APPENDIX 9-4

WFD COMPLIANCE ASSESSMENT

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WATER FRAMEWORK DIRECTIVE ASSESSMENT
SESKIN WIND FARM, CO. CARLOW

FINAL REPORT

Prepared for:

MKO

Prepared by:

HYDRO-ENVIRONMENTAL SERVICES

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1. INTRODUCTION

1.1 BACKGROUND

Hydro-Environmental Services (HES) were requested by MKO Ireland (MKO) on behalf of EDF Renewables Ireland (the Client) to complete a Water Framework Directive (WFD) Compliance Assessment for a planning application for the Proposed Project.

The purpose of this WFD assessment is to determine if 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 Assessment is intended to supplement the EIAR submitted as part of the Seskin Wind Farm planning application. The Proposed Project is described in full in Chapter 4 of the EIAR. For the purposes of this WFD Assessment, and consistent with the EIAR, the various components are described and assessed using the following references: 'Proposed Project', 'Proposed Wind Farm', 'Proposed Grid Connection Route' and the 'site'.

1.2 STATEMENT OF AUTHORITY

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 their office is located in Dungarvan, County Waterford. HES 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 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.

Conor McGettigan (BSc, MSc) is an Environmental Scientist with over 3 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 routinely competes WFD Assessments for a wide variety of projects including wind farms, quarries and proposed residential developments.

Jenny Law (BSc, MSc) is an environmental geoscientist holding a first honours degree in applied environmental geosciences from the University College Cork. Jenny has assisted in the preparation of the land, soils and geology and hydrology chapters for various environmental impact assessment reports, hydrological impact assessments, Water Framework Directive Assessment reports and Flood Risk Assessment reports for a variety of projects including wind farm developments and strategic housing 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 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. 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 RBMP (2018 - 2021) objectives, which have been integrated into the design of the Proposed 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.

Furthermore, the Department of Housing, Local Government and Heritage are currently reviewing the submissions made on the Draft 3rd Cycle River Basin Management Plan (2022 - 2027) which was out for public consultation in Q4 of 2021 and Q1 of 2022. As of April 2024, the plan has not been published while the draft plan is available to view at https://www.gov.ie/en/consultation/2bda0-public-consultation-on-the-draft-river-basin-management-plan-for-ireland-2022-2027/.

HES's 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.

2. WATERBODY IDENTIFICATION 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 Wind Farm site is located in 2 no. surface water catchments. The vast majority of the Proposed Wind Farm site, including all proposed infrastructure is located in the River Nore surface water catchment within Hydrometric Area No. 15 of the South Eastern River Basin District. Small areas in the northeast of the Proposed Wind Farm site, which do not include any proposed infrastructure, are mapped within the River Barrow surface water catchment within Hydrometric Area No. 14 of the South Eastern River Basin District.

On a more local scale, the majority of the Proposed Wind Farm site is located within the Dinin (South)_SC_010 WFD sub-catchment and the Dinin (South)_020 WFD river sub-basin. Within this sub-basin a headwater stream, locally named the Seskinrea stream, drains from the north of the Proposed Wind Farm site, and two other unnamed streams drain the southern section. These streams confluence with the Coolcullen River which flows to the north ~1km west of the Proposed Wind Farm site. All watercourses draining the Proposed Wind Farm site form part of the Dinin (South)_020 SWB. This watercourse discharges into the Dinin River ~1.8km northwest of the Proposed Wind Farm site. The Dinin (South)_020 SWB flows to the west before it veers to the southwest ~10km west of the Proposed Wind Farm site. From this location the Dinin River forms part of the Dinin (Main Channel)_010 SWB. The Dinin River flows southwards before the Dinin (Main Channel)_020 SWB discharges into the River Nore (Nore_160 SWB) ~17km to the southwest.

The small northeastern section of the Proposed Wind Farm site that lies within the Barrow WFD catchment, is mapped within the Barrow_SC_110 WFD sub-catchment and the Rathornan_010 river sub-basin. As mentioned above, there is no infrastructure proposed within this area of the Proposed Wind Farm site and no EPA mapped watercourses associated with the Rathornan_010 SWB, encroach upon the Proposed Wind Farm site boundary.

With regards to the Turbine Delivery Route (TDR), junction accommodation works are proposed at the junction between the N78 and the L1834. This work location is mapped in the Dinin(North)_030 and Dinin(North)_020 WFD river sub-basins. Meanwhile, works are also proposed at the Black Bridge. These works are located on the boundary between the Dinin (South)_010 river sub-basin (upstream) and the Dinin (South)_020 river sub-basin downstream. Black Bridge is an existing crossing over the Dinin River, located ~500m upstream of the confluence of the Dinin and Coolcullen rivers.

Table A presents the catchment area of each waterbody downstream of the Proposed Wind Farm site as far as the Nore and Barrow Rivers. The catchment area for the waterbodies increases progressively downstream as more tributaries discharge into the Dinin, Nore and Barrow Rivers. For example, the Nore_160 and the Barrow_180 river waterbodies downstream of the Dinin (Main Channel)_020 and Rathornan_010 river waterbodies respectively, have catchment area's in excess of 1,500km^2. Therefore, those waterbodies which are located in close proximity to the Proposed Wind Farm site are more susceptible to water quality impacts as a result of activities associated with the Proposed Project. The potential for the Proposed Project to impact a waterbody decreases further downstream due to the increasing catchment area to the surface waterbody and resulting increase in flow volumes.

Table A: Catchment Area Downstream of the Proposed Wind Farm Site

WFD River Sub-Basin	Total Upstream Catchment Area (km²)
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	~1,558
Barrow sub-catchment (Barrow_SC_110)	
Rathornan_010	13.539643385
Barrow_180	~2,373

The Proposed Grid Connection Route runs from the proposed onsite 38kV substation to the existing Kilkenny 110kV substation. The Proposed Grid Connection Route begins along the L30372, travelling to the west. The Proposed Grid Connection Route then travels to the southwest along the L30371 as far as Ballysallagh, Co. Kilkenny. The Proposed Grid Connection Route continues southwards along the L2627 before joining the R712 and continuing for ~1.8km along this regional road before terminating at Kilkenny 110kV substation.

The Proposed Grid Connection Route is predominantly located in the River Nore surface water catchment. Within this catchment there are a total of 10 no. watercourse crossings, comprising 7 no. bridge crossings and 3 no. culvert crossings.

A small section of the Proposed Grid Connection Route along the L30371 is also mapped in the River Barrow surface water catchment. However, there are no mapped watercourses in close proximity to this section of the Proposed Grid Connection Route.

The Proposed Grid Connection Route passes through a total of 6 no. WFD river sub-basins comprising the Dinin (South)_020, Monefelim_010, Gowran_010, Brownstown (Pococke)_010, Kilderry_010 and Nore_190 WFD river sub-basins. The total upstream catchment area for the waterbodies along the Proposed Grid Connection Route are detailed in **Table B**.

Figure A below is a hydrology map which identifies all SWBs downstream of the Proposed Project.

Table B: Catchment Area Downstream of Proposed Grid Connection Route

WFD River Sub-Basin	Total Upstream 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	~1,744
Barrow sub-catchment (Barrow_SC_120)	
Monefelim_010	9.95124995
Gowran_010	30.58254991

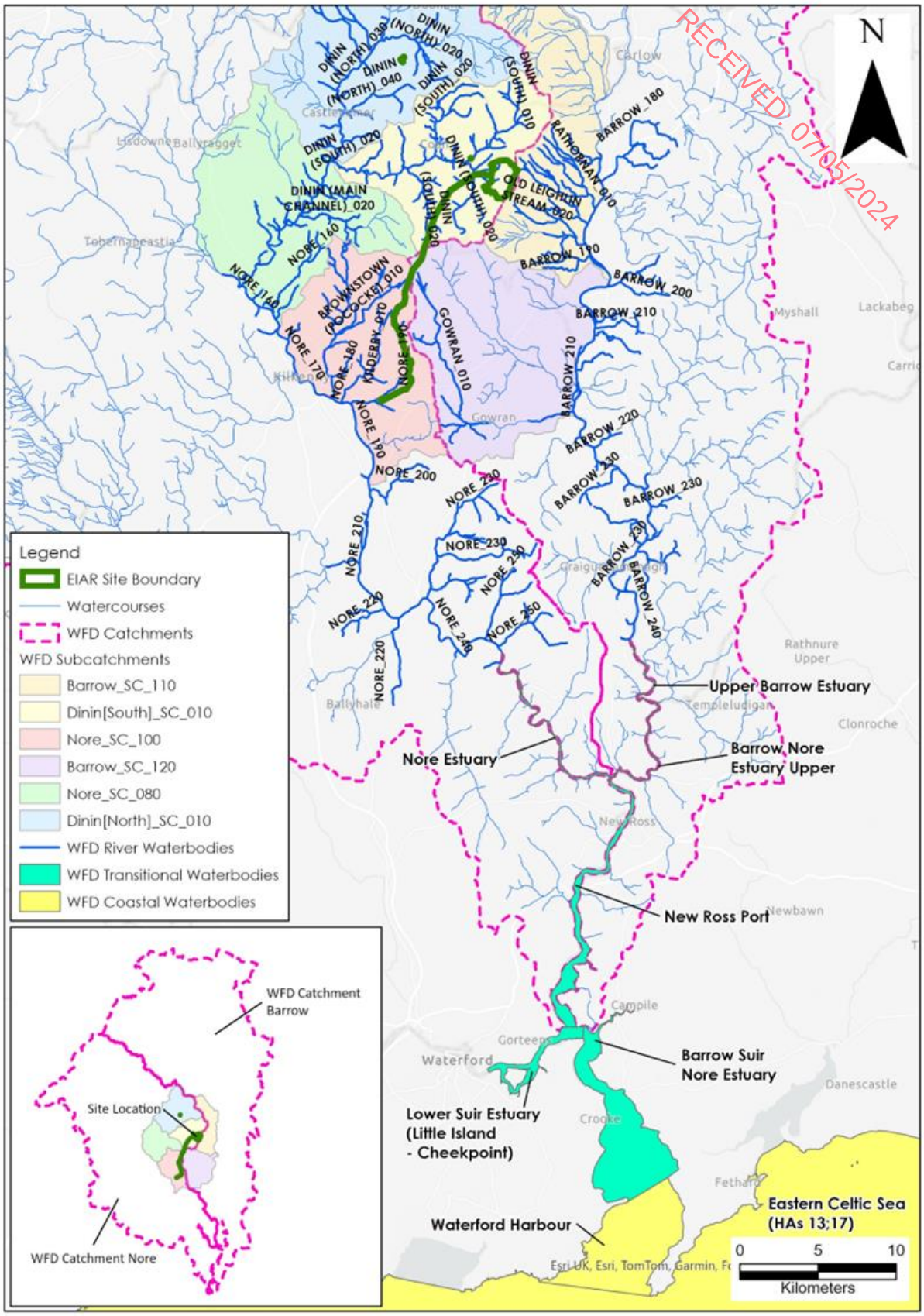

Figure A: Local Hydrology Map

2.3 SURFACE WATER BODY CLASSIFICATION

A summary of the WFD status and risk result for 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 Proposed 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 Proposed Wind Farm site ranges from "Good" (Dinin (South)_020) to "Moderate" (Dinin (Main Channel)_010 and _020). The Dinin (Main Channel)_020 feeds into the Nore_160 river segment which achieved "Good" status in the latest WFD cycle (2016-2021).

Further downstream, the latest WFD status of the Nore River ranges from "Good" (Nore_170, Nore_180, Nore_200, Nore_210, Nore_220, Nore_240 and Nore_250) to "Moderate" (Nore_190 and Nore_230).

The Dinin (South)_020, in the vicinity of the Proposed Wind Farm site is classified as "not at risk" of failing to meet its future WFD objectives. Both the Dinin (Main Channel)_010 and Dinin (Main Channel) _020 are "at risk" of not meeting their WFD objectives. Significant pressures on the Dinin (Main Channel)_010 SWB include agricultural activities and domestic wastewater. Abstraction for public water supply was identified as a significant pressure in Dinin (Main Channel)_020 from Kilkenny City (Radestown) PWS, whilst agriculture and activities from mines and quarries are also noted as significant pressures on this river waterbody.

The Nore_160, Nore_170 and Nore_180 river waterbodies, located downstream of the Dinin River, are all deemed to be "not at risk". Further downstream, the risk status of the Nore_190, Nore_200, Nore_210, Nore_220 and Nore_240 river waterbodies are all currently "under review". The Nore_230 is deemed to be "at risk" of failing to meet its WFD objectives. Urban run-off is listed as a significant pressure on this SWB. The very lower reaches of the Nore River, the Nore_250 SWB, is listed as being "not at risk".

Within the Barrow River catchment, the Rathornan_010 river waterbody achieved "Good" status in the latest WFD cycle. With regards to the 3rd Cycle River waterbody risk classification the Rathornan_010 river is currently "under review".

Further downstream the Barrow River ranged from "Poor" (Barrow_210 and Barrow_230) to "Moderate" (Barrow_180, Barrow_190, Barrow_200, Barrow_220 and Barrow_240). The majority of Barrow River waterbodies downstream from the Proposed Wind Farm site are deemed to be "at risk" of failing to meet their WFD objectives. Meanwhile, the Barrow_200 is classified as being "not at risk" and the risk status of the Barrow_190 and Barrow_240 river waterbodies are currently "under review".

With regards the transitional waterbodies downstream of the Proposed Wind Farm site, the Nore Estuary and the Upper Barrow Estuary both achieved "Moderate" status. These transitional waterbodies come together to form the Barrow and Nore Estuary Upper transitional waterbody which also achieved "Moderate" status. Further downstream the New Ross Port, the Lower Suir Estuary (Little Island - Cheekpoint) and the Barrow Suir Nore Estuary transitional waterbodies all achieved "Moderate" status.

All of the downstream transitional waterbodies are classified as being "at risk" of failing to meet their WFD objectives. 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.

The Waterford Harbour and the Eastern Celtic Sea (Hydrometric Areas 13;17) coastal waterbodies downstream of the Proposed Wind Farm site achieved a "Moderate" and "High" 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".

With regards to the Proposed Grid Connection Route, the WFD status and risk result of the Dinin (South)_020 has been outlined above. Within the Barrow catchment, the Monelelim_010 SWB achieved a "High" status and is "not at risk", whilst the Gowran_010 SWB has a "Moderate" status and is deemed to be "at risk".

Within the Nore catchment, the Brownstown (Pococke)_010, the Kilderry_010 and the Nore_190 river waterbodies all have a "Moderate" WFD status. The Brownstown (Pococke)_010 is deemed to be "at risk", whereas the risk status for both the Kilderry_010 and the Nore_190 river waterbodies are "under review".

TDR works at the junction between the N78 and the L1834 are mapped in the Dinin(North)_030 and Dinin(North)_020 WFD river sub-basins. Both the Dinin(North)_030 and Dinin(North)_020 river waterbodies achieved "Moderate" Status. The Dinin(North)_020 is deemed to be "at risk", whilst the risk status for the Dinin(North)_030 is "under review".

TDR works at the Black Bridge are located on the boundary between the Dinin (South)_010 river sub-basin (upstream) and the Dinin (South)_020 river sub-basin downstream. The WFD status and risk result of the Dinin (South)_020 has been outlined above. The Dinin (South)_010 has achieved "Good" WFD status and is "not at risk".

The SWB status for the 2016-2021 WFD cycle are shown on **Figure B.**

Table C: Summary WFD Information for River Water Bodies

SWB	Overall Status 2010-2015	Overall Status 2013-2018	Overall Status 2016-2021	Risk Status 3rd Cycle	Pressures
	Nore River Catchment				
Dinin (South)_020	Moderate	Good	Good	Not at risk	None
Dinin (Main Channel)_010	Good	Moderate	Moderate	At risk	Agriculture & domestic wastewater
Dinin (Main Channel)_020	Moderate	Moderate	Moderate	At risk	Agriculture, mines and quarries & other
Nore_160	Unassigned	Good	Good	Not at risk	None
Nore_170	Good	Good	Good	Not at risk	None
Nore_180	Good	Good	Good	Not at risk	None
Nore_190	Unassigned	Moderate	Moderate	Under Review	None
Nore_200	Unassigned	Moderate	Good	Under Review	None
Nore_210	Moderate	Good	Good	Under Review	None
Nore_220	Good	Moderate	Good	Under Review	None
Nore_230	Good	Moderate	Moderate	At risk	Urban run-off
Nore_240	Good	Moderate	Good	Under Review	None
Nore_250	Good	Good	Good	Not at risk	None
Nore Estuary	Moderate	Good	Moderate	At risk	Agriculture
	Barrow River Catchment				
Rathornan_010	Unassigned	Moderate	Good	Under Review	None
Barrow_180	Moderate	Moderate	Moderate	At risk	Agriculture & urban run-off
Barrow_190	Unassigned	Unassigned	Moderate	Under Review	None
Barrow_200	Good	Good	Moderate	Not at risk	None
Barrow_210	Poor	Poor	Poor	At risk	Hydromorphology, industry & urban run-off
Barrow_220	Moderate	Moderate	Moderate	At risk	Agriculture
Barrow_230	Poor	Poor	Poor	At risk	Hydromorphology

Barrow_240	Unassigned	Moderate	Moderate	Under Review	None
Upper Barrow Estuary	Good	Good	Moderate	At risk	None
Barrow Nore Estuary Upper	Good	Moderate	Moderate	At risk	Agriculture & urban run-off
New Ross Port	Moderate	Moderate	Moderate	At risk	Agriculture
Lower Suir Estuary (Little Island - Cheekpoint)	Moderate	Good	Moderate	At risk	Agriculture
Barrow Suir Nore Estuary	Good	Moderate	Moderate	At risk	Agriculture
Waterford Harbour	Good	Moderate	Moderate	At risk	None
Eastern Celtic Sea (HAs 13;17)	Unassigned	Good	High	Not at risk	None
Proposed Grid Connection Route					
Monefelim_010	Good	Good	High	Not at risk	None
Gowran_010	Moderate	Moderate	Moderate	At risk	Agriculture
Brownstown (Pococke)_010	Poor	Poor	Moderate	At risk	Urban runoff
Kilderry_010	Unassigned	Good	Moderate	Under Review	None
TDR					
Dinin(North)_020	Good	Good	Moderate	At risk	None
Dinin(North)_030	Unassigned	Moderate	Moderate	Under Review	None
Dinin (South)_010	Good	Moderate	Good	Not at risk	None

2.4 GROUNDWATER BODY IDENTIFICATION

The Namurian Shales that are mapped to underlie the eastern side of the Proposed Wind Farm site are classified by the GSI (www.gsi.ie) as a Poor Aquifer (Pl), bedrock which is generally unproductive except for local zones. The Westphalian Shales that occupy the centre of the Proposed Wind Farm site are also classified as a Poor Aquifer (Pu) by the GSI and described as bedrock which is generally unproductive. The western area of the Proposed Wind Farm site is underlain by Westphalian Sandstones which have been classified by the GSI as a Locally Important Aquifer (Lm) and has bedrock which is generally moderately productive.

In terms of Groundwater Bodies (GWBs), the eastern section of the Proposed Wind Farm site is underlain by the Shanragh GWB (IE_SE_G_124). The western section is underlain by the Castlecomer GWB (IE_SE_G_034).

The Proposed Grid Connection Route is underlain by a total of 5 no. GWBs. The northern section, in the vicinity of the Proposed Wind Farm site, is underlain by the Castlecomer GWB. Further south, ~600m of the L30371 is underlain by the Shanragh GWB. The southern section of the L30371 and some of the L2627 are underlain by the Ballingarry GWB (IE_SE_G_009), which is characterised by poorly productive bedrock. Approximately 3.3km of the L2627 and R17 are underlain by the Kilkenny GWB (IE_SE_G_078), which is characterised by a karstic flow regime. The Kilkenny 110kV substation is underlain by the Clifden GWB (IE_SE_G_038), characterised by poorly productive bedrock.

The proposed temporary junction accommodation works at the N78 and the L1834 junction is underlain by the Newtown GWB (IE_SE_G_104). The GWB underlying the Black Bridge is the Castlecomer GWB.

The GWB status for the 2016-2021 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. Summary WFD information for GWBs underlying the Proposed Project is presented in **Table D**.

The Castlecomer GWB (IE_SE_G_034) underlies the western section of the Proposed Wind Farm site, the northern portion of the Proposed Grid Connection Route and the TDR works at Black Bridge. This GWB has been assigned 'Good' status and it has been deemed to be 'Not at Risk'.

The Shanragh GWB (IE_SE_G_124) underlies the eastern portion of the Proposed Wind Farm site and some of the Proposed Grid Connection Route and is also of 'Good' status. The risk status, however, is currently "under review".

Underlying the Proposed Grid Connection Route, the Ballingarry GWB, the Clifden GWB and the Kilkenny GWB all achieved "Good" status. Both the Ballingarry GWB and the Clifden GWB are "not at risk" whilst the Kilkenny GWB is deemed to be "at risk". Agriculture is listed as a significant pressure on the Kilkenny GWB.

The Newtown GWB that underlies junction accommodation works along the TDR has achieved "Good" status and is "not at risk".

Table D: Summary WFD Information for Groundwater Bodies

GWB	Overall Status 2010-2015	Overall Status 2013-2018	Overall Status 2016-2021	Risk Status 3rd Cycle	Pressures
Castlecomer	Good	Good	Good	Not at risk	None
Shanragh	Good	Good	Good	Under Review	None
Ballingarry	Good	Good	Good	Not at risk	None
Kilkenny	Good	Good	Good	At risk	Agriculture
Clifden	Good	Good	Good	Not at risk	None
Newtown	Good	Good	Good	Not at risk	None

2.6 PROTECTED AREA IDENTIFICATION

The WFD requires that activities are also in compliance with other relevant legislation, as considered below. Nature conservation designations, bathing waters, nutrient Sensitive areas (NSA), shellfish areas and drinking water protected area's (DWPA) are looked at as part of the assessment.

2.6.1 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 (cSAC) 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.

The Proposed Wind Farm site is not located within any designated conservation site, however there are downstream hydrological connections with some of the Natura 2000 sites in the region as described below:

- The River Barrow and River Nore SAC (002162) is located ~1km west of the Proposed Wind Farm site and is hydrologically connected via the Seskinrea Stream. This SAC consists of the freshwater stretches of the Barrow and River Nore catchment as far upstream as the Slieve Bloom Mountains and it also includes the tidal elements and estuary.
- The River Barrow and River Nore SPA (Site Code: 004233) is located ~16.5km (straight line distance) southwest of the Proposed Wind Farm site and is hydrologically connected via the Seskinrea Stream and the Dinin River. The length of the hydrological pathway between the Proposed Wind Farm site and this SPA is ~26.5km.

Other designated sites within close proximity to the Proposed Wind Farm site include:

- Coans Bog NHA (Site Code: 002382) situated ~3km to the northwest.
- Mothel Church pNHA (Site Code: 000408) is located ~3.3km to the west
- Cloghristick Wood pNHA (Site Code: 002162) is located ~5.5km to the east.
- Whitehall Quarries (Site Code: 000855) are located ~5km south of the Wind Farm Site.

All watercourse draining the Proposed Grid Connection Route drain to the River Barrow and River Nore SAC and the River Nore SPA. Meanwhile, the TDR works area at the Black Bridge are located immediately upstream of the SAC.

2.6.2 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 in or directly adjacent to either the Nore or Barrow River catchments identified under the Bathing Water Regulations 2008.

2.6.3 Nutrient Sensitive Areas

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

Within the Nore catchment, there are 4 no. NSAs downstream of two urban wastewater agglomerations, downstream of the Proposed Wind Farm site. These are the Nore River (180 - 250) NSA and the Nore Estuary NSA downstream of the Kilkenny City Agglomeration, and the Barrow Nore Estuary NSA and New Ross Port NSA downstream of the New Ross Agglomeration.

Within the Barrow catchment, there are 3 no. NSAs in the catchment that are downstream of the Proposed Wind Farm site. These NSA's include the Barrow River (160-180) NSA downstream of the Carlow urban wastewater agglomeration, and the Barrow River (190-240) NSA and the Upper Barrow Estuary NSA, both downstream of the Muinebheag and Leighlinbridge.

The EPA carried out a review of the NSAs downstream of large urban wastewater discharges in 2020. Once the regulations are in place, and NSAs have been identified, additional nutrient removal must be applied (if not already applied) to wastewater treatment plants discharging to the sensitive area. If this treatment was in place the objective was deemed to have been met. According to the 3rd Cycle Draft Catchment Report (2021, EPA) the NSA objectives are being met for the all the NSAs within the Barrow
and Nore catchments.

2.6.4 Shellfish Areas

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

Approximately 90km downstream from the Proposed Wind Farm site, is the Waterford Harbour (Cheekpoint/Arthurstown/Creadan)(IE_SE_100_0100) shellfish area.

The Marine Institute assessed the average dissolved concentrations for metals in shellfish waters for the period 2016-2019 and the microbial quality in shellfish flesh for 2018. This assessment was used to determine if the WFD protected area objective for shellfish areas was met. The WFD objectives for the Waterford Harbour
(Cheekpoint/Arthurstown/Creadan)(IE_SE_100_0100) shellfish area are being met.

2.6.5 Drinking Water Protected Areas

The 3rd Cycle Nore Catchment Report (EPA, 2021) states that there are 6 no. SWBs in the Nore Catchment which have been identified as Drinking Water Protected Areas (DWPAs). The closest downstream DWPA is the Dinin River (Dinin (Main Channel)_020 SWB) located ~11km (straight line distance) west of the Proposed Wind Farm site. Further downstream the River Nore (Nore_160 SWB) is also listed as a DWPA. In addition, the Dinin River (Dinin (North)_030 SWB) downstream of the junction accommodation works along the TDR is identified as a DWPA.

The 3rd Cycle Barrow Catchment Report (EPA, 2021) states that there are 6 no. SWBs in the Barrow Catchment which have been identified as DWPAs. However, none of these SWBs are located downstream of the Proposed Wind Farm site.

Meanwhile, all GWBs within the catchment are listed as DWPAs.

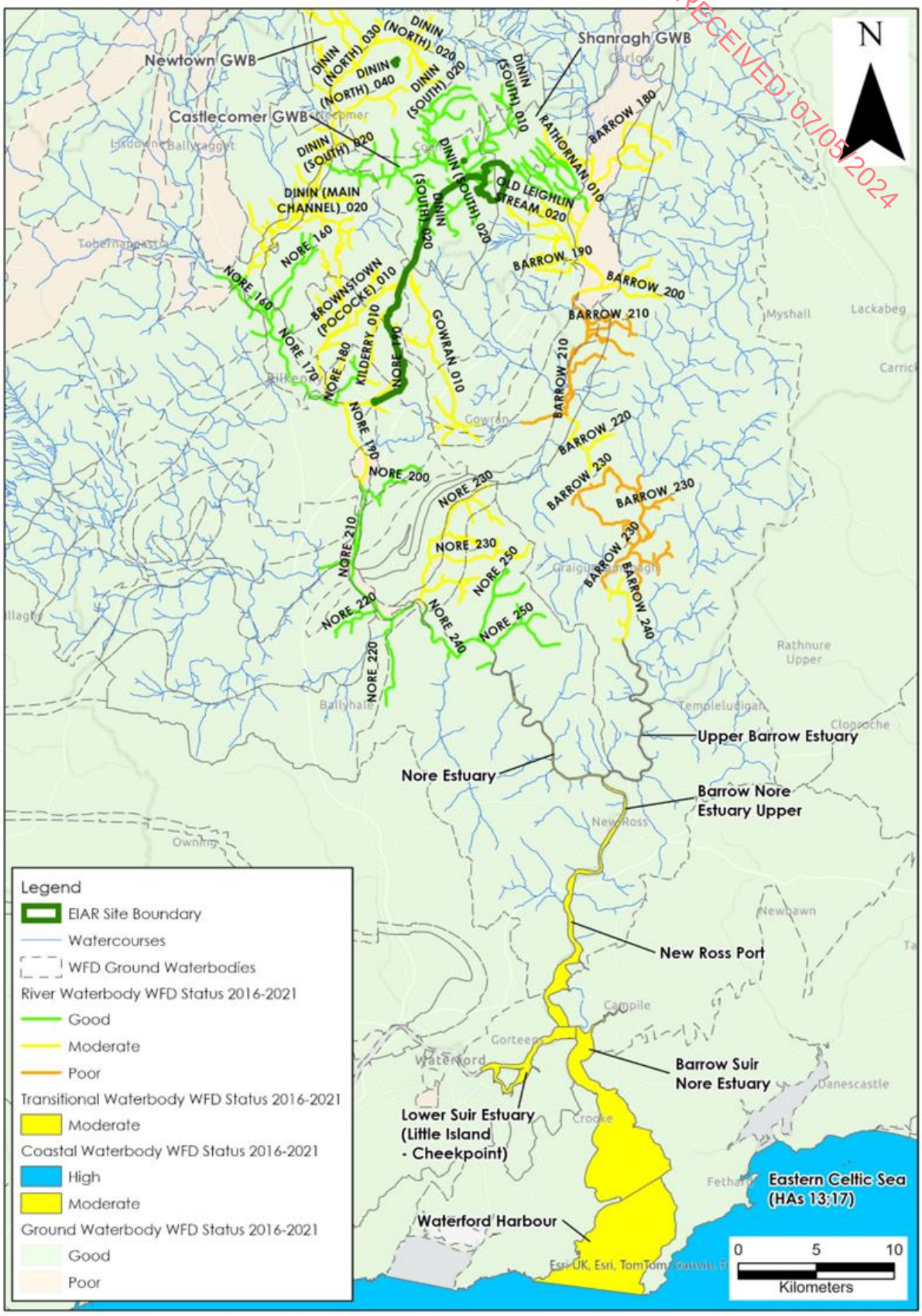

Figure B: WFD Groundwater and Surface Waterbody Status (2016-2021)

3. WFD SCREENING

As discussed in **Section 2**, there are a total of 36 no. surface waterbodies which are located in the vicinity and downstream of the Proposed Project site. These include 28 no. river waterbodies, 6 no. transitional waterbodies and 2 no. coastal waterbodies. In addition, 6 no. groundwater bodies underlie the Proposed Project. Furthermore, there are a number of protected areas in the vicinity and downstream of the Proposed Project.

3.1 SURFACE WATER BODIES

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

With consideration for the construction, operational and decommissioning phases of the Proposed Project, it is considered that all sections of the Dinin River (Dinin (South)_020, Dinin (Main Channel)_010 and Dinin (Main Channel)_020 SWBs) in the vicinity and downstream of the Proposed Wind Farm site are carried through into the WFD Compliance Assessment. These SWBs have been included for further assessment due to their proximal location to Proposed Project works. The proposed works within the Proposed Wind Farm site must not in any way result in a deterioration in the status of these river waterbodies 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 distant location (hydrological flow path of ~26.5km) from the Proposed Wind Farm 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 Proposed Project to impact a waterbody decreases further downstream due to the increasing catchment area to the surface waterbody and resulting increase in flow volumes.

The Rathornan_010 river waterbody has been screened out due to the absence of any proposed works or infrastructure in this river sub-basin. There are no drainage pathways between the Proposed Project works areas and this SWB. The proposed works have no potential to cause a deterioration in the status of these screened out SWBs and/or jeopardise their attainment of good surface water status.

The River Barrow has been screened out due to the lack of Proposed Project works in its catchment and the large flow volumes in this regional river waterbody. The Proposed Project 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.

Along the Proposed Grid Connection Route, the Dinin (South)_020, Monefelim_010, Gowran_010, Brownstown (Pococke)_010, Kilderry_010 and Nore_190 river waterbodies have been carried through into the WFD Compliance Assessment. These SWBs have been screened in due to their close proximity to the Proposed Grid Connection Route and the occurrence of proposed works within their catchments and within close proximity to mapped watercourses. The Proposed Project must not in any way result in a deterioration in the status of these river waterbodies and/or prevent them from meeting the biological and chemical characteristics for 'Good' status in the future.

TDR junction accommodation works are proposed within the Dinin(North)_030 and Dinin(North)_020 WFD river sub-basins, therefore both the Dinin(North)_030 and Dinin(North)_020 river waterbodies have been screened into the WFD Compliance Assessment. Further TDR works are located at the Black Bridge, within the Dinin (South)_010 river sub-basin (upstream) and the Dinin (South)_020 river sub-basin downstream. The Proposed Project works only have the potential to cause a deterioration in the status of the Dinin (South)_020 river waterbody as this is immediately downstream of the proposed works at

the Black Bridge. Therefore, the Dinin (South)_010 has been screened out of the WFD Compliance Assessment.

The Nore Estuary, Upper Barrow Estuary, New Ross Port, Lower Suir Estuary (Little Island - Cheekpoint) and the Barrow Suir Nore Estuary transitional waterbodies have been screened out due to the large volumes of water within these transitional waterbodies and the saline nature of these waters. The Proposed Project has no potential to cause a deterioration in status of these coastal waterbodies and/or jeopardise the attainment of good surface water status in the future.

The Waterford Harbour and Eastern Celtic Sea (HAs 13;17) coastal waterbodies have also been screened out due to the large volumes of water within these coastal waterbodies and the saline nature of these waters. The Proposed Project has no potential to cause a deterioration in status of these coastal waterbodies and/or jeopardise the attainment of good surface water status in the future.

3.2 GROUNDWATER BODIES

With respect to GWBs, the Castlecomer and Shanragh GWBs are carried through to the WFD Compliance Assessment due to their location directly underlying the Proposed Wind Farm site.

The Kilkenny, Newtown, Clifden and Ballingarry GWBs will also be brought through to the WFD Compliance Assessment as they are underlying the Proposed Grid Connection Route and TDR works.

3.3 PROTECTED AREAS

The River Barrow and River Nore SAC and the River Barrow and River Nore SPA are hydrologically connected to the Proposed Project site. The surface water connections from the site could transfer poor quality surface water that may affect the conservation objectives of these designated sites. The River Barrow and River Nore SAC is more susceptible to potential effects given its close proximity to the Proposed Wind Farm site (hydrological flow path of ~1.2km). The mapped extent of the River Barrow and River Nore SPA lies within the main channel of the River Nore, the potential for effects on the SPA are limited given the 26.5km hydrological pathway between the Proposed Wind Farm site and the SPA.

As outlined in **Table A** the catchment area for the River Nore immediately downstream of the Dinin River increases dramatically. The potential for the Proposed Wind Farm to impact a waterbody decreases further downstream due to the increasing catchment area to the surface waterbody and resulting increase in flow volumes. Therefore, the River Nore SPA has little potential to be impacted by the works at the Proposed Wind Farm site. Meanwhile, works along the Proposed Grid Connection Route are located only ~2km upstream of the River Nore SPA. Therefore, the River Nore SPA will be included in the WFD Compliance Assessment due to the potential effects associated with works along the Proposed Grid Connection Route.

All other downstream designated sites have been screened out of the assessment due to their distant location from the Proposed Project and the increasing volumes of water within these downstream waterbodies which will dilute any potential effects associated with the Proposed Project.

Furthermore, other nearby designated sites have been screened out of the impact assessment due to the lack of hydrological and hydrogeological connectivity.

The NSA's downstream of the Proposed Project have been screened out of the compliance assessment due to their location within either of the Nore and Borrow Rivers and transitional waterbodies. The NSA's distant location from the Proposed Project and the large volumes of

water within these rivers and estuaries means that the proposed works have no potential to cause a deterioration in the status of these NSA's.

The Waterford Harbour (Cheekpoint/Arthurstown/Creadan)(IE_SE_100_0100) shellfish area has been screened out due to its significant downstream distance from the site. The Proposed Project works have no potential to cause a deterioration in the status of this shellfish protected area.

As stated above in **Section 2.6.5**, there are 3 no. surface water abstractions mapped downstream of the Proposed Project. Both the Dinin (Main Channel)_020 and Dinin (North)_030 DWPA's have been screened in to the assessment due to their location in the vicinity and downstream of the Proposed Wind Farm site and TDR works respectively.

The Nore_160 DWPA however has been screened out due to its distant location (>10km) from the Proposed Project. 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 Proposed Project to impact a waterbody decreases further downstream due to the increasing catchment area to the surface waterbody and resulting increase in flow volumes.

3.4 WFD SCREENING SUMMARY

A summary of WFD Screening for SWBs and GWBs discussed above is shown in **Table E** below.

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 (South)_020	**Yes**	The Proposed Wind Farm site, including all 7 no. turbines, the northern section of the Proposed Grid Connection Route and TDR works at the Black Bridge are mapped within the Dinin (South)_020 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 Proposed 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 Proposed 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	Brownstown (Pococke)_010	**Yes**	The Brownstown (Pococke)_010 SWB has been screened in due to the occurrence of Proposed Grid Connection Route within this river sub-basin. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
	River	Kilderry_010	**Yes**	The Kilderry_010 SWB has been screened in due to the occurrence of Proposed Grid Connection Route within the river sub-basin. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
	River	Dinin(North)_030	**Yes**	TDR junction accommodation works are proposed within the Dinin(North)_030 WFD river sub-basin. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
	River	Dinin(North)_020	**Yes**	TDR junction accommodation works are proposed within the Dinin(North)_020 WFD river sub-basin. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
	River	Dinin (South)_010	No	TDR works are located at the Black Bridge, within the Dinin (South)_010 river sub-basin (upstream). The proposed works only have the potential to cause a deterioration in the status of the Dinin (South)_020 river waterbody as this is immediately downstream of the proposed works at Black Bridge. Therefore, the Dinin (South)_010 has been screened out of the assessment.
	River	Nore_160	No	The Nore_160 SWB has been screened out due to its distant location from the Proposed Wind Farm site (~20km) and the increasing volumes of water within the Nore River. Therefore, the Proposed Project has no potential to effect the status of this SWB.
	River	Nore_170	No	The Nore_170 SWB has been screened out due to its distant location from the Proposed Project and the increasing volumes of water within the Nore River. Therefore, the Proposed Project has no potential to effect the status of this SWB.
	River	Nore_180	No	The Nore_180 SWB has been screened out due to its distant location from the Proposed Project and the increasing volumes of water within the Nore River. Therefore, the Proposed Project has no potential to effect the status of this SWB.

	River	Nore_190	**Yes**	The Nore_190 SWB has been screened in due to the occurrence of Proposed Grid Connection Route within this 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 distant location from the Proposed Project and the increasing volumes of water within the Nore River. Therefore, the Proposed Project has no potential to effect the status of this SWB.
	River	Nore_210	No	The Nore_210 SWB has been screened out due to its distant location from the Proposed Project and the increasing volumes of water within the Nore River. Therefore, the Proposed Project has no potential to effect the status of this SWB.
	River	Nore_220	No	The Nore_220 SWB has been screened out due to its distant location from the Proposed Project and the increasing volumes of water within the Nore River. Therefore, the Proposed Project has no potential to effect the status of this SWB.
	River	Nore_230	No	The Nore_230 SWB has been screened out due to its distant location from the Proposed Project and the increasing volumes of water within the Nore River. Therefore, the Proposed Project has no potential to effect the status of this SWB.
	River	Nore_240	No	The Nore_240 SWB has been screened out due to its distant location from the Proposed Project and the increasing volumes of water within the Nore River. Therefore, the Proposed Project has no potential to effect the status of this SWB.
	River	Nore_250	No	The Nore_250 SWB has been screened out due to its distant location from the Proposed Project and the increasing volumes of water within the Nore River. Therefore, the Proposed Project has no potential to effect the status of this SWB.
	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 estuary. The Proposed Project has no potential to impact the status of this SWB.
	Barrow River Catchment			
	River	Rathornan_010	No	A small section of the Proposed Wind Farm site is mapped within the Rathornan_010 river sub basin. However, no works are proposed within this river sub-basin. Therefore, the Proposed Project has no potential to effect the status of this SWB.
	River	Monefelim_010	**Yes**	The Monefelim_010 SWB has been screened in due to the occurrence of the Proposed Grid Connection Route within the river sub basin. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
	River	Gowran_010	**Yes**	The Gowran_010 SWB has been screened in due to the occurrence of the Proposed Grid Connection Route within the river sub basin. An assessment is required to consider the potential impacts of the Proposed Project on this SWB.
	River	Barrow_180	No	The Barrow_180 SWB has been screened out due to the lack of proposed works upstream of this SWB. Therefore, the Proposed Project has no potential to effect the status of this SWB.
	River	Barrow_190	No	The Barrow_190 SWB has been screened out due to the lack of proposed works upstream of this SWB. Therefore, the Proposed Project has no potential to effect the status of this SWB.
	River	Barrow_200	No	The Barrow_200 SWB has been screened out due to the lack of proposed works upstream of this SWB. Therefore, the Proposed Project has no potential to effect the status of this SWB.

	River	Barrow_210	No	The Barrow_210 SWB has been screened out due to its distant location from the Proposed Project and the large flow volumes of water within the Barrow River. Therefore, the Proposed Project has no potential to effect the status of this SWB.
	River	Barrow_220	No	The Barrow_220 SWB has been screened out due to its distant location from the Proposed Project and the large flow volumes of water within the Barrow River. Therefore, the Proposed Project has no potential to effect the status of this SWB.
	River	Barrow_230	No	The Barrow_230 SWB has been screened out due to its distant location from the Proposed Project and the large flow volumes of water within the Barrow River. Therefore, the Proposed Project has no potential to effect the status of this SWB.
	River	Barrow_240	No	The Barrow_240 SWB has been screened out due to its distant location from the Proposed Project and the large flow volumes of water within the Barrow River. Therefore, the Proposed Project has no potential to effect the status of this SWB.
	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 estuary. 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 estuary. 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 estuary. 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 transitional waterbody. The Proposed Project has no potential to impact the status of this SWB.
	Transitional	Barrow Suir Nore Estuary	No	The Barrow Suir Nore Estuary SWB has been screened out due to the saline nature of its waters and the large volumes of water within the estuary. 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 Harbour. 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 coastal waterbody. The Proposed Project has no potential to impact the status of this SWB.
Groundwater Bodies				
Groundwater Body	Groundwater	Castlecomer	**Yes**	The Proposed Wind Farm site, including 4 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 Proposed Wind Farm site, including 3 no. turbines, is mapped to overlie the Shanragh GWB. An assessment is required to consider the potential impacts of the Proposed Project on this GWB.

	Groundwater	Kilkenny	**Yes**	The Proposed Grid Connection Route is mapped over the Kilkenny GWB. An assessment is required to consider the potential impacts of the Proposed Project on this GWB.
	Groundwater	Ballingarry	**Yes**	The Proposed Grid Connection Route is mapped over the Ballingarry GWB. An assessment is required to consider the potential impacts of the Proposed Project on this GWB.
	Groundwater	Clifden	**Yes**	The Proposed Grid Connection Route is mapped over the Clifden GWB. An assessment is required to consider the potential impacts of the Proposed Project on this GWB.
	Groundwater	Newtown	**Yes**	The proposed junction accommodation works at the N78 and the L1834 junction are underlain by the Newtown GWB. An assessment is required to consider the potential impacts of the Proposed Project on this GWB.
Protected Areas				
Protected Areas	Nature Conservation Designations	River Barrow and River Nore SAC	**Yes**	The River Barrow and River Nore SAC is within 2km of the Proposed Wind Farm site and is located immediately downstream of the Proposed Grid Connection Route at Philips Bridge and the TDR works at Black Bridge. An assessment is required to consider the potential impacts of the Proposed Project on this protected area.
		River Nore SPA	**Yes**	The River Nore SPA has been screened into the assessment due to its location in close proximity to the Proposed Grid Connection Route. The Proposed Grid Connection Route is mapped in the Nore_190 river sub-basin and the SPA is also mapped in the Nore River at this location (the hydrological flow path is ~2km in length). An assessment is required to consider the potential impacts of the Proposed Project on this protected area.
		Coan Bog NHA	No	The Dinin River acts as a hydrological boundary between the Proposed Project and this NHA and as a result there is no hydrological connection. Due to the low permeability of the bedrock aquifers and the short groundwater flowpaths there is no hydrogeological connection.
		Mothel Church pNHA	No	The Coolcullen River acts as a hydrological boundary between the Proposed Project and this pNHA and as a result there is no hydrological connection. Due to the low permeability of the bedrock aquifers and the short groundwater flowpaths there is no hydrogeological connection.
		Cloghristick Wood pNHA	No	This pNHA is located in the Barrow catchment and is located upstream of the Rathornan and Old Leighlin Streams and is therefore upstream of the Proposed Wind Farm site. Furthermore, no proposed infrastructure within the Proposed Wind Farm site is located within the Barrow Catchment. Therefore, there is no hydrological or hydrogeological connection between the Proposed Wind Farm site and this pNHA.
		Whitehall Quarries	No	There is no hydrological or hydrogeological connection. The Proposed Project has no potential to impact the status of this Site.
	Nutrient Sensitive Areas	Barrow River (160-180) NSA	No	The Barrow River NSA has been screened out due to its distant location from the Proposed Project and the increasing volumes of water within the Barrow River. The Proposed Project has no potential to impact the status of this NSA.
		Barrow River (190-240) NSA	No	The Barrow River NSA has been screened out due to its distant location from the Proposed Project and the increasing volumes of water within the Barrow River. The Proposed Project has no potential to impact the status of this NSA.
		Upper Barrow Estuary NSA	No	The Upper Barrow Estuary NSA has been screened out due to its distant location from the Proposed Project and the large volumes of water within the NSA. The Proposed Project has no

				potential to impact the status of this NSA.
		Nore River (180-250) NSA	No	The Nore River NSA has been screened out due to its distant location from the Proposed Project and the increasing volumes of water within the Nore River. The Proposed Project has no potential to impact the status of this NSA.
		Nore Estuary	No	The Nore Estuary NSA has been screened out due to its distant location from the Proposed Project and the increasing volumes of water within the Nore Estuary. The Proposed Project has no potential to impact the status of this NSA.
		Barrow Nore Estuary NSA	No	The Barrow Nore Estuary NSA has been screened out due to its distant location from the Proposed Project and the large volumes of water within the NSA. The Proposed Project has no potential to impact the status of this NSA.
		New Ross Port NSA	No	The New Ross Port NSA has been screened out due to its distant location from the Proposed Project and the large volumes of water within the NSA. The Proposed Project has no potential to impact the status of this SWB.
	Shellfish Area	Waterford Harbour (Cheekpoint/Arthurstown/Creadan)	No	Waterford Harbour (Cheekpoint/Arthurstown/Creadan) Shellfish area has been screened out due to its distant location from the Proposed Project. Therefore, the Proposed Project has no potential to impact on this protected area.
	Drinking Water Protected Areas	Dinin(Main Channel)_020	**Yes**	The Dinin (Main Channel)_020 is located proximally to the Proposed Wind Farm site. An assessment is required to consider the potential impacts of the Proposed Project on this DWPA.
		Nore_160	No	The Nore_160 DWPA has been screened out due to its distant location from the Proposed Project (~20km) and the increasing volumes of water within the Nore River. The Proposed Project has no potential to impact the status of this DWPA.
		Dinin (North)_030	**Yes**	Dinin (North)_030 DWPA has been screened into the assessment due to its location downstream of the TDR junction accommodation works. An assessment is required to consider the potential impacts of the Proposed Project on this DWPA.

4. WFD COMPLIANCE ASSESSMENT

4.1 PROPOSALS

The Proposed Project is described in full in Chapter 4 of the EIAR.

The Proposed Project includes 7 no. proposed wind turbines, an onsite 38kV substation, a battery energy storage compound, 2 no. temporary construction compounds, a permanent meteorological mast, peat and spoil management areas, new site access roads, upgrades to existing site access roads, an underground grid connection to the existing Kilkenny 110kV substation and works along the TDR.

Due to the nature of wind farm developments (and associated grid connections and TDR 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 will be chemical pollution of groundwater from cementitious materials, hydrocarbon spillage and leakages.

The primary risk to surface waters will be entrained suspended sediments (peat and soil particles) in site runoff during earthworks and tree felling along with release cement-based compounds and/or hydrocarbons. The Proposed Project may also result in changes to surface water runoff volumes and flow patterns.

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 Potential Surface Water Quality Effects from Works within Proposed Wind Farm site

Construction phase activities including tree felling, site levelling/construction and building turbine foundation excavation and storage of peat and spoil in onsite repositories will require earthworks resulting in removal of vegetation cover and excavation of peat, soil and subsoils. The main risk will be from surface water runoff from bare soil/peat and peat and spoil management areas 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.

Clear felling of coniferous forestry plantations is also proposed over 19ha. Potential surface water quality effects from felling include the release of elevated concentrations of suspended solids and nutrient release which has the potential to effect downstream surface water quality.

There are also 2 no. crossings proposed over mapped watercourses in the Proposed Wind Farm site. The works within the Proposed Wind Farm site also include the removal of a

degraded culvert and concrete slab and replacement with a suitably sized culvert. These works have the potential to result in morphological changes to watercourses.

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 in the downstream SWBs.

The SWB likely to be most impacted by these activities is the Dinin (South)_020 SWB. Further downstream, the potential for water quality effects will decrease downstream due to the increasing volumes of water within the respective SWBs.

A summary of potential status change to SWBs arising from works within the Proposed Wind Farm site during the construction phase of the Proposed Project in the unmitigated scenario are outlined in **Table F**.

Table F: Potential Surface Water Quality Effects Downstream of the Proposed Wind Farm 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	Moderate
Dinin (Main Channel)_020	IE_SE_15D020800	Moderate	Moderate

4.2.1.1.1Potential Surface Water Quality Effects Associated with TDR Works

With regards to the TDR, the junction accommodation works are proposed at the junction between the N78 and the L1834. This work location is mapped in the Dinin(North)_030 and Dinin(North)_020 WFD river sub-basins. The closest mapped watercourse is Gurteen Stream, located ~850m southeast of the works area.

Due to the fact that there are no direct drainage pathways between the works and any mapped surface watercourses within these river sub-basins, the proposed works have very limited potential to cause a deterioration in the status of these screened out SWBs and/or jeopardise their attainment of good surface water status.

Meanwhile, strengthening works are also proposed at the Black Bridge. The Dinin (South)_020 river waterbody is immediately downstream of the proposed works. Construction etc. along the TDR have the potential to adversely impact the status of the (Dinin South)_020 SWB.

Due to the minor and short-term nature of the proposed works along the TDR, there is limited potential for the Proposed Project to alter the overall status of the receiving SWBs.

A summary of potential status change to SWBs arising from works along the TDR during the construction phase of the Proposed Project in the unmitigated scenario are outlined in **Table G.**

Table G: Potential Surface Water Quality Effects Associated with TDR Works during Construction Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Dinin (North)_020	ETC._SE_15D070200	Moderate	Moderate
Dinin (North)_030	ETC._SE_15D070250	Moderate	Moderate
Dinin (South)_020	ETC._SE_15D080600	Good	Good

4.2.1.2 Potential Surface Water Quality Effects Along the Proposed Grid Connection Route

Based on the WFD mapping, there will be a requirement for 10 no. watercourse crossings over EPA mapped waterbodies along the Proposed Grid Connection Route. These are located over existing bridges (7 no.) and culverts (3 no.).

Due to the close proximity of local waterbodies to the at the crossing locations, there is a potential for surface water quality impacts during trench excavation work due to runoff from the road surface. This runoff may contain elevated concentrations of suspended sediment, cementitious runoff and/or hydrocarbons.

Some minor groundwater/surface water seepages will likely occur in trench excavations and substation foundation excavations and this will create additional volumes of water to be treated by the runoff management system. Inflows will likely require management and treatment to reduce suspended sediments.

Construction activities along the Proposed Grid Connection Route only have the potential for short term effects due to the minor and transient nature of the works. The limits the potential for the Proposed Project to alter the overall status of a SWB.

A summary of potential status change to SWBs arising from works along the Proposed Grid Connection Route during the construction phase of the Proposed Project in the unmitigated scenario are outlined in **Table H.**

Table H: Potential Surface Water Quality Effects along the Proposed Grid Connection Route During Construction Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Dinin (South)_020	IE_SE_15D080600	Good	Good
Monefelim_010	IE_SE_14M030100	High	High
Gowran_010	IE_SE_14G030100	Moderate	Moderate
Brownstown(Pococke)_010	IE_SE_15B041100	Moderate	Moderate
Kilderry_010	IE_SE_15K540650	Moderate	Moderate
Nore_190	IE_SE_15N012090	Moderate	Moderate

4.2.1.3 Potential Groundwater Quality/Quantity Effects at Proposed Wind Farm site

The accidental spillage of hydrocarbons, the release of effluent from wastewater treatment systems and the release of cement-based products have the potential to negatively impact on groundwater water quality at the Proposed Wind Farm site.

In addition, groundwater seepages may occur in turbine base excavations, particularly those on lower elevations and this will create additional volumes of water to be treated by the drainage management system.

Furthermore, temporary dewatering of excavations (turbine bases etc) may drawdown the local groundwater table.

However, due to the low permeability of the bedrock aquifer and the shallow nature of the proposed works, there is limited potential for the Proposed Wind Farm to alter the overall status of the underlying GWBs.

A summary of potential status change to GWBs arising from works at the Proposed Wind Farm site during the construction phase of the Proposed Project in the unmitigated scenario are outlined in **Table I**.

Table I: Potential Groundwater Effects at the Proposed Wind Farm site during Construction 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

4.2.1.3.1 Potential Groundwater Quality Effects along TDR Works

The proposed temporary junction accommodation works at the N78 and the L1834 junction are underlain by the Newtown GWB. The bedrock underlying the Black Bridge forms part of the Castlecomer GWB.

Due to the small scale, shallow and short-term nature of the proposed TDR works, there is no potential for any effects during earthworks and excavation works on the GWB's.

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

Table J: Potential Groundwater Effects along the TDR during Construction Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Castlecomer	Wind Farm_SE_G_034	Good	Good
Newtown	Wind Farm_SE_G_104	Good	Good

4.2.1.4 Potential Groundwater Quality/Quantity Effects along the Proposed Grid Connection Route

The Proposed Grid Connection Route is located in the Castlecomer GWB, the Shanragh GWB, the Ballingarry GWB, the Kilkenny GWB and the Clifden 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.

However, due to the shallow, short-term and transient nature of the proposed works, there is no potential for any effects during earthworks and excavation works on the GWBs.

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

Table K: Potential Groundwater Effects Along the Proposed Grid Connection Route during Construction 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

4.2.1.5 Potential Effects on Protected Areas

The surface water connections from the Proposed Project could transfer poot quality surface water that may affect the conservation objectives of these designated sites. The designated site included in this assessment and deemed to be hydrologically connected to the Proposed Project include:

River Barrow and River Nore SAC: This SAC is located immediately downstream of the Proposed Wind Farm site, the Proposed Grid Connection Route, and the TDR works at Black Bridge. Any potential deterioration in surface water quality has the potential to affect this SAC.

River Barrow and River Nore SPA: The potential for works at the Proposed Wind Farm site to affect this SPA is limited due to the length of the connecting hydrological pathway (~26.5km). The main potential for effects is associated with works along the Proposed Grid Connection Route, as these works are located ~2km upstream of the SPA. However, given the minor and transient nature of the works, the potential for effects is limited.

Dinin (Main Channel)_020 DWPA: This DWPA is located downstream of the Proposed Wind Farm site, sections of the Proposed Grid Connection Route and the TDR work areas. Any potential deterioration in surface water quality has the potential to affect this SAC.

Dinin (North)_030 DWPA: This DWPA is located downstream of the TDR work areas. There is limited potential for effects on this DWPA due to the short-term and minor nature of the proposed works along the TDR.

4.2.2 Operational Phase (Unmitigated)

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

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

4.2.2.1 Potential Surface Water Quantity Effects Downstream of the Proposed Wind Farm site

Progressive replacement of the soil or vegetated surfaces 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 developed areas and increase flood risk downstream of the Proposed Project.

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 L**.

Table L: Potential Surface Water Quantity Effects Downstream of the Proposed Wind Farm 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

4.2.2.2 Potential Surface Water Quality Effects 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 phase of the Proposed Project in the unmitigated scenario are outlined in **Table M**.

Table M: Potential Surface Water Quality Effects Downstream of the Proposed Wind Farm 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
Rathornan_010	IE_SE_14R430830	Good	Good

4.2.2.3 Potential Effects on Protected Areas

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.

Therefore, the risk of any operational phase activities that may affect the conservation objectives of the protected areas is greatly reduced.

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 during Earthworks

A suite of general SuDs drainage controls available for surface water management are summarised (along with their application) in **Table N** below. These include avoidance controls, source controls, in-line controls, water treatment controls, and outfall controls.

During the construction phase of the Proposed Project, excavations will be limited to minimise the generation of spoil. Sediment will be generated where excavations are required (turbine foundations) and dirty water from these work areas will be routed via drains to settlement ponds for treatment and removal of suspended solids prior to release into the existing drainage network. There will be no direct or untreated discharge from construction work areas into the existing drainage network.

Finally, regular inspection and maintenance for the on-site drainage system will be completed regularly during the construction phase. This will be of particular importance following periods of heavy rainfall to check for blockages in any drains and any excess build-up of silt within settlement ponds which will decrease the effectiveness of the drainage system unless removed.

Table N: Summary of Drainage Mitigation and their Application

Management Type	Description of SuDs drainage control method	Applicable Works Area
Avoidance Controls:	• Application of buffer zones to natural watercourses where possible to avoid excavations in close proximity to watercourses and avoid the release of suspended sediment into watercourses; • Using small working areas; and, • Working in appropriate weather and suspending certain work activities in advance of forecasted wet weather.	Construction work areas where sediment is being generated.
Source Controls:	• Use of upstream interceptor drains and downstream collector drains, vee-drains, diversion drains, flumes and culvert pipes.	Construction work areas where sediment is being generated.
	• Using small working areas; • Covering stockpiles; • Weathering off / sealing stockpiles and promoting vegetation growth.	Stockpiles areas
In-Line Controls:	• Interceptor drains, vee-drains, oversized swales/collector drains; • Erosion and velocity control measures such as: o sand bags; o oyster bags filled with gravel; o filter fabrics; o straw bales; o flow limiters; o weirs or baffles; o and/or other similar/equivalent or appropriate systems. • Silt fences, filter fabrics; • Collection sumps, temporary sumps, pumping systems; • Attenuation lagoons; • Sediment traps, stilling / settlement ponds.	Interceptor and collection drainage systems
Water Treatment Controls:	• Temporary sumps; • Attenuation ponds; • Temporary storage lagoons; • Sediment traps, Stilling / Settlement ponds, silt bags; • Proprietary settlement systems such as Siltbuster, and/or other similar/equivalent or appropriate systems.	Surface water treatment locations
Outfall Controls:	• Levelspreaders; • Buffered outfalls; • Vegetation filters; • Silt bags; • Flow limiters and weirs.	Drainage run outfalls and overland discharge points

Each element of the Proposed Project (i.e., access roads, turbines, onsite 38kV substation, peat and spoil repositories, etc) 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).

Where works are proposed within the delineated hydrological buffer zone, the following additional mitigation measures will be implemented to ensure there are no effects on surface water quality:

- Double or triple silt fences will be placed downgradient of all work locations within the hydrological buffer zones.

- All works will be completed during the dry summer months and works will be postponed in the event of rainfall.

4.3.1.2 Mitigation Measures to Protect Against Release of Hydrocarbons

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:

- All plant will be inspected and certified to ensure that they are leak free and in good working order prior to use at the site;
- On site 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 off site and will be towed around the site by a 4x4 jeep to where machinery is located.
    - The 4x4 jeep 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;
- Onsite refuelling will be carried out by trained personnel only;
- A permit to fuel system will be put in place;
- Taps, nozzles or valves associated with refuelling equipment will be fitted with a lock system;
- All fuel storage areas will be bunded appropriately for the duration of the construction phase. All bunded areas will be fitted with a storm drainage system and an appropriate oil interceptor. Ancillary equipment such as hoses, pipes will be contained within the bunded area;
- Fuel and oil stores including tanks and drums will be regularly inspected for leaks and signs of damage;
- The electrical control building (at the onsite substation) will be bunded appropriately to the volume of oils likely to be stored and to prevent leakage of any associated chemicals to groundwater or surface water. The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor;
- The plant used during construction will be regularly inspected for leaks and fitness for purpose;
- An emergency plan for the construction phase to deal with accidental spillages is included within the Construction and Environmental Management Plan (Appendix 4-4 of the EIAR); and,
- Spill kits will be available to deal with any accidental spillage in and outside the re-fuelling area.

4.3.1.3 Mitigation Measures to Prevent Release of Wastewater

The best practice methods for wastewater management at the proposed on-site 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 construction compounds, maintained by the providing contractor, and removed from site on completion of the construction works;
- Water supply for the site office and other sanitation will be brought to site and removed after use from the site to be discharged at a suitable off-site treatment location; and,

- No water or wastewater will be sourced on the site, nor discharged at the Proposed Wind Farm site.

4.3.1.4 Mitigation Measures to Prevent Release of Cement-Based Products

Best practice methods for cement-based compounds includes:

- No batching of wet-concrete products will occur on site. Ready-mixed supply of wet concrete products and where possible, emplacement of pre-cast elements, will take place;
- Where possible pre-cast elements for culverts and concrete works will be used;
- Where concrete is delivered on site, only the chute will be cleaned, using the smallest volume of water practicable. No discharge of concrete contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed. Chute cleaning water will be undertaken at lined concrete washout ponds;
- Weather forecasting will be used to plan dry days for pouring concrete; and,
- The pour site will be kept free of standing water and plastic covers will be ready in case of sudden rainfall event.

4.3.1.5 Mitigation Measures for Clear-Felling

All felling operations will conform to current best practice Forest Service regulations, policies and strategic guidance documents as well as Coillte and DAFM guidance documents, to ensure that felling, planting and other forestry operations result in minimal potential negative effects to the receiving environment.

There is a requirement in the Forest Service Code of Practice and in the FSC Certification Standard for the installation of buffer zones adjacent to aquatic zones at planting stage. Minimum buffer zone widths recommended in the Forest Service (2000) guidance document "Forestry and Water Quality Guidelines" will be adhered to during felling operations. The setback distance from sensitive hydrological features means that adequate room is maintained for the proposed mitigation measures (discussed below) to be properly installed and operate effectively.

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

- Machine combinations will be chosen which are most suitable for ground conditions at the time of felling, and which will minimise soils disturbance. The harvester and the forwarder are designed specifically for the forest environment and are low ground pressure machines;
- All machinery will be operated by suitably qualified personnel;
- Checking and maintenance of roads and culverts will be on-going through any felling operations. 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;
- These machines will traverse the site along specified off-road routes (referred to as racks);
- The location of racks will be chosen to avoid wet and potentially sensitive areas;
- Brash mats will be placed on the racks to support the vehicles on soft ground, reducing peat and mineral soil disturbance and erosion and avoiding the formation of rutted areas, in which surface water ponding can occur. Brash mat renewal should take place when they become heavily used and worn. Provision should be made for brash mats along all off-road routes, to protect the soil from compaction and rutting. Where there is risk of severe erosion occurring, extraction will be suspended during periods of high rainfall;

- Silt fences will be installed at the outfalls of existing drains downstream of felling areas. No direct discharge of such drains to watercourses will occur. Sediment traps and silt fences will be installed in advance of any felling works and will provide surface water settlement for runoff from work areas and will prevent sediment from entering downstream watercourses. Accumulated sediment will be carefully disposed of at pre-selected peat disposal areas. Where possible, all new silt traps will be constructed on even ground and not on sloping ground;
- In areas particularly sensitive to erosion it will be necessary to install double or triple sediment traps and increase buffer zone width. These measures will be reviewed on site during construction;
- Double silt fencing will also be put down slope of felling areas which are located in close proximity to streams and/or relevant watercourses;
- Drains and silt traps will be maintained throughout all felling works, ensuring that they are clear of sediment build-up and are not severely eroded;
- Timber will be stacked in dry areas, and outside watercourse buffer zones. Straw bales and check dams to be emplaced on the down gradient side of timber storage/processing sites;
- Works will be carried out during periods of no, or low rainfall, in order to minimise entrainment of exposed sediment in surface water runoff;
- Refuelling or maintenance of machinery will not occur within 50m of an aquatic zone or within 20m of any other hydrological feature. Mobile bowser, drip kits, qualified personnel will be used where refuelling is required; and,
- Branches, logs or debris will not be allowed to build up in aquatic zones. All such material will be removed when harvesting operations have been completed, but care will be taken to avoid removing natural debris deflectors.

In addition, felling works will only be completed during periods of low rainfall and all drains will be inspected and maintained before, during and after the proposed felling works.

4.3.1.6 Mitigation Measures to Prevent Morphological Changes to Surface Watercourses within the Wind Farm Site

The Proposed Project design has been optimised to utilise the existing infrastructure (i.e. existing site roads) where practicable. This design prevents the unnecessary disturbance of the existing site drainage network prevents the requirement for widespread instream works. Only 2 no. new crossings are proposed, one of which includes for the removal of a degraded culvert and concrete slab. This design prevents the unnecessary disturbance of the existing site drainage network prevents the requirement for widespread instream works across the Proposed Wind Farm site.

Mitigation measures for the proposed new crossing over the Seskinrea Stream are detailed below:

- The proposed new stream crossing and upgrade of an existing crossing will be clear span bridge crossings and the existing banks will remain undisturbed. No in-stream excavation works are proposed at this location and therefore there will be no direct impact on the streams at the proposed crossing locations;
- All guidance / mitigation measures required by the OPW and/or the Inland Fisheries Ireland (IFI) is incorporated into the design of the proposed crossings;
- All drainage measures will be installed in advance of the works;
- Plant and equipment will not be permitted to track across the watercourse;
- Access to the opposite site of the watercourse for excavation and foundation installation will require the installation of a temporary pre-cast concrete or metal bridge;

- Once the foundations have been completed at both sides of the watercourse, the pre-cast concrete box culvert will be installed using a crane and there will be no contact with the watercourse;
- Where the box culvert is installed in sections, the joint will be sealed to prevent granular material entering the watercourse;
- As a further precaution, near stream construction work, will only be carried out during the period permitted by IFI for in-stream works according to the IFI (2016) guidance document "Guidelines on protection of fisheries during construction works in and adjacent to waters", i.e., July to September inclusive. This time period coincides with the period of lowest expected rainfall, and therefore minimum runoff rates. This will minimise the risk of entrainment of suspended sediment in surface water runoff, and transport via this pathway to surface watercourses (any deviation from this will be done in discussion with (IFI);
- Where works are necessary inside the 50m buffer double row silt fences will be emplaced immediately down-gradient of the construction area for the duration of the construction phase. There will be no batching or storage of concrete allowed in the vicinity of the crossing construction areas; and,
- All new river/stream crossings will require a Section 50 application (Arterial Drainage Act, 1945). The river/stream crossings will be designed in accordance with OPW guidelines/requirements on applying for a Section 50 consent.

Meanwhile, the following mitigation measures will be implemented during the upgrade of the existing crossing of the tributary of the Seskinrea Stream:

- It is proposed to remove the existing culvert and replace with a clear span bottomless culvert;
- Section 50 Approval will be in place before any works commence;
- Advance notice will be provided, and agreement obtained from IFI;
- Works will be completed during the time period permitted by IFI;
- The works will be planned based on expected weather conditions and low flows;
- The area will be fenced off prior to the onset of works;
- Pumping equipment will be set up at the upstream end of the works area, with the hose positioned to one side of the channel and surrounded by clean stone for protection. The hose will be laid out and shall discharge back into the watercourse downstream of the works area;
- A dam will be constructed upstream using sandbags and water will be overpumped and discharged at an approved downstream location;
- Splash plates will be utilised at the discharge point to protect against scouring;
- A second dam will also be constructed downstream of the works location to prevent any sediment laden water from entering the watercourse;
- Any water pumped from the works area will be discharged through a suitable treatment system to remove suspended solids;
- Any suitable material removed from the watercourse during the works will be stockpiled for reinstatement following completion of the works;
- Once the works have been completed, the upstream and downstream dams will be slowly removed, and the watercourse will be allowed to run through the newly installed culvert.

The watercourse crossings will be constructed to the specifications of the OPW bridge design guidelines 'Construction, Replacement or Alteration of Bridges and Culverts - A Guide to Applying for Consent under Section 50 of the Arterial Drainage Act, 1945', and in consultation with IFI. Abutments will be constructed from precast units combined with in-situ foundations, placed within an acceptable backfill material.

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

4.3.1.7 Mitigation Measures to Prevent Morphological Changes to surface watercourses along the Proposed Grid Connection Route

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

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

Horizontal directional drilling (HDD) will be used at the 7 no. existing bridge crossings along the Proposed Grid Connection Route. The following mitigation measures will be implemented:

- Although no in-stream works are proposed, the HDD works will only be done over a dry period between July and September (as required by IFI for in-stream works) to avoid the salmon spawning season and to have more favourable (dryer) ground conditions;
- The crossing works area will be clearly marked out with fencing or flagging tape to avoid unnecessary disturbance;
- There will be no storage of material / equipment or overnight parking of machinery inside the 15m buffer zone;
- Before any ground works are undertaken, double silt fencing will be placed upslope of the watercourse channel along the 15m buffer zone boundary;
- Additional silt fencing or straw bales (pinned down firmly with stakes) will be placed across any natural surface depressions / channels that slope towards the watercourse;
- Silt fencing will be embedded into the local soils to ensure all site water is captured and filtered;
- The area around the bentonite batching, pumping and recycling plant will be bunded using terram (as it will clog) and sandbags in order to contain any spillages;
- Drilling fluid returns will be contained within a sealed tank / sump to prevent migration from the works area;
- Spills of drilling fluid will be clean up immediately and stored in an adequately sized skip before been taken off-site;
- If rainfall events occur during the works, there will be a requirement to collect and treat small volumes of surface water from areas of disturbed ground (i.e. soil and subsoil exposures created during site preparation works);

- This will be completed using a shallow swale and sump down slope of the disturbed ground; and water will be pumped to a proposed percolation area at least 50m from the watercourse;
- The discharge of water onto vegetated ground at the percolation area will be via a silt bag which will filter any remaining sediment from the pumped water. The entire percolation area will be enclosed by a perimeter of double silt fencing;
- Any sediment laden water from the works area will not be discharged directly to a watercourse or drain;
- Works shall not take place during periods of heavy rainfall and will be scaled back or suspended if heavy rain is forecasted;
- Daily monitoring of the compound works area, the water treatment and pumping system and the percolation area will be completed by a suitably qualified person during the construction phase. All necessary preventative measures will be implemented to ensure no entrained sediment, or deleterious matter is discharged to the watercourse;
- If high levels of silt or other contamination is noted in the pumped water or the treatment systems, all construction works will be stopped. No works will recommence until the issue is resolved and the cause of the elevated source is remedied;
- On completion of the works, the ground surface disturbed during the site preparation works and at the entry and exit pits will be carefully reinstated and re-seeded at the soonest opportunity to prevent soil erosion;
- The silt fencing upslope of the river will be left in place and maintained until the disturbed ground has re-vegetated;
- There will be no batching or storage of cement allowed at the watercourse crossing;
- There will be no refuelling allowed within 100m of the watercourse crossing; and,
- All plant will be checked for purpose of use prior to mobilisation at the watercourse crossing.

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

- The drilling fluid/bentonite will be non-toxic and naturally biodegradable (i.e., Clear Bore Drilling Fluid or similar will be used);
- The area around the drilling fluid batching, pumping and recycling plants will be bunded using terram and/or sandbags to contain any potential spillage;
- One or more lines of silt fencing will be placed between the works area and the adjacent river;
- Spills of drilling fluid will be cleaned up immediately and transported off-site for disposal at a licensed facility;
- Adequately sized skips will be used where temporary storage of arisings are required;
- The drilling process / pressure will be constantly monitored to detect any possible leaks or breakouts into the surrounding geology or local watercourse;
- This will be gauged by observation and by monitoring the pumping rates and pressures. If any signs of breakout occur then drilling will be immediately stopped;
- Any frac-out material will be contained and removed off-site;
- The drilling location will be reviewed, before re-commencing with a higher viscosity drilling fluid mix; and,
- If the risk of further frac-out is high, a new drilling alignment will be sought at the crossing location.

4.3.1.8 Mitigation Measures to Protect Water Quality During Excavation Dewatering

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

- Appropriate interceptor drainage, to prevent upslope surface runoff from entering excavations will be put in place;
- If required, pumping of excavation inflows will prevent build-up of water in the excavation;

- The interceptor drainage will be discharged to the site constructed drainage system or onto natural vegetated surfaces and not directly to surface waters;
- The pumped water volumes will be discharged via volume and sediment attenuation ponds adjacent to excavation areas, or via specialist treatment systems such as a Siltbuster unit;
- There will be no direct discharge to surface watercourses, and therefore no risk of hydraulic loading or contamination will occur;
- Daily monitoring of excavations by a suitably qualified person will occur during the construction phase. If high levels of seepage inflow occur, excavation work should immediately be stopped and a geotechnical assessment undertaken; and,
- A mobile 'Siltbuster' or similar equivalent specialist treatment system will be available on-site for emergencies in order to treat sediment polluted waters from settlement ponds or excavations should they occur. Siltbusters are mobile silt traps that can remove fine particles from water using proven technology and hydraulic design in a rugged unit. The mobile units are specifically designed for use on construction sites. They will be used as a final line of defence if needed.

4.3.1.9 Mitigation Measures for Works Along TDR

The "Pre-commencement Temporary Drainage Works" described in **Section 4.3.1.1** will be employed at all the TDR works areas.

Furthermore, the carriageway strengthening works proposed at the Black Bridge will be carried out to the specifications of the OPW bridge design guidelines 'Construction, Replacement or Alteration of Bridges and Culverts - A Guide to Applying for Consent under Section 50 of the Arterial Drainage Act, 1945', and in consultation with IFI.

4.3.1.10 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 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 Proposed Grid Connection Route 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 outlined in **Section 4.3.1.1** above.

Mitigation measures for oils and fuels during the operational phase of the Proposed Project are the same as those outlined in **Section 4.3.1.2** 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.

4.3.2.4 Mitigation Measures for Protected Areas

The mitigation measures to protect against poor quality runoff during the operational phase of the Proposed Project are the same as those outlined **Section 4.3.1.1** above.

Mitigation measures for oils and fuels during the operational phase of the Proposed Project are the same as those outlined in **Section 4.3.1.2** above.

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

4.3.3 Decommissioning Phase

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

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

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

The internal electrical cabling connecting the Proposed Wind Farm site infrastructure to the on-site substation will be removed, while the ducting itself will remain in-situ rather than

excavating and removing it, as this is considered to have less of a potential environmental impact, in terms of soil exposure, and thus on the possibility of the generation of suspended sediment which could enter nearby watercourses.

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

Other impacts such as possible soil 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 implemented during the construction phase will be utilised during the decommissioning phase to ensure no impacts of receiving waters.

Some of the potential effects water bodies will be avoided by leaving elements of the Proposed Project in place where appropriate. The onsite 38kV substation will be retained by ESB Networks and/or EirGrid as a permanent part of the national grid, along with the Proposed Grid Connection Route cabling and battery energy storage system. The turbine bases will be rehabilitated by covering with local topsoil 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 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 O** below.

Table O: 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 (North)_020	IE_SE_15D070200	Moderate	Moderate	Moderate
Dinin (North)_030	IE_SE_15D070250	Moderate	Moderate	Moderate
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	Moderate	Moderate	Moderate
Kilderry_010	IE_SE_15K540650	Moderate	Moderate	Moderate
Nore_190	IE_SE_15N012090	Moderate	Moderate	Moderate
Barrow Catchment				
Monefelim_010	IE_SE_14M030100	High	High	High
Gowran_010	IE_SE_14G030100	Moderate	Moderate	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	Good	Good

Kilkenny	IE_SE_G_078	Good	Good	Good
Clifden	IE_SE_G_038	Good	Good	Good

5. SUMMARY AND CONCLUSION

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

The Proposed 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 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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