APPENDIX 9-3

WFD ASSESSMENT REPORT

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WATER FRAMEWORK DIRECTIVE COMPLIANCE ASSESSMENT
LEMANAGHAN WIND FARM, CO. OFFALY

FINAL REPORT

Prepared for:

LEMANAGHAN WIND FARM DAC

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 Lemanaghan Wind Farm DAC (the Applicant), to complete a Water Framework Directive (WFD) Compliance Assessment for a planning application for 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. The Proposed Project site relates to the primary study area for the EIAR.

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 wind farm 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 9.2.2 of the EIAR; and,
- Surface Water Quality sampling as described in Section 9.3.8 of the EIAR.

1.2 STATEMENT OF AUTHORITY

Hydro-Environmental Services (HES) are a specialist 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 Michael Gill, Conor McGettigan and Nitesh Dalal.

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.

Conor McGettigan (BSc, MSc) is an Environmental Scientist with over 5 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 competes WFD compliance Assessments for a wide variety of projects including wind farms, quarries and proposed residential developments.

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).

1.3 WATER FRAMEWORK DIRECTIVE

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

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.

[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.

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

Regionally, the Proposed Project site is located in a total of 3 no. surface water catchments. The vast majority of the Proposed Project site is located in the Lower Shannon surface water catchment within Hydrometric Area 25A of the Shannon Irish River Basin District (Shannon IRBD). Meanwhile, a small area in the northwest of the Proposed Project site is located within the Lower Shannon surface water catchment within Hydrometric Area 25B of the Shannon IRBD. Furthermore, a small section towards the north of the Proposed Project site is located in the Upper Shannon surface water catchment within Hydrometric Area 26G of the Shannon IRBD (www.epa.ie). Therefore, all surface waters draining the Proposed Project site will eventually discharge to the River Shannon. The River Shannon flows to the southwest approximately 10km northwest of the Proposed Project site before veering to the southeast at Shannonbridge, Co. Offaly approximately 15km west of the Proposed Project site. The River Shannon then flows to the southwest, north of Banagher, approximately 17km southwest of the Proposed Project site before eventually discharging into Lough Derg.

Within the Upper Shannon regional surface water catchment (26G), the Proposed Project site is located in the Shannon Lower sub-catchment (Shannon[Lower]_SC_010) and the Boor_020 WFD river sub-basin. This area of the Proposed Project site is drained by the Boor River (Boor_020 SWB). Within this WFD river sub-basin the EPA named the Ballynahown Stream flows to the northwest from the vicinity of the Proposed Project site. The Ballynahown Stream, form part of the Boor_020 SWB and discharges into the Boor River approximately 6.5km northwest of the Proposed Project site. The Boor River the continues to the west for 4.5km before the Boor_020 SWB discharges into the River Shannon (Shannon (Upper)_120 SWB).

Within the Lower Shannon (25B) regional surface water catchment, the Proposed Project site is located in the Shannon Lower sub-catchment (Shannon[Lower]_SC_030) and the Blackwater(Shannonbridge)_010 WFD river sub-basin. The closest EPA mapped watercourse is the EPA named Holy Well of Clongawny Stream, which forms part of the Blackwater(Shannonbridge)_010 SWB. This stream flows to the northwest approximately 950m west of the Proposed Project site and discharges into the Blackwater River approximately 3.3km northwest of the Proposed Project site. The Blackwater River then continues to the southwest before the Blackwater(Shannonbridge)_020 SWB discharges into the Lower River Shannon (Shannon (Lower)_010) approximately 13.5km southwest of the Proposed Project site and southeast of the village of Shannonbridge.

As stated above, the majority of the Proposed Project site is located within the Lower Shannon (25A) surface water catchment. On a more local scale within this catchment, the Proposed Project site is situated in the River Brosna sub-catchment (Brosna_060) and 3 no. river sub-basins. The easternmost section of the Proposed Project site is located in the Brosna_100 sub-basin. In this area of the Proposed Project site the Castlearmstrong and Derrynagun streams flow southwards and discharge into the Brosna River to the east and south of the Proposed Project site respectively. All these watercourses form part of the Brosna_100 SWB. Meanwhile, the majority of the Proposed Project site is located in the Lemanaghan Stream_010 sub-basin with the Lemanaghan stream flowing southwards through the centre of the Proposed Project site. This stream discharges into the Brosna River ~1.2km south of the Proposed Project site which flows to the southwest. In addition, the west of the Proposed Project site is located in the Brosna_110 sub-basin, with the Kilcolgan Beg stream flowing southwards from the vicinity of the Proposed Project site before discharging into the Brosna River.

The Brosna River then continues to flow to the west before the Brosna_140 SWB discharges into the River Shannon (Shannon(Lower)_010 SWB) ~14.5km from the Proposed Project site. The Shannon itself then continues to flow to the southwest before the Shannon(Lower)_030 SWB discharges into the Lough Derg TN lake waterbody near Portumna.

Note that as part of the Proposed Project, turbine accommodation works will be required as Kennedys Cross, located in the townland of Ballindown, Co. Offaly at the junction of the N52 and N62. These works are located in the Rapemills_010 WFD river sub-basin. The Rapemills_020 SWB discharges into the Shannon (Lower)_010 SWB near Banagher.

Figure A below is a local hydrology map which identifies the SWBs in the vicinity and downstream of the Proposed Project site.

Table A presents the catchment area of each waterbody downstream of the Proposed Project site. The Lemanaghan Stream SWB in the vicinity of the Proposed Project site has the smallest catchment area of ~13km^2. Similarly, the Boor and Blackwater SWBs have relatively small catchment areas. However, the catchment area increases dramatically downstream of the Proposed Project site where the local waterbodies discharge into the Brosna River to the south of the Proposed Project site and the River Shannon to the west. For example the Lemanaghan stream discharges into the Brosna_110 SWB to the south of the Proposed Project site which has a total upstream catchment area of ~990km^2. Therefore, those waterbodies which are located in close proximity to the Proposed Project site are more susceptible to water quality impacts as a result of activities associated with the Proposed Project. The potential for effect decreases progressively downstream due to the increasing flow volumes. Note that the Proposed Project does not rely in any way upon the dilution or assimilative capacity of any downstream waterbody. The mitigation measures prescribed in Section 4.3 ensure the protection of all SWBs downstream of the Proposed Project site.

As detailed in Section 9.3.5 of Chapter 9, the Proposed Project site is drained by a network of field drains, main drains which direct water to silt ponds prior to discharge to streams and drains around the perimeter of the Proposed Project site. There are a total of 4 no. surface water outfalls (SW22, SW22A, SW22B and SW22C) in the Brosna_100 WFD river sub-basin, 2 no. surface water outfalls (SW19 and SW19A) in the Lemanaghan Stream_010 WFD river sub-basin, 1 no. surface water outfall (SW19B) in the Brosna_110 WFD river sub-basin and 1 no. surface water outfall (SW22D) in the Boor_020 WFD river sub-basin. There are no outfalls within the Blackwater(Shannonbridge)_010 WFD river sub-basin.

Table A: Downstream Catchment Size

WFD River Sub-Basin	Total Catchment Area (km²)	Proposed Project Infrastructure Located in Sub-basin
Boor_020	11	All Proposed Grid Connection infrastructure including the proposed onsite 220kV substation, wind farm control building, overhead line, 4 no. new steel masts, 2 no. new gantry structures, as well as the proposed temporary access road and upgrades to existing roads and 1 no. temporary construction compound (TCC5)
Blackwater(Shannon bridge)_010	26	1 no. temporary construction compound (TCC1), biodiversity mitigation and enhancement areas, new internal roads (Note that there is no outfall from Lemanaghan Bog within this WFD river sub-basin)
Blackwater(Shannon bridge)_020	93	None
Brosna_100	884	1 no. turbine (T15), amenity tracks
Lemanaghan Stream_010	13	11 no. turbines (T04 to T14), 2 no. borrow pits (BP03 and BP04), 2 no. temporary construction compounds (TCC2 and TCC4), 2 no. existing pump stations, internal roads (new and existing) and biodiversity enhancement and mitigation areas
Brosna_110	990	3 no. turbines (T01, T02 and T03), met mast, 2 no. borrow pits (BP01 and BP02), 1 no. temporary construction compound (TCC3), internal roads (new and existing) and biodiversity enhancement and mitigation measures
Brosna_120	1,180	None
Brosna_130	1,195	None
Brosna_140	1,244	None
Shannon(Lower)_010	7,971	None
Rapemills_010	57	TDR accommodation works
Rapemills_020	92	None
Shannon(Lower)_020	8,111	None
Shannon(Lower)_030	9,093	None
Lough Derg	10,913	None

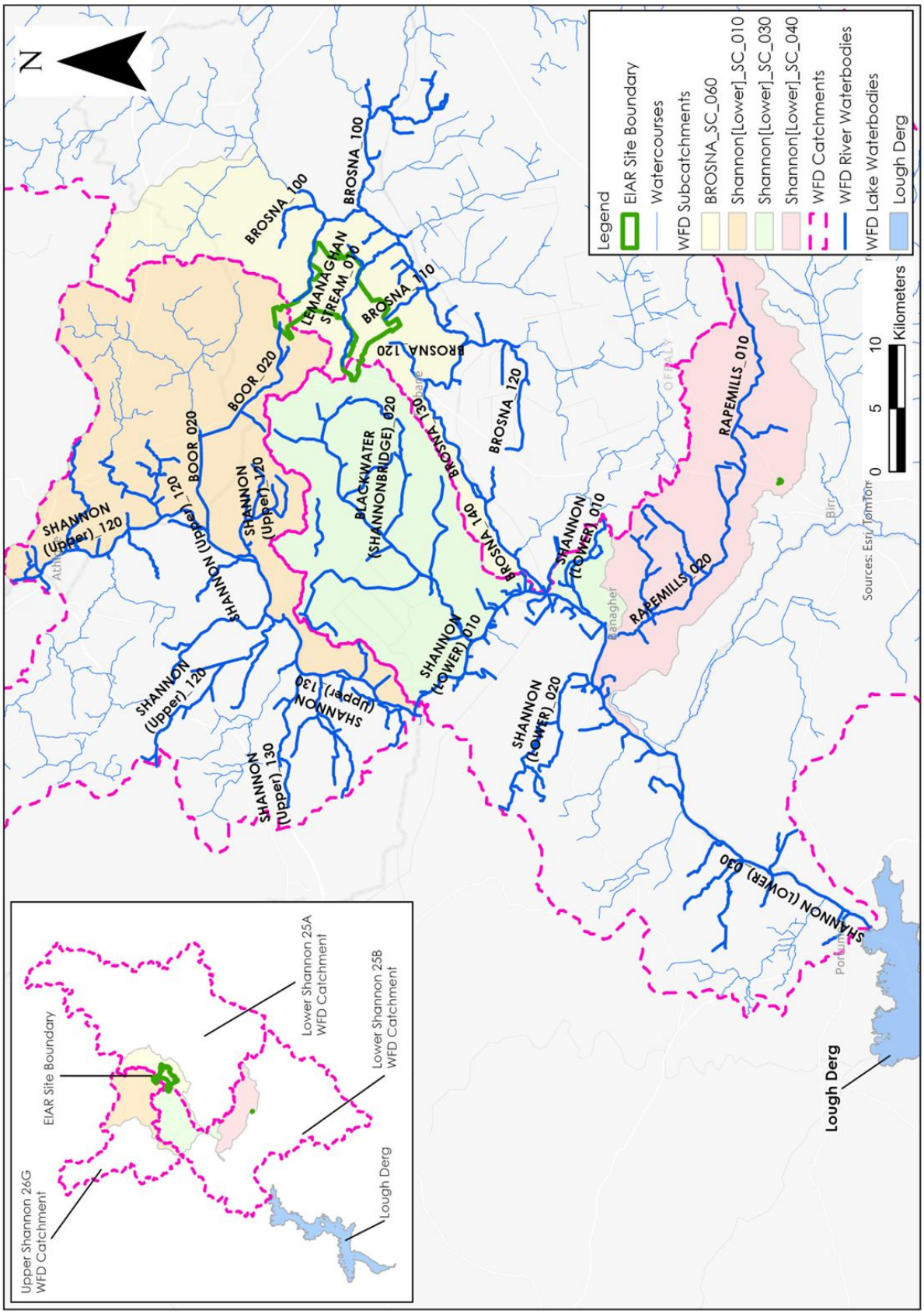

Figure A: Local Hydrology Map

2.3 SURFACE WATER BODY CLASSIFICATION

A summary of the WFD status and risk result for Surface Water Bodies (SWBs) downstream of the Proposed Project site are shown in **Table B**. The overall status is based on the ecological, chemical and quantitative status of each SWB. Local SWB status information is available from (www.catchments.ie).

Within the Shannon Lower_SC_010 sub-catchment, SW22D discharges to the EPA named Ballynahown Stream. This stream forms part of the Boor_020 SWB which achieved 'Moderate' status in the latest WFD cycle (2019-2024). This was a deterioration on the 'Good' status which this SWB achieved previously. Further downstream, the Boor_020 SWB discharges into the Shannon (Upper)_120 SWB. The Shannon (Upper)_120 and _130 SWBs achieved "Poor" and "Moderate" status respectively in the latest WFD cycle. Within this sub-catchment, the Boor_020 SWB is considered to be 'not at risk' of failing to meet its WFD objectives. No significant pressures have been identified to be impacting on this SWB. Further downstream, the Shannon (Upper)_120 SWB is deemed to be 'at risk' in the 3rd WFD cycle with hydromorphology listed as the significant pressure.

Within the Shannon Lower_SC_030 sub-catchment, the Blackwater(Shannonbridge)_010 and _020 SWBs downstream of the Proposed Project site achieved "Poor" status in the latest WFD cycle. This represented a deterioration in WFD status for the Blackwater(Shannonbridge)_020 SWB. These SWBs are deemed to be 'at risk' of failing to meet their WFD objectives in the 3rd WFD cycle. Extractive industry (peat) has been listed as being the significant pressure on these SWBs. Note that there is no surface water discharge from Lemanaghan Bog within this sub-catchment. Industrial peat extraction ceased at Lemanaghan Bog in June 2020.

Meanwhile, within the Brosna_SC_060 sub-catchment, SW22, SW22A, SW22B and SW22C discharge to the EPA named Fortified House Castlearmstrong Stream which forms part of the Brosna_100 SWB. SW19 and SW19A discharge to the Lemanaghan Stream_010 SWB whilst SW19B discharges to the EPA named Kilcolgan Beg Stream which forms part of the Brosna_110 SWB. The Brosna_100 and Lemanaghan Stream_010 SWBs achieved 'Moderate' status whilst the Brosna_110 SWB is of 'Good' status. The Brosna_120 SWB is also of 'Good' status. This represented an improvement in the WFD status of the Brosna_110 and _120 SWBs. Further downstream the Brosna River (Brosna_130 and _140 SWBs), the River Shannon (Shannon(Lower)_010, _020 and _030 SWBs) and Lough Derg all achieved 'Moderate' status in the latest WFD cycle.

With respect to the 3rd Cycle risk status, the Brosna River in the vicinity and downstream of the Proposed Project site is 'deemed to be risk'. The risk status of the Lemanaghan Stream_010 SWB is currently 'under review'. Agriculture is listed as a significant pressure on the Brosna_100 and _110 SWBs in the vicinity of the Proposed Project site. Hydromorphology is also listed as a significant pressure on the Brosna_110 SWB.

The Rapemills_010 SWB in the vicinity of the TDR accommodation works achieved "Moderate" status in the 3 no. most recent WFD cycles. This SWB is deemed to be 'at risk' and agriculture is listed as a significant pressure.

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

Table B: Summary WFD Information for Downstream Surface Water Bodies

River Waterbody	Status 2013-2018	Status 2016-2021	Status 2019-2024	WFD 3rd Cycle Risk Status	WFD Pressures
Boor_020	Moderate	Good	Moderate	Not at risk	None
Shannon(Upper)_120	Poor	Poor	Poor	At risk	Hydromorphology
Shannon(Upper)_130	Poor	Moderate	Moderate	Under Review	None
Blackwater(Shannonbridge)_010	Good	Poor	Poor	At Risk	Extractive Industry (Peat)
Blackwater(Shannonbridge)_020	Good	Moderate	Poor	At Risk	Extractive Industry (Peat)
Brosna_100	Moderate	Moderate	Moderate	At risk	Agriculture
Lemanaghan Stream_010	Good	Moderate	Moderate	Under Review	None
Brosna_110	Good	Moderate	Good	At Risk	Agriculture & Hydromorphology
Brosna_120	Good	Moderate	Good	At risk	Agriculture
Brosna_130	Moderate	Moderate	Moderate	At risk	Anthropogenic
Brosna_140	Moderate	Moderate	Moderate	At risk	Hydromorphology
Shannon(Lower)_010	Unassigned	Moderate	Moderate	Under Review	None
Rapemills	Moderate	Moderate	Moderate	At risk	Agriculture
Rapemills	Moderate	Moderate	Moderate	At risk	Agriculture
Shannon(Lower)_020	Moderate	Moderate	Moderate	At risk	Anthropogenic
Shannon(Lower)_030	Moderate	Moderate	Moderate	Under Review	None
Lough Derg	Moderate	Moderate	Moderate	At risk	Agriculture, Hydromorphology & Invasive Species

2.4 GROUNDWATER BODY IDENTIFICATION

The bedrock geological formations which underlie the Proposed Project site are predominantly classified by the GSI as being Locally Important Aquifers - Bedrock which is Moderately Productive only in Local Zones (Ll) (www.gsi.ie). These bedrock geological formations include the massive, unbedded lime-mudstones of the Waulsortian Limestone Formation which underlie the northwest of the Proposed Project site, the dark muddy limestones and shales of Ballysteen Formation and the limestone, mudstone and sandstones of Navan Beds. Meanwhile, the Old Red Sandstones, found in the core of the Ferbane Inlier, are classified by the GSI as a Locally Important Aquifer - Bedrock which is Generally Moderately Productive (Lm).

In terms of Groundwater Bodies (GWBs), the Proposed Project site is primarily underlain by a total of 3 no. GWBs. The vast majority of the Proposed Project site is underlain by the Clara GWB (IE_SH_G_240). A small area in the north of the Proposed Project site is underlain by the Inny GWB (IE_SH_G_110) whilst some of the south of the Proposed Project site is underlain by the Ferbane GWB (IE_SH_G_089). The Boor Gravels GWB (IE_SH_G_258) is also located in close proximity to the Proposed Project site.

The TDR works at Kennedy's Cross are mapped to be underlain by the Birr and Banagher GWBs.

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

2.5 GROUNDWATER BODY CLASSIFICATION

The Clara, Ferbane, Boor Gravels, Birr and Banagher GWBs underlying the Proposed Project site achieved 'Good' status in the 3 no. most recent WFD cycles (2013-2018, 2016-2021 and 2019-2024). These GWBs have been deemed to be "not at risk" of failing to meet their respective WFD objectives. No significant pressures have been identified to be impacting upon these GWBs. The Inny GWB achieved 'Poor' status in the latest WFD cycle. This status was assigned based on the quantitative status of the GWB and represented a deterioration in WFD status from the 'Good' status which this SWB achieved previously.

Table C: Summary WFD Information for Groundwater Bodies

Groundwater body	Status 2013-2018	Status 2016-2021	Status 2019-2024	WFD 3rd Cycle Risk Status	WFD Pressures
Clara	Good	Good	Good	Not at risk	None
Ferbane	Good	Good	Good	Not at risk	None
Inny	Good	Good	Poor	Not at risk	None
Boor Gravels	Good	Good	Good	Not at risk	None
Birr	Good	Good	Good	Not at risk	None
Banagher	Good	Good	Good	Not at risk	None

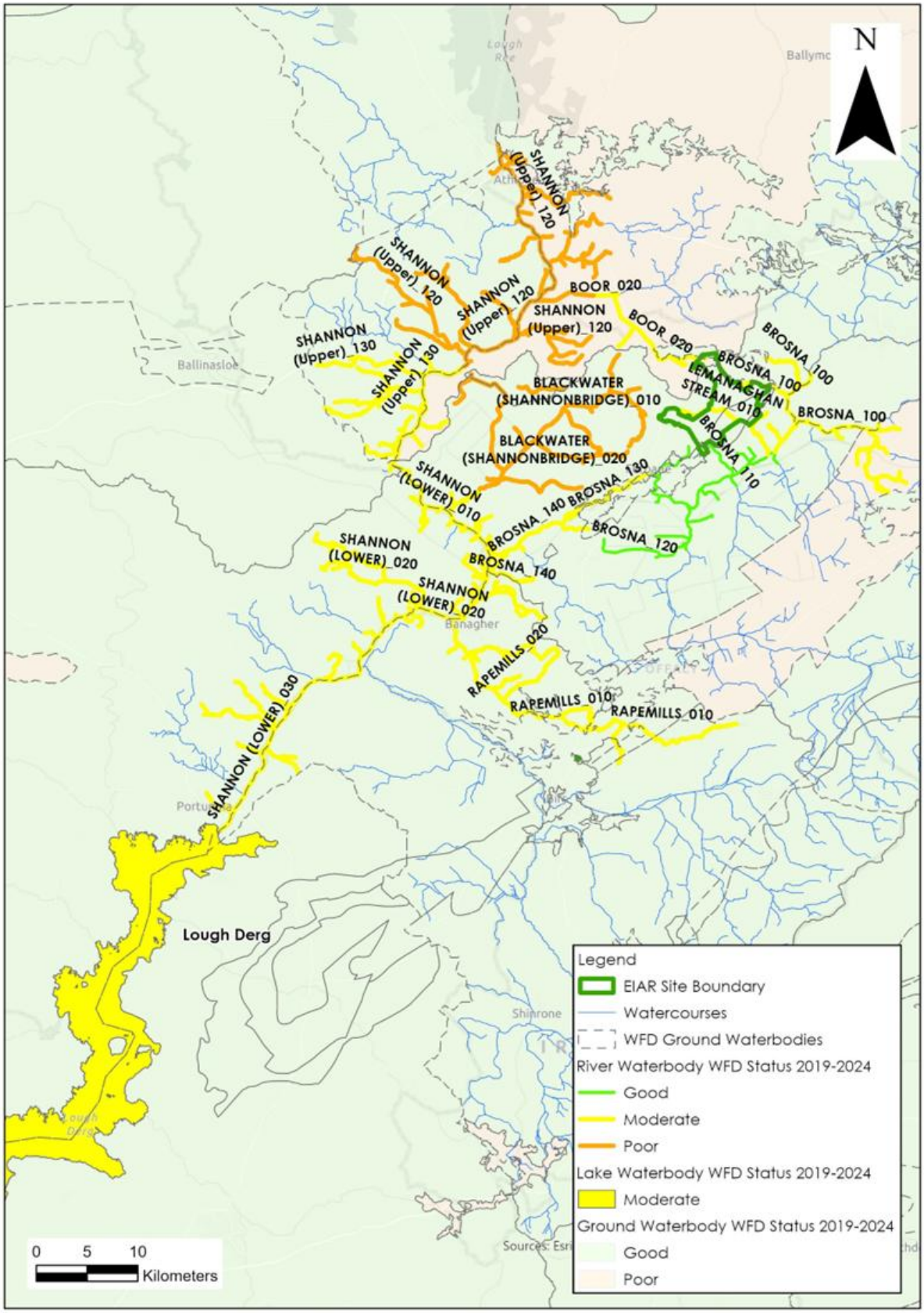

Figure B: WFD Groundwater and Surface Waterbody Status (2019-2024)

2.6 ZONE OF INFLUENCE

The Zone of Influence (ZoI) of the Proposed Project site extends to the following SWBs and GWBS:

- River SWBs –Boor_ 020, Shannon(Upper)_120 and 130, Blackwater(Shannonbridge)_010 and 020, Lemanaghan Stream_010, Brosna_100 to 140 and Shannon(Lower)_010 to 030 SWBs;
- GWBs – Clara, Ferbane, Inny and Boor Gravels GWBs; and,
- Lake Waterbody – Lough Derg.

Note that the TDR works at Kennedy's Cross are not included in the ZoI due to the temporary and minor nature of these works. These works are similar to roadworks being completed across the country and have no potential for significant effects on the receiving water environment.

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 (NSAs), shellfish protected areas and Drinking Water Protected Areas (DWPA) within the vicinity of the Proposed Project site are considered at as part of the assessment.

2.7.1 Nature Conservation Designations

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

Ramsar sites are wetlands of international importance designated under the Ramsar Convention (adopted in 1971 and came into force in 1975), providing a framework for the conservation and wise use of wetlands and their resources.

Within the Shannon Lower_SC_010 sub-catchment, the River Shannon Callows SAC/pNHA (Site Code: 000216) and the Middle Shannon Callows SPA (Site Code: 004096), are located approx. 8.5km to the northwest of the Proposed Project site. This area of the Proposed Project site is hydrologically connected to this SAC/pNHA/SPA via the Ballynahown Stream (receives discharge from SW22D) and the Boor River. The length of the hydrological flowpath between the Proposed Project site and this SAC/pNHA/SPA is approx. 10.5km.

Within the Brosna_SC_060 sub-catchment, the River Shannon Callows SAC/pNHA (Site Code: 000216) and the Middle Shannon Callows SPA (Site Code: 004096), are located approx. 8.3km to the southwest of the Proposed Project site. This area of the Proposed Project site is hydrologically connected to this SAC/pNHA/SPA via the tributaries of the Brosna River which receive discharge from the Proposed Project site (SW22, SW22A, SW22B, SW22C, SW19, SW19A and SW19B). The length of the hydrological flowpath between the Proposed Project site and the SAC/pNHA/SPA in this sub-catchment is approx. 22.1km.

Lough Derg, North-East Shore SAC (Site Code: 002241), the Lough Derg pNHA (Site Code: 00011) and Lough Derg SPA (Site Code: 004048) are also hydrologically connected to the Proposed Project site via the River Shannon and its associated tributaries. These designated sites are located 18.2km (straight line distance) from the TDR accommodation works at Kennedy's Cross Roads. The length of the hydrological flowpath from Lemanaghan Bog to Lough Derg is ~47km.

Other designated sites within 10km of the Proposed Project site considered for this assessment are as follows:

- Clara Bog SAC and pNHA (Site Code: 000572), approx. 3.1km to the east. This SAC/pNHA is located upstream and upgradient of the Proposed Project site;

- Ferbane Bog SAC and pNHA (Site Code: 000575), approx. 1.2km to the west. This SAC is located upstream and upgradient of the Proposed Project site;
- Grand Canal pNHA (Site Code: 002104), approx. 2.2km to the south. This pNHA lies to the south of the Brosna River which acts as a hydrological barrier between the Proposed Project site and this pNHA;
- Ballyduff Esker pNHA (Site Code: 000885), approx. 7.1km to the east. This pNHA is located upstream and upgradient of the Proposed Project site;
- Woodfield Bog pNHA (Site Code: 000586), approx. 9km to the northeast. This pNHA is located upstream and upgradient of the Proposed Project site;
- Clonydonnin Bog NHA (Site Code: 000565), approx. 2.5km to the north. There is no hydrological connection between the Proposed Project site and this NHA;
- Lough Boora pNHA (Site Code: 001365), approx. 6.9km to the south. The Brosna River acts as a hydrological barrier between the Proposed Project site and this pNHA;
- Moyclare Bog SAC and pNHA (Site Code: 000581), approx. 4.9km to the west. This SAC is located upstream of the Proposed Project site;
- Pilgrim's Road Esker SAC (site Code: 001776), approx. 7.7km to the northwest. There is no hydrological connection with this SAC;
- Mongan Bog SAC/pNHA (Site Code: 000580) and SPA (Site Code: 004017), approx. 8.4km to the northwest There is no hydrological connection with this SAC;
- Doon Esker Wood pNHA (Site Code: 001830), approx. 4.2km to the northwest. There is no hydrological connection between the Proposed Project site and this pNHA;
- Clonlyon Glebe Bog pNHA (Site Code: 000893), approx. 3.9km to the west. This pNHA is located downstream of the Proposed Project site on the southern banks of the Blackwater River. However, there is no discharge from the Proposed Project site within this sub-catchment;
- Crosswood Bog SAC (Site Code: 002337), approx. 9.6km to the north. There is no hydrological connectivity with the Proposed Project site; and,
- Fin Lough SAC and pNHA (Site Code: 000576), approx. 8.4km to the northwest. The Blackwater River acts as a hydrological barrier between the Proposed Project site and this SAC/pNHA.

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 bathing waters located in the vicinity of the Proposed Project site. The closest designated bathing waters are located at Portumna in the north of Lough Derg within the ZoI.

2.7.3 Nutrient Sensitive Areas

Nutrient Sensitive Areas (NSAs) 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.

The Brosna River is located ~2km directly south of the Proposed Project site is identified as an NSA. The Proposed Project site is hydrologically connected with this NSA via several surface water outfalls (SW22, SW22A, SW22B, SW22C, SW19, SW19A and SW19B).

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 area sites within the vicinity of the Proposed Project site.

2.7.5 Salmonid Waters

There are no Salmonid Waters mapped within the vicinity of the Proposed Project site or within the ZoI.

2.7.6 Drinking Water

According to the EPA (www.epa.ie) the Shannon (Lower)_010 SWB, which is located 20.7km downstream and southwest of the Proposed Project site, has been deemed to be a drinking water protected area (DWPA). This abstraction is associated with the Banagher Public Water Scheme (PWS) with a daily abstraction volume of 2,688m^3/day.

The Shannon(Upper)_120 SWB has also been identified as a Drinking Water Protected Area (DWPA). This DWPA is associated with the Uisce Eireann's abstraction for the Athlone Water Supply. The maximum daily abstraction volume is 19,350m^3/day.

Meanwhile, all GWBs within the catchment are listed as DWPAs. However, the GSI do not map the presence of any National Federation registered Group Water Schemes (GWS) or PWS or an associated Source Protection Area (SPA) within the Proposed Project site. There is Group Water Scheme (GWS), the Boher Lamonaghan GWS, located ~270m northeast of the Proposed Project site.

3. WFD SCREENING

3.1 SURFACE WATER BODIES

With consideration for the construction, operational and decommissioning phases of the Proposed Project, it is considered that due to their proximal location to the Proposed Project site and the occurrence of proposed infrastructure within their respective catchments, that the Boor_020, Lemanaghan Stream_010, and Brosna_100 and _110 SWBs are carried through to the WFD Compliance Assessment. The Proposed Project site discharges to these SWBs via existing surface water outfalls. Further downstream the Boor_020 and Brosna_120 to _140 SWBs are included in the WFD Compliance Assessment due to their location downstream of the Proposed Project site.

The Blackwater(Shannonbridge)_010 SWB has been included for the purposes of a conservative WFD Compliance Assessment. Some of the Proposed Project site is located in this WFD river sub-basin, but due to the artificial bog drainage, drainage in this area of the Proposed Project site is directed into the Brosna_110 WFD river sub-basin from where it discharges to this SWB. The bog drainage comprising of field drains, main drains, silt ponds and surface water outfalls was well in place by the transposition of the WFD into Irish Law in 2003. Nevertheless, this SWB will be included in the assessment. However, for the above reasons, the Blackwater(Shannonbridge)_020 SWB has been screened out of the WFD Compliance Assessment.

Downstream of the Boor and Brosna rivers, the River Shannon has been screened out of the WFD Compliance Assessment due to its distant location from the Proposed Project site and the significant volumes of water within these SWBs. The significant flows are associated with the large upstream catchment area of the River Shannon (refer to **Table A**). The Proposed Project has no potential to cause a deterioration in the status of these screened out SWBs and/or jeopardise their attainment of good surface water status.

Similarly, the Lough Derg lake waterbody has been screened out due to its distant location from the Proposed Project site and the large volume of water within this SWB. The Proposed Project has 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 Rapemills_010 and Rapemills_020 SWBs have been screened out of the WFD Compliance Assessment. The temporary accommodation works along the TDR at Kennedy's Cross are minor in nature and have no potential to alter the WFD status of local waterbodies.

Regarding the SWBs which have been screened in the potential for the Proposed Project to impact these waterbodies will vary. This will be dependent on the nature of the proposed activities within the upstream catchment area to a specific waterbody. As shown in **Table A** the SWB with the greatest potential to be impacted by the Proposed Project is the Lemanaghan Stream_010 SWB due to its small catchment area and the occurrence of Proposed Project infrastructure within its catchment.

3.2 GROUNDWATER BODIES

With respect to GWBs, the Clara, Inny, Ferbane and Boor Gravels GWBs will be carried through to the WFD Compliance Assessment due to the occurrence of proposed infrastructure overlying these GWBs. The Proposed Project must not cause a deterioration in the status of these GWBs and/or jeopardise the attainment of good groundwater status in the future.

The Birr and Banagher GWBs underlying Kennedy's Cross has been screened out of the WFD Compliance Assessment due to the minor and temporary nature of these works which have no potential to change the overall status of the underlying GWBs.

3.3 PROTECTED AREAS

The River Shannon Callows SAC/pNHA and the Middle Shannon Callows SPA are located downstream of the Proposed Project site, and its surface water outfalls, via the Boor and Brosna rivers. With consideration for the Proposed Project, it is considered that the River Shannon Callows SAC/pNHA and the Middle Shannon Callows SPA are carried through into the WFD Compliance Assessment.

All other designated sites have been screened out of the WFD Compliance Assessment due to the lack of hydrological and/or hydrogeological connectivity.

The Lough Derg, North-east Shore SAC, Lough Derg (Shannon) SPA and Lough Derg have been screened out due to the length of the hydrological flowpath between the Lough Derg and Lemanaghan Bog.

The Brosna River is a designated Nutrient Sensitive Area (NSA) and is located ~800m to the south of the Proposed Project site. This NSA will be carried through to the WFD Compliance Assessment.

The Shannon(Lower)_010 and Shannon(Upper)_120 DWPAs are located on the River Shannon downstream of the Proposed Project site. However, due to their distant location from the Proposed Project site and the large volumes of water within the River Shannon these DWPAs have been screened out.

The GWB DWPAs are included in the WFD Compliance Assessment and are assessed in the overall assessment with regards to the Clara, Ferbane, Inny and Boor Gravels GWBs.

3.4 WFD SCREENING SUMMARY

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

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

Type	WFD Classification	Waterbody Name/ID	Inclusion in Assessment	Justification
Surface Water Body	River	Boor_010	No	The Boor_010 SWB has been screened out due to its location upstream of the Proposed Project site.
	River	Boor_020	**Yes**	A small area in the north of the Proposed Project site is located in the Boor_020 WFD river sub-basin. There is an existing surface water outfall (SW22D) from the bog in this river sub-basin. The Proposed Grid Connection is also located in agricultural fields in this river sub-basin, which are located outside of the bog drainage regime. An assessment is required to consider the potential effects that the Proposed Project may have on this SWB.
	River	Shannon(Upper)_120	No	The Shannon (Upper)_120 SWB is located directly downstream of the Boor_020 SWB. This SWB has been screened out due to its distant location from the Proposed Project site and the large volumes of water within the River Shannon.
	River	Shannon(Upper)_130	No	The Shannon (Upper)_130 SWB is located directly downstream of the Shannon (Upper)_130 SWB. This SWB has been screened out due to its distant location from the Proposed Project site and the large volumes of water within the River Shannon.
	River	Blackwater(Shannonbridge)_010	**Yes**	The Blackwater(Shannonbridge)_010 SWB has been screened in due to the occurrence of an area in the northwest of the Proposed Project site within this river sub-basin. However, the potential for effects is limited as the artificial bog drainage regime does not include any surface water outfalls within this river sub-basin. Nevertheless, this SWB is included for the purposes of a conservative assessment.
	River	Blackwater(Shannonbridge)_020	No	The Blackwater(Shannonbridge)_020 SWB is located directly downstream of the Blackwater(Shannonbridge)_010 SWB. This SWB has been screened out due to its distant location from the Proposed Project site and the lack of any surface water outfalls from the Proposed Project site to the Blackwater River or any of its tributaries.
	River	Brosna_100	**Yes**	The east of the Proposed Project site is located in the Brosna_100 river sub-basin. There are 4 no. surface water outfalls (SW22, SW22A, SW22B and SW22C) from the Proposed Project site within this river sub-basin. An assessment is required to consider the potential impacts that the Proposed Project may have on this SWB.
	River	Lemanaghan Stream_010	**Yes**	The centre of the Proposed Project site is located in the Lemanaghan Stream_010 river sub-basin. There are 2 no. surface water outfalls (SW19 and SW19A) within this river sub-basin. An assessment is required to consider the potential impacts that the Proposed Project may have on this SWB.
	River	Brosna_110	**Yes**	The west of the Proposed Project site is located in the Brosna_110 river sub-basin. There is 1 no. surface water outfall (SW19B) from the Proposed Project site within this river sub-basin. An assessment is required to consider the potential impacts that the Proposed Project may have on this SWB.

	River	Brosna_120	**Yes**	The Brosna_120 SWB is located directly downstream of the Brosna_110 SWB and in close proximity to the Proposed Project site (<2km). Therefore, an assessment is required to consider the potential impacts of the Proposed Project on this SWB.
	River	Brosna_130	**Yes**	The Brosna_130 SWB is located directly downstream of the Brosna_120 SWB and in close proximity to the Proposed Project site (<5km). Therefore, an assessment is required to consider the potential impacts of the Proposed Project on this SWB.
	River	Brosna_140	**Yes**	The Brosna_140 SWB is located directly downstream of the Brosna_130 SWB and in close proximity to the Proposed Project site (<10km). Therefore, an assessment is required to consider the potential impacts of the Proposed Project on this SWB.
	River	Shannon(Lower)_010	No	The Shannon(Lower)_010 SWB has been screened out due to its distal location from the Proposed Project site (~15km) and the large volumes of water within the River Shannon associated with its large upstream catchment. Therefore, the Proposed Project has no potential to impact the status of this SWB.
	River	Shannon(Lower)_020	No	The Shannon(Lower)_020 SWB has been screened out due to its distal location from the Proposed Project site (~17km) and the large volumes of water within the River Shannon associated with its large upstream catchment. Therefore, the Proposed Project has no potential to impact the status of this SWB.
	River	Shannon(Lower)_030	No	The Shannon(Lower)_030 SWB has been screened out due to its distal location from the Proposed Project site (~22km) and the large volumes of water within the River Shannon associated with its large upstream catchment. Therefore, the Proposed Project has no potential to impact the status of this SWB.
	Lake	Lough Derg TN	No	The Lough Derg SWB has been screened out due to its distal location from the Proposed Project site (~35km) and the large volumes of water within Lough Derg associated with its large upstream catchment. Therefore, the Proposed Project has no potential to impact the status of this SWB.
	River	Rapemills_010	No	This SWB has been screened out of the assessment due to the minor nature of the TDR accommodation works proposed at Kennedy's Cross. These temporary works have no potential to effect the status of this SWB.
	River	Rapemills_020	No	This SWB has been screened out of the assessment due to the minor nature of the TDR accommodation works proposed at Kennedy's Cross. These temporary works have no potential to effect the status of this SWB.
Groundwater Body	Groundwater	Clara	**Yes**	The Proposed Project site overlies the Clara GWB. Therefore, an assessment is required to consider the impacts of the Proposed Project on the Clara GWB.
	Groundwater	Inny	**Yes**	The north of the Proposed Project site overlies the Inny GWB. Therefore, an assessment is required to consider the impacts of the Proposed Project on the Inny GWB.
	Groundwater	Ferbane	**Yes**	The south of the Proposed Project site overlies the Ferbane GWB. Therefore, an assessment is required to consider the impacts of the Proposed Project on the Ferbane GWB.
	Groundwater	Boor Gravels	**Yes**	A small section in the north of the Proposed Project site overlies the Boor Gravels GWB Therefore, an assessment is required to consider the impacts of the Proposed Project on the Boor Gravels GWB.

	Groundwater	Birr	No	This GWB has been screened out of the assessment due to the minor nature of the TDR accommodation works proposed at Kennedy's Cross. These temporary works have no potential to effect the status of this GWB.
	Groundwater	Banagher	No	This GWB has been screened out of the assessment due to the minor nature of the TDR accommodation works proposed at Kennedy's Cross. These temporary works have no potential to effect the status of this GWB.
Protected Areas	SAC and pNHA	Ferbane Bog	No	The Ferbane Bog SAC and pNHA is not hydrologically connected to the Proposed Project site and therefore will not be carried through to the WFD Compliance Assessment.
	SAC and pNHA	Clare Bog	No	The Clare Bog SAC and pNHA is not hydrologically connected to the Proposed Project site and therefore will not be carried through to the WFD Compliance Assessment.
	pNHA	Grand Canal	No	The Grand Canal pNHA is not hydrologically connected to the Proposed Project site and therefore will not be carried through to the WFD Compliance Assessment.
	pNHA	Ballyduff Esker	No	The Ballyduff Esker pNHA is not hydrologically connected to the Proposed Project site and therefore will not be carried through to the WFD Compliance Assessment.
	pNHA	Woodfield Bog	No	The Woodfield Bog pNHA is not hydrologically connected to the Proposed Project site and therefore will not be carried through to the WFD Compliance Assessment.
	NHA	Clonydonnin Bog	No	The Clonydonnin Bog NHA is not hydrologically connected to the Proposed Project site and therefore will not be carried through to the WFD Compliance Assessment.
	pNHA	Kilkormac Esker	No	The Kilkormac Esker pNHA is not hydrologically connected to the Proposed Project site and therefore will not be carried through to the WFD Compliance Assessment.
	SAC	Pilgrim's Road Esker	No	The Pilgrim's Road Esker SAC is not hydrologically connected to the Proposed Project site and therefore will not be carried through to the WFD Compliance Assessment.
	SAC, SPA and pNHA	Mongan Bog	No	The Mongan Bog SAC, SPA and pNHA is not hydrologically connected to the Proposed Project site and therefore will not be carried through to the WFD Compliance Assessment.
	pNHA	Clonlyon Glebe Bog	No	The Clonlyon Glebe Bog pNHA is not hydrologically connected to the Proposed Project site and therefore will not be carried through to the WFD Compliance Assessment.
	SAC	Crosswood Bog SAC	No	The Crosswood Bog SAC is not hydrologically connected to the Proposed Project site and therefore will not be carried through to the WFD Compliance Assessment.
	SAC and pNHA	Fin Lough	No	The Fin Lough SAC and pNHA is not hydrologically connected to the Proposed Project site and therefore will not be carried through to the WFD Compliance Assessment.
	pNHA	Doon Esker Wood	No	The Doon Esker Wood pNHA is not hydrologically connected to the Proposed Project site and therefore will not be carried through to the WFD Compliance Assessment.
	SAC and pNHA	Moyclare Bog	No	The Moyclare Bog SAC and pNHA is not hydrologically connected to the Proposed Project site and therefore will not be carried through to the WFD Compliance Assessment.
	SAC and pNHA	River Shannon Callows	**Yes**	The Proposed Project site is hydrologically connected to the River Shannon Callows SAC/pNHA via several drains and streams which flow from the bog area into the Boor and Brosna rivers which in turn discharge into the River Shannon. An assessment is required to consider the potential impacts that the Proposed Project may have on this designated site.

	SPA	Middle Shannon Callows	**Yes**	The Proposed Project site is hydrologically connected to the Middle Shannon Callows SPA via several drains and streams which flow from the bog area into the Boor and Brosna rivers which in turn discharge into the River Shannon. An assessment is required to consider the potential impacts that the Proposed Project may have on this designated site.
	pNHA	Woodville Woods	No	The TDR works areas at Kennedy's Cross are located on the opposite site of the N62 to the pNHA. The proposed works are minor and temporary in nature and have no potential for significant effects. The works are similar to roadworks being completed across the country and have no potential for significant effects on the pNHA.
	SAC	Lough Derg, North-east Shore	No	The SAC has been screened out due to its distal location from the Proposed Project site (~35km) and the large volumes of water within Lough Derg associated with its large upstream catchment. Therefore, the Proposed Project has no potential to impact the status of this SAC.
	SPA	Lough Derg (Shannon)	No	The SPA has been screened out due to its distal location from the Proposed Project site (~35km) and the large volumes of water within Lough Derg associated with its large upstream catchment. Therefore, the Proposed Project has no potential to impact the status of this SPA.
	pNHA	Lough Derg	No	The pNHA has been screened out due to its distal location from the Proposed Project site (~35km) and the large volumes of water within Lough Derg associated with its large upstream catchment. Therefore, the Proposed Project has no potential to impact the status of this pNHA.
Bathing Waters	Bathing Waters	Portumna	No	The bathing waters at Portumna have been screened out due to their distal location from the Proposed Project site (~35km) and the large volumes of water within Lough Derg associated with its large upstream catchment. Therefore, the Proposed Project has no potential to impact the status of these bathing waters.
Nutrient Sensitive Area	River	Brosna River	**Yes**	The Brosna River NSA is located ~2km to the south of the Proposed Project site and is hydrologically connected to the site. An assessment is required to consider the potential impacts that the Proposed Project may have on this designated site.
Drinking Water Protected Area	River	Shannon (Lower)_010	No	The Shannon (Lower)_010 river waterbody will not be carried through to the WFD Compliance Assessment as it is located ~20km downstream of the Proposed Project site and any possible contaminants will not make it to this receptor.
	River	Shannon (Upper)_120	No	The Shannon (Upper)_120 DWPA will not be carried through to the WFD Compliance Assessment due to its distant location from the Proposed Project site and the large volumes of water within the River Shannon.

4. WFD COMPLIANCE ASSESSMENT

4.1 PROPOSALS

In summary, the Proposed Wind Farm consists of 15 no. wind turbines and associated infrastructure including hardstands, 1 no. meteorological mast, 5 no. temporary construction compounds, 4 no. borrow pits, peat deposition areas, 3 no. permanent amenity carparks (located within the footprint of 3 no. temporary construction compounds which will have their concrete foundation left in situ for conversion into an amenity car park), approximately 20.8km of new road (including new amenity tracks), the upgrade of approximately 3km of existing road (including that for the purpose of amenity), felling of immature woodland (1.02ha), proposed biodiversity mitigation and enhancement measures, and all associated development and drainage works. The Proposed Grid Connection comprises of a 220kV electricity substation, control buildings, approximately 0.8km of overhead line, 4 no. new steel masts, 2 no. gantry structures, 1 no. telecommunications tower and 0.3km of temporary access track. Please refer to Chapter 4 for a full description of the Proposed Project.

Due to the nature of wind farm developments being near-surface construction activities, impacts on groundwater are generally negligible and surface water is generally the main sensitive receptor assessed during impact assessments. The primary risks to groundwater at the Proposed Project site will be from cementitious materials, hydrocarbon spillage and leakages, and potential piling works.

The primary risk to surface waters will be entrained suspended sediments (peat and soil particles) in Proposed Project site runoff during earthworks along with chemical pollution of surface waters by concrete, oil and or fuels.

4.2 POTENTIAL EFFECTS

4.2.1 Construction Phase (Unmitigated)

4.2.1.1 Potential Surface Water Quality Effects During Earthworks

Construction phase activities including site levelling/construction, turbine and substation foundation excavation and borrow pit excavation will all 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, spoil storage areas and borrow pit drainage/dewatering during construction works. These activities could result in the entrainment of suspended solids in surface waters with direct pathways existing between the Proposed Project site and downstream surface water receptors.

Hydrocarbons and cement-based compounds will also 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. 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.

The Proposed Project also includes a Biodiversity Management and Enhancement Plan (BMEP), provided as Appendix 6-5 to the EIAR. Works associated with the BMEP include the creation of a seasonal flooded area (10ha) which will be controlled to ensure that it contains water during the winter months. It is also proposed to enhance 10ha for Lapwing which will require drain reprofiling and infilling.

Vegetation removal will also be completed during the construction phase and has the potential to impact surface water quality.

Therefore, construction phase activities could result in an increase in the suspended sediment load, resulting in increased turbidity, increased pH and contamination which could affect the water quality and fish stocks of downstream water bodies. The SWBs likely to be most impacted by these activities are the Lemanaghan Stream_010, Boor_020, Brosna_100 and Brosna_110 as these SWBs receive surface water discharge from the Proposed Project site. Further downstream, the potential for water quality effects will decrease downstream due to the increasing volumes of water within the respective SWBs (due to the increasing size of the drainage catchment).

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

Table E: Surface Water Quality Effects During Construction Phase (Unmitigated)

SWB	WFD Code	WFD Status (2019-2024)	Assessed Potential Status Change
Boor_020	IE_SH_26B071200	Moderate	Poor
Blackwater(Shannon bridge)_010	IE_SH_25B270110	Poor	Poor
Brosna_100	IE_SH_25B090761	Moderate	Poor
Lemanaghan Stream_010	IE_SH_25L040890	Moderate	Poor
Brosna_110	IE_SH_25B090800	Good	Moderate
Brosna_120	IE_SH_25B090950	Good	Good
Brosna_130	IE_SH_25B091000	Moderate	Moderate
Brosna_140	IE_SH_25B091200	Moderate	Moderate

4.2.1.2 Groundwater Quality Effects

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.

The release of untreated wastewater would also have the potential to impact local groundwater quality.

Piled foundations may be required at many of the turbine locations due to the depth of peat. Piled foundations will also be required for several elements of the Proposed Grid Connection including the proposed onsite 220kV substation. Piling works would have the potential to impact on local groundwater quality through the creation of pathways through low permeability subsurface layers.

However, due to the local hydrogeological regime, and the isolated perched water table in the peat bog which is separated from the underlying regional groundwater table there is limited

potential for the Proposed Wind Farm to alter the overall status of the underlying GWBs. The potential for the Proposed Project to impact the status of the underlying GWBS is further limited given the scale of the Proposed Project in comparison to the overall size of the Clara GWB (~641km^2), Ferbane GWB (~14km^2), Inny GWB (~1,384km^2) and Boor Gravels GWB (~6.12km^2).

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 F**.

Table F: Groundwater Quality Effects During Construction Phase (Unmitigated)

GWB	WFD Code	WFD Status (2019-2024)	Assessed Potential Status Change
Clara	IE_SH_G_240	Good	Good
Ferbane	IE_SH_G_089	Good	Good
Inny	IE_SH_G_110	Poor	Poor
Boor Gravels	IE_SH_G_258	Good	Good

4.2.2 Operational Phase (Unmitigated)

4.2.2.1 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 Proposed Project site and increase flood risk downstream of the site. In reality, the internal 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.

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 G**.

Table G: Potential Effect on Surface Water Flows During Operational Phase (Unmitigated)

SWB	WFD Code	WFD Status (2019-2024)	Assessed Potential Status Change
Boor_020	IE_SH_26B071200	Moderate	Moderate
Blackwater(Shannon bridge)_010	IE_SH_25B270110	Poor	Poor
Brosna_100	IE_SH_25B090761	Moderate	Moderate
Lemanaghan Stream_010	IE_SH_25L040890	Moderate	Moderate
Brosna_110	IE_SH_25B090800	Good	Good
Brosna_120	IE_SH_25B090950	Good	Good
Brosna_130	IE_SH_25B091000	Moderate	Moderate

Brosna_140	IE_SH_25B091200	Moderate	Moderate

4.2.2.2 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 Proposed Project site entrances (see Table 4-9 in Chapter 4 of the EIAR), 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 H**.

Table H: Surface Water Quality Effects During Operational Phase (Unmitigated)

SWB	WFD Code	WFD Status (2019-2024)	Assessed Potential Status Change
Boor_020	IE_SH_26B071200	Moderate	Moderate
Blackwater(Shannon bridge)_010	IE_SH_25B270110	Poor	Poor
Brosna_100	IE_SH_25B090761	Moderate	Moderate
Lemanaghan Stream_010	IE_SH_25L040890	Moderate	Moderate
Brosna_110	IE_SH_25B090800	Good	Good
Brosna_120	IE_SH_25B090950	Good	Good
Brosna_130	IE_SH_25B091000	Moderate	Moderate
Brosna_140	IE_SH_25B091200	Moderate	Moderate

4.2.2.3 Potential Effects on Groundwater Quality

The risks to groundwater quality are the same as those described in **Section 4.2.1.2** but of a lesser extent than during the construction phase due to the limited activity at Proposed Project site during the operational phase.

Note that the risk posed by the amenity car parks is very limited due to small numbers of cars (estimated to be 20 amenity users per day and 1 -2 maintenance staff visits per day) envisaged at any one time and the unlikely scenario of oil/fuel leaks from parked cars. Mitigation measures for hydrocarbon spills at amenity car parks are therefore not required.

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

Table I: Groundwater Quality Effects During Operational Phase (Unmitigated)

GWB	WFD Code	WFD Status (2013-2018)	Assessed Potential Status Change
Clara	IE_SH_G_240	Good	Good
Ferbane	IE_SH_G_089	Good	Good
Inny	IE_SH_G_110	Poor	Poor
Boor Gravels	IE_SH_G_258	Good	Good

4.3 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.

4.3.1 Construction Phase

4.3.1.1 Mitigation Measures to Protect Surface Water Quality from Suspended Solids Entrainment

Proposed Mitigation by Avoidance:
The key mitigation measure during the construction phase is the avoidance of sensitive hydrological features where possible, by application of suitable buffer zones (i.e. 50m to main watercourses, and 10m to main drains). All of the key Proposed Project areas are located significantly away from the delineated 50m watercourse buffer zones with the exception of the upgrading of the existing watercourse crossing, new drain crossing and upgrades to existing site access tracks. Additional control measures, which are outlined further on in this section, will be undertaken at these locations.

With regards to the Proposed Grid Connection infrastructure, site surveys and drainage mapping have revealed an error in EPA mapping in the vicinity of the existing OHL. As detailed in EIAR Figure 9-7, the EPA mapping shows the Ballynahown Stream to extend across the full width of the field within which the Grid Connection infrastructure is proposed. However, detailed site-specific drainage mapping has shown that in reality a dry drain extends only halfway across this field and, as shown on EIAR Figure 9-8, the main drainage outfall from the bog is further to the south. Nevertheless, a conservative 20m buffer was applied to the drain in the vicinity of the Grid Connection infrastructure.

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

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

In addition, and as outlined above, the Proposed Project drainage system will link into the existing bog drainage system, and discharge from the bog via existing large settlement

ponds, which are some distance from the Proposed Project footprint. As such, there is significant distance for wind farm related surface water to travel before it reaches the edge of the bogs and joins any receiving waters outside of the overall bog boundaries.

Proposed Mitigation by Design:
There is an extensive network of drains already existing at the Proposed Project 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 Project site will be maintained and expanded locally as required for use within the Proposed Project drainage system. The key elements are the upgrading and improvements to water treatment elements, such as in-line controls and treatment systems, including wind farm related 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 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 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 Project site there are section of proposed floating road between turbine infrastructure. In these sections, and depending on intermediate topography, a collector drain (dirty water system as described above) may be used during 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 through the entire 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. 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 Proposed 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.

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

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

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

Earthworks should be suspended if forecasting suggests any of the following is likely to occur:

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

Prior to earthworks being suspended the following control measures should be completed:

- Secure all open peat/spoil excavations;
- Provide temporary or emergency drainage to prevent back-up of surface runoff; and,
- Avoid working during heavy rainfall and for up to 24 hours after heavy events to ensure drainage systems are not overloaded.

Management of Runoff from Peat and Subsoil Storage Areas:
It is proposed that excavated peat and spoil will be used for landscaping close to its original extraction point. Peat will also be stored in the designated Peat Deposition Areas, whilst excess peat and spoil will be placed in the proposed onsite borrow pits[PB35.1][CM35.2], sidecast along 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.

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

Proposed Drainage and Water Quality Monitoring:
An inspection and maintenance plan for the on-site drainage system will be prepared in advance of commencement of any works and will be included in the Construction and Environmental Management Plan (CEMP), provided as Appendix 4-4 to this EIAR. 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 (Environmental Quality Standards) 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.

4.3.1.2 Mitigation Measures for Potential Effects on Surface Water Quality During Excavation Dewatering

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

- Appropriate interceptor drainage, to prevent upslope surface runoff from entering excavations will be put in place;
- If required, pumping of excavation inflows will prevent the build-up of groundwater in the excavation;
- The interceptor drainage will be discharged to the existing drainage system or onto the bog surface within the overall bog drainage and treatment system;

- 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 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 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.

4.3.1.3 Mitigation Measures to Protect Against the Release of Hydrocarbons

The potential pollution of ground and surface water during the construction phase will be mitigated by the provision of appropriate controls and working methods. These include best practice methods for storage and handling of fuels and chemicals and include:

- All plant will be inspected and certified to ensure they are leak free and in good working order prior to use on site;
- On-site re-fuelling of machinery will be carried out using a mobile double skinned fuel bowser. The fuel bowser, a double-axel custom-built refuelling trailer or truck will be re-filled off site and will be towed/driven around the site to where machinery are located. The 4x4 jeep/fuel truck will also carry fuel absorbent material and pads in the event of any accidental spillages. The fuel bowser will be parked on a level area in the construction compound when not in use and only designated trained and competent operatives will be authorised to refuel plant on site. Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations;
- Fuels stored on site will be minimised. Any storage areas will be bunded appropriately for the fuel storage volume during the construction phase;
- The electrical control building will be bunded appropriately to the volume of oils likely to be stored and to prevent leakage of any associated chemicals and to groundwater or surface water. The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor;
- The plant used will be regularly inspected for leaks and fitness for purpose;
- An emergency plan for the construction phase to deal with accidental spillages will be contained within the Construction Environmental Management Plan (CEMP) (Appendix 4-4 of the EIAR). Spill kits will be available to deal with accidental spillages.

4.3.1.4 Mitigation Measures to Prevent Release of Cement-Based Products

Best practice methods for cement-based compounds:

- No batching of wet-cement products will occur on site. Ready-mixed supply of wet concrete products and where possible, emplacement of pre-cast elements, will take place;
- Where possible pre-cast elements for culverts and concrete works will be used;
- No washing out of any plant used in concrete transport or concreting operations will be allowed on-site;
- Where concrete is delivered on site, only the 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 is to be isolated in temporary lined wash-out pits located near proposed site compounds. These temporary lined wash-out pits will be removed from the site at the end of the construction phase;
- Any washing out of concrete pumping plant will also be into the temporary lined wash-out pits;
- Will use weather forecasting to plan dry days for pouring concrete; and,

- Will ensure pour site is free of standing water and plastic covers will be ready in case of sudden rainfall event.

4.3.1.5 Mitigation Measures to Prevent the Release of Wastewater

The best practice methods for wastewater management at the 5 no. temporary construction compounds 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 compounds, maintained by the providing contractor, and removed from site on completion of the construction works;
- Water supply for the site office and other sanitation will be brought to site and removed after use from the site to be discharged at a suitable off-site treatment location; and,
- No water or wastewater will be sourced on the site, nor discharged to the site.

4.3.1.6 Mitigation Measures associated with Piled Foundations

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

- Mitigation measures for sediment control are detailed in Section 4.3.1.1 and 4.3.1.2.
- Mitigation measures for the control of hydrocarbons during construction works are detailed in Section 4.3.1.3.
- Mitigation measures for the control of cement-based products during construction works are detailed in Section 4.3.1.4.
- Mitigation measures in relation to wastewater are detailed in Section 4.3.1.5.

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 Quality Assurance/Quality Control (QA/QC) procedures for piling works will be followed;
- Piles will be kept vertical during piling works;
- Good workmanship will be employed during all piling works; and,
- Where required use bentonite seal to prevent upward/downward movement of surface water/groundwater.

4.3.1.7 Mitigation Measures Associated with Amenity Proposals

Detailed mitigation measures for sediment control are outlined in Section 4.3.1.1. and detailed mitigation measures for control of hydrocarbons during construction works are outlined in Section 4.3.1.3. No additional mitigation measures are required due to the small-scale nature of the proposed works.

4.3.1.8 Mitigation Measures Associated with Turbine Delivery Route Works

General Best Practice Pollution Prevention Measures will include:

- No stock-piling of construction materials will take place within the constraints zone. 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 shall not take place at periods of high rainfall, and shall be scaled back or suspended if heavy rain is forecast;
- Plant will travel slowly across bare ground at a maximum of 5km/hr.
- Machinery deliveries shall be arranged using existing structures along the public road;

- All machinery operations shall take place away from the stream and ditch banks, although no instream works are proposed or will occur;
- Any excess construction material shall be immediately removed from the area and taken to a licensed waste facility or the on-site spoil management areas;
- No stockpiling of materials will be permitted in the constraint zones;
- Spill kits shall be available in each item of plant required; and,
- Silt fencing will be erected on ground sloping towards watercourses at the stream crossings if required.

Mitigation Measures relating to the use and storage of fuels and chemicals in terms of groundwater protection:

- No maintenance of construction vehicles or plant will take place along the temporary junction works areas;
- The plant used will be regularly inspected for leaks and fitness for purpose; and,
- Spill kits will be available to deal with accidental spillage.

4.3.1.9 Mitigation Measures Associated with Biodiversity Management and Enhancement Plan

No specific mitigation measures are required in relation to the proposed biodiversity enhancement works. The proposed works will have a positive effect on bog hydrology/hydrogeology. All works undertaken will be completed in accordance with 'best practice' procedures and the mitigation measures in relation to the protection of surface and groundwater quality are detailed in Section 4.3.1.1 to 4.3.1.5 above.

4.3.1.10 Mitigation Measures for Vegetation Removal

Mitigation measures which will reduce the risk of entrainment of suspended solids and nutrient release in surface watercourses as a result of vegetation removal are as follows:

- The felling will be completed primarily by hand in order to limit disturbance;
- If machinery is required, works will be undertaken using machinery which are most suitable for the ground conditions and which will minimise soil disturbance;
- Where possible, trees will be felled away from drains to prevent the unnecessary deposition of peat or brash into the bog drains;
- Where machinery is required, brash mats will be used to protect the peat surface and reduce erosion;
- Silt fences will be installed downgradient of the works to intercept potentially silt laden runoff; and,
- Works will be completed during period of low rainfall.

4.3.1.11 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 to affect the qualifying interests of downstream designated sites is not significant.

4.3.2 Operational Phase

4.3.2.1 Increased Proposed Project site Runoff and Hydromorphology Effects

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 new proposed drainage measures will then create significant additional attenuation to what is already present. The operational phase drainage system will be installed and constructed in conjunction with the existing bog drainage network where appropriate and will include the following:

- Interceptor drains will be installed up-gradient of all proposed infrastructure to collect clean surface runoff, in order to minimise the amount of runoff reaching areas where suspended sediment could become entrained. It will then be directed to areas where it can be re-distributed into downstream field drains;
- Collector drains will be used to gather runoff from access roads and turbine hardstanding areas of the site, likely to have entrained suspended sediment, and channel it to new local settlement ponds for sediment settling;
- On sections of access road transverse drains ('grips') will be constructed where appropriate in the surface layer of the road to divert any runoff off the road into swales/roadside drains;
- Check dams will be used along sections of access road drains to intercept silts at source. Check dams will be constructed from a 4/40mm non-friable crushed rock;
- Settlement ponds, emplaced downstream of access road sections and at proposed turbine locations, will buffer volumes of runoff discharging from the drainage system during periods of high rainfall, by retaining water until the storm hydrograph has receded, thus reducing the hydraulic loading to existing drains;
- Settlement ponds will be designed in consideration of the greenfield runoff rate, existing bog settlement ponds will also buffer discharges from Lemanaghan Bog; and,
- Finally, all surface water runoff from the Proposed Project will have to pass through the settlement ponds at the existing bog outfall locations.

4.3.2.2 Mitigation Measures for Surface water Quality Protection

Mitigation measures for sediment control are the same as those outlined in Section 4.3.1.1. Mitigation measures for control of hydrocarbons during maintenance works are similar to those outlined in Section 4.3.1.3.

4.3.2.3 Mitigation Measures in Relation to Wastewater

It is proposed to install a sealed underground holding tank for effluent (wastewater) from the proposed onsite 220kV substation. The tank shall be routinely emptied by a licensed contractor. A level sensor will be installed in the tank which shall be linked to the on-site SCADA system. If the level of the tank contents rise to a predetermined 'high' level a warning shall appear on the overall SCADA system for the site and automatic notification shall be sent to the facility manager. A formal service agreement will be entered into with a suitably permitted waste contractor, in relation to the servicing and de-sludging of the wastewater holding tank on site. There will be no discharge of wastewater to ground at the site, and therefore there is no potential to impact groundwater or surface water quality.

4.3.2.4 Mitigation Measures in Relation to Water Supply at Proposed Onsite 220kV Substation

The abstraction rate for the proposed groundwater well at the proposed onsite 220kV substation will be comparable to a domestic well, with a well supplying a single household typically abstracting less than 1m^3/day. The well is proposed in a locally important aquifer which is moderately productive only in local zones. This aquifer forms part of the Inny GWB

which is comprised of only moderate permeability rocks where groundwater flow is concentrated in the upper weathered zone of the aquifer. Therefore, due to the nature of the bedrock aquifer and the proposed extraction rate, no effects on local groundwater levels will occur. For these reasons no mitigation measures are required.

4.3.3 Decommissioning Phase

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

A decommissioning plan will be agreed with Offaly County Council prior to decommissioning of the Proposed Wind Farm. A decommissioning plan is included as Appendix 4-8.

During decommissioning, it may be possible to reverse or reduce some of the potential impacts caused during construction by rehabilitating construction areas such as turbine bases, hard standing areas and peat deposition areas.

This will be done by covering with peatland vegetation/scraw or poorly humified peat to encourage vegetation growth and reduce run-off and sedimentation. Other impacts such as possible soil compaction and contamination by fuel leaks will remain but will be of reduced magnitude. However, as noted in the Scottish Natural Heritage report (SNH) Research and Guidance on Restoration and Decommissioning of Onshore Wind Farms (SNH, 2013) reinstatement proposals for a wind farm are made approximately 30 years in advance, so within the lifespan of the wind farm, technological advances and preferred approaches to reinstatement are likely to change. According to the SNH guidance, it is, therefore:

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

Some of the impacts will be avoided (i.e., the proposed onsite 220kV substation, 4 no. steel masts, and 2 no. gantry structures) and will be retained by ESB/EirGrid. The turbine bases will be rehabilitated by covering with local topsoil/peat in order to regenerate vegetation which will reduce runoff and sedimentation effects. Internal roads will remain as amenity pathways. Mitigation measures to avoid contamination by accidental fuel leakage and compaction of soil by on-site plant will be implemented as per the construction phase mitigation measures.

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

4.3.4 Potential Effects with the Implementation of Mitigation

In all instances, the mitigation measures described in **Section 4.3** are sufficient to meet the WFD Objectives. The assessment of WFD elements for the WFD waterbodies is summarised in **Table J** below.

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

SWB	WFD Code	WFD Status (2019-2024)	Assessed Status – Unmitigated	Assessed Status – with Mitigation Measures
Boor_020	IE_SH_26B071200	Moderate	Poor	Moderate
Blackwater(Shannonbridge)_010	IE_SH_25B270110	Poor	Poor	Poor
Brosna_100	IE_SH_25B090761	Moderate	Poor	Moderate

Lemanaghan Stream_010	IE_SH_25L040890	Moderate	Poor	Moderate
Brosna_110	IE_SH_25B090800	Good	Moderate	Good
Brosna_120	IE_SH_25B090950	Good	Good	Good
Brosna_130	IE_SH_25B091000	Moderate	Moderate	Moderate
Brosna_140	IE_SH_25B091200	Moderate	Moderate	Moderate
Clara	IE_SH_G_240	Good	Good	Good
Ferbane	IE_SH_G_089	Good	Good	Good
Inny	IE_SH_G_110	Poor	Poor	Poor
Boor Gravels	IE_SH_G_258	Good	Good	Good

4.4 CUMULATIVE ASSESSMENT

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.

As part of the IPC licence rehabilitation requirements, BnM is required to produce cutaway bog decommissioning and rehabilitation plans, please see Appendix 2-4 to view the Draft Rehabilitation Plan for Lemanaghan Bog. These plans have considered the Proposed Project footprint and demonstrate that both peatland rehabilitation and renewable energy can coexist harmoniously onsite. Irrespective of any further development on the site, BnM's statutory duties to discharge the conditions of its IPC Licence will remain ongoing. Given the overlap of these proposals and the Proposed Project site, the Proposed Project has the potential to interact with the Draft Rehabilitation Plan; cumulative effects are assessed below.

The main likelihood of cumulative effects is assessed to be hydrological (surface water quality) rather than hydrogeological (groundwater). Due to the hydrogeological setting (i.e. predominantly low permeable subsoils 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 Peatland Climate Action Scheme (PCAS) which comprises enhanced peatland rehabilitation (above and beyond IPC licence requirements). This scheme is in addition to the IPC licence requirements and therefore does not form part of the Proposed Wind Farm application but has been cumulatively assessed

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

4.4.1 Cumulative Effects with Turbary Peat Cutting

Private peat cutting on turbary plots will likely continue at Lemanaghan Bog, within which the majority of the Proposed Project site is located. The construction phase of the Proposed Project may interact with these turbary activities and result in a deterioration of downstream surface water quality through the emissions of elevated concentrations of suspended solids and ammonia.

However, the areas of private peat cutting will be very small, significantly limiting the potential for cumulative effects to arise with the Proposed Project. Nevertheless, 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.

4.4.2 Cumulative Effects with Agriculture

The Proposed 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 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.

4.4.3 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 site.

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).

4.4.4 Cumulative Effects with Leamonaghan Urban Wastewater Treatment Plant

The Leamaonaghan Urban WWTP is located within the delineated hydrological cumulative study area. This WWTP discharges treated effluent to the Brosna River. There is no discharge of untreated wastewater and the WWTP operates under an existing discharge licence. With the implementation of the mitigation measures prescribed in this chapter, there will be no potential for cumulative effects.

4.4.5 Cumulative Effects with Other Developments

Other notable, larger scale developments located within close proximity to the site include the Solar Photovoltaic Energy Development, ~3.6km to the south of the site (ABP Case Number 316303). Several quarries and sand and gravel pits are also located within the delineated hydrological cumulative study area at Bunaterin, Agall and Carrowkeel. All of these developments were subject to environmental impact assessment reports, and where permitted, have been subject to conditions. These conditions and the EIARs for these developments ensure that there will be no significant effects on the hydrological environment.

Furthermore, the mitigation measures detailed in Section 4.3 above 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 other large scale solar farm or extractive industry developments

4.4.6 Cumulative Effects with Substitute Consent and EPA Licensed Activities

As identified in Table 2-2 in Chapter 2, an application for substitute consent was submitted to An Coimisiún Pleanála (Case Ref: SU19.323676) on 12th September 2025, for peat extraction and ancillary works from July 1988 to the present day that have been carried out within Lemanaghan Bog. A Remedial Natura Impact Statement (rNIS) and Remedial Environmental Impact Assessment Report (rEIAR) was submitted with this application.

The rEIAR undertaken for historical industrial peat extraction at Lemanaghan Bog concluded the following in relation to potential effects on the hydrology and hydrogeology of Lemanaghan Bog: '*the residual effects of the Draft Bord na Móna Cutaway Bog Decommissioning and Rehabilitation Plan to be moderate, positive, direct, long-term effect on local peat bog hydrology/hydrogeology, and is Not Significant*.'

A negative, slight/imperceptible, direct, likely, long-term effect on hydrology and hydrogeology is concluded in this assessment for the Proposed Project given the implementation of appropriate mitigation measures, Section 4.3 above.

The Draft Rehabilitation Plan will be implemented in order to meet the requirements of the IPC licence. The Draft Rehabilitation Plan, attached as Appendix 2-4, 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 implementation of the Draft Rehabilitation Plan in conjunction with the construction, operation and decommissioning of the Proposed Project as well as proposed, permitted and operational plans and projects listed in Chapter 2 of its EIAR is considered. The overall footprint of the Proposed Project will be less than 3% of the total area of the site and therefore will not impact or change the overall goals and outcomes of the Draft Rehabilitation Plan. As such, it is the intention of the BnM to integrate the peatland remedial measures proposed as part of the substitute consent project with the Proposed Project.

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 Proposed 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 Draft Rehabilitation Plan, 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.

During the operational phase of the Draft Rehabilitation Plan, 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.

Overall, there are no significant cumulative effects when considering the future works associated with the Lemanaghan Bog (i.e., the Draft Rehabilitation Plan) and the Proposed Project.

4.4.7 Cumulative Effects with other Wind Farm Developments

A cumulative impact assessment was undertaken regarding other wind farm developments.

A total of 10 no. wind farms/private turbines are located within 25km of the proposed turbines. These wind farms include several existing wind farms including Derrinlough Wind Farm (21 no. turbines), Meenwaun Wind Farm (5 no. turbines), Leabeg Wind Farm (2 no. turbines) and the Cloghan Wind Farm (9 no. turbines). The permitted Cush Wind Farm (8 no. turbines) and Kilbeggan Turbine are also located within 25km of the Proposed Project site. The proposed Umma More Wind Farm (9 no. turbines) and the proposed Bellair Wind Farm (no information available in the public domain) are also located within 25km of the site. Finally, 2 no. private turbines, 1 no. existing (James Nally turbine) and 1 no. permitted (Lea Mor turbine) are situated within 25km.

However, none of these existing, permitted or proposed wind farms are located within the delineated hydrological cumulative study area. The large volumes of water within the Brosna River ensure that there will be no potential for cumulative effects to occur even if the construction phases of the Proposed Project and the construction phase of other wind farm developments were to overlap. However, the Proposed Project does not in any way rely upon the dilution capacity of any downstream watercourse. Indeed, the mitigation measures prescribed in this EIAR chapter will ensure the protection of all watercourses downstream of the site (both smaller tributaries and larger regional rivers).

4.4.8 Cumulative Effects from PCAS

In 2024, PCAS has selected Curraghalassa Bog and Derrynagun bog which are adjacent to the Proposed Project site. These two areas are on the southern side of the R436 road which connects Ferbane, Co. Offaly to Ballycumber, Co. Offaly. The two sections include an area of drained high bog, Curraghalassa Bog, located 65m south of the site and a larger section of cutaway bog, Derrynagun Bog, located 105m south of the site. Please note, the Curraghlassa Bog and Derrynagun Bog discharge to the same watercourses as Lemanaghan Bog and there is the potential for cumulative effects. The PCAS measures in the Derrynagun and Curraghalassa bogs will provide greater surface water attenuation and surface water quality benefits in and downstream of the restoration areas. These PCAS measures will have a positive effect on bog hydrogeology and surface water quality.

There is therefore no potential for cumulative effects to occur between the Proposed Project and PCAS works ongoing in nearby bogs during construction, operation or decommissioning.

5. SUMMARY AND CONCLUSIONS

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

The Proposed Project does not involve any significant abstraction of groundwater or 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 site 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 Proposed Project site during the construction, operational and decommissioning phases of the Proposed Project. These mitigation measures will ensure the qualitative status of the underlying GWB will not be altered by the Proposed Project.

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

As such, the Proposed Project:

- will not cause a deterioration in the status of all surface and groundwater bodies assessed;
- will not jeopardise the objectives to achieve 'Good' surface water/groundwater status;
- does not jeopardise the attainment of 'Good' surface water/groundwater chemical status;
- does not jeopardise the attainment of 'Good' surface water/groundwater quantity status;
- does not permanently exclude or compromise the achievement of the objectives of the WFD in other waterbodies within the same river basin district;
- 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 EIAR Chapter 9).

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6. REFERENCES

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Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption.

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