HYDRO ENVIRONMENTAL SERVICES

22 Lower Main St
Dungarvan
Co.Waterford
Ireland

tel: +353 (0)58 44122
fax: +353 (0)58 44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie

# WATER FRAMEWORK DIRECTIVE ASSESSMENT REPORT
# PROPOSED GARRANE GREEN ENERGY PROJECT, CO. LIMERICK

**FINAL REPORT**

Prepared for:

**GARRANE GREEN ENERGY LTD**

Prepared by:

**HYDRO-ENVIRONMENTAL SERVICES**

## DOCUMENT INFORMATION

| | |
|---|---|
| **Document Title:** | **WATER FRAMEWORK DIRECTIVE ASSESSMENT REPORT<br>GARRANE GREEN ENERGY PROJECT, CO. LIMERICK** |
| **Issue Date:** | **11TH August 2025** |
| **Project Number:** | **P1605-1** |
| **Project Reporting History:** | **P1605-0** |
| **Current Revision No:** | **P1605-0_WFD_REV_F0** |
| **Author:** | **MICHAEL GILL<br>DAVID BRODERICK<br>CONOR MCGETTIGAN<br>NITESH DALAL** |
| **Signed:** |  <br>_____<br>**Michael Gill B.A., B.A.I., M.Sc., MIEI<br>Managing Director – Hydro-Environmental Services** |

***Disclaimer:***
*This report has been prepared by HES with all reasonable skill, care and diligence within the terms of the contract with the client, incorporating our terms and conditions and taking account of the resources devoted to it by agreement with the client. We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above. This report is confidential to the client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies upon the report at their own risk.*

## TABLE OF CONTENTS



### FIGURES (IN TEXT)



### TABLES IN TEXT

# 1. INTRODUCTION

## 1.1 BACKGROUND

Hydro-Environmental Services (HES) were requested by Jennings O'Donovan (JOD) to complete a Water Framework Directive (WFD) Compliance Assessment for the proposed Garrane Green Energy Project (i.e. the Project).

The Project is described in full in Chapter 2 of the EIAR.

The purpose of this WFD Compliance Assessment is to determine if any specific components or activities associated with the proposed wind farm development 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 compliant with the objectives of the WFD.

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

This report has been complied using the following data sources:

- Environmental Protection Agency databases and WFD information (www.catchments.ie);
- Observation recorded during various site visits as described in Section 10.2.5 of the EIAR;
- Drainage mapping as described in Section 10.3.6 of the EIAR; and,
- Surface Water Quality sampling as described in Section 10.3.8 of the EIAR.
- Reports from the Maigue River Trust (https://maigueriverstrust.ie/).

## 1.2 STATEMENT OF AUTHORITY

Hydro-Environmental Services (HES) are a specialist geological, hydrological, hydrogeological and environmental practice that delivers a range of water and environmental management consultancy services to the private and public sectors across Ireland and Northern Ireland. HES was established in 2005, and our office is located in Dungarvan, County Waterford. We routinely complete impact assessments for hydrology and hydrogeology for a large variety of project types including wind farms.

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

Michael Gill (P. Geo., B.A.I., MSc, Dip. Geol., MIEI) is an Environmental Engineer with over 22 years' environmental consultancy experience in Ireland. 22 years' environmental consultancy experience in Ireland. Michael has a degree in Civil and Environmental Engineering, a MSc in Engineering hydrology from TCD and a MSc in Applied Hydrogeology from Newcastle University. Michael has completed numerous (60+) hydrological and hydrogeological assessments relating to bedrock quarries and sand and gravel pits. Recent examples include Ardfert quarry in County Kerry and Middleton Quarry in County Cork.

David Broderick (BSc, H. Dip Env Eng, MSc) is a hydrogeologist with over 15 years' experience in both the public and private sectors. Having spent two years working in the Geological Survey of Ireland working mainly on groundwater and source protection studies David moved into the private sector. David has a strong background in groundwater resource assessment and hydrogeological/hydrological investigations in relation to developments such as quarries and wind farms. David has completed numerous geology and water sections for input into EIARs for a range of commercial developments. David has worked on the EIS/EIARs for

Derrykillew WF, Croagh WF, and Oweninny WF, and over 60 other wind farm related projects across the country.

Conor McGettigan (MSc, BSc) is an Environmental Scientist with over 5 years' experience in the environmental sector in Ireland. Conor holds an MSc in Applied Environment Science and a BSc in Geology. Conor routinely completed hydrological and hydrogeological impact assessment, flood risk assessments and WFD compliance assessments for a range of proposed developments including wind farms, residential developments, industrial developments, and quarries.

Nitesh Dalal (B.Tech, PG Dip., MSc) is an Environmental Scientist with over 7 years' experience in environmental consultancy and environmental management in India. Nitesh holds a M.Sc. in Environmental Science from University College Dublin (2024), a PG Diploma in Health, Safety and Environment from Annamalai University, India (2021) and B.Tech. in Environmental Engineering (2016) from Guru Gobind Singh Indraprastha University, India (2016).

## 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), as amended.

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 2009 to 2015 with the second cycle plan covering the period from 2016 to 2021, and the third cycle covers the period from 2022 to 2027[1]. The RBMPs are forward looking.

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

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

# 2. WATERBODY IDENTIFICAITON AND CLASSIFICATION

## 2.1 INTRODUCTION

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

## 2.2 SURFACE WATERBODY IDENTIFICATION

Regionally the Site is located within the Shannon Estuary South WFD catchment, Hydrometric area 24 and also within the Shannon River Basin District (refer to **Figure A**).

More locally, the Site is located within 3 no. sub-catchments of the River Maigue: The eastern section of the Site is located in the Maigue_SC_020 river sub-catchment, the western section of the Site is located in the Maigue_SC_010 river sub-catchment whilst a very small areas in the north of the Site is mapped in the Maigue_SC_040 river sub-catchment.

Within the Maigue_SC_010 river sub-catchment, the Site is mapped in the Charleville Stream_020 WFD river sub-basin. The EPA named Charleville Stream is a 2nd order stream which dissects the Site, flowing from south to north approximately 95m east of T3. The Charleville Stream discharges into the River Maigue approximately 180m southwest of T7. Several other watercourses are mapped by the EPA in this area of the Site. A small, locally unnamed, 1st order stream, referred to by the EPA as the Graigues Stream, is mapped to originate along the N20 before flowing to the northeast through the Site and approximately 80m west of T5. This stream confluences with another small stream, referred to by the EPA as the Creggane Stream, which flows from the west. This confluence is located approximately 190m northwest of T5. The Graigues Stream then continues to flow for approximately 250m before it discharges into the River Maigue at the same location as the Charleville Stream. All mapped watercourses in this area of the Site form part of the Charleville Stream_020 SWB ((refer to **Figure A**).

Within the Maigue_SC_020 river sub-catchment, the eastern section of the Site is mapped in the Maigue_030 WFD river sub-basin. The main drainage feature in this area is the River Loobagh which discharges into the River Maigue downstream of the Site and approximately 28m north of T7. A small locally unnamed stream, referred to by the EPA as the Loobagh Stream, is mapped to flow along the northeastern boundary of the Site and approximately 80m east of T4. This stream discharges into the River Maigue just south of the confluence of the River Maigue and the main River Loobagh. Meanwhile, the EPA named Ballysallagh Stream is mapped to flow to the north approximately 270m east of the Site Entrance from the Local Road L1537. This stream flows to the north and discharges into the River Loobagh upstream of Garroose Bridge. All mapped watercourses in this area of the Site form part of the Maigue_030 SWB.

Within the Maigue_SC_040 river sub-catchment, the Site is also mapped in the Maigue_030 WFD river sub-basin, with the River Maigue flowing to the north approximately 215m east of T9.

Downstream of the Site, the River Maigue continues to the north, flowing through Bruree and Croom before becoming the Maigue_090 SWB discharges into the Maigue Estuary at Adare, ~20km north-northwest of the Site (straight line distance). Further downstream the Maigue Estuary discharges into the Upper Shannon Estuary and the Lower Shannon Estuary into the Mouth of the Shannon coastal waterbody.

**Table** A presents the total upstream catchment area of each of the SWBs in the vicinity and downstream of the Site. The lower reaches of the River Maigue (Maigue_090 SWB) has a total upstream catchment area of 839km² and discharges into the Maigue Estuary at Adare town. The total upstream catchment area of the Charleville Stream_020 SWB is 105km². This is

significantly less than the catchment area for the Maigue_030 SWB (240km²) and its downstream counterparts. Therefore, the river waterbodies which are located in close proximity to the Site that have relatively smaller catchment areas (i.e. Charleville stream_020 SWB) will be more susceptible to water quality impacts as a result of the Project in comparison to the lower reaches of the River Maigue.

Note that the Project does not in any way rely upon the dilution or assimilative capacity of any downstream watercourse. The mitigation measures prescribed in Section 4.3 ensure the protection all of watercourses in the immediate vicinity of the Project. By protecting those watercourses which are proximal to the Site, all downstream watercourses are also protected.

**Table A: Downstream Catchment Size for River Waterbodies**

| WFD River Sub-Basin | Total Upstream Catchment Area (km²) |
|---|---|
| Charleville stream_020 | 105 |
| Maigue_030 | 240 |
| Maigue_040 | 277 |
| Maigue_050 | 477 |
| Maigue_060 | 489 |
| Maigue_070 | 771 |
| Maigue_080 | 807 |
| Maigue_090 | 839 |

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

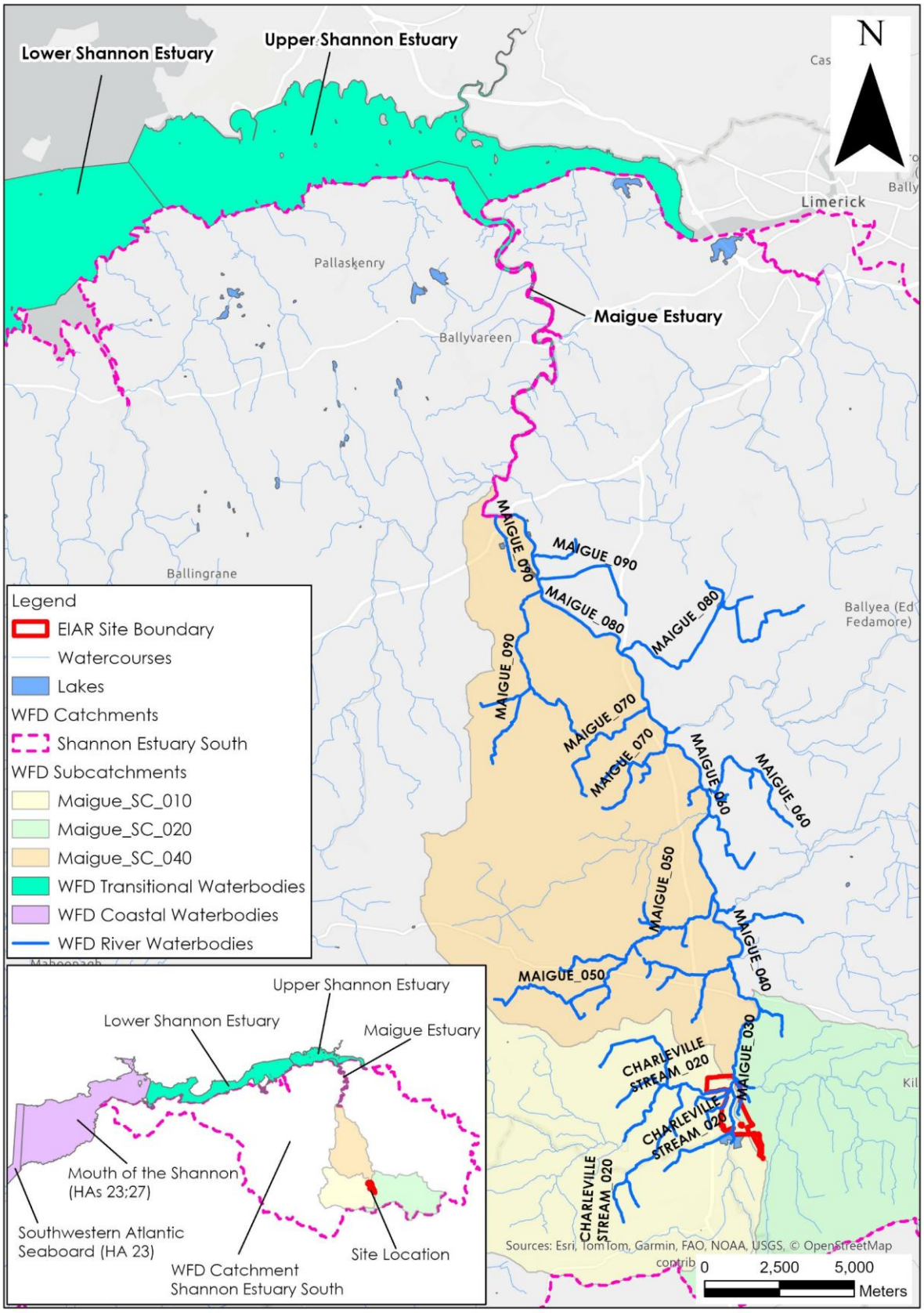


**Figure A: Local Hydrology Map**

## 2.3 SURFACE WATER BODY CLASSIFICATION

A summary of the WFD status and risk result for SWBs downstream of the Site are shown in **Table B**. The overall status of SWBs is based on the ecological, chemical and quantitative status of each SWB.

Local SWB status information is available from (www.catchments.ie).

As stated above the majority of the Site drains to the Charleville Stream_020 SWB (IE_SH_24C020800). This SWB which achieved "Poor" status in both the 2010-2015 and 2013-2018 WFD cycles. In the latest WFD cycle (2016-2021) the Charleville stream_020 SWB status improved to "Moderate" and has been deemed "at risk" of failing to meet its WFD objectives. Agriculture and urban wastewater have been listed as significant pressures on the Charleville Stream_020 SWB.

The east and north of the Site is drained by the Maigue_030 SWB (IE_SH_24M010300). The Maigue_030 SWB achieved "Moderate" Status in all 3 no. WFD cycles (2010-2015, 2013-2018 and 2016-2021) and has been deemed "at risk" of failing to meet its WFD objectives. Agriculture has been listed as a significant pressure on the Maigue_030 SWB. We note that there is an existing discharge from Rathgoggan Wastewater Treatment Plant to the Maigue_030 SWB in the vicinity of the Site. The discharge licence is (P0386-04) is held by Kerry Ingredients Ltd and permits a discharge of 5,000m$^3$/day to the Maigue River immediately downstream of the Site. This is not listed as a significant pressure on this SWB and a review of the 2024 Annual Environmental Report shows 100% compliance with the Emission Limit Values (ELVs).

Further downstream, the WFD status of the River Maigue ranges from "Moderate" (Maigue_040, Maigue_060 and Maigue_070 SWBs) to "Good" (Maigue_050 SWB) until it reaches Croom Town. Downstream of Croom, the lower reaches of the River Maigue (Maigue_080 and _090 SWBs) achieved "Poor" status in the latest WFD cycle. With the exception of the Maigue_050 SWB which was deemed to be "not at risk", the River Maigue downstream of the Site is "at risk". Meanwhile, the risk status of the Maigue_090 SWB is currently under review.

Agricultural activities is the main significant pressure that exists along the majority of the River Maigue (Maigue_040, Maigue_060, Maigue_070 and Maigue_080 SWBs). The Maigue_050 and _090 SWBs have no recognised significant pressures.

In relation to the transitional waterbodies downstream of the Site, the Maigue Estuary SWB (IE_SH_060_0700) has achieved a "Moderate" status in all 3 no. WFD cycles and is "at risk" of failing to meet its WFD objectives. The Upper Shannon Estuary SWB achieved "Poor" status in each WFD cycle and is also "at risk" of failing to meet its WFD objectives. Meanwhile, the Lower Shannon Estuary SWB (IE_SH_060_0300) has achieved "Good" status in the latest WFD cycle and is classified as being "not at risk". Agricultural pressures have been listed as a significant pressure on the Maigue Estuary and Upper Shannon Estuary transitional SWBs.

The Mouth of the Shannon (HAs 23;27) and the Southwestern Atlantic Seaboard (HA 23) downstream coastal waterbodies achieved "Good" and "High" status respectively. Both of these coastal waterbodies have been deemed to be "not at risk" of failing to meet their WFD objectives in the future.

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

**Table B: Summary WFD Information for Surface Water Bodies**

| SWB | Overall Status (2010-2015) | Overall Status (2013-2018) | Overall Status (2016-2021) | Risk Status (3rd Cycle) | Pressures |
|---|---|---|---|---|---|
| Charleville Stream_020 | Poor | Poor | Moderate | At risk | Agriculture, Urban Wastewater |
| Maigue_030 | Moderate | Moderate | Moderate | At Risk | Agriculture |
| Maigue_040 | Moderate | Moderate | Moderate | At risk | Agriculture |
| Maigue_050 | Good | Moderate | Good | Not at risk | None |
| Maigue_060 | Unassigned | Moderate | Moderate | At risk | Agriculture |
| Maigue_070 | Good | Moderate | Moderate | At risk | Agriculture |
| Maigue_080 | Moderate | Poor | Poor | At risk | Agriculture |
| Maigue_090 | Unassigned | Moderate | Poor | Under Review | None |
| Maigue Estuary | Moderate | Moderate | Moderate | At risk | Agriculture |
| Upper Shannon Estuary | Poor | Poor | Poor | At risk | Agriculture |
| Lower Shannon Estuary | Moderate | Good | Good | Not at risk | None |
| Mouth of the Shannon (HAs 23;27) | Moderate | Good | Good | Not at risk | None |
| Southwestern Atlantic Seaboard (HA 23) | Unassigned | High | High | Not at Risk | None |

## 2.4 GROUNDWATER BODY IDENTIFICATION

The Hospital GWB (IE_SH_G_107) is mapped to the north of the Site coinciding with the mapped Visean Limestones and the Ballysteen Formation in the north. The North Kilmallock GWB (IE_SH_G_193) is mapped to the south of the Hospital GWB, along the band of Waulsortian Limestones mapped to underlie the centre of the Site. Meanwhile, the south of the Site is within the Charleville GWB (IE_SH_G_055) comprised of undifferentiated Visean limestones.

## 2.5 GROUNDWATER BODY CLASSIFICATION

The Hospital (IE_SH_G_107), the North Kilmallock (IE_SH_G_193) and the Charleville (IE_SH_G_055) GWBs which underly the Site, from north to south respectively, all achieved "Good" status in the 3 no. WFD cycles. The status is defined based on the quantitative status and chemical status of the GWB.

The Hospital GWB is deemed to be "Not at risk" of failing to meet its WFD objectives. The North Kilmallock and the Charleville GWB's are "at risk" with agriculture listed as a significant pressure on both of these GWBs.

The GWB status for the 2010-2015 and 2013-2018 WFD cycles are shown on **Figure B**.

**Table C: Summary WFD Information for Groundwater Bodies**

| GWB | Overall Status (2010-2015) | Overall Status (2013-2018) | Overall Status (2016-2021) | Risk Status (3rd WFD Cycle) | Pressures |
|---|---|---|---|---|---|
| Hospital | Good | Good | Good | Not at risk | None |
| North Kilmallock | Good | Good | Good | At risk | Agriculture |
| Charleville | Good | Good | Good | At risk | Agriculture |

## 2.6 ZONE OF INFLUENCE

The Zone of Influence (ZoI) of the Project extends to the following SWBs and GWBs:

- River waterbodies – Charleville Stream_020, Maigue (030 to 090) rivers
- GWBs – Hospital, North Kilmalock and Charleville GWBs.
- Transitional and Coastal waterbodies – Maigue Estuary, Upper Shannon Estuary, Lower Shannon Estuary, Mouth of the Shannon (HAs 23;27)and Southwestern Atlantic Seaboard (HA 23).

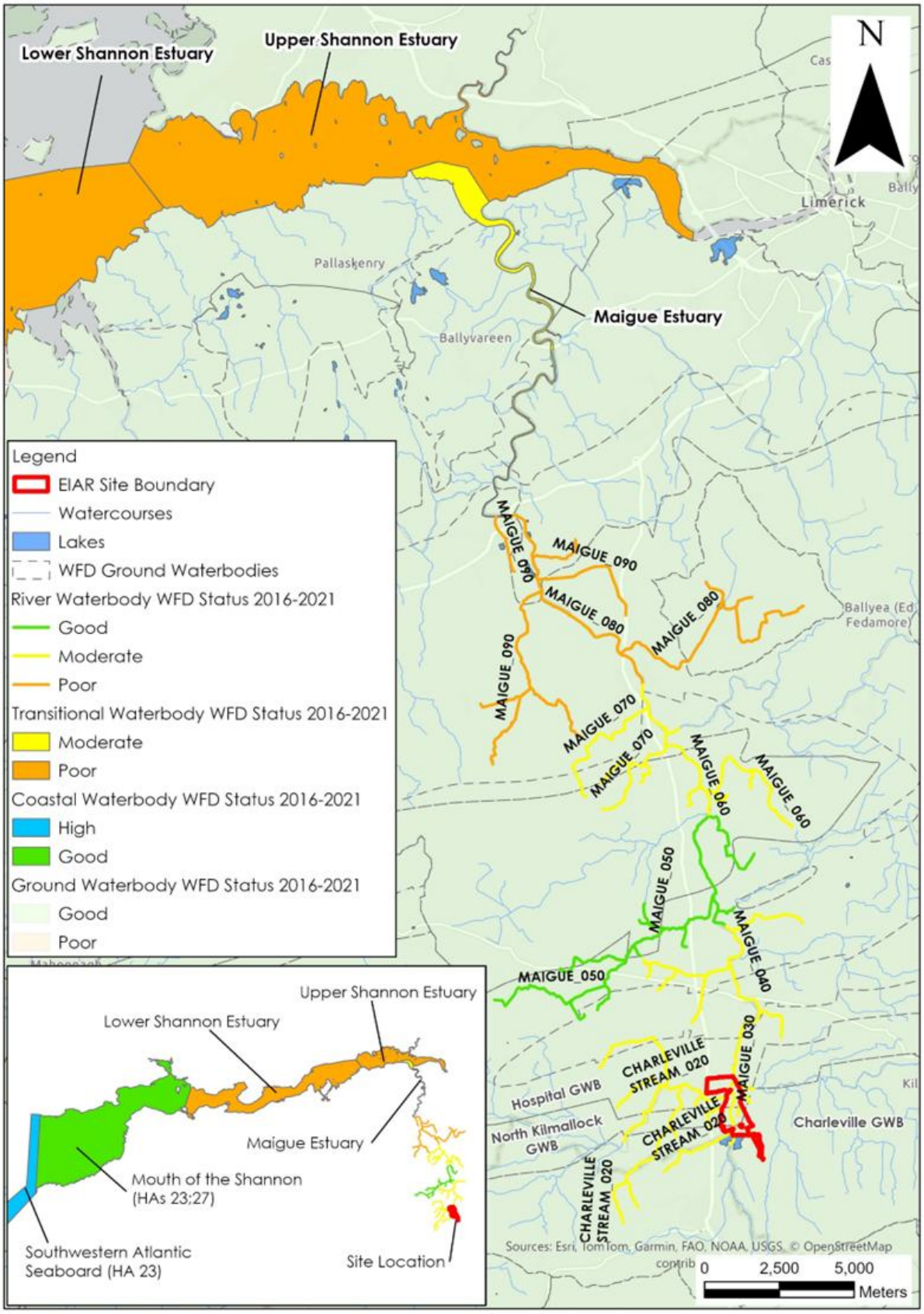


**Figure B: WFD Groundwater and Surface Waterbody Status (2016-2021)**

## 2.7 PROTECTED AREA IDENTIFICATION

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

### 2.7.1 Nature Conservation Designations

Within the Republic of Ireland designated sites include Natural Heritage Areas (NHAs), Proposed Natural Heritage Areas (pNHAs), Special Areas of Conservation (SACs), candidate Special Areas of Conservation (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 Site is not mapped within or in the vicinity of any designated areas.

The nearest designated site is the Blackwater River (Cork/Waterford) SAC (Site code: 002170) situated approximately 8km south of the Site. However, this SAC is mapped within a different surface water catchment to the Site. There is no hydrological linkage between the Site and this designated site.

There are downstream hydrological connections with some Natura 2000 sites within the Shannon Estuary South surface water catchment. Designated sites that lie downstream of the Site include:

- Lower River Shannon SAC (Site Code: 002165) is located ~20km to the north-northwest (straight line distance) and downstream of the Site along the River Maigue. The SAC includes the River Maigue estuary. The length of the hydrological flowpath between the Site and this SAC is approximately 25km;
- The River Shannon and River Fergus Estuaries SPA (Site Code:004077) is located ~25km to the north-northwest (straight line distance) and downstream of the Site along the River Maigue Estuary. The length of the hydrological flowpath between the Site and this SPA is approximately 34.5km;
- The Inner Shannon Estuary - South Shore pNHA (Site Code: 000435) is located ~26.5km to the north-northwest (straight line distance) and downstream of the Site. the length of the hydrological flowpath between the Site and this pNHA is approximately 37km; and,
- The Fergus Estuary and Inner Shannon, North Shore pNHA (Site Code: 002048) is located ~30km to the north-northwest (straight line distance) and downstream of the Site.
- Ballyhoura Mountains SAC (site code: 002036) is located ~9km southeast of the SAC (closest straight-line distance). There are no ecological or hydrological linkages between the Wind Farm Site and the SAC.
- Kilcolman Bog SPA (site code: 004095) is located approximately 14.1km south-southwest of the SPA (closest straight-line distance). There is no ecological or hydrological linkages between the Wind Farm Site and the SAC.

Other designated sites are mapped within the River Maigue catchment and downgradient of the Site include Tory Hill SAC/pNHA (Site code: 000439), Glen Bog SAC (site code: 001430), and Adare Woodlands pNHA (Site Code: 000429). However, these designated sites are located approximately 14km, 14.7km and 17km from the Site and are not hydrologically connected to the Site. All water draining the Site will be in the River Maigue and there will be no potential for effects on the designated sites which are not mapped along the course of the River Maigue.

### 2.7.2 Bathing Waters

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

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

### 2.7.3 Nutrient Sensitive Areas

Nutrient Sensitive Areas (NSA) comprise Nitrate Vulnerable Zones and polluted waters designated under the Nitrates Directive (91/676/EEC) and areas designated as sensitive areas under the Urban Wastewater Treatment Directive (UWWTD)(91/271/EEC). Sensitive areas under the UWWTD are water bodies affected by eutrophication associated with elevated nitrate concentrations and act as an indication that action is required to prevent further pollution caused by nutrients.
There are no NSAs in the vicinity or downstream of the Site.

### 2.7.4 Shellfish Area

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

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

The closes designated shellfish area is the West Shannon Ballylongford (IEPA2_0061) shellfish protected area. However, this shellfish protected area is ~57km to the northwest (straight line distance) and is located within the Lower Shannon Estuary.

### 2.7.5 Salmonid Waters

The Salmonid Regulations (S.I. 293 / 1988) identifies the protected river that are designated as Designated Salmonid Waters under S.I. No. 293/1988 - European Communities (Quality of Salmonid Waters) Regulations 1988, 14th August 1988. The Council Directive 78/659/EEC of 18th July 1978 on the quality of fresh waters needing protection or improvement in order to support fish life and the Council Directive 92/42/EEC of 21st May 1992 on the conservation of natural habitats and of wild fauna and flora was transposed into Irish law under the Fish Directive S.I. 293/1988 and Habitats Directive S.I. 477/2011.

There are no designated Salmonid Waters within the vicinity or downstream of the Site.

### 2.7.6 Drinking Water Protected Areas

According to the 3rd Cycle Shannon Estuary South Catchment Report (EPA, 2024) there are 5 no. surface waterbodies in the catchment identified as Drinking Water Protected Areas (DWPAs).

The nearest DWPA to the Site is the Loobagh_020 DWPA (IEPA1_SH_24L010400) approximately 6.5km east and upstream of the Site. There is no direct hydrological linkage between the Site and the DWPA as the DWPA is located upstream of the Site.

The closest downstream DWPA is the Maigue_080 DWPA (IEPA1_SH_24M010900) which is situated approximately 13.5km northwest (straight line distance) of the Site. This DWPA is downstream of the Site via the River Maigue. This abstraction is for Uisce Éireann's Adare Water Supply (Licence Code: 1900PUB1002). The maximum daily abstraction is estimated to be 1,927m3/day. The length of the hydrological flowpath between the Site and this DWPA is approximately 16.7km.

Meanwhile, all GWBs within the catchment are listed as DWPAs. The GWB DWPAs are assessed in the WFD Compliance Assessment under the overall qualitative and quantitative assessment on the overall GWBs.

# 3. WFD SCREENING

As discussed in **Section 2**, there are a total of 8 no. river water bodies that are located in the vicinity or downstream of the Site. In addition, there are 3 no. transitional waterbodies and 2 no. coastal waterbodies located downstream. The Site is underlain by 3 no. GWBs. Furthermore, there are protected areas hydrologically connected to the Site.

## 3.1 SURFACE WATER BODIES

As shown in **Figure A** above, there are 13 no. SWBs located in the vicinity or downstream of the Site.

With consideration for the construction, operational and decommissioning phases of the Project, it is considered that the Charleville Stream_020, Maigue_030, Maigue_040 and the Maigue_050 in the vicinity and downstream of the Site are carried through into the WFD Compliance Assessment. These SWBs have been screened in due to their close proximity to the Site. The Project must not in any way result in a deterioration in the status of these SWBS and/or prevent them from meeting the biological and chemical characteristics for good status in the future.

Meanwhile, the remaining lower reaches of the River Maigue (Maigue_060, Maigue_070, Maigue_080 and Maigue_090 SWBs) have been screened out due to their distant location from the Site and the increasing volumes of water within the River Maigue, making them less susceptible to potential water quality impacts associated with the Project. The proposed works have no potential to cause a deterioration in status of these SWBs and/or jeopardise the attainment of good surface water status in the future.

The Maigue Estuary, the Upper Shannon Estuary and the Lower Shannon Estuary transitional SWBs and the Mouth of the Shannon (HAs 23;27) and the Southwestern Atlantic Seaboard (HA 23) coastal SWBs have been screened out due to the large volumes of water within these SWBs and the saline nature of these waters. The Project has no potential to cause a deterioration in status of these SWBs and/or jeopardise the attainment of good surface water status in the future.

## 3.2 GROUNDWATER BODIES

The Hospital, the North Kilmallock and the Charleville GWBs have been screened in due to their location directly underlying the Site. The Project must not in any way result in a deterioration in the status of this GWB and/or prevent it from meeting the biological and chemical characteristics for good status in the future.

## 3.3 PROTECTED AREAS

The Blackwater River (Cork/Waterford) SAC situated ~8km south of the Site. However, this SAC is mapped within a different surface water catchment to the Site. There is no hydrological linkage between the Site and this designated site. Therefore, there is no potential for the Project to impact the SAC and thus the Blackwater River (Cork/Waterford) SAC has been screened out.

The Lower River Shannon SAC is mapped within the Maigue Estuary transitional waterbody ~25km north-northwest (straight line distance) and downstream of the site along the River Maigue. For the purposes of a conservative assessment, the Lower River Shannon SAC has been included in the assessment. However, the length of the hydrological flowpath between the Site and the SAC limits the potential for effects to occur.

Further downstream, the River Shannon and River Fergus Estuaries SPA and the Inner Shannon Estuary - South Shore pNHA are also mapped within the Maigue Estuary transitional waterbody. Both the River Shannon and River Fergus Estuaries SPA and the Inner Shannon Estuary - South Shore pNHA have been screened out due to their distant location from the Site. The Project has no potential to impact the status of these protected areas.

The Shellfish waters of West Shannon Ballylongford have been screened out due to their distant location from the Site. The Project has no potential to cause a deterioration to the shellfish areas.

The Loobagh_020 DWPA has been screened out as this DWPA is located upstream of the Site. Therefore, there is no potential for the Project to impact the DWPA.

The Maigue_080 DWPA has been included in the WFD Compliance Assessment for the purposes of a conservative assessment. However, note that the length of the hydrological flowpath between the Site and this DWPA is ~17km. The length of this flowpath limits the potential for effects.

The Bruree PWS has been included in the WFD Compliance Assessment as this PWS is located ~3.3km downstream of the Site and includes some input from the River Maigue to the source.

## 3.4 WFD SCREENING SUMMARY

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

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

| Type | WFD Classification | Waterbody Name/ID | Inclusion in Assessment | Justification |
|---|---|---|---|---|
| Surface Water Body | River | Charleville stream_020 | **Yes** | The western section of the Site is mapped within the catchment area of the Charleville stream_020 SWB. An assessment is required to consider the potential impacts of the Project on this SWB. |
| | River | Maigue_030 | **Yes** | The eastern and northern sections of the Site is mapped Maigue_030 WFD river sub-basin. An assessment is required to consider the potential impacts of the Project on this SWB. |
| | River | Maigue_040 | **Yes** | The Maigue_040 SWB is located directly downstream of the Maigue_030 SWB. Therefore, an assessment of the Maigue_040 SWB will be carried out to consider the potential impacts of the Project on this downstream SWB. |
| | River | Maigue_050 | **Yes** | The Maigue_050 SWB is located directly downstream of the Maigue_040 SWB. An assessment of the Maigue_050 SWB will be carried out to consider the potential impacts of the Project on this downstream SWB. |
| | River | Maigue_060 | No | The Maigue_060 SWB has been screened out due to its distant location from the Site and the large volume of water within the River Maigue. The Project has no potential to effect the status of this SWB. |
| | River | Maigue_070 | No | The Maigue_070 SWB has been screened out due to its distant location from the Site and the large volume of water within the River Maigue. The Project has no potential to effect the status of this SWB. |
| | River | Maigue_080 | No | The Maigue_080 SWB has been screened out due to its distant location from the Site and the large volume of water within the River Maigue. The Project has no potential to effect the status of this SWB. |
| | River | Maigue_090 | No | The Maigue_090 SWB has been screened out due to its distant location from the Site and the large volume of water within the River Maigue. The Project has no potential to effect the status of this SWB. |
| | Transitional | Maigue Estuary | No | The Maigue Estuary transitional waterbody has been screened out due its' distant location from the Site, the saline nature of its waters and the large volumes of water within the estuary. The Project has no potential to impact the status of this SWB. |
| | Transitional | Upper Shannon Estuary | No | The Upper Shannon Estuary transitional waterbody has been screened out due to its' distant location from the Site, the saline nature of its waters and the large volumes of water within the estuary. The Project has no potential to impact the status of this SWB. |
| | Transitional | Lower Shannon Estuary | No | The Lower Shannon Estuary transitional waterbody has been screened out due to its distant location from the Site, the saline nature of its waters and the large volumes of water within this waterbody. The Project has no potential to impact the status of this SWB. |

| | | | | |
|---|---|---|---|---|
| | Coastal | Mouth of the Shannon (HAs 23;27) | No | The Mouth of the Shannon (HAs 23;27) coastal waterbody has been screened out due to its distant location from the Site and the large volumes of saline water within the waterbody. The Project has no potential to impact the status of this SWB. |
| | Coastal | Southwestern Atlantic Seaboard (HA 23) | No | The Southwestern Atlantic Seaboard (HA 23) coastal waterbody has been screened out due to its distant location from the Site and the large volumes of saline water within the waterbody. The Project has no potential to impact the status of this SWB. |
| Groundwater Body | Groundwater | Hospital GWB | **Yes** | The northern section of the Site is underlain by the Hospital GWB. Therefore, an assessment is required to consider potential impacts of the Project on this GWB. |
| | Groundwater | North Kilmallock GWB | **Yes** | The North Kilmallock GWB underlies the centre of the Site. Therefore, an assessment is required to consider potential impacts of the Project on this GWB. |
| | Groundwater | Charleville GWB | **Yes** | The Charleville GWB underlies the southern section of the Site. Therefore, an assessment is required to consider potential impacts of the Project on this GWB. |
| Protected Areas | Nature Conservation Designations | Blackwater River (Cork/Waterford) SAC | No | The Blackwater River (Cork/Waterford) SAC is mapped within a different catchment to the Site. Therefore, there is no potential for the Project to impact the SAC. |
| | | Lower River Shannon SAC | **Yes** | For the purposes of a conservative assessment, the Lower River Shannon SAC has been included in the compliance assessment as this is the closest downstream designated site. However, the length of the hydrological flowpath between the Site and the SAC is ~25km. Therefore, there is very limited potential for effects. |
| | | River Shannon and River Fergus Estuaries SPA | No | The River Shannon and River Fergus Estuaries SPA has been screened out due to its distant location from the Site (~25km straight line distance), and the large volumes of saline waters within the associated waterbody. The Project has no potential to impact the status of this SPA. |
| | | Inner Shannon Estuary - South Shore pNHA | No | The Inner Shannon Estuary - South Shore pNHA has been screened out due to its distant location from the Site (~26.5km straight line distance) and the large volumes of saline waters within the associated waterbody. The Project has no potential to impact the status of this SPA. |
| | | Fergus Estuary and Inner Shannon, North Shore pNHA | No | This pNHA has been screened out due to its distant location from the Site (~30km straight line distance) and the large volumes of saline water in the associated waterbody. The Project has no potential to impact the status of this pNHA. |
| | Shellfish Areas | West Shannon Ballylongford | No | The West Shannon Ballylongford Shellfish area has been screened out due to its distant location from the Site (~57km straight line distance). The Project has no potential to impact these Shellfish areas. |
| | Drinking Water | Loobagh_020 | No | The Loobagh_020 DWPA is located to the east and upstream of the Site. Therefore, there is no potential for the Project to impact this DWPA. |

| | | | | |
|---|---|---|---|---|
| | | Maigue_080 | **Yes** | The Maigue_080 DWPA has been included for the purposes of a conservative assessment. However, this DWPA is located ~17km downstream of the Site along the River Maigue. The length of this flowpath limits the potential for effects. |
| | | Bruree PWS | **Yes** | The Bruree PWS is located ~3.3km downstream of the Site along the River Maigue and includes some input from the river. Therefore, an assessment is required to consider the potential effects of the Project on this PWS. |

# 4. WFD COMPLIANCE ASSESSMENT

## 4.1 DEVELOPMENT PROPOSALS

Permission is being sought by the Developer for the construction of 9 no. wind turbines, a permanent Met Mast, an on-site 110kilovolt (kV) Substation with a 'loop in' Grid Connection to the existing 110kV overhead line (OHL) between Charleville and Killonan, and all ancillary works. Temporary accommodation requirements at locations along the TDR are not included in the planning application but are assessed as part of the EIAR. The full description of the Project is provided in Chapter 2: Project Description of this EIAR.

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 at the site will be from cementitious materials, hydrocarbon spillage and leakages, and potential piling works.

The primary risk to surface waters will be entrained suspended sediments (soil particles) in site runoff during earthworks and tree felling along with cement-based compounds.

The Project includes works over and in close proximity to waterbodies. There are a number of potential adverse effects to both surface and groundwater.

The primary risks of degradation of surface water bodies include:

- Changes in surface runoff flow volumes and flow patterns;
- Entrainment of suspended solids in surface waters; and,
- Chemical pollution of surface waters by concrete, oil and or fuels.

The primary risks of degradation of groundwaters include:

- Chemical pollution of groundwaters by concrete, oils and fuels.

## 4.2 POTENTIAL EFFECTS

### 4.2.1 Construction Phase (Unmitigated)

#### 4.2.1.1 Potential Surface Water Quality Effects from Works

Construction phase activities including of the construction of Site entrances, construction of the new Access Tracks, upgrades to existing Access Tracks, construction of turbine hardstand areas, turbine foundations, 110kV Substation compound, temporary construction compound, met mast, internal grid cabling, spoil storage areas, Grid Connection cabling and all associated landscaping and drainage works at the Site will require varying degrees of earthworks resulting in excavation of soils and subsoils.

Hydrocarbons and cement-based compounds will also be used during the construction phase. The release of effluent from the on-site wastewater treatment systems also has the potential to impact on surface water quality.

These activities can result in the release of suspended solids and pollutants in runoff water and could result in an increase in the suspended sediment load, resulting in increased turbidity, increased pH and contamination which in turn could affect the water quality and fish stocks of downstream water bodies such as the Charleville Stream and the River Maigue.

Some areas of the Site are located in fluvial flood zones and have a history of flooding. Should a flood event coincide with the construction phase of the Project, there is the potential for surface water quality effects to occur.

Contaminants have the potential to cause a deterioration in the overall status of the Charleville stream_020, and Maigue_030 SWBs. Further downstream the status of the Maigue_040 and Maigue_050 SWBs is unlikely to be impacted even in an unmitigated scenario due to the increasing distance from the Site and the volumes of water within the River Maigue.

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

**Table E: Surface Water Quality Impacts during Construction Phase (Unmitigated)**

| SWB | WFD Code | Current Status | Assessed Potential Status Change |
|---|---|---|---|
| Charleville Stream_020 | IE_SH_24C020800 | Moderate | Poor |
| Maigue_030 | IE_SH_24M010300 | Moderate | Poor |
| Maigue_040 | IE_SH_24M010400 | Moderate | Moderate |
| Maigue_050 | IE_SH_24M010500 | Good | Good |

#### 4.2.1.2 Potential Groundwater Quality/Quantity Effects

Accidental spillage during refuelling of construction plant with petroleum hydrocarbons is a major pollution risk to groundwater. The accumulation of small spills of fuels and lubricants during routine plant use can also be a pollution risk. Chemicals such as cement-based compounds also pose a threat to the groundwater environment. Runoff from concrete works can impact on groundwater quality. Furthermore, the release of effluent from the on-site wastewater treatment systems also has the potential to impact on groundwater quality. These sources of contamination have the potential to impact on groundwater quality in the underlying groundwater bodies in the area of the Site.

The dewatering deep excavations such as turbine bases have the potential to impact local groundwater levels. However, groundwater level impacts are not anticipated to be significant due to the local hydrogeological regime. No groundwater level impacts are predicted from the construction of the collector cabling trench, access roads, substation, compound or met mast due to the shallow nature of the excavation (i.e. 0 -~1.2m).

Several turbines will also require piled foundations. Piling has the potential to create preferential flowpaths and contamination of groundwater.

However, the Project is unlikely to change the overall status of the underlying GWBs due to the scale of these GWBs. The Hospital GWB covers a total area of 260km$^2$, the North Kilmallock GWB covers a total area of 44km$^2$ and the Charleville GWB covers an area of 218km$^2$. Meanwhile, the Site has a total area of ~1.6km$^2$.

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

**Table F: Groundwater Quality Impacts during Construction Phase (Unmitigated)**

| GWB | WFD Code | Current Status | Assessed Potential Status Change |
|---|---|---|---|
| Hospital GWB | IE_SH_G_107 | Good | Good |
| North Kilmallock GWB | IE_SH_G_193 | Good | Good |
| Charleville GWB | IE_SH_G_055 | Good | Good |

#### 4.2.1.3 Potential Effects on Protected Areas

**Bruree PWS**

The source protection zone associated with the Bruree PWS is mapped ~2.7km north of the closest turbine (T9). The Bruree PWS is included for the purposes of a conservative assessment. This PWS is predominantly sourced from a Regionally Important Aquifer – fissured bedrock and the borehole is located adjacent to the River Maigue. The length of the hydrological flowpath between the Site and the River Maigue adjacent to the supply well is ~3.3km.

The Source Protection Report for this PWS states that "*the aquifer feeding the Bruree public supply is considered to be sandstones however recharge from the river is likely to be induced during pumping.*" *Furthermore, the report concludes that "Overall the source at Bruree is a reasonable yielding well which is likely to be taking a significant proportion of its water from the river Maigue. The vulnerability of the source to contamination, although it is extreme, is less important than the river water quality*."

Whilst, the Project would have no potential to effect water quality in the bedrock aquifers which feed the well, any deterioration in surface water quality at the Site could affect water quality in the River Maigue which could enter the well which supplies the Bruree PWS. However, at the distances involved the potential for effects is limited.

**Maigue_080 DWPA**

The Maigue_080 DWPA is associated with the Adare PWS. The length of the hydrological flowpath between the Site and the Maigue_080 DWPA is ~17km. Due to this distant location of the Site to this PWS, there is limited potential for effects.

**Lower River Shannon SAC**

The Lower River Shannon SAC is assessed for the purposes of a conservative assessment as this is the closest downstream hydrologically connected designated site. Even in an unmitigated scenario the potential for effects on the Lower River Shannon SAC are limited due to the following:

- The distance between the SAC and the Site.
- The length of the hydrological flowpath between the Site and the SAC is ~25km.
- The SAC is associated with the River Maigue Estuary which contains saline waters which are less vulnerable to effects than freshwaters.
- The significant volumes of water within the estuary limit the potential for effects.

### 4.2.2 Operational Phase (Unmitigated)

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

No maintenance works will be required along the Grid Connection.

#### 4.2.2.1 Potential Surface Water Quantity Effects

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 Site and increase flood risk downstream of the development.

During storm rainfall events, additional runoff coupled with increased velocity of flow could increase hydraulic loading, resulting in erosion of watercourses and causing hydromorphological effects. However, no significant changes in runoff volumes will occur due to the high rates of surface water runoff in the baseline environment. Furthermore, the proposed permanent footprint of the Project equates to 5.6% of the total Site Area. Table 10.20 of the EIAR shows that the replacement of natural surface with hardstands at the Site will only result in a 0.24% increase in the average daily runoff volume. Therefore, there is no potential for the Project to alter the quantitative status of local SWBs.

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

**Table G: Potential Effects on Surface Water Quantity During Operational Phase (Unmitigated)**

| SWB | WFD Code | Current Status | Assessed Potential Status Change |
|---|---|---|---|
| Charleville Stream_020 | IE_SH_24C020800 | Moderate | Moderate |
| Maigue_030 | IE_SH_24M010300 | Moderate | Moderate |
| Maigue_040 | IE_SH_24M010400 | Moderate | Moderate |
| Maigue_050 | IE_SH_24M010500 | Good | Good |

#### 4.2.2.2 Potential Surface Water Quality Effects

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

Any leakage of oils at the Site, associated with the transformers in the turbines and the substation, would have the potential to impact on local surface water quality.

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

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

| SWB | WFD Code | Current Status | Assessed Potential Status Change |
|---|---|---|---|
| Charleville Stream_020 | IE_SH_24C020800 | Moderate | Moderate |
| Maigue_030 | IE_SH_24M010300 | Moderate | Moderate |
| Maigue_040 | IE_SH_24M010400 | Moderate | Moderate |
| Maigue_050 | IE_SH_24M010500 | Good | Good |

#### 4.2.2.3 Potential Groundwater Quality/Quantity Effects

The potential for effects on groundwater quality is reduced in comparison with the construction phase. Any leakage of oils at the Site, associated with the transformers in the turbines and the substation, would have the potential to impact on local groundwater quality. However, due to the nature of the operational phase and the overall scall of the underlying GWBs, there is little potential for the overall qualitative status to be impacted.

The potential piling works will not result in any significant changes to regional groundwater flowpaths or groundwater levels due to the small footprint of any potential piles and the large areas covered by the underlying GWBs. Furthermore, the water supply at the substation will be very small, comparable to a domestic well supplying a single household (~3m$^3$/day). There is no potential for the Project to alter the quantitative status of the underlying GWBs.

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

**Table I: Potential Groundwater Quality/Quantity Effects During Operational Phase (Unmitigated)**

| GWB | WFD Code | Current Status | Assessed Potential Status Change |
|---|---|---|---|
| Hospital GWB | IE_SH_G_107 | Good | Good |
| North Kilmallock GWB | IE_SH_G_193 | Good | Good |
| Charleville GWB | IE_SH_G_055 | Good | Good |

#### 4.2.2.4 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. Minor maintenance works may pose a small risk with regards to the release of hydrocarbons from site vehicles.

Therefore, the risk of any operational phase activities that may affect the conservation objectives of downstream protected areas or water supplies 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 Project. These are outlined in the subsequent sections.

### 4.3.1 Design Phase

#### 4.3.1.1 Mitigation by Avoidance

The proposed wind farm layout have been subject to an iterative design process which considered a wide range of environmental constraints including hydrological buffer zones around watercourses (50m) and manmade drains (10m) (these are best practice buffer sones and are the standard buffer zones used in wind farm developments), archaeological and ecological constraints, set back distances from local houses and the national road (N20), as well as minimising interaction with the industrial outflow pipeline which passes through the Site. The proposed wind farm layout also considered the fluvial flood zones within the Site which are mapped along the River Maigue and the Charleville Stream.

In terms of hydrology, all of the proposed development infrastructure, with the exception of the 2 no. proposed watercourse crossings, are located outside of the 50m delineated hydrological buffer zone which was applied to the natural streams and rivers within the Site. This set-back distance ensures that there is no unnecessary disturbance to these streams and rivers and provides space for the proposed wind farm drainage system to be installed, thereby protecting downstream water quality. Furthermore, where possible, infrastructure has been placed outside of the 10m buffer zone assigned to the manmade drains. Whilst some infrastructure does encroach upon these drain buffers, the drains are manmade features and are not considered to be a significant hydrological constraint. They can be rerouted around or culverted beneath the proposed infrastructure.

Following a review of all of the identified constraints, the proposed 9 no. turbine layout is considered to be the optimum layout for a wind farm. A series of turbine layout were initially considered, and the proposed layout was optimised to ensure it has the least effect on flooding, and the least potential to cause downstream flood effects. As described above in Section 10.3.7, a total of 5 of the 9 no. turbines are located in fluvial flood zones within the Site (4 no. turbines in Flood Zone A and 1 no. turbine in Flood Zone B). Assessments have shown that the avoidance of infrastructure within the flood zones would have rendered the Project, a 4 no. turbine wind farm, unviable.

Therefore, avoidance of infrastructure within the flood zones was not possible. However, the Project has been designed to minimise the potential effects of construction and operation of the wind farm within the flood zone. Several design workshops were completed between HES, Green Source and JoD to ensure that the Project has been designed to minimise the potential effects associated with flooding. Several key elements of the Project have avoided the flood zones, including the substation, 4 no. turbines, the construction compound and all spoil storage area which are located above the 1 in 1,000-year flood level. As discussed above, in order to ensure Project viability, it was necessary to propose 4 no. turbine within the flood zones. Bespoke design measures, detailed in Section 10.6.1.3 below and in the Site Specific Flood Risk Assessment (Appendix 9.1), have been incorporated into the Project to ensure that there is infrastructure is not at significant risk of flooding and to ensure that the Project does not significantly affect the downstream flood risk.

In summary, the mitigation by avoidance incorporated into the design of the Project is as follows:

- The location of all infrastructure outside of the 50m hydrological buffer zones, with the exception of the 2 no. watercourse crossings;
- The location of all infrastructure where possible outside of the 10m drain buffer; and,
- The location of the substation, 4 no. turbines, the construction compound and all spoil storage area which are located above the 1 in 1,000-year flood level.

#### 4.3.1.2 Mitigation by Design

The descriptive mitigation measures outlined in this report will be applied to the Project design and construction methodologies with a view to avoiding and/or minimising any potential adverse effects to water quality in the receiving surface water network. Details on how such measures will be applied (objectives, design considerations, layout) will be contained in a Surface Water Management Plan (SWMP) (appended to the CEMP in Appendix 2.1). The aims and examples of important considerations in relation to mitigation measures described in the SWMP are further clarified here in Section 4.3.2.12 for the construction phase and Section 4.3.3.3 for the operational phase.

#### 4.3.1.3 Flooding Considerations

A series of turbine layout were initially considered, and the proposed layout was optimised to ensure it has the least effect on flooding, and the least potential to cause downstream flood effects.

Additional design measures that were incorporated into the layout include the following:

- All proposed turbines are located outside of 50m watercourse buffers, and 10m buffers for drains.
- All proposed spoil storage areas are located outside of mapped flood zones. There will be no storage of spoil within the flood zones.
- The layout design is intended to minimise earthworks requirements, for hardstands, turbine bases, drainage management, and access tracks within the flood zones.
- All turbines within the flood zones will be constructed with piled foundations, and this will reduce earthworks volumes at those locations (as piled turbine bases are smaller than standard bases).
- Minimise access roads and hardstands buildups (in flood zones, by keeping them as close to existing ground level as possible) during the construction phase, and increase to 1 in 20-year flood levels for operational phase.
- Access tracks will be marked with snow poles to allow for emergency vehicular access.
- The final operational phase hardstand area at each of the turbines in flood zones will be as small as possible (the large construction phase hardstand areas will be reinstated).
- All existing flood zone drainage pathways will be maintained , either by avoidance, by culverting, or by diverting existing drains locally.
- Bespoke construction phase and operational phase drainage has been designed to maximise water quality protection, and minimize flooding effects.
- Detailed emergency response procedures have been outlined for potential flood events during the construction phase and during the operational phase.
- Certain biodiversity enhancement have been designed to avoid mapped flood zones.
- Critical electrical components at turbines, such as transformers in nacelles, and other sensitive electrical components are proposed above 1000-yr flood levels.
- The proposed substation is located in Flood Zone C (i.e. above the 1000-yr flood level).
- As per Section 50 requirements, the river crossings will be located at a height which includes a 300mm freeboard above the 1 in 100-year flood event plus climate change. Additional culverts will be constructed on the access roads on approach to the river crossings to minimise flow disruption during flood events.

### 4.3.2 Construction Phase

#### 4.3.2.1 Mitigation Measures for Potential Effects from Earthworks Resulting in Suspended Solids Entrainment in Surface Waters

**Proposed Mitigation by Avoidance**: The key mitigation measure during the construction phase is the avoidance of sensitive hydrological features, by application of suitable buffer zones (i.e. 50m to main watercourses, and 10m to main drains).

Where possible all of the key development areas (turbines, hardstands, construction compounds etc.) have been located significantly away from the delineated 50m watercourse buffer zones. Where works are proposed within the buffer zone i.e. at watercourse crossings additional mitigation measures are proposed. The only infrastructure elements located within the 50m watercourse buffers are the river crossings over the River Maigue and the Charleville Stream. Furthermore, all designated spoil storage areas are located outside of the fluvial flood zones. There will be no storage of spoil material within the flood zones.

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

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

**Proposed Mitigation by Design:** The Project design has been optimised to utilise the existing infrastructure (site Access Tracks) where practicable. This design prevents the unnecessary disturbance of spoil, significantly reducing the potential for elevated concentrations of suspended solids in runoff.

Presented below are temporary and long-term drainage control measures that will be utilised during the construction phase. As stated above there is an existing drainage network at the Site which comprises of agricultural drains and surface water streams. The measures outlined below will be used in conjunction with the existing drainage network to ensure the protection of all rivers and downstream watercourses.

Source controls:

- Interceptor drains, vee-drains, diversion drains, erosion and velocity control measures such as the use of sand bags, oyster bags filled with gravel, filter fabrics and other similar/equivalent or appropriate systems.
- Small working areas, covering temporary stockpiles, weathering off of side-cast spoil, cessation of works in certain areas or other similar/equivalent or appropriate measures.

In-Line controls:

- Interceptor drains, vee-drains, oversized swales, erosion and velocity control measures such as check dams, sand bags, oyster bags, straw bales, flow limiters, weirs, baffles, silt bags, silt fences, sedimats, filter fabrics, and collection sumps, temporary sumps, sediment traps, pumping systems, settlement ponds, temporary pumping chambers, or other similar/equivalent or appropriate systems.

Treatment systems:

- Temporary sumps and attenuation ponds, temporary storage lagoons, sediment traps, and settlement ponds, and proprietary settlement systems such as "Siltbuster", and/or other similar/equivalent or appropriate systems.

It should be noted that the existing network of manmade agricultural drains present in some areas will be integrated and enhanced as required and used within the Project drainage system. The integration of the existing drainage network and the proposed wind farm network is relatively simple. The key elements are the upgrading and improvements to water treatment elements, such as in-line controls and treatment systems, including silt traps, settlement ponds and buffered outfalls.

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

- Apart from interceptor drains, which will convey clean runoff water to the downstream drainage system, there will be no direct discharge (without treatment for sediment reduction, and attenuation for flow management) of runoff from the proposed wind farm drainage into the existing site drainage network. This will reduce the potential for any increased risk of downstream flooding or sediment transport/erosion.
- Temporary silt traps will be placed in the existing drains downstream of construction works, and these will be diverted into proposed interceptor drains, or culverted under/across the works area.
- During the operational phase, runoff from individual turbine hardstanding areas will be not discharged directly into the existing drainage network but discharged locally at each turbine location through field drains, main drains, and existing settlement ponds.
- Buffered outfalls which will be numerous over the Site will promote percolation of drainage waters across the bog surface and close to the point at which the additional runoff is generated, rather than direct discharge to the existing drains of the Site.
- Velocity and silt control measures such as check dams, sandbags, oyster bags, straw bales, flow limiters, weirs, baffles, silt fences will be used during the upgrade construction works.
- Existing culverts will be lengthened where necessary to facilitate access road widening.

**Pre-Commencement Temporary Drainage Works:** Prior to the commencement of road upgrades (or new road/hardstand or turbine base installs) the following key temporary drainage measures will be installed:

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

**Silt Fences:** Silt fences will be emplaced within drains down-gradient of all construction areas. Silt fences are effective at removing heavy settleable solids. This will act to prevent entry to the existing drainage network of sand and gravel-sized sediment, released from the excavation of mineral sub-soils of glacial and glacio-fluvial origin and entrained in surface water runoff. Inspection and maintenance of these structures during the construction phase will be completed and is critical to their functioning to stated purpose. They will remain in place throughout the entire construction phase.

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

**Settlement Ponds:** The Project footprint will be divided into drainage catchments (based on topography, outfall locations, catchment size and soil type) and stormwater runoff rates based on the 10-year return period rainfall event will be calculated for each catchment. These flows will then be used to design settlement ponds for each drainage catchment. The settlement ponds will either be designed for 4.1hr or 24hr retention times used to settle out medium silt (0.01mm) and fine silt (0.004mm) respectively (EPA, 2006). Settlement ponds along Access Tracks and at Turbine Hardstands will have 4.1hr retention as there is additional in-line drainage controls proposed along Access Tracks and at hardstands.

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

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

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

**Water Treatment Train:** If the discharge water from construction areas fails to be of a high quality, then a filtration treatment system (such as a 'Siltbuster' or similar equivalent treatment train (sequence of water treatment processes)) will be used to filter and treat all surface discharge water collected in the dirty water drainage system. This will apply to all of the construction phase.

**Pre-emptive Site Drainage Management:** The works programme for the construction stage of the Proposed Development will also take account of weather forecasts and predicted rainfall in particular. Large excavations and movements of subsoil or soil stripping will be suspended or scaled back if heavy rain is forecast. The extent to which works will be scaled back or suspended will relate directly to the amount of rainfall forecast.

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

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

- Consultancy Service: Met Éireann provide a 24-hour telephone consultancy service. The forecaster will provide an interpretation of weather data and give the best available forecast for the area of interest.

Earthworks will be suspended in the event of an orange weather warning for rainfall.

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

- All open excavations will be secured and sealed.
- Temporary or emergency drainage will be created to prevent back-up of surface runoff.
- Working during heavy rainfall and for up to 24 hours after heavy events will not be allowed to ensure drainage systems are not overloaded.

**Management of Runoff from Spoil Storage Areas:** It is proposed that excavated spoil will be permanently stored in the proposed spoil storage areas. These designated spoil storage areas are located outside of the flood zones and outside of the 50m hydrological buffer zones. The spoil storage areas are included on EIAR Figure 10.3. During the initial placement of subsoil, silt fences, straw bales and biodegradable matting will be used to control surface water runoff from the designated spoil storage areas.

Where applicable the vegetative topsoil layer of the spoil storage areas will be rolled back to facilitate placement of excavated spoil, following which the vegetative topsoil later will be reinstated. Where reinstatement is not possible, the spoil storage areas will be sealed with a digger bucket and seeded as soon as possible to reduce sediment entrainment in runoff.

Drainage from the spoil storage areas will ultimately be routed to oversized swales and a number of stilling ponds and a 'Siltbuster' with appropriate storage and settlement designed for a 1 in 10 year return period before being discharged to the onsite watercourses.

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

**Allowance for Climate Change:** Climate Change rainfall projections are typically for a mid-century (2050) timeline. The projected effects of climate change on rainfall are therefore modelled towards the end of the life cycle of the Proposed Development, as the turbines have a life span of approximately 35 years. It is likely that the long-term effects of climate change on rainfall patterns will not be observed during the lifetime of the proposed wind farm. As outlined in the above sections we have designed settlement ponds for a 1 in 10 year return flow. This approach is conservative given that the project will likely be built over a much shorter period (38 to 40 weeks), and therefore this in-built redundancy in the drainage design more than accounts for any potential short term climate change rainfall effects.

**Additional Measures for Works within Buffer Zone:** In addition to the above mitigation measures, where works are proposed within the delineated 50m hydrological buffer zone the following additional mitigation measures will be implemented:

- Double row silt fences will be emplaced immediately down-gradient of the construction areas.

**Measures along the Grid Connection**: The GCR will require excavation of cable trenches in greenfield areas. These works are transient in nature with very limited excavation at any one time. Spoil removed from the trench will be reinstated. Any excess spoil will be transported to a licenced facility. A silt fencing filtration system will be installed on all existing drainage

channels for the duration of the cable construction to prevent contamination of any watercourse.

#### 4.3.2.2 Mitigation Measures for Potential Effects from Excavation Dewatering and Potential Effects on Surface Water Quality

Management of surface water and 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 will immediately be stopped and a geotechnical assessment undertaken.
- A mobile 'Siltbuster' or similar equivalent specialist treatment system will be available onsite 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 the final line of defence if needed (specific mitigation measures with respect to the use of a Siltbuster are prescribed in Section 4.3.2.9).

#### 4.3.2.3 Mitigation Measures to Protect Against the Release of Hydrocarbons

Mitigation measures proposed to avoid the release of hydrocarbons at the Site and along the grid connection route include:

- During construction, where possible, all refuelling on site will be within the temporary compound within the dedicated re-fuelling area.
- All plant will be inspected and certified to ensure they are leak free and in good working order prior to use onsite.
- Site vehicles will be refuelled offsite where possible.
- Only essential refuelling will be completed outside of the dedicated re-fuelling area but not within 50m of any watercourses. Onsite re-fuelling of plant and 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.
    - A non-permeable High-Density Polyethylene (HDPE) membrane will be provided beneath connection points to catch any residual oil during filling and

disconnection. These membrane will be inspected and if there is any sign of oil contamination will be removed from the site by a specialist waste contractor.

- 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. Fuels will be stored in the Temporary Construction Compound and bunded to at least 110% of the storage capacity of fuels to be stored. 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 substation) will be bunded appropriately to 110% of the volume of oils that will be stored, and to prevent leakage of any associated chemicals to groundwater or surface water. The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor;
- The plant used during construction will be regularly inspected for leaks and fitness for purpose; and,
- An emergency plan for the construction phase to deal with accidental spillages is included within the Construction and Environmental Management. Spill kits will be available to deal with any accidental spillage in and outside the re-fuelling area.

#### 4.3.2.4 Mitigation Measures to Prevent the Release of Cement-Based Products

- No batching of wet-cement products will occur onsite. Ready-mixed supply of wet concrete products and emplacement of pre-cast elements will take place.
- Where possible pre-cast elements for culverts and concrete works will be used.
- Vehicles will undergo a visual inspection prior to being permitted to drive into the wind farm Site to ensure that there is no excess cementitious material which could be deposited on site.
- Where concrete is delivered onsite, only the chute will be cleaned, using the smallest volume of water possible. No discharge of cement contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed. A dedicated bunded area will be created to cater for concrete wash-out and this will be located in the Temporary Construction Compound.
- The contractor will use weather forecasting to plan dry days for pouring concrete.
- The contractor will ensure pour site is free of standing water and plastic covers will be ready in case of a sudden rainfall event.
- No surplus concrete will be stored or deposited anywhere on Site.
- Raw or uncured waste concrete will be disposed of by removal from the Site and returned to the source location or disposed of appropriately at a suitably licensed facility.
- Where shuttering is required to be installed in order contain the concrete during pouring, it will be installed to a high standard with minimal potential for leaks. Additional measures will be taken to ensure minimal potential of leaking, these measures are the use of plastic sheeting and the use sealing products at joints.

#### 4.3.2.5 Mitigation Measures to Prevent Groundwater and Surface Water Contamination from Wastewater Disposal

- During the construction phase, the Project will include an enclosed wastewater management system at the temporary compound capable of handling the demand during the construction phase with 90 construction workers on site at peak.
- A self-contained port-a-loo with an enclosed wastewater holding tank will be used at the on-site temporary construction compound area, maintained by the providing contractor, and removed from the 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 by a licensed contractor to be discharged at a suitable offsite treatment location.
- Wastewater/sewerage from the staff welfare facilities located in the temporary construction compound will be collected and held in a sealed storage holding tank, fitted with a high-level alarm. The high-level alarm is a device installed in the storage tank that is capable of sounding an alarm during a filling operation when the liquid level nears the top of the tank.
- All wastewater will be emptied periodically, tankered off-site by a licensed waste collector and disposed of at a suitable wastewater treatment plant that has sufficient capacity. There will be no onsite treatment of wastewater.
- No water or wastewater will be sourced on the Site, nor discharged to the site.

#### 4.3.2.6 Mitigation Measures to Prevent Morphological Changes to Surface Watercourses

Mitigation measures for the upgrade of the existing crossings and the new proposed crossing are detailed below:

- The 2 no. new watercourse crossings will be via clear span bridge crossings and the existing banks will remain undisturbed as much as possible.
- No instream excavation works are proposed and therefore there will be no direct effect on the stream at the proposed crossing location.
- Any guidance / mitigation measures proposed by the OPW or the Inland Fisheries Ireland will be incorporated into the design of the proposed crossings.
- As a further precaution near stream construction work will only be carried out during the period permitted by Inland Fisheries Ireland for in-stream works according to the Eastern Regional Fisheries Board (2004) guidance document "Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites", that is, May to September inclusive. This time period coincides with the period of lowest expected rainfall, and therefore minimum runoff rates and the risk of entrainment of suspended sediment in runoff.
- During the near stream construction work double row silt fences will be emplaced immediately down-gradient of the construction area. There will be no batching or storage of cement allowed on-site.
- All new road 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.

#### 4.3.2.7 Mitigation Measures for Potential Effects on Groundwater Levels during Excavation works

The majority of the infrastructure is underlain by Locally Important Aquifers whilst some areas are underlain by a Regionally Important (Karstic) Aquifer.

No significant groundwater dewatering will be required due to the relatively shallow nature of the excavations. Direct rainfall and surface water runoff will be the main inflows that will require water volume and water quality management. For the avoidance of doubt, we would define dewatering as a requirement to permanently drawdown the local groundwater table by means of over pumping, e.g. as would be required for the operation of a bedrock quarry in a valley floor.

In relation to the proposed dewatering works located overlying the Regionally Important Aquifer, no significant effect on groundwater levels will occur due to the following reasons:

- No karst features are mapped by the GSI within the Site.
- No karst features were encountered during the site walkover surveys or trial pit excavations.

- No bedrock was encountered during the site investigations which extended to depths of 3.6mbgl.
- The Site was found to be underlain by low permeability till deposits.
- Shallow groundwater inflows into turbine base excavations will be largely fed by recent rainfall.
- Any shallow groundwater seepage will be small in comparison to the expected surface water flows during heavy rainfall events.
- The management of surface water will form the largest portion of water to be managed and treated.

In terms of locally mapped and unmapped wells, the implementation of the drainage design measures will ensure that the recharge to the aquifers will not be altered, thus downgradient water levels will not be altered. As such there are no well supplies down-gradient of the Site that can be affected by temporary dewatering during turbine base construction.

Relevant environmental management guidelines from the EPA quarry 2006 guidance document – "Environmental Management in the Extractive Industry" in relation to groundwater issues will be implemented during the construction phase.

#### 4.3.2.8 Mitigation Measures for Ground Water Quality in Local Well Supplies

Regardless, if private wells are located downslope of the Project or not (or if wells are installed in the future), the potential for effects is negligible for the following conclusive reasons:

- The Site is underlain by low permeability till subsoils.
- There is no shallow bedrock at the Site.
- Groundwater flowpaths are typically short (approximately 300m maximum).
- Groundwater flows within the Site emerge as springs/baseline along streams/rivers and leave the Site as surface water flows and not groundwater flows.
- Groundwater flow directions will mimic surface topography and flow towards the Charleville Stream and the River Maigue.
- All local dwellings are located upgradient of the Site.
- Therefore, the potential to effect local wells is very low as groundwater flowpaths between the Projects infrastructure and potential source typically do not exist.
- Nevertheless, mitigation is provided in the EIAR to deal with typical construction phase groundwater hazards such as oils and fuels.
- Therefore, based on our hydrogeological assessment of the Site with regard to groundwater user risk and the proposed mitigation measures, we can robustly say the potential to effect local wells/water supply sources is negligible.

#### 4.3.2.9 Mitigation Measure for Potential Effects from the Use of Siltbuster

Measures employed to prevent overdosing and potential chemical carryover:

- The Siltbuster system comprises an electronic in-line dosing system which provides an accurate means of adding agents so overdosing does not occur.
- Continued monitoring and water analysis of pre and post treated water by means of an inhouse lab and dedicated staff, means the correct amount of chemical is added by the dosing system.
- Dosing rates of chemical to initiate settlement is small, being in the order of 2-10 mg/L and the vast majority of the chemical is removed in the deposited sediment.
- Final effluent not meeting the discharge criteria is recycled and retreated, which has a secondary positive effect of reducing carryover.
- Use of biodegradable chemical agents can be used at very sensitive sites (i.e. adjacent to SACs).

### 4.3.2.10 Mitigation Measure for Potential Effects Associated with Piled Foundations

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

- Mitigation measures for sediment control are detailed in Section 4.3.2.1, 4.3.2.2 and 4.3.2.6.
- Mitigation measures for the control of hydrocarbons during construction works are detailed in Section 4.3.2.3.
- Mitigation measures for the control of cement-based products during construction works are detailed in Section 4.3.2.4.

Proposed mitigation measures relative to piling works will comprise:

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

For bored piles, as the temporary steel casing is removed, a steel reinforcement cage is added to the pile column and then concrete is added to the toe of the pile using a tremie pipe. Vermiculite is used to create a plug between the concrete and the displaced water, therefore the concrete seals the entire pile column and pushes the vermiculite plug to the surface as concrete is added. The temporary steel casing is removed carefully as the concreting works are being completed. This concreting process is similar to that used when grouting a water supply production well (IGI (2007), and EPA (2013)). This means that a direct long-term pathway between the surface and the lower bedrock aquifer will not be sustained.

Scenario 1: Creating a Pathway for Downward Flow

To ensure downward flow of water and/or pollutants from the piling works does not occur, the concrete added to the bored pile will seal the pile annulus. As a result, the potential for the piling works to create pathways for downward flow of water or pollutants that could affect groundwater quality in the underlying aquifer is imperceptible.

Scenario 2: Creating a Pathway for Upward Flow

To ensure upward flow of underlying groundwater via potential pathways created by piling works does not occur, the concrete added to the bored pile will seal the pile annulus. As a result, the potential for piling works to create pathways for upward flow of groundwater to the surface is imperceptible.

Scenario 3: Blocking Regional Groundwater Flow

The piles have a very small footprint and if required would account for a very small percentage of the overall footprint associated with the Project. The proposed piles would not penetrate any great distance into the underlying bedrock aquifer, as they will likely find sufficient resistance upon reaching the top of bedrock. The ability of a single cluster of piles, to alter or affect local or regional groundwater flow in the bedrock aquifer is imperceptible.

### 4.3.2.11 Mitigation Measure for Turbine Delivery Route Works

No significant effects will occur for the following reasons:

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

Nevertheless, the "Pre-commencement Temporary Drainage Works" described in Section 4.3.2.1 will be employed at all the TDR works areas.

#### 4.3.2.12 Mitigation Measure to Prevent Surface Water Quality due to Fluvial Flooding During Construction

A key element of the site layout design has been to design for flood events and flood resilience. For example:

- Excavation works and infill are minimised in flood zones;
- Construction compounds and soil/subsoil storage areas are located outside of mapped flood zones;
- The proposed substation is located on land above the 0.01% AEP flood elevation, i.e. the Substation is located in flood zone C;
- Turbines within the flood zones will be constructed using piled foundations which will reduce ground disturbance within the flood zone and will also reduce spoil volumes and earthworks within the flood zones;
- During the construction phase, turbine hardstands (T4, T5, T6, T7 and T8) located within the modelled flood zones will be constructed as close to ground level as possible, depending on the grade from the nearest river crossing;
- As per Section 50 requirements, the main river crossings will be located at a height which includes a 300mm freeboard above the 1 in 100-year flood event plus climate change. Additional culverts will be constructed on the access roads on approach to the river crossings to minimise flow disruption during flood events;
- All access roads within the floodplain during the construction phase will be constructed as close to existing ground level as possible, depending on the grade from the nearest river crossing. Turbine cabling and access track infrastructure can be submerged temporarily without any impact on their function; and,
- Site roads located within mapped flood zones are designed to have shallow flood depths and be accessible by emergency response vehicles should that be required. All site trackways will be demarked by reflective marker poles. No turbine maintenance will occur during flood events, so the requirement for emergency vehicle access will be limited to fire or turbine failure.

A potential fluvial flooding event at the Site would likely be identified ~5-7 days in advance, with more accurate forecasts of severity within 24-48 hours of occurrence. Weather warnings will be issued from Met Eireann at least 60 hours before an event, but there will likely be indications from a week out that a likely significant event might occur. Preparation for a significant event will begin from the initial indications of the pending flood event. This will allow time for preparation and the implementation of additional emergency mitigation measures outlined below if there were to be a pending risk of an extreme flooding event. A forecast red weather warning (combining high river levels and heavy rainfall) is the defined trigger for the Managed Retreat described below.

The first point of mitigation is ongoing monitoring of weather forecasts, weather warnings, wind direction, and rainfall depths. The project Environmental Manager or the site ECoW will be responsible for monitoring weather forecasts during the construction phase.

When a pre-determined rainfall trigger levels is exceeded (e.g., sustained rainfall (any foreseen rainfall event longer than 4 hour duration) and/or any yellow or greater rainfall warning (>25mm/hour) issued by Met Eireann), planned responses will be undertaken.

- Cessation of all construction works until the storm event, including the storm runoff has passed. All construction works will cease during storm events such as yellow warning rainfall events. Following heavy rainfall events, and before construction works recommence, the Site

will be inspected and corrective measures implemented to ensure safe working conditions e.g. dewatering of standing water in open excavations, etc.

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

With regards to the fluvial flood zones at the Site, a **Managed Retreat** from the fluvial flood zones will be implemented in the event of a high intensity rainfall event and/or red weather warning related to rainfall. This will include the following:

- Any areas where soil/subsoil is exposed at the surface will be compacted firmly with a digger bucket of a suitably sized excavator.
- Open trenches will be backfilled and compacted.
- All oils, fuels and waste material will be removed from the flood zones.
- Existing sediment control measures will be removed, as these may be washed away and deposited elsewhere by the floodwaters.
- Site access tracks will be scraped, and any excess soft material will be removed from the flood zones.

All plant, machinery and equipment will be removed from the flood zones.

### 4.3.2.13 Mitigation Measure to Prevent Public Water Supplies

Mitigation measures implemented for the protection of groundwater and surface water quality at the Site will ensure that there is no potential for effects on the Bruree PWS or the Adare PWS.

- Mitigation measures for sediment control are detailed in Section 4.3.2.1 and Section 4.3.2.2.
- Mitigation measures for the control of hydrocarbons during construction works are detailed in Section 4.3.2.3.
- Mitigation measures for the control of cement-based products during construction works are detailed in Section 4.3.2.4.

Implementation of these mitigation measures will ensure the protection of surface water quality in receiving waters.

### 4.3.2.14 Mitigation Measure to Hydrologically Connected Designates Sites

Mitigation measures implemented for the protection of surface water quality at the Site will ensure that there is no potential for effects on the Lower River Shannon SAC.

- Mitigation measures for sediment control are detailed in Section 4.3.2.1 and Section 4.3.2.2.
- Mitigation measures for the control of hydrocarbons during construction works are detailed in Section 4.3.2.3.
- Mitigation measures for the control of cement-based products during construction works are detailed in Section 4.3.2.4.

Implementation of these mitigation measures will ensure the protection of surface water quality in receiving waters.

### 4.3.2.15 Mitigation Measure to WFD Status

Mitigation measures relating to the protection of surface water drainage regimes and surface water quality within the Site have been detailed in Section 4.3.2.1 (suspended solids), Section 4.3.2.3 (hydrocarbons), Section 4.3.2.4 (cement-based products), Section 4.3.2.5 (wastewater) and Section 4.3.2.6 (morphological changes to watercourses). These mitigation measures will also be implemented during the construction of the Grid Connection.

Similarly, mitigation measures for the protection of groundwater quantity and quality have been detailed in Section 4.3.2.7 (groundwater levels), Section 4.3.2.3 (hydrocarbons), Section 4.3.2.4 (cement-based products), Section 4.3.2.5 (wastewater).

The implementation of these mitigation measures will ensure the protection of downstream SWBs and underlying GWBs. There will be no deterioration in the status of any WFD waterbody and the Project will not impact the ability of any waterbody to achieve its WFD objectives.

#### 4.3.2.16 Mitigation Measure for Potential Effects Associated with Ecological Enhancement Proposals

All planting works will be undertaken during dry weather.

All mitigation measures with respect to suspended solids entrainment in surface waters and hydrocarbons detailed in Section 4.3.2.1 and Section 4.3.2.3 will be implemented during the ecological enhancement works.

### 4.3.3 Operational Phase

#### 4.3.3.1 Progressive Replacement of Natural Surface with Lower Permeability Surfaces

The Proposed Development design has been optimised to use the existing infrastructure (roads and hardstands) where practicable. Where practicable the existing Access Tracks will be upgraded as part of the Project. These works in these areas will not alter the existing runoff and recharge rates. This design prevents the unnecessary creating of additional hardstand areas which would increase surface water runoff from the Site.

All turbined located within the flood zones will have a reduced hardstand area in comparison with a typical wind turbine hardstand. This bespoke design will therefore have a positive effect on runoff rates in comparison to a typical wind farm design due to less areas of the site being covered in impermeable surfaces.

As part of the proposed wind farm drainage design, it is proposed that runoff from the proposed infrastructure will be collected locally in new proposed silt traps, settlement ponds and vegetated buffer areas prior to release into the existing site drainage network. The new proposed drainage measures will then create significant additional attenuation to what is already present. The operational phase drainage system will be installed and constructed in conjunction with the existing site drainage network and will include the following:

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

- All surface water runoff from the development will have to pass through the proposed settlement ponds prior to release into the existing site drainage network.

#### 4.3.3.2 Increased Site Runoff Resulting in Contamination of Surface Waters

Mitigation measures for sediment control are the same as those outlined for the construction phase in Section 4.3.2.1 and Section 4.3.2.2.

Mitigation measures for the control of hydrocarbons during maintenance works are similar to those outlined in Section 4.3.2.3.

#### 4.3.3.3 Mitigation Measures to Prevent Downstream Flood Risk

During the operational phase, access to the Site will be infrequent, and will be only done for scheduled maintenance works. In advance of scheduled site visits review of weather and river water levels will be completed and works will be postponed, and thereafter rescheduled to avoid high risk periods and weather warning events.

A key element of the site layout design has been to design for flood events and flood resilience during the operational phase. For example:

- As per Section 50 requirements, the main river crossings will be located at a height which includes a 300mm freeboard above the 1 in 100-year flood event plus climate change. Additional culverts will be constructed on the access roads on approach to the river crossings to minimise flow disruption during flood events;
- During the operational phase, the roads will be set to the 1 in 20-year flood level. In the event of a flood event, the maximum flooded depth along access roads will be between 200 and 400mm. Access tracks will be marked with snow poles to allow for emergency vehicular access. The proposed access point for emergency access is from the southern end of the Site which is unlikely to be affected during flood events.
- The turbine plinths within the flood zone will be located at a height which includes a 150mm freeboard above the 1 in 1,000-year flood event plus climate change.
- During the operational phase, turbine hardstand areas will be reduced, with the reduced hardstand area being built up to the 1 in 20-year flood level. The reinstatement of these hardstand areas post construction will reduce the hardstand area in the flood zone and will reduce the downstream flood risk.
- In the unlikely event that a key component of a turbine fails during the operational phase, the hardstand will need to be built back again, and will be built up to the 1 in 20-year flood level. Once works are complete, the hardstand will be reinstated once again.

Culverts constructed beneath the site access track within the flood zones will allow flood waters to pass through should a flooding event occur, maintaining hydrological flowpaths in a flood event.

During the operational phase, access to the Site will be infrequent, and will be only done for scheduled maintenance works. In advance of scheduled site visits review of weather and river water levels will be completed and works will be postponed, and thereafter rescheduled to avoid high risk periods and weather warning events.

#### 4.3.3.4 Mitigation Measures for Use of Water Supply at Substation

The abstraction rate for the proposed groundwater well at the 110kV Substation will be very small 3m3/day. This abstraction volume is comparable to approximately 3 no. domestic wells supplying single households. The well at the Substation is proposed in a Locally Important Aquifer – Bedrock which is Moderately Productive only in Local Zones and the Charleville

GWB. Due to the small, proposed abstraction rate, no significant effects on local groundwater levels will occur.

For these reasons no specific mitigation measures are required.

#### 4.3.3.5 Mitigation Measures to Prevent Contamination due to Wastewater Quality

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

#### 4.3.3.6 Mitigation Measures to Achieve WFD Compliance

There is no direct discharge from the Project to downstream receiving waters. Mitigation for the protection of surface water during the operational phase will ensure the qualitative status of the receiving SWBs will not be altered by the Project.

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

The operational phase of the Project will not result in any deterioration in the status of the receiving SWBs or underlying GWBs. The Project will not prevent the receiving SWBs and underlying GWBs from achieving their respective WFD objectives.

### 4.3.4 Decommissioning Phase

The potential impacts associated with decommissioning of the 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 roadways will be kept and maintained following decommissioning of the wind farm infrastructure, as these will be utilised by ongoing forestry works and by other participating landowners.

The electrical cabling connecting the 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 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 impacts of water bodies will be avoided by leaving elements of the Project in place where appropriate. The substation will be retained by EirGrid as a permanent part of the national grid. 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 Project.

### 4.3.5 Potential Effects with the Implementation of Mitigation

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

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

| SWB | WFD Code | Current Status | Assessed Potential Status Change- Unmitigated | Assessed Status with Mitigation Measures |
|---|---|---|---|---|
| Charleville Stream_020 | IE_SH_24C020800 | Moderate | Poor | Moderate |
| Maigue_030 | IE_SH_24M010300 | Moderate | Poor | Moderate |
| Maigue_040 | IE_SH_24M010400 | Moderate | Moderate | Moderate |
| Maigue_050 | IE_SH_24M010500 | Good | Good | Good |
| Hospital GWB | IE_SH_G_107 | Good | Good | Good |
| North Kilmallock GWB | IE_SH_G_193 | Good | Good | Good |
| Charleville GWB | IE_SH_G_055 | Good | Good | Good |

## 4.4 CUMULATIVE IMPACTS

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

The main likelihood of cumulative effects is assessed to be hydrological (surface water quality) rather than hydrogeological (groundwater). Due to the hydrogeological setting (i.e. predominantly low permeable subsoils and high density of surface water drainage features) and the near surface nature of construction activities, cumulative effects with regard groundwater quality or quantity arising from the Project are assessed as not likely.

The greatest potential for cumulative effects will occur during the construction phase of the Project as this is when earthworks and excavations will be undertaken. The potential for cumulative effects during the operational phase of the Project will be significantly reduced as there will be no exposed excavations, there will be no sources of sediment to reach

watercourses, there will be no use of cementitious materials and fuels/oil will be kept to a minimum at the Site. During the decommissioning phase, the potential cumulative effects are similar to the construction phase, but to a lesser degree with less ground disturbance.

The assessment detailed in this chapter is based on flow volumes obtained from the EPA Hydrotool Nodes downstream of the Site. This assessment concludes that there will be no hydrological cumulative effects beyond EPA Hydrotool Node 24_188 on the River Maigue. At this location the River Maigue has a total upstream catchment area of 277km2. There will be no potential for cumulative effects beyond this cumulative study area due to increases in flow volumes (as the catchment area increases) and increasing distance from the Project (refer to EIAR Chapter 10 Section 10.7.4).

### 4.4.1 Cumulative Effects with Agriculture

The Site is located in a largely agricultural area and the primary pressures on the River Maigue relate to agricultural practices within its catchment.

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

In an unmitigated scenario the Project would have the potential to interact with these agricultural activities in the wider area and contribute to a deterioration of downstream surface water quality through the emissions of elevated concentrations of suspended solids and ammonia. Within the Site itself, agricultural activities will likely be reduced during the construction phase.

However the mitigation measures detailed in Sections 4.3.1, 4.3.2, 4.3.3 and Section 4.3.4 for the design, construction, operation and decommissioning phases of the Project will ensure the protection of downstream surface water quality.

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

### 4.4.2 Cumulative Effects with Industrial Emissions Licence

An IE licence including emissions to water exists to the south of the Site. This licence (P0386-04) associated with the Rathgoggan North WwTP is held by Kerry Ingredients (Ireland) Ltd and includes discharge of treated effluent to the River Maigue (discharge was formerly to the Charleville Stream but the treated effluent is now piped across the Site and is discharges to the River Maigue just downstream of its confluence with the Loobagh River). However, the licence sets out strict ELVs for several hydrochemical parameters including BOD (20mg/l), COD (75mg/l), suspended solids (35mg/l), Total Nitrogen (15mg/l), Ammonia as N (0.3mg/l) and Orthophosphate as P (0.165mg/l). Discharge volume limits are also detailed in the IE licence (maximum of 5,000m3/day). A review of the 2024 AER shows that this facility is operating in accordance with its discharge licence.

Furthermore, the mitigation measures detailed in Section 4.3.2, Section 4.3.3 and Section 4.3.4 for the construction, operation and decommissioning phases of the Project will ensure the protection of downstream surface water quality and quantity.

For these reasons we consider that there will not be a significant cumulative effect associated with the existing IE discharge to the Charleville Stream.

### 4.4.3 Cumulative Effects with Other Developments

A detailed cumulative assessment has been completed for all planning applications (granted and awaiting decisions) within the cumulative hydrological study area.

The planning applications identified within the cumulative study area are for new dwellings or renovations of existing dwellings, as well as for the erection of farm buildings (refer to Chapter 2). Based on the scale of the works, their proximity to the Project and the temporal period of likely works, no cumulative effects will occur as a result of the Project (construction, operation and decommissioning phases).

Other larger developments identified in Section 2.3.3 are located outside of the cumulative hydrological study area.

### 4.4.4 Cumulative Effects with Other Wind Farms

Section 2.3.2 of the EIAR identified a total of 10 no. wind farms within 20km of the Site of which 7 no. are operational, 1 no. is consented and 2 no. are proposed.

Table K below identifies whether these wind farms are located within the delineated hydrological study area. Only 1 no. wind farm was identified in the hydrological cumulative study area. This is the operational Slievaragh Wind Farm. This wind farm drains to the Loobagh River and is located at the eastern boundary of the hydrological cumulative study area. There is limited potential for cumulative effects as the Slievaragh Wind Farm is already operational. Nevertheless, the mitigation measures are prescribed in this EIAR chapter will ensure that the Project does not have the potential to result in significant effects on the hydrological/hydrogeological environment.

Therefore, with the implementation of the proposed mitigation measures there will be no cumulative effects associated with the construction, operational or decommissioning phases of the Project with other wind farms within the cumulative study area.

**Table K: Wind Farms within 20km and Hydrological Connectivity**

| Wind Farm Name | Status | No. Turbines | Distance from Site | Within Cumulative Hydrological Study Area |
|---|---|---|---|---|
| Rathnacally Wind Farm | Operational | 2 | c. 5.9km | No<br>Located in Blackwater (Munster) Catchment |
| Boolard Wind Farm | Operational | 2 | c. 9.0km | No<br>Located in Blackwater (Munster) Catchment |
| Kilmeedy Wind Farm | Operational | 2 | c. 16km | No<br>Located in Shannon Estuary South Catchment and Deel (Newcastlewest)_SC_030 sub-catchment |
| Slieveragh Wind Farm | Operational | 2 | c. 19.3km | Yes<br>Maigue_SC_020 sub-catchment |
| Knocknatallig Wind Farm (formerly Buttevant Wind Farm) | Operational | 6 | c. 11.3km | No<br>Located in Blackwater (Munster) Catchment |
| Castlepook Wind Farm | Operational | 14 | c. 14km | No<br>Located in Blackwater (Munster) Catchment |
| Kilberehert Wind Farm | Operational | 3 | c. 18.8km | No<br>Located in Blackwater (Munster) Catchment |
| Annagh Wind Farm | Proposed | 6 | c. 8.6km | No<br>Located in Blackwater (Munster) Catchment |
| Tullacondra Wind Farm | Consented | 9 | c. 20.7km | No<br>Located in Blackwater (Munster) Catchment |
| Ballinlee Wind Farm | Proposed | 17 | c. 7.7km | No<br>Located in Maigue_SC_030 sub-catchment |

# 5. SUMMARY CONCLUSIONS

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

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

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

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

There will be no change in GWB or SWB status in the underlying GWB or downstream SWBs resulting from the 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 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) as amended; 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 10.2.1 of EIAR Chapter 10).

* * * * * * * * * * * * * *

# 6. REFERENCES

Department of Housing, Local Government and Heritage (2024). Water Action Plan 2024. A River Basin Management Plan for Ireland.

Environmental Protection Agency (2024). Cycle 3: HA 24 Shannon Estuary South Catchment Report.

Water Framework Directive "catchments.ie" Map Viewer (www.catchments.ie).

**Directives and Legislation**
Council Directive (76/160/EEC) Bathing Water and revised (2006/7/EC).

Council Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources (Nitrates Directive).

Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment.

Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.

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

Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy.

Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds.

Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014, amending Directive 2011/92/EU of the European Parliament and the Council of 13 December 2011 on the assessment of the impacts of certain public and private projects on the environment.

S.I. No. 293/1988: Quality of Salmon Water Regulations.

S.I. No. 722/2003 – European Communities (Water Policy) Regulations 2003.

S.I. No. 268/2006 - European Communities (Quality of Shellfish Waters) Regulations 2006.

S.I. No. 9/2010 - European Communities Environmental Objectives (Groundwater) Regulations 2010, as amended.

S.I. No. 272/2009 - European Communities Environmental Objectives (Surface Waters) Regulations 2009, as amended.

S.I. No. 350/2014 - European Union (Water Policy) Regulations 2014.

S.I. No. 351/2011 - Bathing Water Quality (Amendment) Regulations 2011.

S.I. No. 477/2011 - European Communities (Birds and Natural Habitats) Regulations 2011.

22 Lower Main Street, Dungarvan, Co. Waterford, X35 HK11
**T:** +353-(0)58-441 22 **F:** +353-(0)58-442 44 **E:** info@hydroenvironmental.ie

**www.hydroenvironmental.ie**