White Hill Wind Farm

Environmental Impact Assessment Report

Annex 7.3: Water Framework Directive Report

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WATER FRAMEWORK DIRECTIVE ASSESSMENT
WHITE HILL WIND FARM, CO. CARLOW & CO. KILKENNY

FINAL REPORT

Prepared for:

WHITE HILL WIND LIMITED

Prepared by:

HYDRO-ENVIRONMENTAL SERVICES

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TABLE OF CONTENTS

FIGURES (IN TEXT)

TABLES IN TEXT

1. INTRODUCTION

1.1 BACKGROUND

Hydro-Environmental Services (HES) were requested by White Hill Wind Limited (WHWL), to complete a Water Framework Directive (WFD) Compliance Assessment for a planning application for a wind farm, along with its secondary and/or off-site elements located at c. 4km west of Oldleighlin, Co. Carlow and Co. Kilkenny. The project comprises a 7no. turbine wind farm, underground grid connection and all associated site development works.

The purpose of this WFD assessment is to determine if any specific components or activities associated with the 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 Assessment is intended to supplement the Environmental Impact Assessment Report (EIAR) submitted as part of the project planning application.

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 and grid connections.

This WFD assessment was prepared by David Broderick, Michael Gill and Jenny Law.

Michael Gill (P. Geo., B.A.I., MSc, Dip. Geol., MIEI) is an Environmental Engineer with over 18 years' environmental consultancy experience in Ireland. Michael has completed numerous hydrological and hydrogeological impact assessments of wind farms in Ireland. He has also managed EIAR assessments for infrastructure projects and private residential and commercial developments. In addition, he has substantial experience in wastewater engineering and site suitability assessments, contaminated land investigation and assessment, wetland hydrology/hydrogeology, water resource assessments, surface water drainage design and SUDs design, and surface water/groundwater interactions. For example, Michael has worked on the EIS/EIARs for Slievecallan WF, Cahermurphy (Phase I & II) WF, Carrownagowan WF, and Croagh WF and over 100 other wind farm related projects across the country.

David Broderick (BSc, H.Dip Env Eng, MSc) is a hydrogeologist with over 13 years' experience in both the public and private sectors. David has a strong background in groundwater resource assessment and hydrogeological/hydrological investigations in relation to developments such as quarries and wind farms. David has completed numerous geology and water sections for input into Environmental Impact Assessment Reports/Environmental Impact Statements (EIAR/EIS) for a range of commercial developments. For example, David has worked on the EIS/EIAR for Oweninny WF, Cloncreen WF, Meenbog WF, Arderroo WF and Yellow River WF, and over 80 other wind farm related projects across the country.

Jenny Law (BSc, MSc) is a junior Environmental Geoscientist, holding an M.Sc. in Applied Environmental Geoscience (2022) from University College Cork. Jenny has also completed a B.Sc. in Earth and Ocean Science (2019) from National University of Ireland. In recent times Jenny has assisted in the preparation of hydrological and hydrogeological impact assessments for a variety of developments.

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[1] 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 comprise six-yearly cycle of planning, action and review. RBMPs include 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.

The River Basin Management Plan (2018-2021) objectives, which have been integrated into the design of the project, include:

- Ensure full compliance with relevant EU legislation;
- Prevent deterioration and maintain a 'high' status where it already exists;
- Protect, enhance and restore all waters with aim to achieve at least good status by 2027;
- Ensure waters in protected areas meet requirements; and,
- Implement targeted actions and pilot schemes in focused sub-catchments aimed at (1) targeting water bodies close to meeting their objectives and (2) addressing more complex issues that will build knowledge for the third cycle.

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 Third Cycle Draft River Basin Management Plan 2022-2027

2. WATERBODY IDENTIFICATION CLASSIFICATION

2.1 INTRODUCTION

This section identifies those surface water and groundwater bodies with potential to be affected by the proposed project and reviews any available WFD information.

2.2 SURFACE WATERBODY IDENTIFICATION

On a regional scale, the wind farm site is located predominantly (c. 97%) in the River Nore surface water catchment within Hydrometric Area 15. The southernmost section of the wind farm site (c. 3%), which includes only the location of the electricity substation, is situated within the regional River Barrow surface water catchment within Hydrometric Area 14. The entire wind farm and grid connection is situated in the South Eastern Irish River Basin District.

On a more local scale, the majority (c. 97%) of the wind farm site (including all of the proposed turbine locations) is located in the Dinin River sub-catchment (Dinin [South]_SC_010). The Dinin River drains into the River Nore approximately 25km downstream of the wind farm site. The River Nore continues in a south easterly direction for approximately 35km before discharging into the Nore Estuary transitional waterbody.

The southernmost section (c. 3%) of the wind farm site within the regional River Barrow catchment drains locally to the Monefelim River within the Barrow_SC_120 sub-catchment. The Monefelim River drains into the River Barrow approximately 15km downstream of the wind farm site.

The forestry replanting lands, in Co. Monaghan, are located within the Fane_SC_010 sub catchment and the Fane_020 river sub basin. However, no key infrastructures associated with the project are located within this surface water catchment.

Table A presents the catchment area of each waterbody downstream of the wind farm site as far as the Nore and Barrow Rivers to which the waterbodies drain to. The Monefelim_010 river in the vicinity of the site has the smallest catchment area of 9.95km^2. The catchment area for the waterbodies increases progressively downstream as more tributaries discharge into the Dinin (Main Channel), the Nore and the Barrow Rivers. For example, the Nore_160 river segment and the Barrow_210 river segment downstream of the Dinin (Main Channel)_020 and Monefelim_030 river waterbodies respectively, have catchment areas of at least 1,000km^2. Therefore, those waterbodies which are located in close proximity to the site are more susceptible to water quality impacts as a result of activities associated with the project. The potential for the project to impact a waterbody decreases further downstream due to the increasing catchment area to the surface waterbody and resulting increase in flow volumes.

Table A: Catchment Area Downstream of Wind Farm Site

WFD River Sub-Basin	Total Downstream Catchment Area (km^2)
Dinin [South] sub-catchment (Dinin [South]_SC_010)	
Dinin (South)_020	87.01466238
Nore sub-catchment (Nore_SC_080)	
Dinin (Main Channel)_010	244.91666238
Dinin (Main Channel)_020	298.22656239
Nore_160	>1000
Barrow sub-catchment (Barrow_SC_120)	
Monefelim_010	9.95124995
Monefelim_020	17.91184984
Monefelim_030	59.69894933

Barrow_210	>1000

In terms of the grid connection route, the majority (c. 13km of the total c. 15km) is located in the River Nore surface water catchment within the Dinin [South]_SC_010 and Nore_SC_100 sub-catchment. The remaining c. 2km is located in the regional River Barrow surface water catchment within the Monefelim River sub-catchment (Barrow_SC_120). The route passes through 6 no. WFD river sub-basins (Dinin South)_020, Monefelim_010, Gowran_010, Brownstown (Pococke)_010, Kilderry_010 & Nore_190) and there will be a requirement for 10 no. watercourse crossings; which comprise 3 no. bridge crossings and 7 no. culvert crossings. All watercourses crossed are headwater streams of 1st or 2nd order in size. The 3 no. bridge crossed watercourses and 1 no. of the culvert crossings are mapped by the EPA (www.epa.ie) (refer to **Table B**).

Table B: Catchment Area Downstream of Grid Connection Route

WFD River Sub-Basin	Total Downstream Catchment Area (km²)
Dinin [South] sub-catchment (Dinin [South]_SC_010)	
Dinin (South)_020	87.01466238
Nore sub-catchment (Nore_SC_100)	
Brownstown (Pococke)_010	36.04420002
Kilderry_010	10.74979763
Nore_190	>1000
Barrow sub-catchment (Barrow_SC_120)	
Monefelim_010	9.95124995
Monefelim_020	17.91184984
Monefelim_030	59.69894933
Gowran_010	30.58254991
	38.8472999
Barrow_210	>1000

The haul route works at the junction of the N78 and L1834, Crettyard Bridge and Black Bridge are located in the Dinin [North]_SC_010 and the Dinin (North)_030 river sub basin.

The forestry replanting lands are located in the Fane_SC_010 sub-catchment and the Fane_020 sub River basin.

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

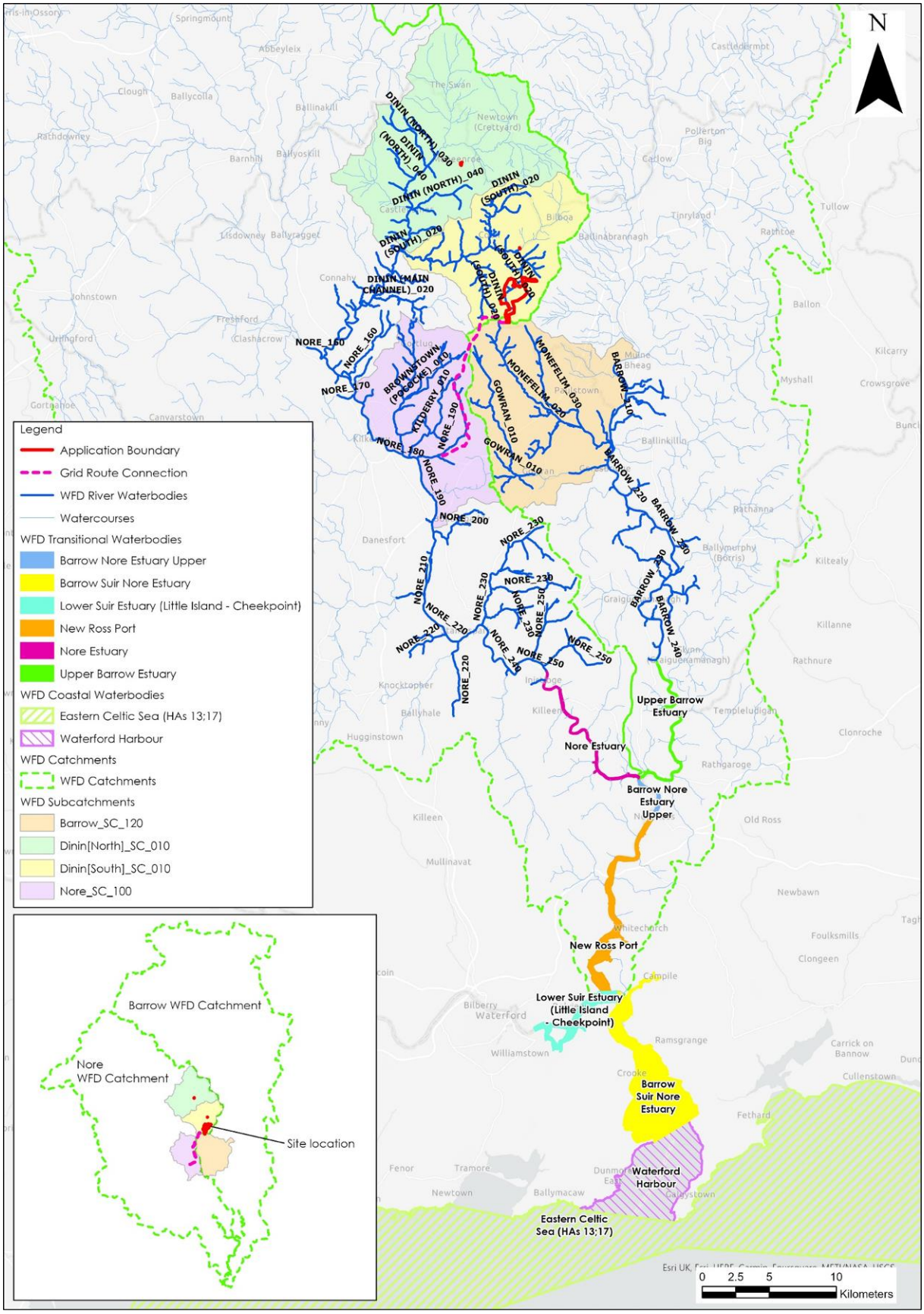

Figure A: Local Hydrology Map

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 are shown in **Table C**. The overall status is based on the ecological, chemical and quantitative status of each SWB.

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

As described in **Section 2.2** above, the majority of the wind farm site is drained by the Dinin River. The latest WFD cycle status of the Dinin River in the vicinity and downstream of the wind farm site ranges from "Good" (Dinin (South)_020 river segment) to "Moderate" (Dinin (Main Channel)_010 and _020 river segments). The Dinin (Main Channel)_020 feeds into the Nore_160 river segment which achieved "Good" status in the latest WFD cycle (2013-2018). Further downstream, the Nore_170 and Nore_180 SWB's achieved "Good" status, whilst the Nore_190 river segment achieved "Moderate" status in the latest WFD cycle. The WFD statuses for the remaining Nore river segments downstream of the windfarm site, ranged from "Good" (Nore_200, Nore_210 & Nore_250) to "Moderate" (Nore_220, Nore_230 & Nore _240).

Both segments of the Dinin (Main Channel) river (Dinin (Main Channel)_010 &_020) are "at risk" of not meeting their WFD framework objectives, whereas the upstream Dinin (South)_020 river in the vicinity of the wind farm is "not at risk". Domestic wastewater and agriculture have been listed as significant pressures on the Dinin (Main Channel)_010. Significant pressures on the Dinin (Main Channel)_020 include agriculture, as well as mines and quarries.

The Nore_160, Nore_170 and Nore_180 river segments that are further downstream of the Dinin River are all deemed to be "not at risk". Downstream the Nore_190, Nore_200, Nore_210, Nore_220 and Nore_240 river segments are all currently "under review". The Nore_230 is deemed to be "at risk" of failing to meet its WFD objectives and has urban run-off noted as a significant pressure on the SWB, whereas the very lower reach of the Nore River, the Nore_250 was characterised as "not at risk".

Within the Barrow River catchment, the upper reaches of the Monefelim River (Monefelim_010 & Monefelim_020) achieved "Good" status, whereas the lower reach of the Monefelim River (Monefelim_030) achieved "Moderate" status in the latest WFD cycle. With regards to the 3rd Cycle River waterbody risk classifications, the Monefelim_010 SWB was deemed as "not at risk", the Monefelim_020 SWB is "under review" and the Monefelim_030 is "at risk" of failing to meet its WFD objectives in the future. Both agriculture and domestic wastewater were listed as being significant pressures on the Monefelim_030 SWB.

Further downstream the Barrow River segments ranged from "Poor" (Barrow_210 & Barrow_230) to "Moderate" (Barrow_220 & Barrow_240) with regard to their WFD status and are all deemed to be "at risk" of failing to meet their WFD objectives apart from the Barrow_240 river segment which is currently "under review". The Barrow_210 SWB has hydromorphology, industry and urban run-off pressures listed as significant pressures, whilst agriculture and hydromorphology are significant pressures on the Barrow_220 and the Barrow_230 respectively.

The Gowran_010 river, which the grid connection route passes through, achieved "Moderate" status in the 2013-2018 WFD cycle and is "at risk" of failing to meet its WFD objectives. Agriculture is listed as a significant pressure on the Gowran_010 river. Within the Nore_SC_100 sub-catchment, the grid connection route is mapped to pass the Brownstown (Pococke)_010 and the Kilderry_010 river sub basins. The Brownstown (Pococke)_010 and the Kilderry_010 SWB's achieved "Poor" and "Good" WFD statuses respectively. The Brownstown (Pococke)_010 SWB is deemed to be "at risk" with urban runoff listed as a significant pressure on the SWB, whilst the Kilderry_010 is "under review".

The haul route works at the junction of the N78 and L1834, Crettyard Bridge and Black Bridge are within the Dinin (North)_030 river sub basin catchment area. The Dinin (North)_030 SWB achieved "Moderate" status, and regarding its risk status is currently "Under Review".

The replanting lands are located in the Fane_SC_010 sub-catchment and the Fane_020 sub-River basin. The Fane_020 SWB achieved "Moderate" status and is currently "under review" regarding its risk status.

With regards the transitional waterbodies downstream of the project site the Nore estuary SWB, downstream of the Nore River, and the Upper Barrow Estuary SWB, downstream of the Barrow River, both achieved "Good" status. These SWB's come together at the Barrow and Nore Estuary Upper SWB which achieved "moderate" status. The New Ross Port, Lower Suir Estuary (Little Island - Cheekpoint) and the Barrow Suir Nore Estuary transitional waterbodies achieved "Moderate", "Good" and "Moderate" statuses respectively. All of the downstream transitional waterbodies are classified as being "at risk" of failing to meet their WFD objectives, apart from the Upper Barrow Estuary SWB which is currently "under review". Agriculture was listed as the main significant pressure on each of the transitional waterbodies downstream of the proposed project mentioned above, apart from the Upper Barrow Estuary SWB. Urban run-off was additionally listed as a significant pressure on the Barrow and Nore Estuary Upper SWB.

The Waterford Harbour and Eastern Celtic Sea (HAs 13;17) coastal waterbodies downstream of the project achieved a "moderate" and "Good" status respectively. The Waterford Harbour SWB is deemed to be "at risk" whereas the Eastern Celtic Sea (HAs 13;17) SWB is deemed to be "not at risk".

The SWB status for the 2013-2018 WFD cycle are shown on **Figure B.**

Table C: Summary WFD Information for River Water Bodies

SWB	Overall Status 2010-2015	Risk Status 2010-2015	Overall Status 2013-2018	Risk Status 2013-2018	Pressures
Nore River Catchment					
Dinin (North)_030	Unassigned	Under Review	Moderate	Under Review	-
Dinin (South)_020	Moderate	At risk	Good	Not at risk	-
Dinin (Main Channel)_010	Good	Not at risk	Moderate	At risk	Agriculture & domestic wastewater
Dinin (Main Channel)_020	Moderate	At risk	Moderate	At risk	Agriculture, mines and quarries & other
Nore_160	Unassigned	Not at risk	Good	Not at risk	-
Nore_170	Good	Under Review	Good	Not at risk	-
Nore_180	Good	Under Review	Good	Not at risk	-
Nore_190	Unassigned	Under Review	Moderate	Under Review	-
Nore_200	Unassigned	At risk	Moderate	Under Review	-
Nore_210	Moderate	At risk	Good	Under Review	-
Nore_220	Good	Not at risk	Moderate	Under Review	-
Nore_230	Good	Under Review	Moderate	At risk	Urban run-off
Nore_240	Good	Not at risk	Moderate	Under Review	-
Nore_250	Good	Not at risk	Good	Not at risk	-
Nore Estuary	Moderate	At risk	Good	At risk	Agriculture
Brownstown (Pococke)_010	Poor	At risk	Poor	At risk	Urban run-off
Kilderry_010	Unassigned	Under Review	Good	Under Review	-
Barrow River Catchment					
Monefelim_010	Good	Not at risk	Good	Not at risk	-
Monefelim_020	Moderate	At risk	Good	Under Review	-
Monefelim_030	Moderate	At risk	Moderate	At risk	Agriculture & domestic wastewater
Gowran_010	Moderate	At risk	Moderate	At risk	Agriculture

Barrow_210	Poor	At risk	Poor	At risk	Hydromorphology, industry & urban run-off
Barrow_220	Moderate	At risk	Moderate	At risk	Agriculture
Barrow_230	Poor	At risk	Poor	At risk	Hydromorphology
Barrow_240	Unassigned	Under Review	Moderate	Under Review	-
Upper Barrow Estuary	Good	Under Review	Good	Under Review	-
Barrow Nore Estuary Upper	Good	Under Review	Moderate	At risk	Agriculture & urban run-off
New Ross Port	Moderate	At risk	Moderate	At risk	Agriculture
Lower Suir Estuary (Little Island - Cheekpoint)	Moderate	At risk	Good	At risk	Agriculture
Barrow Suir Nore Estuary	Good	Not at risk	Moderate	At risk	Agriculture
Waterford Harbour	Good	Under Review	Moderate	At risk	-
Eastern Celtic Sea (HAs 13;17)	Unassigned	Not at risk	Good	Not at risk	-
Newry, Fane, Glyde and Dee Catchment					
Fane_020	Unassigned	Under Review	Moderate	Under Review	-

2.4 GROUNDWATER BODY IDENTIFICATION

The Westphalian Shales and Westphalian Sandstones, which underlie the wind farm site and the northern section of the grid connection route, are classified by the GSI (www.gsi.ie) as a Poor Aquifer (bedrock which is generally unproductive- Pu) and a Locally Important Aquifer (bedrock which is generally moderately productive-Lm). The haul route works at the junction of the N78 and L1834, at Crettyard Bridge and Black Bridge are mapped to be underlain by Westphalian Shales. The mapped bedrock type (Silurian Metasediments and Volcanics) at the replanting lands are classified as a Poor Aquifer (Bedrock which is Generally Unproductive except for Local Zones).

Namurian Sandstones and Shales which underlie the central section of the grid connection route are classified as a Poor Aquifer – bedrock which is Generally Unproductive except for Local Zones (Pl). Further south the Dinantian Upper Impure Limestones and Dinantian Pure Bedded Limestones are classified as Regionally Important Aquifer – Karstified (diffuse) (Rkd) and Locally Important Aquifer – Bedrock which is Moderately Productive only in Local Zones (Ll).

In terms of local Groundwater Bodies (GWBs), the wind farm site and the northern section of the grid connection route are located in the Castlecomer GWB (IE_SE_G_034). Sections of the grid connection route, further south, are mapped in the Shanragh GWB (IE_SE_G_124), the Ballingarry GWB (IE_SE_G_009) and the Kilkenny GWB (IE_SE_G_078) before terminating within the Clifden GWB (IE_SE_G_038).

The haul route works at the junction of the N78 and L1834, at Crettyard Bridge and Black Bridge are also located in the Newtown GWB (IE_SE_G_104).

The replanting lands are located in the Louth GWB (IEGBNI_NB_G_019)

The GWB status for the 2013-2018 WFD cycle are shown on **Figure B.**

2.5 GROUNDWATER BODY CLASSIFICATION

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

The Castlecomer GWB (IE_SE_G_034) underlies the wind farm site and the northern section of the grid connection route. This GWB has been assigned 'Good' status and it has been deemed to be 'Not at Risk'.

The Shanragh GWB (IE_SE_G_124) is also of 'Good' status but its risk status is currently under review. Meanwhile the Ballingarry GWB (IE_SE_G_009), the Kilkenny (IE_SE_G_078) GWB and the Clifden GWB achieved 'Good' status in both WFD cycles. The Ballingarry GWB is currently "under review", whilst the Kilkenny GWB is deemed to be "at risk" whereas the Clifden (IE_SE_G_038) GWB is "not at risk". Agriculture is listed as a significant pressure on the Kilkenny GWB according to the 3rd Cycle Draft Barrow Catchment Report.

The Newtown GWB (IE_SE_G_104) achieved 'Good' status in the latest WFD cycle. The risk status of this GWB is "not at risk". The Louth GWB achieved "Good" status and is deemed to be "not at risk".

Table D: Summary WFD Information for Groundwater Bodies

GWB	Overall Status 2010-2015	Risk Status 2010-2015	Overall Status 2013-2018	Risk Status 2013-2018	Pressures
Castlecomer	Good	Not at risk	Good	Not at risk	-
Shanragh	Good	Not at risk	Good	Under Review	-
Ballingarry	Good	Under Review	Good	Under Review	-
Kilkenny	Good	At risk	Good	At risk	Agriculture & other
Clifden	Good	Not at risk	Good	Not at risk	-
Newtown	Good	Not at risk	Good	Not at risk	-
Louth	Good	Under Review	Good	Not at risk	-

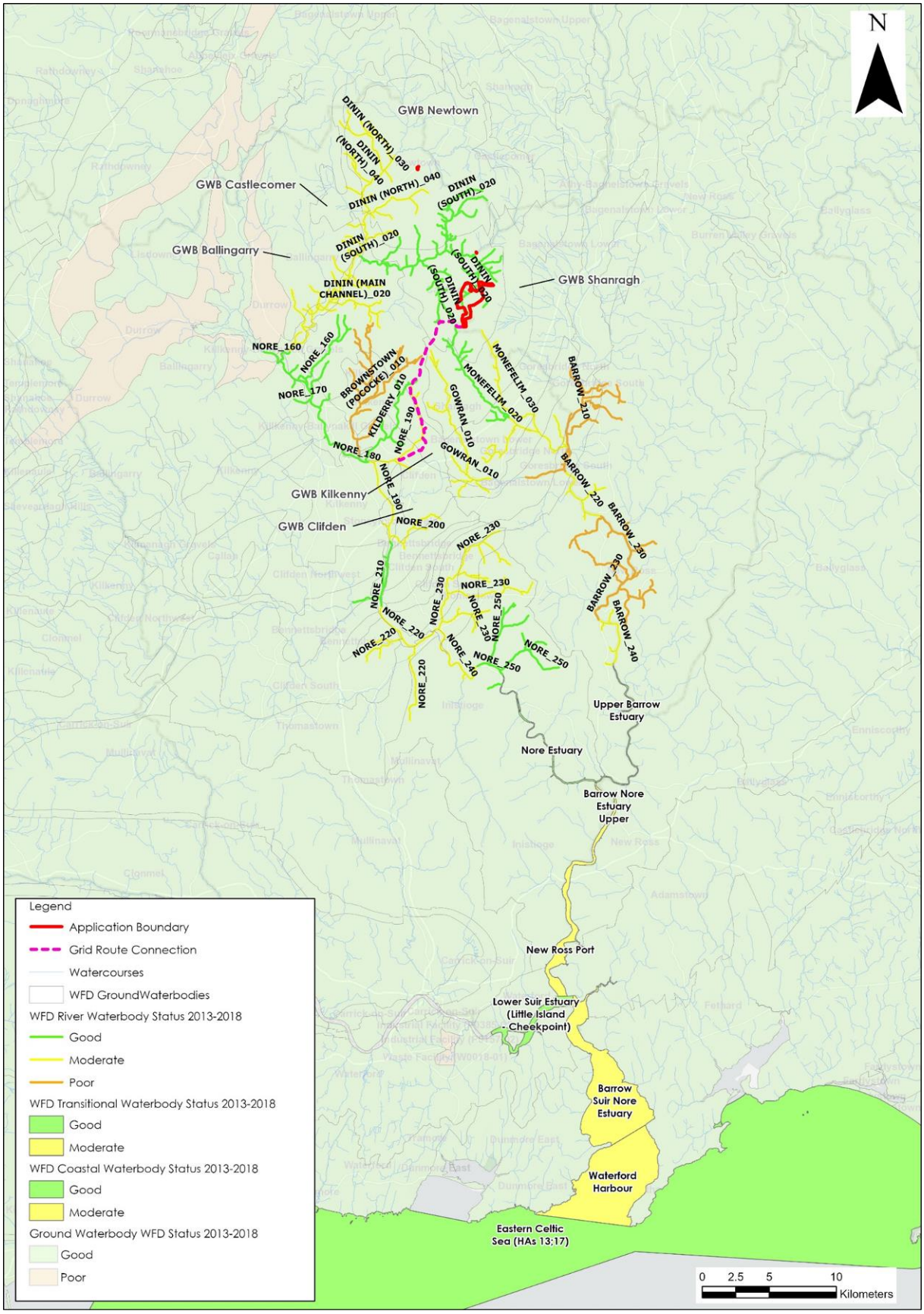

Figure B: WFD Groundwater and Surface Waterbody Status (2013-2018)

3. WFD SCREENING

As discussed in **Section 2**, there are a total of 31 no. surface waterbodies which are located in the vicinity of the project site (including the secondary and/or off-site elements) and downstream of the site. There are 23 no. river waterbodies, 6 no. transitional waterbodies and 2 no. coastal waterbodies downstream of the project site. In addition, 7 no. groundwater bodies underlie the project site and its secondary and/or off-site elements.

3.1 SURFACE WATER BODIES

The river waterbodies in the immediate vicinity and downstream of the project site are shown in **Figure A** and described in **Section 2.2** above.

With consideration for the construction, operational and decommissioning phases of the project, it is considered that all sections of the Dinin (Dinin (South)_020, Dinin (Main Channel)_010 & Dinin (Main Channel)_020) and the Monefelim (river segments _010 through to _030) Rivers within the vicinity and downstream of the project are carried through into the WFD Impact Assessment. These SWBs have been included for further assessment due to their proximal location to the wind farm and grid connection route. The works related to the project must not in any way result in a deterioration in the status of these SWBS and/or prevent them from meeting the biological and chemical characteristics for good status in the future.

Downstream of its confluence with the Dinin River, the River Nore has been screened out due to its distal location (>10km) from the project site. As outlined in **Table A** the catchment area for the Nore_160 river segment immediately downstream of the Dinin (Main Channel)_020 increases dramatically. The potential for the project to impact a waterbody decreases further downstream due to the increasing catchment area to the surface waterbody and resulting increase in flow volumes. Similarly, the River Barrow, downstream of the Monefelim River has been screened out due to its distal location (>10km) from the project site and due to its increased catchment area and flow volumes, which decreases the potential for the project to impact a waterbody. The works have no potential to cause a deterioration in the status of these screened out SWBs and/or jeopardise their attainment of good surface water status.

The Nore_190, Brownstown (pococke)_010 and Kilderry_010 SWB's within the Nore WFD Catchment, and the Gowran_010 SWB within the Barrow Catchment, have been included for further assessment due to the presence of grid route works within these river sub-basins. The works have the potential to cause a deterioration in the status of these SWBs and/or jeopardise their attainment of good surface water status.

The haul route works at the junction of the N78 and L1834, Crettyard Bridge and Black Bridge are located in the Dinin [North]_SC_010 and the Dinin (North)_030 river sub basin. However, the infrastructure works associated with the proposed project here are localised and will not require instream works therefore they have very low potential to cause a deterioration in the status of these screened out SWBs and/or jeopardise their attainment of good surface water status.

An area within the Fane_SC_010 sub catchment and the Fane_020 river sub basin is will be planted to replace forestry lost from the wind farm site. However, no key infrastructure associated with the project are located within this surface water catchment, therefore the Fane_020 river waterbody will be screened out as the minor works have no potential to cause a deterioration in the status of these screened out SWBs and/or jeopardise their attainment of good surface water status.

The Nore Estuary, Upper Barrow Estuary, New Ross Port, Lower Suir Estuary (Little Island - Cheekpoint) and the Barrow Suir Nore Estuary transitional SWBs and the Waterford Harbour and Eastern Celtic Sea (HAs 13;17) coastal SWBs have been screened out due to the large volumes of water within these SWBs and the saline nature of these waters. The project has no

potential to cause a deterioration in status of these SWBs and/or jeopardise the attainment of good surface water status in the future.

3.2 GROUNDWATER BODIES

With respect to groundwater bodies, the Castlecomer, Shanragh, Ballingarry, Kilkenny, Clifden and Newtown GWBs are carried through to the WFD Impact Assessment due to their location directly underlying the project. The Louth GWB, underlying the replanting lands, has been screened out due to the characteristics of this component of the project and the absence of interaction with groundwater.

3.3 WFD SCREENING SUMMARY

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

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

Type	WFD Classification	Waterbody Name/ID	Inclusion in Assessment	Justification
Surface Water Body	Nore River Catchment			
	River	Dinin (North)_030	No	The infrastructures associated with the proposed project within the Dinin (North)_030 river sub-basin is not within the vicinity of any local SWB's. Therefore, there is no potential to cause a deterioration in the status of these screened out SWBs and/or jeopardise their attainment of good surface water status.
	River	Dinin (South)_020	**Yes**	The wind farm site, including all 7 no. turbines, is mapped within the Dinin (South)_010 river sub-basin. An assessment is required to consider the potential impacts of the proposed project on this SWB.
	River	Dinin (Main Channel)_010	**Yes**	The Dinin (Main Channel)_010 is located proximally to the wind farm site and directly downstream of the Dinin (South)_020 SWB. An assessment is required to consider the potential impacts of the proposed project on this SWB.
	River	Dinin (Main Channel)_020	**Yes**	The Dinin (Main Channel)_020 is located proximally to the wind farm site and directly downstream of the Dinin (Main Channel)_010 SWB. An assessment is required to consider the potential impacts of the proposed project on this SWB.
	River	Nore_160	No	The Nore_160 SWB has been screened out due to its distal location from the site (~10.5km) and the increasing volumes of water within the Nore River.
	River	Nore_170	No	The Nore_170 SWB has been screened out due to its distal location from the site (~10.5km) and the increasing volumes of water within the Nore River.
	River	Nore_180	No	The Nore_180 SWB has been screened out due to its distal location from the site (~10.5km) and the increasing volumes of water within the Nore River.
	River	Nore_190	**Yes**	The grid connection route is mapped within the Nore_190 river sub-basin. An assessment is required to consider the potential impacts of the proposed project on this SWB
	River	Nore_200	No	The Nore_200 SWB has been screened out due to its distal location from the site and the increasing volumes of water within the Nore River.
	River	Nore_210	No	The Nore_210 SWB has been screened out due to its distal location from the site and the increasing volumes of water within the Nore River.
	River	Nore_220	No	The Nore_220 SWB has been screened out due to its distal location from the site and the increasing volumes of water within the Nore River.
	River	Nore_230	No	The Nore_230 SWB has been screened out due to its distal location from the site and the increasing volumes of water within the Nore River.
	River	Nore_240	No	The Nore_240 SWB has been screened out due to its distal location from the site and the increasing volumes of water within the Nore River.
	River	Nore_250	No	The Nore_250 SWB has been screened out due to its distal location from the site and the increasing volumes of water within the Nore River.
	Transitional	Nore Estuary	No	The Nore Estuary SWB has been screened out due to the saline nature of its waters and the large volumes of water within the Bay. The Proposed project has no potential to impact the status of

				this SWB.
	River	Brownstown (Pococke)_010	**Yes**	The grid connection route is mapped within the Brownstown (Pococke)_010 river sub-basin. An assessment is required to consider the potential impacts of the proposed project on this SWB
	River	Kilderry_010	**Yes**	The grid connection route is mapped within the Kilderry_010 river sub-basin. An assessment is required to consider the potential impacts of the proposed project on this SWB.
			Barrow River Catchment	
	River	Monefelim_010	**Yes**	The very southern section of the wind farm site and a portion of the Grid connection route is mapped within the Monefelim_010 river sub-basin. An assessment is required to consider the potential impacts of the proposed project on this SWB.
	River	Monefelim_020	**Yes**	The Monefelim_020 SWB is located proximally to the wind farm site and directly downstream of the Monefelim_010 SWB. An assessment is required to consider the potential impacts of the proposed project on this SWB.
	River	Monefeilim_030	**Yes**	The Monefelim_030 SWB is located proximally to the wind farm site and directly downstream of the Monefelim_020 SWB. An assessment is required to consider the potential impacts of the proposed project on this SWB.
	River	Gowran_010	**Yes**	The grid connection route is mapped within the Gowran_010 river sub-basin. An assessment is required to consider the potential impacts of the proposed project on this SWB.
	River	Barrow_210	No	The Barrow_210 SWB has been screened out due to its distal location from the site and the increasing volumes of water within the Barrow River.
	River	Barrow_220	No	The Barrow_220 SWB has been screened out due to its distal location from the site and the increasing volumes of water within the Barrow River.
	River	Barrow_230	No	The Barrow_230 SWB has been screened out due to its distal location from the site and the increasing volumes of water within the Barrow River
	River	Barrow_240	No	The Barrow_240 SWB has been screened out due to its distal location from the site and the increasing volumes of water within the Barrow River
	Transitional	Upper Barrow Estuary	No	The Upper Barrow Estuary SWB has been screened out due to the saline nature of its waters and the large volumes of water within the Bay. The Proposed project has no potential to impact the status of this SWB.
	Transitional	Barrow Nore Estuary Upper	No	The Barrow Nore Estuary SWB has been screened out due to the saline nature of its waters and the large volumes of water within the Bay. The Proposed project has no potential to impact the status of this SWB.
	Transitional	New Ross Port	No	The New Ross Port SWB has been screened out due to the saline nature of its waters and the large volumes of water within the Bay. The Proposed project has no potential to impact the status of this SWB.
	Transitional	Lower Suir Estuary (Little Island - Cheekpoint)	No	The Lower Suir Estuary (Little Island - Cheekpoint) SWB has been screened out due to the saline nature of its waters and the large volumes of water within the Bay. The Proposed project has no potential to impact the status of this SWB.
	Transitional	Barrow Suir Nore	No	The Barrow Suir Nore Estuary SWB has been screened out due to the saline nature of its waters

		Estuary		and the large volumes of water within the Bay. The Proposed project has no potential to impact the status of this SWB.
	Coastal	Waterford Harbour	No	The Waterford Harbour SWB has been screened out due to the saline nature of its waters and the large volumes of water within the Bay. The Proposed project has no potential to impact the status of this SWB.
	Coastal	Eastern Celtic Sea (HAs 13;17)	No	The Eastern Celtic Sea (HAs 13;17) SWB has been screened out due to the saline nature of its waters and the large volumes of water within the Bay. The Proposed project has no potential to impact the status of this SWB.
Newry, Fane, Glyde and Dee Catchment				
	River	Fane_020	No	The replanting activities associated with the proposed project within the Fane_020 river sub-basin 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.
Groundwater Bodies				
Groundwater Body	Groundwater	Castlecomer	**Yes**	The wind farm site, including all 7 no. turbines, is mapped to overlie the Castlecomer GWB. An assessment is required to consider the potential impacts of the proposed project on this GWB.
	Groundwater	Shanragh	**Yes**	The grid connection route is mapped to overlie the Shanragh GWB. An assessment is required to consider the potential impacts of the proposed project on this GWB.
	Groundwater	Ballingarry	**Yes**	The grid connection route is mapped to overlie the Ballingarry GWB. An assessment is required to consider the potential impacts of the proposed project on this GWB.
	Groundwater	Kilkenny	**Yes**	The grid connection route is mapped to overlie the Kilkenny GWB. An assessment is required to consider the potential impacts of the proposed project on this GWB.
	Groundwater	Cliden	**Yes**	The grid connection route is mapped to overlie the Clifden GWB. An assessment is required to consider the potential impacts of the proposed project on this GWB.
	Groundwater	Newtown	**Yes**	The infrastructures associated with the proposed project within the Dinin (North)_030 river sub-basin overlies the Newtown GWB. An assessment is required to consider the potential impacts of the proposed project on this GWB.
	Groundwater	Louth	No	The replanting activities associated with the proposed project that will overly the Louth GWB has no potential to cause a deterioration in the status of the screened out GWB.

4. WFD COMPLIANCE ASSESSMENT

4.1 PROPOSALS

The project comprises the following main components of 7 no. wind turbines with an overall tip height of 185m, and all associated ancillary infrastructure, upgrades to the turbine component haul route and construction of an electricity substation and installation of c. 15km of underground grid connection cable between the White Hill Wind Farm and the existing Kilkenny 110kV electricity substation. The project will include all associated and ancillary site development, excavation, construction, landscaping and reinstatement works, including provision of site drainage infrastructure.

The wind farm site traverses the administrative boundary between counties Carlow and Kilkenny; with 4 no. turbines located in Co. Carlow and 3 no. turbines within Co. Kilkenny. The electricity substation is located within Co. Carlow while the vast majority, c. 14km, of the underground electricity line is located in Co. Kilkenny. Forestry replant lands are located within County Monaghan; while candidate quarries which may supply construction materials are also located within counties Carlow and Kilkenny.

The turbine component haul route, and associated upgrade works are located within counties Kilkenny, Waterford, Carlow, and Kildare.

Due to the nature of wind farm developments (and associated grid connections and haul route works), being near surface construction activities, impacts on groundwater are generally negligible and surface water is generally the main sensitive receptor assessed during impact assessments. The primary risks to groundwater at the site will be chemical pollution of groundwater from cementitious materials, hydrocarbon spillage and leakages. Borrow pits, if developed also have the potential to impact groundwater levels albeit effects in the EIAR (Chapter 7) have being assessed as not significant.

The primary risk to surface waters will be entrained suspended sediments (peaty topsoil and soil particles) in site runoff during earthworks and tree felling along with release cement-based compounds and/or hydrocarbons. The project may also result in changes to surface water runoff volumes and flow patterns. The project includes works over and in close proximity to waterbodies.

There are a number of potential adverse effects to both surface and groundwater.

4.2 POTENTIAL EFFECTS

4.2.1 Construction Phase (Unmitigated)

4.2.1.1 Clear Felling and Potential Surface Water Quality Impacts

A total of 15 hectares of forestry will be permanently felled within and around the footprint of the project.

The total amount to be felled (15ha) accounts for ~8.3% of the existing forestry coverage at the wind farm site which is ~180ha.

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

Potential effects during tree felling occurs mainly from:

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

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 F**.

Table F: Surface Water Quality Impacts (WF Site) during Construction Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Dinin (South)_020	IE_SE_15D080600	Good	Moderate
Dinin (Main Channel)_010	IE_SE_15D020700	Moderate	Poor
Dinin (Main Channel)_020	IE_SE_15D020800	Moderate	Poor
Monefelim_010	IE_SE_14M030100	Good	Moderate
Monefelim_020	IE_SE_14M030600	Good	Good
Monefelim_030	IE_SE_14M031000	Moderate	Moderate

4.2.1.2 Earthworks (Removal of Vegetation Cover, Excavations and Stock Piling) Resulting in Suspended Solids Entrainment in Surface Water

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

Hydrocarbons and cement-based compounds will be used during the construction phase. Accidental spillage during refuelling of construction plant with petroleum hydrocarbons is a significant pollution risk to surface waters at all construction sites. The accumulation of small spills of fuels and lubricants during routine plant use can also be a pollution risk. Hydrocarbon has a high toxicity to humans, and all flora and fauna, including fish, and is persistent in the environment. It is also a nutrient supply for adapted micro-organisms, which can rapidly deplete dissolved oxygen in waters, resulting in the death of aquatic organisms.

Release of effluent from wastewater treatment systems also has the potential to impact on surface waters if site conditions are not suitable for an on-site percolation unit. The temporary construction compound will include a number of chemical toilets (portaloos) while the site office is served by an existing wastewater treatment system.

Construction phase activities can result in the release of suspended solids and pollutants in runoff water and could result in an increase in the suspended sediment load, resulting in increased turbidity, increased pH and contamination which in turn could affect the water

quality and fish stocks of downstream water bodies such as the Dinin River and the upper reach of the Monefelim River.

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 G.**

Table G: Surface Water Quality Impacts (WF Site) during Construction Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Dinin (South)_020	IE_SE_15D080600	Good	Moderate
Dinin (Main Channel)_010	IE_SE_15D020700	Moderate	Poor
Dinin (Main Channel)_020	IE_SE_15D020800	Moderate	Poor
Monefelim_010	IE_SE_14M030100	Good	Moderate
Monefelim_020	IE_SE_14M030600	Good	Good
Monnefelim_030	IE_SE_14M031000	Moderate	Moderate

4.2.1.3 Potential Surface Water Quality Effects along Grid Connection Route

The grid connection route passes through 6 no. WFD river sub-basins (Dinin South)_020, Monefelim_010, Gowran_010, Brownstown (Pococke)_010, Kilderry_010 & Nore_190) and there will be a requirement for 10 no. watercourse crossings; which comprise 3 no. bridge crossings and 7 no. culvert crossings. All watercourses crossed are headwater streams of 1st or 2nd order in size. The 3 no. bridge crossed watercourses and 1 no. of the culvert crossings are mapped by the EPA (www.epa.ie).

No in-stream works are required at any of these watercourse crossings, however due to the close proximity of local waterbodies to construction activities at the crossing locations, there is a potential for surface water quality impacts during trench excavation work due to runoff from the road surface and during directional drilling works. This runoff may contain elevated concentrations of suspended sediment, cementitious runoff and/or hydrocarbons.

Construction activities along the grid route therefore have the potential to adversely impact the status of these SWBs.

Table H: Surface Water Quality Impacts (Grid Route) during Construction Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Dinin (South)_020	IE_SE_15D080600	Good	Moderate
Monefelim_010	IE_SE_14M030100	Good	Moderate
Gowran_010	IE_SE_14G030100	Moderate	Moderate (potential deterioration in water quality)
Brownstown (Pococke)_010	IE_SE_15B041100	Poor	Poor (potential deterioration in water quality)
Kilderry_010	IE_SE_15K540650	Good	Good (potential deterioration in water

			quality)
Nore_190	IE_SE_15N012090	Moderate	Poor

4.2.1.4 Potential Groundwater Quality Impacts

The wind farm site and the northern section of the grid connection route are located in the Castlecomer GWB. Sections of the grid connection further south are mapped in the Shanragh GWB, the Ballingarry GWB and the Kilkenny GWB before terminating with in the Clifden GWB. The haul route works are located in the Newtown GWB.

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. Release of effluent from site welfare wastewater treatment systems has the potential to impact on groundwater and surface waters.

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

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

Table I: Groundwater Quality Impacts during Construction Phase (Unmitigated)

GWB	WFD Code	Current Status	Assessed Potential Status Change
Castlecomer	IE_SE_G_034	Good	Moderate
Shanragh	IE_SE_G_124	Good	Moderate
Ballingarry	IE_SE_G_009	Good	Moderate
Kilkenny	IE_SE_G_078	Good	Moderate
Clifden	IE_SE_G_038	Good	Moderate
Newtown	IE_SE_G_104	Good	Moderate

4.2.2 Operational Phase (Unmitigated)

Potential effects associated with the operational phase of the project will be much reduced in comparison to the construction phase. Any effects will occur at the wind farm site and will be associated with minor maintenance works.

Little maintenance work will be required along the grid connection route and therefore there is no potential to impact on the status of downstream SWBs or underlying GWBs.

4.2.2.1 Increased Wind Farm Site Runoff and Potential Hydromorphology Effects

Progressive replacement of the soil, peaty topsoil or vegetated surface with impermeable surfaces could potentially result in an increase in the proportion of surface water runoff

reaching the surface water drainage network. This could potentially increase runoff from the site and increase flood risk downstream of the development.

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.

The additional runoff volume is low (calculated to be 0.58% in Section 7.4.4.1 of the EIAR) due to the fact that the runoff potential from the site is already relatively high (75%) due to the prevailing baseline hydrogeological conditions at the site. Also, this calculation assumes that all hardstanding areas will be impermeable which is a conservative approach given that access tracks and crane hardstands will be constructed of aggregates which will facilitate the permeation of rainfall.

A summary of potential status change to SWBs arising from increased runoff during the operation stage of the proposed project in the unmitigated scenario are outlined in **Table J**.

Table J: Potential Impact on Surface Water Flows (Wind Farm) during Operational Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Dinin (South)_020	IE_SE_15D080600	Good	Good
Dinin (Main Channel)_010	IE_SE_15D020700	Moderate	Moderate
Dinin (Main Channel)_020	IE_SE_15D020800	Moderate	Moderate
Monefelim_010	IE_SE_14M030100	Good	Good
Monefelim_020	IE_SE_14M030600	Good	Good
Monefelim_030	IE_SE_14M031000	Moderate	Moderate

4.2.2.2 Surface Water Quality Impacts from Operational Wind Farm Site Drainage

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

A summary of potential status change to SWBs arising from surface water quality impacts during the operation stage of the proposed project in the unmitigated scenario are outlined in **Table K**.

Table K: Surface Water Quality Impacts (WF Site) during Operational Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Dinin (South)_020	IE_SE_15D080600	Good	Good
Dinin (Main Channel)_010	IE_SE_15D020700	Moderate	Moderate

Dinin (Main Channel)_020	IE_SE_15D020800	Moderate	Moderate
Monefelim_010	IE_SE_14M030100	Good	Good
Monefelim_020	IE_SE_14M030600	Good	Good
Monefelim_030	IE_SE_14M031000	Moderate	Moderate

4.2.2.3 Groundwater Quality Impacts at the Wind Farm Site

The risks to groundwater quality are the same as those described in **Section 4.2.1.4** but of a lesser extent than during the construction phase due to the limited activity at the wind farm site with only minor maintenance required during the operational phase.

A summary of potential status change to GWBs arising from groundwater quality impacts during the operation stage of the proposed project in the unmitigated scenario are outlined in **Table L**.

Table L: Groundwater Quality Impacts (WF Site) During Operational Phase (Unmitigated)

GWB	WFD Code	Current Status	Assessed Potential Status Change
Castlecomer	IE_SE_G_034	Good	Good
Shanragh	IE_SE_G_124	Good	Good
Ballingarry	IE_SE_G_009	Good	Good
Kilkenny	IE_SE_G_078	Good	Good
Clifden	IE_SE_G_038	Good	Good
Newtown	IE_SE_G_104	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 Clear Felling Surface Water Quality Effects

During the construction phase a self-imposed conservative buffer zone of 50 metres will be maintained for all streams. With the exception of the northern end of the T4 hardstand and proposed stream crossings, the proposed tree felling areas are generally located outside of imposed buffer zones.

The large distance between the majority of the proposed felling areas and sensitive aquatic zones means that potential poor quality runoff from felling areas can be adequately managed and attenuated prior to even reaching the aquatic buffer zone and primary drainage routes. Where tree felling is required in the vicinity of streams, the following additional mitigation measures will be employed.

- Machine combinations (i.e. handheld or mechanical) will be chosen which are most suitable for ground conditions and which will minimise soils disturbance;
- Checking and maintenance of roads and culverts will be on-going through any felling operation. No tracking of vehicle through watercourses will occur, as vehicles will use road infrastructure and existing watercourse crossing points. Where possible, existing drains will not be disturbed during felling works;
- Ditches which drain from the proposed area to be felled towards existing surface watercourses will be blocked, and temporary silt traps will be constructed. No direct discharge of such ditches to watercourses will occur. Drains and sediment traps will be installed during ground preparation. Collector drains will be excavated at an acute angle to the contour (~0.3%-3% gradient), to minimise flow velocities. Main drains to take the discharge from collector drains will include water drops and rock armour, as required, where there are steep gradients, and avoid being placed at right angles to the contour;
- Sediment traps will be sited in drains downstream of felling areas. Machine access will be maintained to enable the accumulated sediment to be excavated. Sediment will be carefully disposed of in the spoil disposal areas. All new silt traps will be constructed on even ground and not on sloping ground;
- In areas particularly sensitive to erosion or where felling inside the 50 metre buffer is required, it will be necessary to install double or triple sediment traps;
- All drainage channels will taper out before entering the 50m buffer zone. This ensures that discharged water gently fans out over the buffer zone before entering the aquatic zone, with sediment filtered out from the flow by ground vegetation within the zone. On erodible soils, silt traps will be installed at the end of the drainage channels, to the outside of the buffer zone;
- Drains and silt traps will be maintained throughout all felling works, ensuring that they are clear of sediment build-up and are not severely eroded. Correct drain alignment, spacing and depth will ensure that erosion and sediment build-up are minimized and controlled;
- Brash mats will be used to support vehicles on soft ground, reducing topsoil and mineral soils erosion and avoiding the formation of rutted areas, in which surface water ponding can occur. Brash mat renewal will take place before they become heavily used and worn. Provision will be made for brash mats along all off-road routes, to protect the soil from compaction and rutting. Where there is risk of severe erosion occurring, extraction will be suspended during periods of high rainfall;
- Timber will be stacked in dry areas, and outside a local 50 metre watercourse buffer. Straw bales and check dams will be emplaced on the down gradient side of timber storage/processing sites;
- Works will be carried out during periods of no, or low rainfall, in order to minimise entrainment of exposed sediment in surface water run-off;
- Checking and maintenance of roads and culverts will be on-going through the felling operation;
- Refuelling or maintenance of machinery will not occur within 100m of a watercourse. Mobile bowser, drip kits, qualified personnel will be used where refuelling is required;
- A permit to refuel system will be adopted:
- Branches, logs or debris will not be allowed to build up in aquatic zones. All such material will be removed when harvesting operations have been completed, but care will be taken to avoid removing natural debris deflectors;
- Crossing of streams will not be permitted;
- Trees will be cut manually from along streams and using machinery to extract whole trees; and
- Travel only perpendicular to and away from stream.

Silt Traps:

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

Drain Inspection and Maintenance:

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

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

Surface Water Quality Monitoring:

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

Details of the proposed surface water quality monitoring programme are outlined in the Surface Water Management Plan.

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

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

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

4.3.1.2 Earthworks (Removal of Vegetation Cover, Excavations and Stock Piling) Resulting in Suspended Solids Entrainment in Surface Water

The key mitigation measure during the construction phase is the avoidance of sensitive aquatic areas where possible by using a 50m buffer. Apart from some sections of access track, a small section of the T4 hardstand along with the watercourse crossing locations, the majority of the project areas (including all turbine locations, borrow pits and spoil storage areas) are located outside of areas that have been assessed to be hydrologically sensitive. Specific mitigation measures, incorporated into the design of the development and through implementation of best practice methodologies (discussed below) will be employed where work inside buffer zones is proposed.

The generally large setback distance from sensitive hydrological features means that sufficient space is provided for the installation of proposed drainage mitigation measures (discussed below) and to ensure their effective operation. The proposed buffer zone will ensure:-

- Avoidance of physical damage to watercourses, and associated release of sediment;
- Avoidance of excavations within close proximity to surface water courses;
- Avoidance of the entry of suspended sediment from earthworks into watercourses; and,
- Avoidance of 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.

Mitigation by Prevention

The following section details the measures which will be put in place during the construction phase to ensure that surface water features are protected from the release of silt or sediment and to ensure that all surface water runoff is fully attenuated to avoid the discharge of dirty water.

- Source controls to limit the likelihood for 'dirty water' to occur include:
  - Interceptor drains, vee-drains, diversion drains, flume pipes, erosion and velocity control measures such as use of sand bags, oyster bags filled with clean washed gravel, filter fabrics, and other similar/equivalent or appropriate systems;
  - Small working areas, covering stockpiles, weathering off stockpiles, cessation of works in certain areas or other similar/equivalent or appropriate measures.
- In-Line controls to ensure appropriate management of silt laden water:-
  - Interceptor drains, vee-drains, oversized swales, erosion and velocity control measures such as check dams, sand bags, oyster bags, straw bales, flow limiters, weirs, baffles, silt bags, silt fences, sedimats, filter fabrics, and collection sumps, temporary sumps/attenuation lagoons, sediment traps, pumping systems, settlement ponds, temporary pumping chambers, or other similar/equivalent or appropriate systems.
- Treatment systems to fully attenuate silt laden waters prior to discharge:-
  - Temporary sumps and attenuation ponds, temporary storage lagoons, sediment traps, and settlement ponds, and proprietary settlement systems such as Siltbuster, and/or other similar/equivalent or appropriate systems.
  - Final Tertiary treatment lagoons

It should be noted for this site that an extensive network of land and forestry drains already exists, and these will be integrated and enhanced as required and used within the wind farm development drainage system. The integration of the existing land drainage network and the proposed wind farm network is common practice in wind energy developments and will also result in benefits to surrounding agricultural lands.

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

- Apart from interceptor drains, which will convey clean runoff water to the downstream drainage system, there will be no direct discharge (without treatment for sediment reduction, and attenuation for flow management) of runoff from the proposed wind farm drainage into the existing site drainage network. This will reduce the likelihood for any increased risk of downstream flooding or sediment transport/erosion;
- Silt traps will be placed in the existing drains upstream of any streams where construction works is taking place, and these will be diverted into proposed interceptor drains, or culverted under/across the works area;
- During the operational phase of the wind farm, runoff from individual turbine hardstanding areas will be not discharged into the existing drain network but discharged locally at each turbine location through stilling ponds and buffered outfalls onto vegetated surfaces;
- Buffered outfalls which will be numerous over the site will promote percolation of drainage waters across vegetation and close to the point at which the additional runoff is generated, rather than direct discharge to the existing drains of the site;
- Drains running parallel to the existing roads that requiring widening will be upgraded. Velocity and silt control measures such as check dams, sand bags, oyster bags, straw bales, flow limiters, weirs, baffles and silt fences will be used during the upgrade works. Regular buffered outfalls will also be added to these drains to protect downstream surface waters.

Water Treatment Train

While the primary, secondary and tertiary silt/sediment ponds and lagoons are assessed as providing a sufficient level of protection to avoid any deterioration in downstream water quality; a final line of defence can be provided by a water treatment train such as a "Siltbuster", if required. 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 water treatment train will apply for the entirety of the construction phase.

Silt Fences

Silt fences will be emplaced within drains down-gradient of all construction areas. Silt fences are effective at removing heavy settleable solids. This will act to prevent entry to watercourses of sand and gravel sized sediment, released from excavation of mineral sub-soils of glacial and glacio-fluvial origin, and entrained in surface water runoff. Inspection and maintenance of these of these structures during construction phase is critical to their functioning to stated purpose. They will remain in place throughout the entire construction phase. Double silt fences will be emplaced within drains down-gradient of all construction areas inside the hydrological buffer zones to provide an additional layer of protection in these areas.

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. Silt bags will be used with natural vegetation filters or sedimats (sediment entrapment mats, consisting of coir or jute matting) placed at the silt bag location to provide further treatment of the water outfall from the silt bag. Sedimats will be secured to the ground surface using stakes/pegs. The sedimat will extend to the full width of the outfall to ensure all water passes through this additional treatment measure.

Tertiary Treatment System/lagoons

In addition to the silt/settlement ponds, a tertiary treatment system will also be provided to absorb any fine particles that may not settle in the primary and secondary settlement ponds.

From the silt/settlement ponds, water will flow through lagoon-type sediment ponds which will be designed with a retention time of 10-days. These ponds; the design of which will be adapted to the characteristics of the project site but based on the principles of Altmuller & Dettmer (2006)[2] will be vegetated so as to perform the role of a 'plant filtration bed'.

Management of Runoff from Soil Deposition Areas

It is proposed that excavated overburden/spoil will be utilised for reinstatement of excavated areas etc. and for landscaping purposes. Excess material, or material which cannot be used for this purpose, will be stored, permanently, at 2 no. dedicated spoil deposition areas and in the 3 no. spent borrow pits (if developed).

Excavated soil from grid connection to be used as backfill and landscaping/reinstatement. Excavated spoil from grid on public road (as well as road surfacing) to be removed to licenced facility.

Both proposed spoil deposition areas and all borrow pits are located outside the 50m stream buffer zone.

During the initial placement of spoil in the deposition areas, silt fences, straw bales and biodegradable matting will be used to control surface water runoff. Drainage from overburden deposition areas will ultimately be routed to an oversized swale and a number of settlement ponds and a 'Siltbuster' with appropriate storage and settlement capacity, designed for a '1-in-100 year 6-hour return' period, before being discharged to the on-site drains.

Spoil deposition areas will be sealed with a digger bucket and vegetated as soon possible to reduce sediment entrainment in runoff. Once re-vegetated and stabilised, spoil deposition areas will no longer be a likely source of silt laden runoff. Settlement ponds will be left in place until the areas have stabilised.

Grid Connection Installation Works

Temporary silt fencing/silt trap arrangements will be placed within existing roadside/field drainage features along the grid connection to remove any suspended sediments from the works area. The trapped sediment will be removed and disposed at an appropriate licenced facility. The bare ground re-seeded/reinstated immediately and silt fencing temporally left in place if necessary.

The following mitigation will be carried out during grid directional drilling works:

- The works area will be clearly marked out with fencing or flagging tape to avoid unnecessary disturbance of vegetation;
- A minimum 10m buffer zone will be maintained between disturbed areas and the watercourse bank. There will be no storage of material/equipment, excavated material (see below) or overnight parking of machinery inside the 10m buffer zone;
- Double silt fencing will be placed upslope of the buffer zone on each side of the watercourse.
- Temporary storage of excavated material will be undertaken outside of the 10m buffer on flat ground or within a local hollow area. A containment berm will be placed downslope of the excavated material which in turn will be surrounded by secondary silt fence protection to prevent saturated soil from flowing back into the watercourse;

[2] *Altmüller R. & Dettmer, R. (2006)* Successful species protection measures for the Freshwater Pearl Mussel (Margaritifera margaritifera) through the reduction of unnaturally high loading of silt and sand in running waters – Experiences within the scope of the Lutterproject.

- Operation of machinery and use of equipment within the 10m buffer will be kept to a minimum to avoid any unnecessary disturbance;
- There will be no refuelling allowed within 100m of the watercourse crossing;
- All plant will be checked for purpose of use prior to mobilisation at the watercourse crossing; and
- Works shall not take place during periods of heavy rainfall and will be scaled back or suspended if heavy rain is forecasted.

Mitigation Measures relating to the use of a mixture of a natural, inert and fully biodegradable drilling fluid such as Clear Bore™ and water for directional drilling include:

- The area around the Clear Bore™ batching, pumping and recycling plants will be bunded using terram and sandbags in order to contain any spillages;
- One or more lines of silt fences will be placed between the works area and adjacent rivers and streams on both banks;
- Accidental spillage of fluids will be cleaned up immediately and transported off site for disposal at a licensed facility; and,
- Adequately sized skips will be used for temporary storage of drilling arisings during directional drilling works. This will ensure containment of drilling arisings and drilling flush.

Pre-emptive Site Drainage Management

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

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

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

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

Works will be suspended if forecasting suggests either of the following is likely to occur:-
- >10 mm/hr (i.e. high intensity local rainfall events);
- >25 mm in a 24-hour period (heavy frontal rainfall lasting most of the day); or,
- >half monthly average rainfall in any 7 days.

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

- Secure all open 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.

Timing of Site Construction Works

The construction of the site drainage system will be carried out, at the respective location, prior to other activities being commenced. The construction of the 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 functional for all subsequent construction works.

Monitoring

Prior to the commencement of development, a detailed Site Drainage Plan and Surface Water Management Plan (SWMP) will be prepared to detail the siting and composition of the surface water management measures. The respective plans, which will form part of the detailed Construction Environmental Management Plan (CEMP), will be agreed in writing with the Planning Authority.

The SWMP will also include a programme for the monitoring of surface waters in the vicinity of the construction site by a designated Environmental Manager. The monitoring programme will comprise field testing and laboratory analysis of a range of agreed parameters. The civil works contractor, who will be responsible for the construction of the site drainage system, and Environmental Manager will undertake regular inspections of the drainage system to ensure that all measures are functioning effectively. 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 that may decrease the effectiveness of the drainage feature, will be removed and disposed of in an appropriate manner.

Each element of the wind farm development (*i.e.,* access roads, turbines, borrow pit and clear felling) will have an array of drainage control measures to ensure protection of downstream watercourses. Each drainage control element is not stand alone but occurs as part of a treatment train of control systems (i.e., check dams, silt traps, settlement ponds etc).

4.3.1.3 Mitigation Measures to Protect Groundwater Quality

The potential pollution of groundwater 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:

- The volume of fuels or oils stored on site will be minimised. All fuel and oil will be stored in an appropriately bunded area within the temporary construction compound. Only an appropriate volume of fuel will be stored at any given time. The bunded area will be roofed to avoid the ingress of rainfall and will be fitted with a storm drainage system and an appropriate oil interceptor;
- All bunded areas will have 110% capacity of the volume to be stored;
- 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 will be re-filled at the temporary compound and will be towed around the site by a 4x4 jeep to where plant and machinery is located. No refuelling will be permitted at works locations within the 50m hydrological buffer. The 4x4 jeep will also be fully stocked with 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 to avoid any accidental leakages;
- All plant and machinery used during construction will be regularly inspected for leaks and fitness for purpose;
- Spill kits will be readily available to deal with and accidental spillage in;
- All waste tar material arising from road cuttings (from trenching or other works in public roads) will be removed off-site and taken to a licensed waste facility. Due to the potential for contamination of soils and subsoils, it is not proposed to utilise this material for any reinstatement works; and
- An outline emergency plan for the construction phase to deal with accidental spillages is contained within the Outline Construction and Environmental Management Plan. This emergency plan will be further developed prior to the commencement of development, and will be agreed with the Planning Authority as part of the detailed CEMP.

Wastewater:

Measures to avoid contamination of ground and surface waters by wastewaters will comprise:-

- The provision of self-contained port-a-loos (chemical toilets) with an integrated waste holding tank will be installed at the site compound, 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 to be discharged at a suitable off-site treatment location; and,
- No water will be sourced on the site, nor will any wastewater be discharged to the site.

Best practice methods for cement-based compounds:

- No batching of wet-cement products will occur on site. Ready-mixed concrete will be brought to site as required and, where possible, emplacement of pre-cast products, will take utilised;
- All watercourse crossings will utilise pre-cast products and the use of wet-cement products within the hydrological buffer will be avoided insofar as possible;
- Where concrete is delivered on site, only the chute will be cleaned, using the smallest volume of water practicable. Chute cleaning will be undertaken at lined cement washout ponds with waters being tankered and stored in the temporary construction compound, removed off site and disposed of at an approved licensed facility. No discharge of cement contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed;
- Weather forecasting will be used to ensure that prolonged or intense rainfall is not predicted during concrete pouring activities; and,
- The pour site will be kept free of standing water and plastic covers will be ready in case of sudden rainfall event.

4.3.2 Operational Phase

4.3.2.1 Increased Site Runoff and Hydromorphology Effects

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

- Interceptor drains will be installed up-gradient of all infrastructure to collect clean surface runoff, in order to minimise the amount of runoff reaching areas where suspended sediment could become entrained. It will then be directed to areas where it can be re-distributed over the ground by means of a level spreader;

- Swales/road side drains will be used to collect runoff from access tracks, turbine hardstanding areas and substation compound areas which may contain entrained suspended sediment, and channel it to settlement ponds for sediment settling;
- Transverse drains ('grips') will be constructed, where appropriate, in the surface layer of access tracks to divert any runoff into swales/track side drains;
- Check dams will be used along sections of access tracks drains to intercept silts at source. Check dams will be constructed from a 40mm non-friable crushed rock or similar;
- Settlement ponds, emplaced downstream of track swale sections, turbine locations and the selected substation option, will buffer volumes of runoff discharging from the drainage system during periods of high rainfall, by retaining water until the storm hydrograph has receded, thus reducing the hydraulic loading to watercourses; and,
- Settlement ponds will be designed in accordance the greenfield runoff rate requirements; and,
- Imported rock for construction purposes and road surfacing will be strong, well-graded limestone which will be resistant to erosion and have a low likelihood to generate fines in hardstand runoff.

The operation of the underground grid connection will not result in any likely hydrological or water quality effects and therefore do not require mitigation measures.

4.3.2.2 Mitigation Measures to Protect Surface Water Quality

The mitigation measures to protect against poor quality runoff during the operational phase of the proposed project are the same as those outlines in **Section 4.3.1** above.

Mitigation measures for oils and fuels during the operational phase of the proposed project are the same as those outlines in **Section 4.3.1.3** above.

4.3.2.3 Mitigation Measures to Protect Groundwater Quality

It is proposed to manage wastewater from the staff welfare facilities in the control buildings by means of a sealed storage tank, with all wastewater being tankered off site by permitted waste collector to wastewater treatment plants.

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.

As in the construction phase, temporary surface runoff control measures will again be put in place during decommissioning works. The drainage system will remain operational during the decommissioning phase and will serve to treat any sediment laden surface water run-off due to a renewed disturbance of soils. Following decommissioning, re-vegetation will be implemented as soon as practicable and monitored to ensure vegetation is established.

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

Other impacts such as possible soil compaction and contamination by fuel leaks will remain but will be of reduced magnitude than the construction phase because of the smaller scale of the works and reduced volumes on-site. Similar mitigation as outlined in **Sections 4.3.1.1** and **4.3.1.3** for the construction stage will be implemented during the decommissioning phase to ensure no impacts of receiving waters.

Some of the potential impacts of water bodies will be avoided by leaving elements of the proposed project in place where appropriate. The turbine bases will be rehabilitated by covering with local topsoil/peat in order to regenerate vegetation which will reduce runoff and sedimentation effects. Mitigation measures to avoid contamination by accidental fuel leakage and compaction of soil by on-site plant will be implemented as per the construction phase mitigation measures.

With the implementation of the mitigation measures outlined above no significant effects on the hydrological and hydrogeological environment will occur during the decommissioning stage of the 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 M** below.

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

SWB	WFD Code	Current Status	Assessed Status - Unmitigated	Assessed Status with Mitigation Measures
Nore Catchment				
Dinin (South)_020	IE_SE_15D0800600	Good	Moderate	Good
Dinin (Main Channel)_010	IE_SE_15D020700	Moderate	Poor	Moderate
Dinin (Main Channel)_020	IE_SE_15D020800	Moderate	Poor	Moderate
Brownstown (Pococke)_010	IE_SE_15B041100	Poor	Poor (Potential deterioration in water quality)	Poor
Kilderry_010	IE_SE_15K540650	Good	Good (Potential deterioration in water quality)	Good
Nore_190	IE_SE_15N012090	Moderate	Poor	Moderate
Barrow Catchment				
Monefelim_010	IE_SE_14M030100	Good	Moderate	Good
Monefelim_020	IE_SE_14M030600	Good	Good	Good
Monefelim_030	IE_SE_14M031000	Moderate	Moderate	Moderate
Gowran_010	IE_SE_14G030100	Moderate	Moderate (potential deterioration in water quality)	Moderate
Groundwater Bodies				
Castlecomer	IE_SE_G_034	Good	Moderate	Good
Shanragh	IE_SE_G_124	Good	Moderate	Good
Ballingarry	IE_SE_G_009	Good	Moderate	Good

Kilkenny	IE_SE_G_078	Good	Moderate	Good
Clifden	IE_SE_G_038	Good	Moderate	Good
Newtown	IE_SE_G_104	Good	Moderate	Good

5. SUMMARY AND CONCLUSION

5.1 SUMMARY

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

The project does not involve any 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, operational and decommissioning phases of the project.

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

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

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

In the event where the current status of the waterbody is 'Moderate' (Dinin (Main Channel) river segments) or 'Poor' (Brownstown (Pococke)_010 river segment) the project will not prevent them from achieving 'Good' status in the future.

As such, the project will not impact upon any surface water or groundwater body as it will not cause a deterioration of the status of the body and/or it will not jeopardise the attainment of good status.

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