adhered to during the operation phase of the Proposed Project, the potential for the project to impact upon the qualifying interests of the local and downstream designated sites is not significant.

5.3.3 Decommissioning Phase

The potential impacts associated with decommissioning of the Proposed Project will be similar to those associated with the construction phase but of a reduced magnitude, due to the smaller scale of the proposed decommissioning works.

A decommissioning plan will be agreed with both Offaly County Council and Kildare County Council prior to decommissioning of the Proposed Project.

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 and peat and spoil areas. This will be done by covering with vegetation to encourage vegetation growth and reduce run-off and sedimentation.

The Proposed Wind Farm roadways will be kept and maintained following decommissioning of the wind farm infrastructure, as these will be utilised by ongoing forestry works and by other participating landowners.

The electrical cabling connecting the Project Site infrastructure to the Onsite 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 impact on the hydrological/hydrogeological environment at the wind farm site.

Other impacts 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. Similar mitigation as outlined for the construction phase will be implemented during the decommissioning phase to ensure no impacts of receiving waters.

Some of the potential impacts of water bodies will be avoided by leaving elements of the Proposed Project in place where appropriate. The Proposed Grid Connection will be retained by EirGrid as a permanent part of the national grid. The turbine bases will be rehabilitated by covering with local topsoil/peat in order to regenerate vegetation which will reduce runoff and sedimentation effects, subject to the detailed decommissioning arrangement in place at that time. Internal roads will remain as amenity tracks. 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.

With the implementation of the mitigation measures outlined above no significant effects on the hydrological and hydrogeological environment will occur during the decommissioning phase of the Proposed Project.

5.4 POTENTIAL EFFECTS ON QUALITY ELEMENTS WITH THE IMPLEMENTATION OF MITIGATION

A summary of potential effects on SWB quality elements is provided in **Table O**, and a summary of potential status change to SWBs arising from potential surface water quality element impacts of the Proposed Project are presented in **Table Q**.

Table O: Potential Effects on receiving SWB Quality Elements

SWB Quality Element	Post Mitigation Potential Risk To Downstream Receptors	Reasoning
Hydromorphology	No	Refer to Sections 5.3.1.7, 5.3.1.8 and 5.3.1.9.
Physio-Chemical Quality	No	Refer to Sections 5.3.1.1 to 5.3.1.14
Biological Quality Elements	No	Refer to Sections 5.3.1.1 to 5.3.1.14
Priority Substances / Specific Pollutants	No	Refer to Sections 5.3.1.3, 5.3.1.4 and 5.3.1.5.
Protected Areas	No	Refer to Section 5.3.1.15.
Fish Migration Passage	No	Refer to Sections 5.3.1.7, 5.3.1.8 and 5.3.1.9.

A summary of potential effects on GWB quality elements is provided in **Table P**, and a summary of potential status change to GWB Status arising from potential groundwater quality element impacts of the Proposed Project is presented in **Table Q**.

Table P: Potential Effects on receiving GWB Quality Elements

GWB Quality Element	Post Mitigation Potential Risk To Downstream Receptors	Reasoning
GWDTE	No	All the downstream designated sites are associated with rivers, please refer to Section 5.3.1.15
Water Balance Test	No	Refer to Section 5.3.2.4
Impact of GW on SW Ecological/Chemical Status	No	Refer to Sections 5.3.1.3, 5.3.1.4, 5.3.1.5 and 5.3.1.6.
DWPAs	No	Refer to Sections 5.3.1.3, 5.3.1.4, 5.3.1.5 and 5.3.1.6.
General Chemical Assessment Tests	No	Refer to Sections 5.3.1.3, 5.3.1.4, 5.3.1.5 and 5.3.1.6.

5.5 POTENTIAL EFFECTS WITH THE IMPLEMENTATION OF MITIGATION

In all instances, the mitigation measures described in **Section 0** are sufficient to meet the WFD Objectives. The assessment of WFD elements for the WFD waterbodies is summarised in **Table Q** below.

Table Q: Summary of WFD Status for Unmitigated and Mitigated Scenarios

SWB	WFD Code	Current Status	Assessed Status - Unmitigated	Assessed Status with Mitigation Measures
Barrow Catchment				
Abbeylough_010	IE_SE_14A010840	Moderate	Poor	Moderate
Figile_020	IE_SE_14F010100	Moderate	Poor	Moderate
Figile_030	IE_SE_14F010200	Moderate	Poor	Moderate
Figile_040	IE_SE_14F010300	Poor	Bad	Poor
Figile_050	IE_SE_14F010400	Poor	Bad	Poor
Figile_060	IE_SE_14F010500	Good	Good	Good
Figile_070	IE_SE_14F010510	Good	Good	Good
Figile_080	IE_SE_14F010600	Good	Good	Good
Slate_010	IE_SE_14S010000	Poor	Poor	Poor
Slate_020	IE_SE_14S010020	Poor	Poor	Poor
Slate_030	IE_SE_14S010036	Poor	Poor	Poor
Slate_040	IE_SE_14S010050	Poor	Poor	Poor
Slate_050	IE_SE_14S010100	Moderate	Poor	Moderate
Slate_060	IE_SE_14S010210	Moderate	Poor	Moderate
Slate_070	IE_SE_14S010300	Moderate	Moderate	Moderate
Grand Canal Main Line East (Barrow)	IE_14_AWB_GCMLE	Good	Good	Good
Boyne Catchment				
Boyne_010	IE_EA_07B040200	Poor	Poor	Poor
Liffey and Dublin Bay Catchment				
Awillyinish Stream_010	IE_EA_09A020300	Moderate	Moderate	Moderate
Lower Shannon Catchment				
Tullamore_020	IE_SH_25T030100	Poor	Poor	Poor
Groundwater Bodies				
Cushina GWB	IE_SE_G_048	Good	Moderate	Good
Bagenalstown Upper GWB	IE_SE_G_153	Good	Moderate	Good
Kildare GWB	IE_SE_G_077	Good	Moderate	Good
Trim GWB	IE_EA_G_002	Good	Moderate	Good
Dublin GWB	IE_EA_G_008	Good	Moderate	Good

5.6 CUMULATIVE EFFECTS

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

The main likelihood of cumulative effects is assessed to be hydrological (surface water quality) rather than hydrogeological (groundwater). Due to the hydrogeological setting of the Proposed Wind Farm site (i.e. low permeability peat, silts and clays overlying predominantly a poor bedrock aquifers, and high density of surface water drainage features) and the near surface nature of construction activities, cumulative effects with regard groundwater quality or quantity arising from the Proposed Project are assessed as not likely.

The greatest potential for cumulative effects will occur during the construction phase of the Proposed Project as this is when earthworks and excavations will be undertaken. 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.

The cumulative assessment detailed herein is based on the delineated cumulative hydrological study area presented in Section 9.5.7 of EIAR Chapter 9.

5.6.1 Cumulative Effects with Turbary Peat Cutting

Private peat cutting on turbary plots at the periphery of the Proposed Wind Farm site will likely continue. 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, private peat cutting is expected to be limited in extent and volume, which limits the potential for cumulative effects to arise in combination with the Proposed Project. Nevertheless, the mitigation measures detailed in Section 5.3 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.

5.6.2 Cumulative Effects with Agriculture

The Project Site is situated within an agricultural setting, with elements of the Proposed Grid Connection being located on agricultural lands. Corine land cover maps (1990 – 2018) show that the majority of the surrounding lands are being used for agricultural purposes.

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

The construction phase of 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 4.3 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.

5.6.3 Cumulative Effects with Forestry

The Project 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, and given that they drain to the Figile and Slate rivers, the potential cumulative effects on downstream water quality and quantity need to be assessed.

Replacement afforestation associated with the Proposed Project has also been considered as part of the cumulative assessment. From a water environment perspective, the principal potential cumulative pathways associated with afforestation establishment relate to sediment and nutrient mobilisation associated with ground preparation and drainage works. The potential for cumulative effects is therefore dependent primarily on hydrological connectivity to a common downstream receptor and temporal overlap with construction activities associated with the Proposed Project, rather than spatial proximity alone. Where replacement afforestation is not hydrologically connected to the same downstream receptors, no cumulative hydrological pathway would exist. Where lands are hydrologically connected, appropriate sequencing of BnM-controlled afforestation establishment relative to the principal earthworks and drainage works associated with the Proposed Project would avoid meaningful temporal interaction.

However the mitigation measures detailed in Section 4.3 for the construction, operation and decommissioning phases of the Proposed Project will ensure the protection of downstream surface water quality.

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

5.6.4 Cumulative Effects with Housing Developments

A detailed cumulative assessment has been carried out for all planning applications (granted and awaiting decisions) within a combined river sub-basin zone within the vicinity of the Proposed Project.

Planning applications have been consulted within the cumulative study area described above. These applications are for new dwellings or renovations of existing dwellings, as well as for the erection of farm buildings. Based on the scale of the works, their proximity to the Proposed Project 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).

5.6.5 Cumulative Effects with other Wind Farm Developments

All consented, proposed and operational wind farms within 25km of the Project Site are detailed in Section 2.10.2.2 of Chapter 2 of the EIAR. Several wind farms have been identified in the cumulative study area. These include the 3 no. operational wind farms (Cloncreen, Cushaling and Mount Lucas WFs), 1 no. wind farm which has been granted planning permission (Cloncarrow WF) and 1 no. proposed wind farm (Ballinla WF). All other wind farm development are located outside of the Water Study Area and have no potential to result in in-com

Three of these wind farms (Cloncreen WF, Cushaling WF and Mount Lucas WF) have already been constructed, significantly reducing the potential for cumulative effects with the Proposed Project. The EIARs for these wind farms detail mitigation measures for both the operation and decommissioning phases to ensure that there will be no significant effects on the water environment. Similarly, this chapter details strict, tried and tested, best practice mitigation measures for the protection of the water environment during the construction, operation and decommissioning phases. Therefore, there is no potential for significant cumulative effects with other wind farm developments.

Cloncarrow WF has been granted planning permission but is yet to be constructed whilst Ballinla WF is currently proposed. The greatest potential for cumulative effects would occur if the construction phase of the Proposed Project was to overlap with the construction phase of

either of these projects. However, Cloncarrow WF and Ballinla WF are accompanied by an EIAR which detailed mitigation measures for the protection of the water environment. Similarly, this chapter details strict, tried and tested, best practice mitigation measures for the protection of the water environment during the construction phase. Therefore, there is no potential for significant cumulative effects with these projects if the construction phases were to overlap.

5.6.6 Cumulative Effects with Uisce Éireann Water Supply Project

Planning permission for the Water Supply Project Eastern and Midlands Region has been submitted to ACP (Case no: 323980). The project includes an abstraction from Parteen Basin on the Lower River Shannon, and various elements of water supply infrastructure, which will extend from Parteen Basin, through the midlands, to Peamount in Co. Dublin. The Water Supply Project aim to increase water supply resilience in the East and Midlands region.

The pipeline associated with the UÉ Water Supply is proposed to pass through Codd 2, Glashabaun North, Glashabaun South and Derrybrennan bogs and will include a proposed abstraction from the Figile River (during the testing and commissioning phase). An overlap of the construction phases associated with the Proposed Project and the Water Supply Project could result in cumulative effects on the local water environment. Without appropriate management, concurrent construction works could result in cumulative pressures on the local water environment, including increased sediment generation and disturbance.

To minimise the potential for cumulative effects, the respective project teams will maintain ongoing liaison during the construction phases, as required. This will facilitate the exchange of programme information and coordination of construction activities where appropriate.

Furthermore, the EIAR submitted for the Water Supply Project concludes that following the implementation of the mitigation and control measures, there would be no significant effect and that the project would not compromise WFD objectives or cause a deterioration in the status of any surface water or groundwater WFD designated water body and/or jeopardise the attainment of good surface water (or good ecological potential) or groundwater status. The EIAR includes details restrictions on abstraction rates from the Figile River (during the testing and commissioning phase) for a range of flow volumes to ensure that there are no significant negative effects.

Similarly, the mitigation measures prescribed in this EIAR for the Proposed Project, will ensure that there are no significant effects on the water environment and compliance with WFD.

Considering the mitigation measures prescribed for both projects, and the coordination between construction teams, significant cumulative effects will not occur.

5.6.7 Cumulative Effects with Proposed Decommissioning and Rehabilitation Plans

The Applicant intends to utilise the Proposed Wind Farm site for both peatland rehabilitation and wind energy infrastructure in order to facilitate environmental stabilisation of the bog group.

The Draft Rehabilitation Plans will be implemented in order to meet the requirements of the IPC licence. The Draft Rehabilitation Plans, attached as Appendix 4-2, detail the proposed restoration and rehabilitation measures to be implemented, and will be subject to consultation as well as input from the EPA prior to their implementation.

The overall footprint of the Proposed Project is <~3% of the total area of the Proposed Wind Farm site area. The Draft Rehab plan for all the Bogs will be updated to incorporate the Proposed Project infrastructure, with the key objectives of the rehabilitation plans i.e.

rewetting and revegetation, occurring between and surrounding the Proposed Project infrastructure.

The main risk to downstream surface water quality and the underlying groundwater quality will occur whilst the restoration measures are being implemented. The construction phase of the Proposed Project will overlap with the implementation of the rehabilitation plans. This will result in increased activity at the Project Site. The increased activity will result in greater peat disturbance which has the potential to result in elevated concentrations of suspended solids in runoff. The increased activity will also heighten the risk of hydrocarbon spills and leaks. However, all works completed as part of the Daft Rehabilitation Plans, will be completed in accordance with IPC licence requirements and using standard best practice measures. This will ensure that there will be no negative effect on downstream surface water quality or quantity or underlying groundwater quality. The rehabilitation works will only be completed once the construction phase of the Proposed Project have been completed.

During the operational phase of the Draft Rehabilitation Plans, the majority of the remedial works, such as drain blocking, will have been completed and there will be little activity on-site with the exception of monitoring and maintenance. The additional volumes of surface water runoff created by the construction of the Proposed Project infrastructure will be further attenuated within the site following the implementation of the rehabilitation measures. The rehabilitation plans will improve both surface water quality and attenuation within the proposed site and in the wider bog area, by slowing the movement of water and the stabilisation of substrates.

There will be no cumulative effects associated with the construction, operational or decommissioning phases of the Proposed Project and the Draft Rehabilitation Plans.

A detailed assessment of the interaction of the operational phase of the Proposed Project and the rehabilitation has been presented in Chapter 9 of the EIAR. This assessment concluded that the Proposed Project is not expected to compromise the rehabilitation potential of the wider cutover bog or prevent the achievement of the objectives of the proposed peatland rehabilitation measures. Any interaction between the operational drainage system and future rehabilitation is expected to be predominantly localised and capable of being managed through the proposed drainage design and local hydrological isolation measures.

6. SUMMARY AND CONCLUSION

WFD status for SWBs (Surface Water Bodies) and GWBs (Groundwater Bodies) hydraulically linked to the Project Site are defined in **Section 2** above.

The Proposed Project does not involve any significant abstraction of groundwater or significant alteration of drainage patterns. Therefore, the quantitative status (i.e., the available quantity (volume) of groundwater and surface water locally) to the receiving waters will remain unaltered during the construction and operational phase of the Proposed Project.

There is no direct discharge from the Proposed Project to downstream receiving waters. Mitigation for the protection of surface water during the construction, operation and decommissioning phases of the Proposed Project will ensure the qualitative status of the receiving waters will not be altered by the Proposed Project.

There is also mitigation proposed to protect groundwater quality within the Project Site during the construction, operational and decommissioning phases of the Proposed Project. These mitigation measures will ensure the qualitative status of the underlying GWBs will not be altered by the Proposed Project.

Furthermore, mitigation measures during the construction, operation and decommissioning phases of the Proposed Project will ensure that there will be no significant effects on any of the protected areas in the vicinity of the Proposed Project.

As such, the Proposed Project:

- Will not cause a deterioration in the status of any surface and groundwater bodies;
- Will not jeopardise the objectives to achieve 'Good' surface water/groundwater status;
- Will not jeopardised the attainment of 'Good' surface water/groundwater chemical status;
- Will not jeopardised the attainment of 'Good' surface water/groundwater quantity status;
- Is compliant with the requirements of the Water Framework Directive (2000/60/EC); and,
- Is consistent with other Community Environmental Legislation including the EIA Directive (2014/52/EU), the Habitats Directive (92/43/EEC) and the Birds Directive (2009/147/EC) (Note that a full list of legislation complied with in relation to hydrology and hydrogeology is included in Section 9.1.4 of the EIAR Chapter 9).

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