9 AQUATIC ECOLOGY

9.1 INTRODUCTION

This chapter of the EIAR assesses the likely significant direct and indirect effects of the Project on aquatic ecology. The 'Project' refers to all elements of the Carrigeen Renewable Energy Development project as a whole, comprising the Wind Farm Site infrastructure, including the works required within the Redline Boundary for the Grid Connection route and Turbine Delivery Route, and any associated temporary works (**Chapter 2: Project Description**). In accordance with Article 3(1) of the EIA Directive (*i.e.,* the 2011 Directive as amended by Directive 2014/52/EU (EIA Directive) and implemented in Ireland under the Planning and Development Act 2000 (as amended) (the 'PDA 2000')), this chapter will identify, describe and assess the direct and indirect effects of the Project on "(*b) biodiversity, with particular attention to species and habitats protected under [the Habitats] Directive 92/43/EEC and Directive [the Birds] 2009/147/EC*" in relation to the receiving aquatic environment during the construction, operation and Decommissioning phases. The assessment will consider the potential for cumulative impacts on aquatic ecology arising from other existing, approved, or proposed developments in the surrounding area, to ensure a comprehensive evaluation of likely significant effects. Where adverse effects are predicted, the chapter identifies appropriate mitigation strategies therein. The assessment will consider the potential effects during the following phases of the Project:

- Construction of the Project
- Operation of the Project
- Decommissioning of the Project

Common acronyms used throughout this EIAR can be found in **Appendix 1.4**. This chapter of the EIAR is supported by Figures provided in **Volume III** and the following Appendix documents provided in **Volume IV**:

- Baseline Aquatic Ecology Survey Report in **Appendix 9.1**;

A Construction and Environmental Management Plan (CEMP) is appended to the EIAR in **Appendix 2.1**. This document will be a key construction contract document, which will ensure that all mitigation measures, which are considered necessary to protect the environment during the construction and Decommissioning phase are implemented. It will include and apply all of the construction and Decommissioning phase mitigation described within the EIAR and incorporate any additional considerations or work programs required by planning conditions, if permitted. For the purpose of this application, a summary of the mitigation measures is included in **Chapter 22: Schedule of Mitigation Measures.**

9.1.1 Statement of Authority

This chapter has been written by Dr. Eddie McCormack, Aisling Hearty, M.Sc and Neve McCann M.Sc (AQUAFACT). Dr McCormack has over 19 years in environmental consultancy specialising in freshwater and marine ecology. Aisling Hearty has over 6 years of work in environmental consultancy and has experience in multiple different areas of marine biology including taxonomy, sampling work, data analysis and ecological report writing. Neve McCann has over 3 years of experience in marine and freshwater ecology, with expertise in environmental impact assessment across a range of public and private sector projects.

AQUAFACT is an environmental consultancy based in Galway City. It has been in operation for almost 40 years, specialising in monitoring and managing resources in marine, freshwater and terrestrial environments. In February 2022 AQUAFACT joined the APEM group. APEM was founded more than 30 years ago and is one of Europe's largest specialist environmental consultancy companies. It offers high quality scientific expertise covering the investigation, monitoring and management of water and terrestrial environments with services including aquatic & ecological consultancy, field surveys, ornithological surveys, fisheries science, laboratory services, and aerial surveys. Furthermore, APEM has helped the environment industry to identify responses to issues such as invasive non-native species, recognised the importance of the natural capital approach and river restoration. Additionally, APEM has employed technological solutions including aerial surveys and digital data collection. In Ireland the APEM Group comprises AQUAFACT, Woodrow, APEM Ireland, and Macro Works.

9.1.2 Assessment Structure

In line with the revised EIA Directive and EPA Guidelines 2022 the structure of this aquatic ecology chapter is as follows:

- Assessment Methodology and Significance Criteria.
- Description of baseline conditions at the Wind Farm Site.
- Identification and assessment of significant effects to aquatic biodiversity associated with the Project during the construction, operational and Decommissioning phases of the Project.
- Identification of cumulative significant effects if and where applicable.
- Mitigation measures to avoid or reduce the significant effects identified.
- Identification and assessment of any residual significant effect(s) of the Project considering mitigation measures.

9.1.3 Assumptions and Limitations

Some general assumptions that have been made during preparation of this EIAR are set out below:

- In undertaking cumulative assessments, consented, but as yet un-built, developments have been assumed to have been built in accordance with and within the duration permitted by the associated grant of permission.
- Information provided by third parties, including publicly available information and databases, is correct at the time of publication;
- Local Authority and the Commission public planning registers reviewed as part of the assessment process are up to date; and
- Baseline conditions and assessments are accurate at the time of the surveys.

Limitations are set out in their respective sections. While certain limitations were encountered during the assessment process, these have not compromised the overall comprehensiveness of the evaluation. All available data and best scientific knowledge were applied to ensure that the assessment remains robust. These limitations have not prevented the formulation of reasoned conclusions, nor have they affected the ability to determine the significance of potential effects with confidence.

9.2 ASSESSMENT METHODOLOGY AND SIGNIFICANCE CRITERIA

9.2.1 Assessment Methodology Aquatic Ecology

The general approach used for the evaluation of ecological receptors and assessment of significant likely effects for this current assessment is based on the '*Guidelines for Ecological Impact Assessment in the UK and Ireland*' (Chartered Institute of Ecology and Environmental Management, 2018 (Updated 2024)). The evaluation of ecological receptors contained within this report uses the geographic scale and criteria defined in the *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (National Roads Authority, 2009).

9.2.1.1 Desktop Study

A desktop study review was carried out in October 2025 of existing data and records for fish, protected aquatic species and habitats (including Annex II & IV aquatic species and aquatic Annex I habitats), and invasive species listed under the Third Schedule of S.I No. 477 of 2011, European Communities (Birds and Natural Habitats) Regulations 2011 (as amended)) on watercourses at or hydrologically connected (*i.e.,* downstream) to the Project on the National Biodiversity Data Centre (NBDC) and National Parks and Wildlife Service (NPWS) websites.

The Project is located within a mixed landscape of agricultural land, peatland, and commercial forestry between Frenchpark and Elphin in north-west County Roscommon This part of Roscommon is characterised by low-lying terrain with extensive artificial drainage and naturally wet soils, reflecting the historical presence of blanket peat and raised bog systems. Numerous small watercourses, drains and modified channels traverse the area, forming the surface-water network that ultimately feeds into tributaries of the Upper Shannon catchment. These watercourses are typically low-gradient and soft-water in nature, with hydrology strongly influenced by rainfall, peat substrates, local drainage patterns, and the presence of forestry blocks.

The Wind Farm site is located within the Upper Shannon hydrological catchment, intersecting several small sub-basins that drain towards the River Breedoge, the Mantua River and the Carricknabraher River. From a desktop perspective, these rivers function as headwater or mid-catchment systems and are typical of the Shannon's northern tributaries: shallow, moderately confined channels with variable flows depending on drainage modifications. The surrounding landscape includes conifer plantations, wet grassland and areas of cutover bog, all of which influence the watercourses through runoff patterns, water colouration, acidity, and sediment dynamics. The wider peatland landscape of north Roscommon contains several protected bog SACs, indicating the region's ecological sensitivity to hydrological disruption.

Based on publicly available EPA mapping, river waterbodies within this region fall within the category of lowland depositing rivers, consistent with their soft substrates and slow to moderate flows. Many waterbodies in the Upper Shannon catchment are subject to existing pressures commonly recorded in agricultural and peat-influenced environments. These include nutrient enrichment from pasturelands, sediment mobilisation from drainage works and peat soils, and hydromorphological modifications linked to historical arterial drainage. Forestry operations, including planting and felling cycles, also contribute to episodic sediment release and variations in dissolved organic carbon. The combination of these pressures means that headwater streams can be sensitive to additional disturbance, even where they appear small or heavily modified.

Ecologically, these watercourses support the typical aquatic assemblages associated with lowland Shannon tributaries, including macroinvertebrate communities suited to soft-water, organic-rich systems, and fish species such as brown trout, resident coarse fish, and eel in connected reaches. Riparian habitats vary depending on surrounding land use, with scrub, wet grassland, and remnants of peatland vegetation contributing to structural diversity along channel margins. Although many streams have been modified through deepening or straightening, they remain important linear habitats linking wetland, forestry and agricultural environments across the wider landscape. Overall, the desktop study indicates that the aquatic environment of the Carrigeen / Ballynahowna area is one of moderate ecological value but elevated sensitivity, shaped by the interaction of peatland hydrology, agricultural activity, and forestry management within the Upper Shannon catchment.

9.2.1.2 Field Survey

Zone of Influence

The Zone of Influence (ZOI) differs for different habitats and species. Within terrestrial habitats, the ZOI may be confined to the study area, whereas for aquatic habitats, the ZOI will be more extensive, and the surveys undertaken were scoped accordingly for the Project. This entailed establishing the baseline conditions in aquatic habitats at a range of points upstream and downstream in the various watercourses draining the Wind Farm Site and is reflected in the range and extent of surveys undertaken. The SPR (Source-Pathway-Receptor) model was used to establish the ZOI. The source being the Wind Farm Site and associated works (taking into account soil type and settling characteristics), the pathway being the watercourses and the receptors being aquatic fauna downstream of the source. The ZOI for aquatic ecology followed a catchment-level approach.

All freshwater watercourses which could be affected directly or indirectly by the Project were considered with riverine sites discussed in **Section 9.3.2** targeted for detailed aquatic assessment. These sites drained the Wind Farm Site boundary and the Grid Connection route (**Appendix 11.2** and **Surface Water Management Plan (MP3)** of the CEMP).

The surveys are summarised below and are described in more detail within the baseline survey report (**Appendix 9.1**). These allow the assessment of any significant effects while being mindful of unrelated discharges and tributaries further downstream that may contribute pollution to or dilute any potential effects.

An **Appropriate Assessment Screening Report** and **Natura Impact Statement** have been prepared for the Project which assesses any significant likely effects on European designated sites (the Natura 2000 network).

Baseline Sampling

The baseline surveys focused on aquatic habitats in relation to fisheries potential (including both salmonid and lamprey habitat), white-clawed crayfish, macroinvertebrates (biological water quality), macrophytes and aquatic invasive species, and species of conservation value which may use the watercourses in the vicinity of the Project. Full details of the survey methodologies are included in **Appendix 9.1** and discussed further below. Site visits were undertaken on 17th & 23rd October 2024 and 31st March, 28th, 30th & 31st of August 2025.

Ground Truthing Survey

A Ground Truthing survey was carried in October 2024. The sampling station locations for this survey are listed in **Table 9.4**. The aim of the survey was to identify the general riparian habitats in the ZOI of the Project along with any sensitive or invasive species that may be present. Images were taken at each station on the walkover survey (listed in **Section 9.3.2.1**) and a record was made of any notable species, general watercourse hydromorphology, and aquatic vegetation on the watercourses draining the Project. The suitability of the habitats for protected species such as white-clawed crayfish, river lamprey (*Lampetra fluviatis*), freshwater pearl mussel (*Margaritafera margaritafera*) and salmonids was considered. **Section 9.3.2** shows the survey locations visited as part of this assessment. None of the stations surveyed during the walkover were found to be suitable habitats for freshwater pearl mussel.

Macroinvertebrate Diversity Sampling

Macroinvertebrate surveys were conducted in Autumn 2024 and Spring 2025.

All selected survey locations were assessed for biological water sampling through Q-sampling on the 23rd of October 2024 and the 31st of March 2025. A further six sites were assessed in a similar manner along a Grid Connection route on the 27th of March 2025 and 31st of August 2025. These dates were selected to provide seasonal coverage and to ensure representative data across different flow and biological conditions. The survey sites were located on the River Breedoge Catchment (BREEDOGE_010: 26_2957, 26_1338, 26_1330, 26_4100, 26_2279, 26_2232, 26_1227, 26_2153), Carricknabraher River Catchment (CARRICKNABRAHER_020: 26_13437, 26_2861, 26_13427), Mantua River Catchment (MANTUA_010: 26_13304, 26_3671), Kinard River Catchment (KINARD_010: 26_2162) and Killukin River Catchment (KILLUKIN_020: 26_1193, 26_2794). The surveys were undertaken using standard kick sampling techniques in line with Environmental Protection Agency (EPA) methodologies. The macroinvertebrate communities sampled were assessed using the EPA Q-value rating system, which is a widely accepted metric for evaluating biological water quality in Irish freshwater systems. The sampling station locations for this survey can be seen in Section 9.3.2.1 Error! Reference source not found. a nd are listed in **Table 9.4.**

Full details of the sampling approach, site selection, and assessment outcomes are provided in **Section 3.2.2 and Section 4.2.3** of the Baseline Aquatic Report. This section includes descriptions of the methodologies employed, habitat conditions, and the results of the Q-value assessments, which collectively inform the ecological evaluation of the receiving aquatic environment.

The aquatic habitat assessment conducted at all sites was based on the Environment Agency's *'River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003'* (Environment Agency, 2003) and the Irish Heritage Council's *'A Guide to Habitats in Ireland'* (Fossitt, 2000). The EPA Biotic Index Biological River Quality Classification System (Q-value) (Toner *et al.,* 2005) has been used to monitor the ecological quality of streams and rivers in Ireland since 1971. It is routinely employed by the EPA. All sites were assessed in terms of:

- Stream width, depth, and other physical characteristics
- Substrate type, listing substrate fractions in order of dominance, *i.e.*, bedrock, boulder, cobble, gravel, sand and silt
- Flow type, listing percentage of riffle, glide and pool in the sampling area
- In-stream macrophyte, bryophytes occurring and their percentage coverage of the stream bottom at the sampling sites
- Riparian habitats and species composition

This method remains fully compliant with the most up-to-date EPA Guidance (EPA, 2022b), which aligns Q-value assessments with the EU Water Framework Directive (WFD) through the use of Ecological Quality Ratios (EQRs). Each Q-value is now mapped to a WFD ecological status category to ensure compatibility with European-wide assessment standards.

Table 9.1: EPA Water Quality and Status Summary.

Biotic Index	Quality Status	Water Quality	WFD Ecological Status
Q5	Unpolluted	Good	High
Q4-5	Unpolluted	Fair-to-Good	High
Q4	Unpolluted	Fair	Good
Q3-4	Slightly Polluted	Doubtful-to-Fair	Moderate
Q3	Moderately Polluted	Doubtful	Poor
Q2-3	Moderately Polluted	Poor-to-Doubtful	Poor
Q2	Seriously Polluted	Poor	Bad
Q1-2	Seriously Polluted	Bad-to-Poor	Bad

A biosecurity protocol was rigidly followed to avoid the potential for transfer of invasive alien species to or from the Wind Farm Site in accordance with guidance produced by Invasive Species Ireland and Inland Fisheries Ireland (IFI, 2010). A specific Biosecurity Method Statement was produced for the survey operation.

Physicochemical Water Quality Sampling

Physicochemical water quality sampling was carried out at the same time and same locations as the Macroinvertebrate Diversity Sampling listed above. The parameters assessed included temperature, dissolved oxygen, pH and turbidity recorded using a Yellow Springs Instruments (YSI) EXO2 probe. Water samples were also taken and tested for BOD (Biological Oxygen Demand), COD (Chemical Oxygen Demand), suspended solids, Total Nitrogen, Nitrate, Nitrite, Phosphate, and TPH (Total Petroleum Hydrocarbons). Two bottles were used for collection. A plastic water sampling bottle was washed out and then slowly filled with water while facing downstream, taking care to minimise air bubbles forming in the sampling bottle. The process was repeated using a glass sampling bottle for testing TPH in the water. Samples were delivered to Complete Laboratory Solution (CLS) in Galway within 24hrs of sampling. Station 1 was not suitable for sampling due to low water levels and S7 and S10 were too hazardous to access. Dissolved oxygen was not recorded in situ at Stations 3, 13, & 14 in Autumn 2024 due to sensor/probe error recording.

White-Clawed Crayfish Survey

Licences to disturb specimens of white-clawed crayfish (WCC – *Austropotamobius pallipes*) through capture and release, including trapping (Licence No. C180/2025), were acquired from the National Parks and Wildlife Services (NPWS) prior to conducting field surveys for WCC at the Wind Farm site. Before commencing the surveys, a desk study was undertaken to identify any existing records of WCC and any evidence of crayfish plague (caused by the water mould *Aphanomyces astaci*) within the catchments (Upper Shannon 26B & 26C).

The WCC survey sites were located on the Breedoge River Catchment, Carricknabraher River Catchment and Mantua River Catchment. Seven sites were deemed suitable to survey for WCC (E Site 1, E Site 2, E Site 3, E Site 4, E Site 6, E Site 7, E Site 8) within proximity of the Project. Standard methods were used as detailed in Peay (2003), Reynolds *et al.* (2010) and Gammell *et al.* (2021). The river sections covered can be viewed in Plate 7.27 to 7.33 of **Appendix 9.1**. Channel conditions were assessed on arrival, and five favourable and accessible survey patches were identified within the first 100 m of the stretch. Ten potential refuges were hand-searched in each patch, selected based on suitability for WCC occupancy and survey feasibility. However, as this survey was being conducted in tandem with an electrofishing survey, WCC presence was also determined by visual identification or capture of WCC while electrofishing. All WCC caught in the electrofishing process were measured (carapace length (CL), nearest mm), sexed and checked for signs of disease.

Electrofishing (E) Site 1, E Site 3, E Site 4 and E Site 7 were all assessed as part of the electrofishing survey. E Site 2, E Site 6, E Site 8 were unsuitable for handsearching due to soft substrate. In these cases, two strings, each consisting of five trappy funnel baited crayfish traps (10 traps total), were set on the 29th and 30th of July and collected on the 30th and 31st of July, respectively. Traps were spaced approximately 3 m apart and laid parallel to the shore in approximately 0.3 m of water. Each end of the rope was secured to the shore to prevent the baited traps from being moved. Each trap was baited with approximately 40 g of mackerel (*Scomber scombrus*).

Any WCC caught were speciated, sexed and measured (carapace length, mm), visually inspected for signs of damage (missing or regenerated chelae (claws), other missing limbs) and/or disease (*e.g.,* whether the underside of the abdomen is opaque white which can indicate the presence of porcelain disease). Any WCC captured were returned to the same watercourse post measurement and inspection. At each survey location, additional signs of WCC presence, such as dropped chelae, moulted exoskeletons, carcasses or remains in otter spraint, were also recorded.

Deploying four traps has proven sufficient for determining WCC presence or absence at sites where hand-searching is not feasible, based on consistent results from previous surveys. While IWM 131 recommends ten traps for estimating abundance (CPUE), this higher effort is not necessary for presence/absence surveys.

Fisheries Assessment

A catchment-wide electrofishing survey across seven riverine sites within the Project Study Area was undertaken during July 2025. The fisheries survey sites were located on the River Breedoge (BREEDOGE_010: Seg Codes 26_2957, 26_1227), Mantua River (MANTUA_010: Seg Code 26_1019) and Carricknabraher River (CARRICKNABRAHER_020: Seg Code 26_13427).The sampling station locations for this survey can be seen in Error! Reference source not found. and are listed in **Table 9.4**.

Electrofishing was carried out at the Wind Farm Site on the 28th, the 30th & 31st of July based on the three-catch removal method (Carle & Strub, 1978), which is a commonly used method for estimating fish populations in wadable rivers and streams. Electrofishing was carried out using bank-based electrofishing equipment (Electrafish EFB2EA bankside unit) or backpack electrofishing equipment (Electrafish EFBP400 backpack unit), where conductivity (µs/cm) allowed (<500 µs/cm).

The survey sites selected were narrow enough (<5 m wide) to allow coverage using a single anode. Surveys were typically conducted by a team of three operatives: an anode operator, a second person assisting in the channel, and a third operator overseeing the safe operation of the electric fishing equipment.

The sampling area (*c*. 50 m stretch) at each site was isolated by using upstream and downstream stop nets to ensure no escape from, or migration into the sampling area during the electrofishing operation. Three passes were conducted in the contained area in an upstream direction from the downstream net. Immobilised fish were captured using hand nets. Fish from each pass were held in aerated bins of water, sorted and processed separately. All fish were identified and measured (fork length, nearest mm), before being returned to the river.

Where possible density estimates for each species were derived from estimates of absolute abundance based on the three-catch removal method and estimates of populations were calculated by the Maximum Likelihood Method (Carle & Strub, 1978). In most cases, however, small sample sizes or insufficient depletion prevented the use of this method. Instead, minimum density estimates (number caught per 100 m²) were calculated based on the total catch of each species. The results of the electrofishing surveys can be found in **Section 4.2.5** of **Appendix 9.1**.

9.2.1.3 Ecological Evaluation and Impact Assessment Methodology

The evaluation of the key ecological receptors and the criteria used to assess the significance of effects are derived from the *Guidelines for Assessment of Ecological Impacts on National Road Schemes* (National Roads Authority, June 2009), *Guidelines on the Information to be contained in Environmental Impact Assessment Reports* (Environmental Protection Agency, 2022) and the *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal* (CIEEM, 2018 (Updated 2024)).

Effects were considered to be either significant or not significant at a geographic scale equivalent to or less than the conservation importance of the ecological feature being assessed (CIEEM, 2018). The duration of significant effects is considered according to Environmental Protection Agency (EPA) guidance (EPA, 2022). The magnitude of an effect will depend on the nature and sensitivity of the ecological features and will be influenced by intensity, duration (temporary/permanent), timing, frequency and reversibility of the significant likely effect (Chartered Institute of Ecology and Environmental Management, 2018 (Updated 2024)).

The criteria used for assessment of the value of the ecological resources sets out the context for the determination of value on a geographic basis with a hierarchy assigned in relation to the importance of any particular receptor. The NRA (2009) guidelines provide a basis for determination of whether any particular site is of importance on a scale presented in **Table 9.2**.

Table 9.2: Valuation of Ecological Resources

Scale of Importance	Determination of Value on a geographic basis
International Importance	• 'European Site' including Special Area of Conservation (SAC), Special Protection Area (SPA) or Site of Community Importance (SCI) • Proposed Special Area of Conservation • Proposed Special Protection Area • Site that fulfils the criteria for designation as a 'European Site' (see Annex III of the Habitats Directive, as amended) • Features essential to maintaining the coherence of the Natura 2000 Network • Site containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive • Resident or regularly occurring populations (assessed to be important at the national level) of the following: - Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; and/or - Species of animal and plants listed in Annex II and/or IV of the Habitats Directive. • Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971). • World Heritage Site (Convention for the Protection of World Cultural & Natural Heritage, 1972) • Biosphere Reserve (UNESCO Man & The Biosphere Programme)

Scale of Importance	Determination of Value on a geographic basis
	• Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979) • Site hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979) • Biogenetic Reserve under the Council of Europe • European Diploma Site under the Council of Europe • Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 293 of 1988)
National Importance	• Site designated or proposed as a Natural Heritage Area (NHA) • Statutory Nature Reserve • Refuge for Fauna and Flora protected under the Wildlife Acts • National Park • Undesignated site fulfilling the criteria for designation as a Natural Heritage Area (NHA); Statutory Nature Reserve; Refuge for Fauna and Flora protected under the Wildlife Act; and/or a National Park • Resident or regularly occurring populations (assessed to be important at the national level) of the following: - Species protected under the Wildlife Acts; and/or - Species listed on the relevant Red Data list • Site containing 'viable areas' of the habitat types listed in Annex I of the Habitats Directive
County Importance	• Area of Special Amenity • Area subject to a Tree Preservation Order • Area of High Amenity, or equivalent, designated under the County Development Plan • Resident or regularly occurring populations (assessed to be important at the County level) of the following: - Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;

Scale of Importance	Determination of Value on a geographic basis
	- Species of animal and plants listed in Annex II and/or IV of the Habitats Directive - Species protected under the Wildlife Acts; and/or - Species listed on the relevant Red Data list • Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or National importance • County important populations of species, or viable areas of semi-natural habitats or natural heritage features identified in the National or Local BAP, if this has been prepared • Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county • Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level
Local Importance (higher value)	• Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared • Resident or regularly occurring populations (assessed to be important at the Local level) of the following: - Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive - Species of animal and plants listed in Annex II and/or IV of the Habitats Directive - Species protected under the Wildlife Acts; and/or - Species listed on the relevant Red Data list • Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality • Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value

Scale of Importance	Determination of Value on a geographic basis
Local Importance (lower value)	• Sites containing small areas of semi-natural habitat that are of some local importance for wildlife • Sites or features containing non-native species that are of some importance in maintaining habitat links

The Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines define a significant effect as, "a*n effect that either supports or undermines biodiversity conservation objectives for 'important ecological features'...or for biodiversity in general*". The criteria used for assessment of significant effects are as follows while the Criteria for Assessing Effect Significance are presented in **Table 9.3**:

Positive or Adverse: Positive and adverse effects should be determined according to whether the change is in accordance with nature conservation objectives and policy.

Extent: Extent should be predicted in a quantified manner and relates to the area over which the significant effect occurs.

Magnitude: Magnitude refers to size, amount, intensity and volume. It should be quantified if possible and expressed in absolute or relative terms *e.g.,* the amount of habitat lost, percentage change to habitat area, percentage decline in a species population.

Duration: Duration is intended to refer to the time during which the significant effect is predicted to continue, until recovery or re-instatement (which may be longer than the effect-causing activity). Duration should be defined in relation to ecological characteristics (such as a species' lifecycle).

Frequency and Timing: The timing of significant effects in relation to important seasonal and/or life-cycle constraints should be evaluated. Similarly, the frequency with which activities (and associated effects) would take place can be an important determinant of the effect on receptors and should also be assessed and described.

Reversibility: An irreversible effect is one from which recovery is not possible within a reasonable timescale or there is no reasonable chance of action being taken to reverse it. A reversible effect is one from which spontaneous recovery is possible or which may be counteracted by mitigation.

Likelihood:

- Certain/Near Certain: >95% chance of occurring as predicted.
- Likely: 50-95% chance as occurring as predicted.
- Unlikely: 5-50% chance as occurring as predicted.
- Extremely Unlikely: <5% chance as occurring as predicted.

Table 9.3: Criteria for Assessing Effect Significance (EPA, 2022).

Significance of Effects	Definition
Imperceptible	An effect capable of measurement but without significant consequences.
Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
Slight Effects	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Moderate Effects	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
Significant Effects	An effect which, by its character, magnitude, duration or intensity, alters a sensitive aspect of the environment.
Very Significant	An effect which, by its character, magnitude, duration or intensity, significantly alters most of the sensitive aspect of the environment.
Profound Effect	An effect which obliterates sensitive characteristics.

9.2.2 Relevant Guidance

- *Water Quality - Sampling of Fish with Electricity. Document* CEN (2003).
- *Methods for the Water Framework Directive. Electric Fishing in Wadeable Reaches. Central Fisheries Board.* CFB (2008).
- *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* (EPA, 2022).
- *Integrated Biodiversity Guidelines for Planning and Development* (EPA, 2022)
- *Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities (DEHLG 2009, Revised February 2010).*

- *Guidelines for Ecological Impact Assessment in the UK and Ireland – Terrestrial, Freshwater and Marine* (CIEEM, 2018(Updated 2024)).
- *Advice Note on the Lifespan of Ecological Data* (CIEEM, 2019).
- *River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003.* (Environment Agency 2003).
- *A guide to habitats in Ireland. Heritage.* (Fossitt, J.A., 2000).
- *Managing Natura 2000 Sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC. Office for Official Publications of the European Communities, Luxembourg.* (European Commission 2000).
- *Guidelines for Assessment of Ecological Impacts on National Road Schemes* (National Roads Authority, June 2009).
- *Invasive Species Ireland and Inland Fisheries Ireland* (IFI, 2010).
- Site-specific Conservation Objectives and Standard Data Forms for relevant SACs/SPAs.
- Sub-basin Management Plans for Freshwater Pearl Mussel (as per Water Framework Directive).
- *Water Action Plan 2024* (DHLGH, 2024).
- *EU Habitats Directive* (92/43/EEC) *and Birds Directive* (2009/147/EC).
- *The Planning and Development Act 2000 (as amended).*
- *4th Irish Biodiversity Action Plan* (NPWS).
- *IFI Biosecurity Protocol for Field Survey Work.* (Inland Fisheries Ireland 2010).
- *Best Practice Guidelines for the Irish Wind Energy Industry. Guidance prepared by Fehily Timoney & Company for the Irish Wind Energy Association.* IWEA (2012).

9.3 BASELINE DESCRIPTION

9.3.1 Project Description

Wind Farm Site

The Wind Farm Site covers an area of approximately 706ha. The principal land use within the Wind Farm Site is comprised of agricultural pasture grazing land, commercial forestry and peat harvesting. The Wind Farm Site is located c.12km northeast of Castlerea and c.16km southwest of Carrick-on-Shannon. The nearest centre of population to the Wind Farm Site is the small village of Frenchpark, which is located along the R361 regional road and is c.2.1km to the north of the closest turbine (T2). The village of Ballinagare is located c.2.2km to the southwest of T5, and Ballinameen c.3.4km to the northeast of T8.

The Project will consist of the provision of the following:

- 11 no. wind turbines with an overall turbine tip height of 185m, turbine hub height of 103.5m, and rotor blade diameter of 163m and a meteorological mast with a height of 30m, and subsequent decommissioning of the wind turbines and meteorological mast, following a 35 year operational life from the date of full commissioning of the wind turbines;
- Associated wind turbines and meteorological mast foundations and hardstanding areas;
- A 110kV substation compound (Including control buildings (with a combined floor area of 594m2) with welfare facilities, all associated electrical plant and apparatus, security fencing, underground cabling, lightening protection poles, underground wastewater holding tank, site drainage and all ancillary works);
- Underground electrical (110kV) and communications cabling from the proposed 110kV substation to the existing Flagford 220kV substation (including joint bays, communication chambers, earth sheath links, and ancillary works along the underground electrical cabling route). This cabling route is primarily located within the public road corridor;
- Underground electrical (33kV) and communications cabling connecting the wind turbines and meteorological mast to the proposed 110kV substation;
- 6 no. temporary construction compounds (including site offices and welfare facilities
- Junction accommodation works to facilitate construction access and turbine delivery to the site (off the existing N5 and new N5 national road, and L5642 and L1217 Local Roads), including a new temporary access road off the existing N5 to the L56402;
- Upgrade of existing roads/ tracks and provision of new site access roads, junctions and hardstand areas (including of the L1217, L56402, L5642, L56421, L56492 and L56491 Local Roads), including new gated site entrances at each junction;
- 2 no. Borrow Pits;
- Peat & Spoil Management;
- Site Drainage;
- Tree felling and vegetation removal;
- Biodiversity enhancement measures;
- Operational stage site signage; and
- All associated site development works and apparatus.

There are several watercourses within and draining the Wind Farm Site that could potentially be affected by the Project, namely the River Breedoge (EPA code: BREEDOGE_010) and the River Carricknabraher (EPA code: CARRICKNABRAHER_020). The Grid Connection route also intersects additional sub-basins including Mantua (MANTUA_010), Kinard (KINARD_010), and Killukin (KILLUKIN_020). The Wind Farm Site covers an area of approximately 1,218 ha of agricultural land, peatland, and commercial forestry between Frenchpark and Elphin. All spoil storage areas fall within the Redline Boundary. The land is private property and the principal land use in the general area is comprised of agricultural pasture grazing farmland. Excavation associated with the grid connection cable trench is estimated to generate approximately 13,626 m3 of subsoil which will be transported off site to a licensed facility. Five major watercourse crossings are required for the internal Site Access Roads within the Wind Farm Site. These crossings occur within the River Breedoge (WFD code: BREEDOGE_010) and River Carricknabraher (WFD code: CARRICKNABRAHER_020) waterbodies, which drain the site and form part of the Upper Shannon catchment. All crossings will be constructed as clear-span bridges in accordance with Inland Fisheries Ireland guidelines, thereby avoiding in-stream works and maintaining hydrological connectivity.

Water Crossing 1 (ITM: 575056, 789876) is located on the Carricknabraher River adjacent to T2, while Water Crossing 2 (ITM: 575205, 790223) is also situated on the Carricknabraher River, south of T1. Water Crossing 3 (ITM: 576010, 789752) is located on the Owenforeesha tributary of the Breedoge waterbody (BREEDOGE_010), adjacent to T3. Water Crossing 4 (ITM: 576552, 789843) is positioned on the main channel of the River Breedoge, north of T4 and T5. Water Crossing 5 (ITM: 580806, 789851) is located on the Mantua River, a tributary within the Breedoge waterbody (BREEDOGE_010), south of T8–T11. There are 7 watercourse crossings within the Wind Farm Site in total, two of which are of minor watercourses and 8 watercourse crossings for the Grid Connection route. There will be five entrances for the Wind Farm Site (**Drawing No. 6575-JOD-CGWF-XX-DR-C-0200** and **6575-JOD-CGWF-XX-DR-C-0215** - **0219**).

The Project is not located within any European Site. The Wind Farm Site and Grid Connection route do not intersect any Natura 2000 sites. The Project redline boundary oversails the boundary of the Cloonashanville Bog SAC; however, no infrastructure is proposed within the SAC and the nearest project infrastructure is located approximately 125 m from the SAC boundary.

The nearest Special Protection Area (SPA) to the Project is the Bellanagare Bog SPA, located approximately 1 km to the west/southwest of the redline boundary.

The Lough Gara SPA is located approximately 5.8 km to the north of the Project site.

These three European Sites were identified during Screening for Appropriate Assessment as occurring within the Zone of Influence of the Project and are assessed in detail within the accompanying Natura Impact Statement.

Grid Connection Route (GCR)

The Grid Connection for the Project will link the 110 kV Onsite Substation to the existing Flagford 220 kV substation via an underground cable route of approximately 17.5 km. The connection will be constructed to EirGrid specifications and will primarily follow the public road corridor to minimise environmental disturbance and land-take.

The route will exit the onsite substation eastwards onto the Local Road L-1217, continuing for approximately 3.7 km before turning north onto the L-5650. From there, it will cross the N61 National Road and proceed northeast along the L-5650, L-6019, L-600, R368 and L-1034 for approximately 11.5 km before terminating at the Flagford substation. The alignment has been selected to avoid sensitive habitats and watercourses where possible, while maintaining engineering feasibility and compliance with safety standards.

The underground cable will be installed within excavated trenches approximately 1.3 m deep and 0.6 m wide, with ducts laid in trefoil formation. Separate ducts will accommodate fibre-optic communications. Cable joint bays, typically 6 m x 2.5 m x 2.3 m deep, will be constructed at intervals along the route to facilitate cable pulling and jointing.

The Grid Connection will cross eight watercourses, including tributaries of the Carricknabraher River and Breedoge River. Horizontal Directional Drilling (HDD) will be employed at 3 watercourse crossings and at the N61 crossing to avoid in-stream works and maintain hydrological and ecological continuity.

Construction activities will include trench excavation, duct installation, backfilling, and reinstatement of road surfaces to pre-existing conditions. All works will adhere to best practice guidelines for water protection, including the use of silt fencing, settlement ponds, and proprietary treatment systems where necessary.

The GCR has been designed to minimise environmental impact by avoiding Natura 2000 sites and sensitive aquatic habitats, implementing HDD at watercourse crossings to prevent direct disturbance and maintaining buffer zones and applying robust drainage controls during construction.

Further details on trenching methodology, HDD operations, and mitigation measures are provided in **Chapter 2: Project Description, Chapter 11: Hydrology and Hydrogeology, and the Grid Connection Geophysical Report (Appendix 2.3).**

Turbine Delivery Route (TDR)

The preferred Turbine Delivery Route for the Project will transport turbine components from Galway Port to the Wind Farm Site. From the port, components will travel via the L5048, R339, N83, N17 and N5 to the upgraded site entrances. Two site entrances on the N5 will facilitate turbine deliveries: Site Entrance 1 (new entrance at Leggatinty) and Site Entrance 2 (existing entrance at Carrigeencreeha). Other entrances (Site Entrance 3-5) may be used for general construction traffic, subject to agreement. Please see **Chapter 2: Project Description** for an in-depth description of Site Entrances.

Temporary works will be required at certain locations along the route to accommodate abnormal loads. These works will include localised road widening and removal of roadside obstacles where necessary. All enabling works will be carried out in accordance with the **Traffic Management Plan (TMP)** contained in **Appendix 16.2** and will comply with relevant safety and environmental guidelines.

The Turbine Delivery Route is shown in **Figure 2.3** and detailed in **Chapter 16: Traffic and Transportation**. All works associated with the TDR will incorporate best practice measures to prevent any adverse effects on watercourses or aquatic habitats. No direct works are proposed within watercourses along the TDR.

9.3.2 Aquatic Habitat Assessment

Section 9.3.2.1 presents a list of the watercourses and the survey station locations for the current ecological data sampled in 2024 and 2025. Two watercourses flow through the Wind Farm site, the River Breedoge (WFD code: BREEDOGE_010) and the River Carricknabraher (WFD code: CARRICKNABRAHER_020), the Grid Connection route intersects several watercourses, including the Mantua River (WFD code: MANTUA_010), Kinard River (KINARD_010), and Killukin River (KILLUKIN_020) all of which ultimately drain to the Upper Shannon catchment. EPA watercourse names, EPA codes and EPA segment codes are also presented. All station references along with the respective surveys are shown in **Table 9.4** below.

Table 9.4: Sampling stations for various aquatic survey elements.

Station	17 Oct 2024	23 Oct 2024	27 Mar 2025	31 Mar 2025	28 Jul 2025	28 Aug 2025
S1	Ground truthing					
S2	Ground truthing	Q-sampling, Physico-chemical		Q-sampling, Physico-chemical		
S3	Ground truthing	Q-sampling, Physico-chemical		Q-sampling, Physico-chemical		
S4	Ground truthing	Q-sampling, Physico-chemical		Q-sampling, Physico-chemical		
S5	Ground truthing	Q-sampling, Physico-chemical		Q-sampling, Physico-chemical		
S6	Ground truthing	Physico-chemical		Physico-chemical		
S7	Ground truthing			Physico-chemical		
S8	Ground truthing	Physico-chemical		Q-sampling, Physico-chemical		
S9	Ground truthing					
S10	Ground truthing					
S11	Ground truthing	Q-sampling, Physico-chemical		Q-sampling, Physico-chemical		
S12	Ground truthing	Physico-chemical		Physico-chemical		
S13	Ground truthing	Physico-chemical				
S14	Ground truthing	Q-sampling, Physico-chemical		Q-sampling, Physico-chemical		

Station	17 Oct 2024	23 Oct 2024	27 Mar 2025	31 Mar 2025	28 Jul 2025	28 Aug 2025
S15	Ground truthing	Physico-chemical		Physico-chemical		
GS1	Ground truthing					
GS2	Ground truthing		Q-sampling, Physico-chemical			Q-sampling, Physico-chemical
GS3	Ground truthing		Q-sampling, Physico-chemical			Q-sampling, Physico-chemical
GS4	Ground truthing		Q-sampling, Physico-chemical			Q-sampling, Physico-chemical
GS5	Ground truthing		Q-sampling, Physico-chemical			Q-sampling, Physico-chemical
GS6	Ground truthing		Q-sampling, Physico-chemical			Q-sampling, Physico-chemical, WCC observation
E Site 1					Electrofishing, WCC survey	
E Site 2					WCC survey	
E Site 3					Electrofishing, WCC survey	
E Site 4					Electrofishing, WCC survey	
E Site 6					WCC survey	
E Site 7					Electrofishing, WCC survey	

Station	17 Oct 2024	23 Oct 2024	27 Mar 2025	31 Mar 2025	28 Jul 2025	28 Aug 2025
E Site 8					WCC survey	

9.3.2.1 Ground Truthing Survey

Wind Farm Site

Fifteen stations were visited during the 2024 ground truthing survey for the Wind Farm site (**Figure 9.1**). The watercourse habitats and surrounding land use visited as part of the Ground Truthing survey were classified according to the Fossitt (2000) classification system (Error! Reference source not found. **- Appendix 9.1**). The sample stations a ssessed were:

- S1 - BREEDOGE_010 (EPA Code: N/A, Seg Code: 26_2957)
- S2 - BREEDOGE_010 (EPA Code: N/A, Seg Code: 26_2957)
- S3 – MANTUA_010 (EPA Code: 26M01, Seg Code: 26_13304)
- S4 - BREEDOGE_010 (EPA Code: 26M01, Seg Code: 26_1338)
- S5 - BREEDOGE_010 (EPA Code: 26M01, Seg Code: 26_1338)
- S6 - BREEDOGE_010 (EPA Code: 26M01, Seg Code: 26_1330)
- S7 – BREEDOGE_010 (EPA Code: 26B09, Seg Code: 26_4100)
- S8 - BREEDOGE_010 (EPA Code: N/A, Seg Code: 26_2279)
- S9 - BREEDOGE_010 (EPA Code: 26T66, Seg Code: 26_2232)
- S10 - BREEDOGE_010 (EPA Code: 26O04, Seg Code: 26_1227)
- S11 - BREEDOGE_010 (EPA Code: 26O04, Seg Code: 26_1227)
- S12 - CARRICKNABRAHER_020 (EPA Code: 26C02, Seg Code: 26_13437)
- S13 – CARRICKNABRAHER_020 (EPA Code: N/A, Seg Code: 26_2861)
- S14 - CARRICKNABRAHER_020 (EPA Code: 26C02, Seg Code: 26_13427)
- S15 - BREEDOGE_010 (EPA Code: 26M01, Seg Code: 26_1330)

The majority of watercourses within the Wind Farm Site were classified as (FW2) Depositing/lowland rivers under the Fossitt (2000) habitat classification system, with occasional (FW4) Drainage ditches recorded at certain stations. Surrounding land use was predominantly (GA1) Improved Agricultural Grassland and (WD4) Conifer Plantation, with areas of (PB) Peat Bog and (WS1) Scrub also present. Riparian vegetation included species typical of agricultural and forestry margins. Potential sources of nutrient enrichment were noted, primarily from surface runoff associated with adjacent farmland and forestry operations, contributing to elevated phosphate levels observed during water quality sampling. Several watercourses exhibited evidence of historical drainage and channel modification, and maintenance by the Office of Public Works (OPW) was noted. A synopsis of the walkover survey results, as detailed in the Baseline Aquatic Ecology Report (**Appendix 9.1**), is provided below.

S1 - BREEDOGE_010 (EPA Code: N/A, Seg Code: 26_2957)

S1 - BREEDOGE_010 was located on the River Breedoge (BREEDOGE_010). The Wind Farm site was located in a bog with no flowing water and was unsuitable for kick sampling and water sampling due to the hazardous cut sides of the peat banks and deep soft substrate. There was no access to standing water. The watercourse was classified as drainage ditch (FW4, Fossitt, 2000). The surrounding land use was peat bog (PB, Fossitt, 2000). Alternative sites in close proximity were assessed but again lacked access and water flow. All other stations surveyed offers optimal coverage and therefore considered that S1 - BREEDOGE_010 was not required. Under NRA 2009 guidelines, this habitat is considered Low Value at Local Importance due to its artificial nature, lack of flow, and limited connectivity, despite adjacent peatland.

Figure 9.1: Representative photo of S1 - BREEDOGE_010, 17th of October 2024.

S2 - BREEDOGE_010 (EPA Code: N/A, Seg Code: 26_2957)

S2 - BREEDOGE_010 was located on the River Breedoge (BREEDOGE_010). This river watercourse had a wet width of 1 m and an average depth of 20 cm with a moderate flow. The substrate was 80% cobble and 20% gravel providing 80% glide and 20% riffle habitats. Bank height was roughly 4 m. Shading consisted of some bramble (*Rubus* sp.) over the bank. Other bankside vegetation included hawthorn (*Crataegus monogyna*), sycamore (*Acer* sp.), Willow (*Salix* sp.), nettle (*Urtica* sp.), cocksfoot grass (*Dactylis glomerata*), lesser water parsnip (*Berula erecta*), common reed grass (*Phragmites* sp.), and immature rowan trees (*Sorbus* sp.). The watercourse was classified as depositing/lowland rivers (FW2, Fossitt, 2000). Surrounding land use was broadleaf and conifer woodland (WD3, Fossitt, 2000). Under NRA 2009 guidelines, this habitat is considered Moderate Value at Local Importance due to its natural channel and moderate flow, but ecological potential is slightly constrained by surrounding woodland management and limited instream diversity.

Figure 9.2: Representative photo of S2 - BREEDOGE_010, 31st of March 2025.

S3 - MANTUA_010 (EPA Code: 26M01, Seg Code: 26_13304)

S3 - MANTUA_010 was located on the Mantua River (MANTUA_010). This river watercourse had a wet width of 1m and an average depth of 30-40 cm with a slow flow. The substrate was 50% boulders, 30% cobble, 10% gravel, and 10% silt, providing a 100% glide habitat. Bank height was roughly 6-8 m. Shading consisted of some overgrowing willow (*Salix* sp.) and birch (*Betula* sp.). Other bankside vegetation included bramble (*Rubus* sp.), hawthorn (*Crataegus monogyna*), dandelion (*Taraxacum* sp.), nettle (*Urtica* sp.), cocksfoot grass (*Dactylis glomerata*), ryegrass (*Lolium* sp.), wild strawberry (*Fragaria vesca*), creeping buttercup (*Ranunculus repens*.), downy birch (*Betula* sp.), wild angelica (*Angelica sylvestris*), lesser celandine (*Ficaria verna*), and purple loosestrife (*Lythrum salicaria*). The watercourse was classified as depositing/lowland rivers (FW2, Fossitt, 2000). Surrounding land use consisted of improved agricultural grassland (GA1, Fossitt, 2000) and conifer plantation (WD4, Fossitt, 2000). Under NRA 2009 guidelines, this habitat is considered Moderate Value at Local Importance due to its natural river characteristics and structural diversity, though ecological potential is reduced by slow flow and adjacent improved grassland and conifer plantation.

Figure 9.3: Representative photo of S3 - MANTUA_010, 17th of October 2024.

S4 - BREEDOGE_010 (EPA Code: 26M01, Seg Code: 26_1338)

S4 - BREEDOGE_010 was located on the River Breedoge (BREEDOGE_010). This river watercourse had a wet width of 1.5 m and an average depth of 15 cm with a slow flow. The substrate consisted of 80% gravel, 15% cobble, and 5% boulder. The associated habitats were 90% glide with 10% pooling. Bank height was roughly 4 m. There was no shading at S4 - BREEDOGE_010. Bankside flora consisted of nettle (*Urtica* sp.), cocksfoot grass (*Dactylis glomerata*), lesser celandine (*Ficaria verna*), crested dogs-tail (*Cynosurus cristatus*), broadleaf dock (*Rumex obtusifolius*), lesser knapweed (*Centaurea nigra*), red and white clover (*Trifolium* sp.), curled leaf dock (*Rumex crispus*), and common reed grass (*Phragmites* sp.). The watercourse was classified as depositing/lowland rivers (FW2, Fossitt, 2000). The surrounding land-use was solely improved agricultural grassland (GA1, Fossitt, 2000). Under NRA 2009 guidelines, this habitat is considered Moderate Value at Local Importance due to its natural river characteristics and structural diversity, though ecological potential is reduced by slow flow and the dominance of improved agricultural grassland in the surrounding area.

Figure 9.4: Representative photo of S4 - BREEDOGE_010, 17th of October 2024

S5 - BREEDOGE_010 (EPA Code: 26M01, Seg Code: 26_1338)

S5 - BREEDOGE_010 was located on the River Breedoge (BREEDOGE_010). This watercourse had a wet width of 5-6 m and an average depth of 10-30 cm with a moderate flow. The substrate consisted of 40% cobble, 10% boulders, 30% gravel, and 20% silt. The associated habitats were 90% glide with 10% riffle. Bank height was roughly 0.5-1 m. Shading was provided by bramble (*Rubus* sp.) and willow (*Salix* sp.) on the bank. Invasive Japanese knotweed (*Reynoutria japonica*) was found at this station. Other bankside vegetation included basket willow (*Salix* sp.), elder (*Sambucus* sp.), alder (*Alnus glutinosa*), and common reed grass (*Phragmites* sp.). The watercourse was classified as depositing/lowland rivers (FW2, Fossitt, 2000). The surrounding land-use consisted of improved agricultural grassland (GA1, Fossitt, 2000). Under NRA 2009 guidelines, this habitat is considered Moderate Value at Local Importance due to its natural river characteristics and moderate flow, but ecological potential is reduced by the presence of invasive species and adjacent improved agricultural grassland.

Figure 9.5: Representative photo of S5 - BREEDOGE_010, with Japanese knotweed. 17th of October 2024.

S6 - BREEDOGE_010 (EPA Code: 26M01, Seg Code: 26_1330)

S6 - BREEDOGE_010 was located on the River Breedoge (BREEDOGE_010). This river watercourse had a wet width of 6-7 m and an average depth of >2 m with a moderate flow. The substrate consisted of 100% silt/mud. The associated habitats consisted of 80% glide, 15% pool, and 5% riffle. The banks were roughly 2-3 m high. The watercourse was shaded by scrub (WS1), with some instream fallen trees blocking the river. Other bankside vegetation included mature hazel (*Corylus* sp.) & birch (*Betula* sp.) trees, Yorkshire fog (*Holcus lanatus*), bramble (*Rubus* sp.), dead conifer tree stumps and dead wood from cuttings. The watercourse was classified as depositing/lowland rivers (FW2, Fossitt, 2000). The station was located at the edge of a conifer plantation (WD4, Fossitt, 2000) which had been felled at the time of the walkover survey. Alternative sites along the river were assessed but the deep water and unstable river substrate made access too hazardous for sampling. Under NRA 2009 guidelines, this habitat is considered Moderate Value at Local Importance due to its natural river form and moderate flow, but ecological potential is reduced by deep silt substrate, instream blockages, and adjacent conifer plantation.

Figure 9.6: Representative photo of S6 - BREEDOGE_010, 17th of October 2024

S7 - BREEDOGE_010 (EPA Code: 26B09, Seg Code: 26_4100)

S7 - BREEDOGE_010 was located on the River Breedoge (BREEDOGE_010). This river watercourse had a wet width of 7 m, and it had an average depth of >1 m with a slow flow. The substrate was difficult to see due to the very turbid water. The associated habitats consisted of 90% glide and 10% pools. The banks were roughly 3 m high. Shading was provided by some overhanging willow (*Salix* sp.) branches. Remaining bankside vegetation consisted of bramble (*Rubus* sp.), Yorkshire fog (*Holcus lanatus*), cocksfoot grass (*Dactylis glomerata*), nettle (*Urtica* sp.), broadleaf dock (*Rumex obtusifolius*), common knapweed (*Centaurea nigra*), dandelion (*Taraxacum* sp.), water forget-me-not (*Myosotis scorpioides*), Herb-Robert (*Geranium robertianum*), purple loosestrife (*Lythrum salicaria*), birch (*Betula* sp.), alder (*Alnus glutinosa*), and buckler fern (*Dryopteris dilatate*). The watercourse was classified as depositing/lowland rivers (FW2, Fossitt, 2000). The surrounding land was comprised of conifer plantation (WD4, Fossitt, 2000) and bog (PB Fossitt, 2000). Alternative sites along the river were assessed but the deep water made access too hazardous for sampling. Under NRA 2009 guidelines, this habitat is considered Moderate Value at Local Importance due to its natural river characteristics and connectivity, though ecological potential is reduced by slow flow, turbidity, and adjacent conifer plantation and bog.

Figure 9.7: Representative photo of S7 - BREEDOGE_010, 17th of October 2024

S8 - BREEDOGE_010 (EPA Code: N/A, Seg Code: 26_2279)

S8 - BREEDOGE_010 was located on the River Breedoge (BREEDOGE_010). This river watercourse had a wet width of 40 cm, and it had an average depth of 1 m with no discernible flow. The substrate was comprised of 90% mud and 10% boulders with the associated habitats consisting of 100% pool. The banks were roughly 3 m high, without any shading provided by vegetation. Other bankside vegetation was composed of cocksfoot grass (*Dactylis glomerata*), nettle (*Urtica* sp.), Yorkshire fog (*Holcus lanatus*), and bramble (*Rubus* sp.). The watercourse was classified as a drainage ditch (FW4, Fossitt, 2000). The surrounding land-use was mostly conifer plantation (WD4, Fossitt, 2000) and wet grassland (GS4, Fossitt, 2000). Alternative sites along the river were assessed but the deep water made access too hazardous for sampling. Alternative sites in close proximity were assessed but lacked water flow. All other stations surveyed offers optimal coverage and therefore considered that S8 - BREEDOGE_010 was not required. Under NRA 2009 guidelines, this habitat is considered Low Value at Local Importance due to its artificial nature, lack of flow, and limited aquatic diversity, despite adjacent wet grassland and conifer plantation.

Figure 9.8: Representative photo of S8 - BREEDOGE_010, 31st of March 2025.

S9 - BREEDOGE_010 (EPA Code: 26T66, Seg Code: 26_2232)

S9 - BREEDOGE_010 was located on the River Breedoge (BREEDOGE_010). This site was deemed unsuitable for sampling as it was entirely encroached by vegetation and there was no water at the station during the time of the ground-truthing survey. The surrounding land use was improved agricultural grassland (GA1, Fossitt, 2000) and conifer plantation (WD4, Fossitt, 2000). Alternative sites in close proximity were evaluated but again was encroached by vegetation with no water flow. All other stations surveyed offers optimal coverage and therefore considered S9 - BREEDOGE_010 not required. Under NRA 2009 guidelines, this habitat is considered Low Value at Local Importance due to the absence of water, lack of aquatic habitat, and dominance of modified terrestrial land uses.

Figure 9.9: Representative photo of S9 - BREEDOGE_010 showing complete vegetation encroachment on the watercourse, 17th of October 2024.

S10 - BREEDOGE_010 (EPA Code: 26O04, Seg Code: 26_1227)

S10 - BREEDOGE_010 was located on the River Breedoge (BREEDOGE_010). This river watercourse had a wet width of 4m, and it had an average depth of >1 m with slow flow. The substrate was difficult to discern due to the turbid water but appeared mostly mud and gravel, with the associated habitats consisting of 100% glide. The banks were roughly 2-4 m high, and the watercourse was shaded by overhanging willow (*Salix* sp.). Other bankside vegetation included nettle (*Urtica* sp.), bramble (*Rubus* sp.), bracken (*Pteridium* sp.), thistle (Asteraceae), greater knapweed (*Centaurea scabiosa*), common reed grass (*Phragmites* sp.), purple loosestrife (*Lythrum salicaria*), willowherb (*Epilobium* sp.) and hawthorn (*Crataegus monogyna*). The watercourse was classified as a depositing/lowland river (FW2, Fossitt, 2000). The surrounding land-use comprised of mostly conifer plantation (WD4, Fossitt, 2000) and wet grassland (GS4, Fossitt, 2000). A river otter (*Lutra lutra*) was sighted at this station travelling upstream. Alternative sites along the river were assessed but the deep water and undiscernible river substrate made access too hazardous for sampling. Under NRA 2009 guidelines, this habitat is considered Moderate Value at Local Importance due to its natural river characteristics and presence of a protected species (otter), though ecological potential is reduced by slow flow, turbidity, and adjacent conifer plantation.

Figure 9.10: Representative photo of S10 - BREEDOGE_010, 17th of October 2024.

S11 - BREEDOGE_010 (EPA Code: 26O04, Seg Code: 26_1227)

S11 - BREEDOGE_010 was located on the River Breedoge (BREEDOGE_010). This site was upstream of S10 - BREEDOGE_010 along the same watercourse. S11 - BREEDOGE_010 had a wet width was 4 m, and it had an average depth of 20 cm with a fast flow. The substrate was 50% cobble, 20% boulder and 30% gravel. The associated habitats consisted of 60% riffle, 20% glide and 20% pools. The banks were roughly 2-4 m high. Shading was provided by some overhanging willow (*Salix* sp.). Remaining bankside vegetation consisted of bramble (*Rubus* sp.), Yorkshire fog (*Holcus lanatus*), nettle (*Urtica* sp.), common pennywort (*Hydrocotyle vulgaris*), water speedwell (*Veronica anagallis-aquatica*), marsh yellowcress (*Rorippa palustris*), lesser celandine (*Ficaria verna*) and soft shield-fern (*Polystichum setiferum*). The watercourse was classified as a depositing/lowland river (FW2, Fossitt, 2000). The surrounding land was comprised of conifer plantation (WD4) and wet grassland (GS4). Under NRA 2009 guidelines, this habitat is considered High Value at Local Importance due to its fast flow, diverse substrate, and presence of riffle-pool sequences, which provide good ecological conditions despite adjacent modified land uses.

Figure 9.11: Representative photo of S11 - BREEDOGE_010, 31st of May 2025.

S12 - CARRICKNABRAHER_020 (EPA Code: 26C02, Seg Code: 26_13437)

S12 – CARRICKNABRAHER_020 was located on the Carricknabraher River (CARRICKNABRAHER_020). This river watercourse had a wet width of 4 m and it had an average depth of >1 m with a slow flow. The substrate was entirely mud with an associated habitat that was 100% glide. The banks were roughly 3-4 m high and shaded by overhanging willow (*Salix* sp.), birch (*Betula* sp.) and bramble (*Rubus* sp.). Remaining bankside vegetation consisted of bilberry (*Vaccinium myrtillus*), cocksfoot grass (*Dactylis glomerata*), heather (*Calluna vulgaris*) nettle (*Urtica* sp.), bracken (*Pteridium* sp.), willowherb (*Epilobium* sp.), lesser knapweed (*Centaurea nigra*), thistle (Asteraceae), and reindeer moss (*Cladonia rangiferina*). The watercourse was classified as a depositing/lowland rivers (FW2, Fossitt, 2000). The surrounding land was solely comprised of bog (PB, Fossitt, 2000). Alternative sites along the river were assessed but the deep water and unstable river substrate made access too hazardous for sampling. Under NRA 2009 guidelines, this habitat is considered Moderate Value at Local Importance due to its natural river form and connectivity, though ecological potential is reduced by slow flow, deep mud substrate, and lack of instream diversity.

Figure 9.12: Representative photo of S12 - CARRICKNABRAHER_020, 17th of October 2024

S13 - CARRICKNABRAHER_020 (EPA Code: N/A , Seg Code: 26_2861)

S13 – CARRICKNABRAHER_020 was located on the Carricknabraher River (CARRICKNABRAHER_020). This site was deemed unsuitable for sampling at the time of the ground truthing survey due to being an active construction site and appeared to have been culverted. The watercourse was classified as drainage ditch (FW4, Fossitt, 2000). Alternative sites along the river were assessed but again there were no water flow obstructed by the construction. Surrounding land use was mostly comprised of improved agricultural grassland (GA1, Fossitt, 2000). Under NRA 2009 guidelines, this habitat is considered Low Value at Local Importance due to its artificial nature, lack of flow, and physical modification, which significantly reduce ecological potential.

Figure 9.13: Representative photo of S13 - CARRICKNABRAHER_020showing construction site, 17th of October 2024

S14 – CARRICKNABRAHER_020 (EPA Code: 26C02, Seg Code: 26_13427)

S14 – CARRICKNABRAHER_020 was located on the Carricknabraher River (CARRICKNABRAHER_020). This river watercourse had a wet width of 7-8 m, and it had an average depth of 30 cm with a moderate flow. The substrate was 70% cobble, 10% boulder, and 20% gravel with associated habitats of 70% riffle, 20% glide, 10% pool. The banks were roughly 15 cm high with no shading over the watercourse. Remaining bankside vegetation consisted of willowherb (*Epilobium* sp.), Yorkshire fog (*Holcus lanatus*), common reed grass (*Phragmites* sp.), ryegrass (*Lolium* sp.), nettle (*Urtica* sp.), broadleaf dock (*Rumex obtusifolius*), curled leaf dock (*Rumex crispus*), soft shield-fern (*Polystichum setiferum*), common pennywort (*Hydrocotyle vulgaris*), willow (*Salix* sp.), creeping buttercup (*Ranunculus repens*), and clover (*Trifolium* sp.). The watercourse was classified as depositing/lowland rivers (FW2, Fossitt, 2000). The surrounding land was comprised of improved agricultural grassland (GA1, Fossitt, 2000). Under NRA 2009 guidelines, this habitat is considered High Value at Local Importance due to its moderate flow, diverse substrate, and presence of riffle-pool sequences, which provide good ecological conditions despite adjacent improved agricultural grassland.

Figure 9.14: Representative photo of S14 - CARRICKNABRAHER_020, 17th of October 2024.

S15 - BREEDOGE_010 (EPA Code: 26M01, Seg Code: 26_1330)

S15 - BREEDOGE_010 was located on the River Breedoge (BREEDOGE_010). This river watercourse had a wet width of 6-7 m and an average depth of >2 m with a moderate flow. The substrate consisted of 100% silt/mud. The associated habitats consisted of 90% glide and 10% pool. The banks were roughly 2-3 m high and shaded by overhanging willow (*Salix* sp.). Other bankside vegetation included mature hazel (*Corylus* sp.) & birch (*Betula* sp.) trees, Yorkshire fog (*Holcus lanatus*), bramble (*Rubus* sp.), dead conifer tree stumps and dead wood from cuttings. The watercourse was classified as depositing/lowland rivers (FW2, Fossitt, 2000). The station was located at the edge of a conifer plantation (WD4, Fossitt, 2000) which had been felled at the time of the walkover survey. Alternative sites along the river were assessed but the deep water and undiscernible river substrate made access too hazardous for sampling. Under NRA 2009 guidelines, this habitat is considered Moderate Value at Local Importance due to its natural river form and moderate flow, though ecological potential is reduced by deep silt substrate, lack of instream diversity, and adjacent conifer plantation.

Figure 9.15: Representative phot of S15 - BREEDOGE_010, 31st of May 2025.

GRID CONNECTION ROUTE

Six stations were visited during the 2024 ground truthing survey for the Wind Farm site (**Figure 9.2**). The watercourse habitats and surrounding land use visited as part of the Grid Connection survey were classified according to the Fossitt (2000) classification system (Error! Reference source not found. - **Appendix 9.1**). The sample stations a ssessed were:

- GS1 - BREEDOGE_010 (EPA Code: 26E18, Seg Code: 26_2153)
- GS2 - MANTUA_010 (EPA Code: 26M01, Seg Code: 26_3671)
- GS3 – KINARD_010 (EPA Code: 26K07, Seg Code: 26_2162)
- GS4 - KILLUKIN_020 (EPA Code: 26K02, Seg Code: 26_1193)
- GS5 - KILLUKIN_020 (EPA Code: 26D27, Seg Code: 26_2794)
- GS6 - KILLUKIN_020 (EPA Code: 26D27, Seg Code: 26_2794)

Grid Connection S1 - BREEDOGE_010 (EPA Code: 26E18, Seg Code: 26_2153)

Grid Connection S1 - BREEDOGE_010 was located on the River Breedoge (BREEDOGE_010). The river watercourse had a wet width of 2.5 m and bank width of 8 m. Depth was estimated between 40 and 50 cm. Flow was very slow. Surrounding and instream vegetation was recorded and included Bramble (*Rubus* sp.), Ivy (*Hedera helix*), the fern Intermediate Polypody (*Polypodium interjectum*), Hawthorn *(Crataegus sp.*), Silver Birch (*Betula pendula*) and a solitary Scots pine (*Pinus sylvestris*). The Wind Farm site was characterised with the Fossitt classification FW4 Drainage ditches. Conifer plantation (WD4, Fossitt, 2000) and Scrub habitat (WS1, Fossitt, 2000) border the banks. The Wind Farm site was unsafe to enter due to steep banks and the lack of a suitable entry point. Under NRA (2009) guidelines, this habitat is considered Lower Value at Local Importance due to its artificial drainage form, very slow flow, and steep modified banks, which limit instream diversity and ecological function. Although some semi-natural riparian vegetation is present, the overall ecological potential is reduced by channel modification and adjacent conifer plantation.

Figure 9.16: Representative photo of Grid Connection S1 - BREEDOGE_010 on the 27th of May 2025.

Grid Connection S2 - MANTUA_010 (EPA Code: 26M01, Seg Code: 26_3671)

Grid Connection S2 - MANTUA_010 was located on the Mantua River (MANTUA_010). The Wind Farm site ranged from low to Moderate shading with a wet and bank width of 2.5 m and 3 m respectively. The water was clear with a slight colour and flow was slow. The substrate was comprised of Boulder (50%), Cobble (20%), and Silt (30%). The overall type of substrate was mud over stones. The depth of the mud was between 1 and 5 cm. Surrounding vegetation included Perennial ryegrass (*Lolium perenne*), Broadleaf Dock (*Rumex obtusifolius*), Hawthorn *(Crataegus sp.*), Nettle (*Urtica* sp.). The watercourse was classified as depositing/lowland rivers (FW2, Fossitt, 2000). The habitat bordering the bankside was classified as GA1 (Fossitt, 2000): Improved agricultural grassland, and WS1 Scrub (Fossitt, 2000). Under NRA (2009) guidelines, this habitat is considered Moderate Value at Local Importance due to its natural river form and moderate flow, though ecological potential is reduced by deep silt substrate, lack of instream diversity, and adjacent improved agricultural grassland.

Figure 9.17: Representative photo of Grid Connection S2 - BREEDOGE_010, 27th of March 2025.

Grid Connection S3 - KINARD_010 (EPA Code: 26K07, Seg Code: 26_2162)

Grid Connection S3 - KINARD_010 was located on the River Kinard (KINARD_010). The river watercourse had a wet width and bank width were 3.5 m and 3 m, respectively. Flow was moderate and the water appeared clear with a slight colouration. The stream bed had a stoney bottom with no mud and was made up predominately of boulders (90%). In stream and bankside vegetation included Bryophytes (unidentified), Hart's tongue fern (*Asplenium scolopendrium*), Bracken (*Pteridium* sp.) and Bramble (*Rubus* sp.). The Wind Farm site was characterised with the Fossitt classification depositing/lowland rivers (FW2) with surrounding land use GA1: Improved agricultural grassland (Fossitt, 2000) as well as WS1: Scrub (Fossitt, 2000). Under NRA (2009) guidelines, this habitat is considered Moderate Value at Local Importance due to its natural river form, clear water, and moderate flow, though ecological potential is reduced by adjacent improved agricultural grassland and limited riparian diversity.

Figure 9.18: Representative photo of Grid Connection S3 - MANTUA_010, the 27th of March 2025.

Grid Connection S4 - KILLUKIN_020 (EPA Code: 26K02, Seg Code: 26_1193)

Grid Connection S4 - KILLUKIN_020 was located on Killukin River (KILLUKIN_020). The velocity of the river was fast over a substratum made up equally of boulder and cobble. Wet and bank width were 3-3.5 m and 4 m, respectively. Average depth was 50 cm. The depth of Mud at the Wind Farm site was <1cm and the water was clear with slight colouration. There was no availability for livestock access at the Wind Farm site. Lesser water parsnip (*Berula erecta*) was the predominant in stream vegetation. Bankside vegetation included Birch (*Betula* sp.), ryegrass (*Lolium* sp.), Lesser Celandine (*Ficaria verna*), Water milfoil (*Myriophyllum* sp), rushes (Juncaceae) and Nettle (*Urtica* sp.). The Wind Farm site was characterised with the Fossitt classification FW2 depositing/lowland rivers (FW2, Fossitt, 2000). The surrounding land use was Improved agricultural grassland (GA1, Fossitt, 2000), Scrub (WS1, Fossitt, 2000) and Treelines (WL2, Fossitt, 2000). Under NRA (2009) guidelines, this habitat is considered Moderate Value at Local Importance due to its natural river form, fast flow, and clear water, though ecological potential is reduced by adjacent improved agricultural grassland and limited riparian diversity.

Figure 9.19: Representative photo of Grid Connection S4 - BREEDOGE_010, 27th of March 2025.

Grid Connection S5 - KILLUKIN_020 (EPA Code: 26D27, Seg Code: 26_2794)

Grid Connection S5 - KILLUKIN_020 was located on Killukin River (KILLUKIN_020). The river watercourse had a wet width was between 0.5 m and 1 m while bank width was 2 m. The velocity of the flow was slow with no colour. Discharge was low and the water was very clear. The dominant types of substrates on the stream bed were fine gravel (50%), cobble (30%), and boulder (20%). This made up a predominantly stoney bottom with moderate sedimentation. Bankside vegetation consisted of Lesser Celandine (*Ficaria verna*), Hart's tongue fern (*Asplenium scolopendrium*), rushes (Juncaceae), Nettle (*Urtica* sp.), Bramble (*Rubus* sp.), Ivy (*Hedera helix*), Yellow flag iris (*Iris pseudacorus*), and ryegrass (*Lolium* sp.). Instream vegetation was predominantly Water mint (*Mentha aquatica*). The watercourse was classified as Depositing/lowland rivers (FW2, Fossitt, 2000). The surrounding Fossitt habitats were GA1 (improved agricultural grassland) and WS1 (Scrub) (Fossitt, 2000). Under NRA (2009) guidelines, this habitat is considered Moderate Value at Local Importance due to its natural river form and clear water, though ecological potential is reduced by slow flow, moderate sedimentation, and adjacent improved agricultural grassland.

Figure 9.20: Representative photo of Grid Connection S5 - BREEDOGE_010, 28th of August 2025.

Grid Connection S6 - KILLUKIN_020 (EPA Code: 26D27, Seg Code: 26_2794)

Grid Connection S6 - KILLUKIN_020 was located on Killukin River (KILLUKIN_020). The river watercourse had a wet width and bank width at Grid Connection S6 - BREEDOGE_010 were 4 m and 4.5 m, respectively. Average depth was 35 cm. The water was clear with a slight colouration. The riverbed had a stoney bottom with no mud. The stream consisted of areas of both riffle and glide. There was a low amount of shading at the Wind Farm site. Instream and bankside vegetation consisted of Lesser water parsnip (*Berula erecta*), ryegrass (*Lolium* sp.), Nettle (*Urtica* sp.), Bramble (*Rubus* sp.) and Willow (*Salix* sp.). Under NRA (2009) guidelines, this habitat is considered Moderate Value at Local Importance due to its natural river form, clear water, and presence of riffle–glide sequences, though ecological potential is reduced by limited riparian diversity and adjacent agricultural land use.

Figure 9.21: Representative photo of Grid Connection S6 - BREEDOGE_010, 27th of March 2025.

9.3.2.2 Physicochemical Water Sampling

Regulation parameters for surface waters and salmonid waters are provided in the table below. Full results and tables for physicochemical are available in **Appendix 9.1.**

Table 9.5: Regulation parameters for surface waters and salmonid waters

Test	Unit	Surface water regulations 2019(amended)		Salmonid waters
Biological Oxygen Demand (BOD)	mg/l	High ≤ 2.2	Good ≤ 2.6	≤ 5
Suspended solids (SS)	mg/l	-	-	≤ 25
Dissolved Oxygen (DO)	-	95%ile >80% (lower limit)	95%ile <120% (Upper limit)	≥9.00 mg O_2/l
Nitrite as NO_2	mg/l	-	-	≤ 0.05
Phosphate as Molybdate Reactive Phosphorus (MRP)	mg/l	High ≤ 0.025	Good ≤ 0.035	-
Non – ionized Ammonia (NH_3)	mg/l	-	-	≤ 0.02
Total Ammonia (NH_4)	mg/l	High ≤ 0.040 (mean)	Good ≤ 0.065 (mean)	≤ 1.00
Total Residual Chlorine (HOC1)	Mg/l	-	-	≤ 0.005

Wind Farm Sites (S1–S15)

Physicochemical sampling was undertaken during autumn (October 2024) and spring (March 2025) at accessible stations within the Wind Farm Site. Parameters measured included dissolved oxygen (DO), biological oxygen demand (BOD), pH, turbidity, suspended solids, nutrients (nitrite, nitrate, phosphate), chemical oxygen demand (COD), and hydrocarbons (TPH), benchmarked against EU Surface Water Regulations (SI 272/2009) and Salmonid Waters Regulations (SI 293/1988).

Several stations were excluded from sampling due to health and safety constraints or unsuitable conditions. These included deep water, unstable silty substrates, hazardous peat banks, and complete vegetation encroachment, which rendered kick sampling and water collection unsafe.

At sampled stations, BOD values were generally low, meeting 'High' or 'Good' status thresholds, except for S5 in autumn (10 mg/l), which significantly exceeded acceptable limits. Dissolved oxygen levels were mostly compliant, though autumn readings at S4

(71.5%) and S8 (73.4%) fell below the 80% saturation threshold and <9 mg/l required for salmonid waters. Phosphate concentrations consistently exceeded the 0.035 mg/l threshold for 'Good' status, with notable enrichment at S6 (0.466 mg/l) and S8 (0.074 mg/l), likely linked to agricultural runoff and slow-flowing conditions that trap nutrients. Suspended solids were typically low but elevated at S12, S14, and S15 in autumn (up to 68 mg/l), correlating with silty substrates and disturbed banks. Nitrite levels remained within salmonid standards (<0.005 mg/l) at most sites, with only minor exceedances at S12 (0.051 mg/l). Hydrocarbon traces (TPH) were detected intermittently, with the highest value at S6 (76 µg/l).

Spring 2025 results showed improved DO levels (>90% saturation at most sites) and generally low BOD (<1–4 mg/l), but phosphate remained above the 'Good' status threshold at all stations, with S8 recording 0.10 mg/l. Suspended solids were mostly low, except at S8 (33 mg/l). Nitrite levels were consistently favourable (<0.007 mg/l). These findings indicate persistent nutrient enrichment and occasional oxygen stress during low-flow conditions, while other parameters generally complied with regulatory standards.

Grid Connection Sites (GS1–GS6)

Physicochemical sampling was conducted in spring (March 2025) and autumn (August 2025) at stations along the Grid Connection route. GS1 was excluded from sampling due to unsafe access caused by steep banks and lack of entry points.

In spring, DO levels were high (89.9–100.5% saturation; 10.2–11.2 mg/l), and BOD was consistently low (<1 mg/l), meeting 'High' status thresholds. Suspended solids were generally low (<2 mg/l), except GS5 (17 mg/l). Phosphate concentrations exceeded the 0.035 mg/l threshold at all stations, with GS5 recording the highest value (0.08 mg/l). Nitrite levels remained favourable (<0.005 mg/l), and hydrocarbons were detected at all sites, with GS2 showing the highest TPH (110 µg/l).

Autumn results revealed a decline in DO at GS4 (83.9%), GS5 (69.1%), and GS6 (81.4%), with GS5 failing the salmonid standard (7.17 mg/l). BOD remained low (<1 mg/l), and suspended solids were negligible (<0.22 mg/l). However, phosphate levels were markedly elevated across all sites (0.56–0.89 mg/l), indicating significant nutrient input, likely from agricultural runoff during late summer. Hydrocarbon contamination was notable at GS3 (1170 µg/l), suggesting a localised pollution source.

Overall, grid connection sites exhibited persistent phosphate enrichment and seasonal oxygen stress during low-flow conditions, while other parameters generally complied with regulatory standards. These results reflect the influence of surrounding pastoral land use and seasonal variability, with implications for aquatic ecological status and salmonid habitat suitability.

Physicochemical water quality results across all surveys indicate that while most parameters generally complied with EU Surface Water Regulations and Salmonid Waters Regulations, there are recurring issues that reduce ecological potential. Dissolved oxygen (DO) levels were satisfactory in spring at all stations (>90% saturation), but autumn surveys revealed sub-optimal values at certain wind farm sites (S4 and S8) and grid connection sites (GS4–GS6), correlating with low flows and reduced aeration. Biological oxygen demand (BOD) was consistently low, suggesting limited organic pollution, except for an isolated exceedance at S5 in autumn (10 mg/l).

Phosphate enrichment was the most persistent issue, with concentrations exceeding the 0.035 mg/l threshold for 'Good' status at nearly all stations during every survey. Elevated phosphate levels were particularly pronounced in autumn at Grid Connection route sites (0.56–0.89 mg/l), likely linked to agricultural runoff and slow-moving watercourses that trap nutrients. Nitrate concentrations remained below the ecological risk threshold (>8 mg/l NO_3), indicating that eutrophication risk is primarily driven by phosphate rather than nitrate. Nitrite levels were generally compliant, with only minor exceedances at isolated sites (e.g., S12 in autumn).

Suspended solids were typically low, but elevated values occurred at stations with silty substrates or riffle/glide sequences (e.g., S12, S14, S15), reflecting natural sediment dynamics rather than point-source pollution. Hydrocarbon contamination (TPH) was detected intermittently, with a significant spike at GS3 in autumn (1170 µg/l), suggesting a localised pollution source.

Overall, the data show that nutrient enrichment, particularly phosphate, combined with seasonal low-flow conditions and physical habitat limitations, poses the greatest constraint on water quality and salmonid suitability. While chemical parameters such as DO, BOD, and nitrite generally meet regulatory standards, persistent phosphate loading and occasional oxygen stress highlight the influence of surrounding pastoral land use and hydromorphological modification on aquatic ecological status.

9.3.2.3 Macroinvertebrate diversity assessment

Water quality was assessed using the Q-Value biotic index system. The Biological River Quality Classification System (Q-Scheme) has been in use in Ireland since 1971. For the purpose of this assessment, benthic invertebrates have been divided into five indicator groups according to the tolerance of pollution, particularly organic pollution.

In order to determine the biological quality of the river, the Q-scheme index is used whereby the analyst assigns a Biotic Index value (Q-Value) based on macroinvertebrate results. The Biotic Index is a quality measurement for freshwater bodies that range from Q1 – Q5 with Q1 being of poorest quality and Q5 being pristine/unpolluted.

The most recent EPA (2023) biological water quality data for rivers within the wind farm site indicate generally Good to Moderate conditions. On the Breedoge, Q-values recorded upstream of the site ranged from Q4 ("Good") to Q3-4 ("Moderate"), while historical data show variability from Poor (Q3 in 2005) to High status (Q4-5 in 1992). The Carricknabraher also recorded Moderate status (Q3-4) in 2023, though earlier monitoring in 2020 classified it as Polluted (Q3). Within the wider catchment, the Owennaforeesha -located slightly south of the site- recorded Good status (Q4) at Bellanagare Bridge in 2023, with older downstream results indicating Moderate conditions (Q3-4 in 2002). The Bella (Derryagh Bridge) monitoring station within the site recorded Good status (Q4) in 2023. These results are summarised in **Table 9.6**.

Table 9.6: Historical Q-value data from stations on the Wind Farm Site1 (upstream (u/s) and downstream (d/s))

River Name	Station Name	Q-Value	Year
BREEDOGE BREEDOGE_010	100 m u/s Breedoge confl	Q4 "Good"	2023
BREEDOGE BREEDOGE_010	BREEDOGE- Br 2 km E.S.E of Frenchpark	Q3 "Poor"	2005
CARRICKNABRAHER CARRICKNABRAHER_020	U/s Owennaforeesha River	Q3-4* "Moderate"	2023
CARRICKNABRAHER CARRICKNABRAHER_020	~900m u/s Owennaforeesha river conflu	Q3* "Polluted"	2020

[1] https://epawebapp.epa.ie/qvalue/webusers/PDFS/HA24.pdf?Submit=Get+Results

River Name	Station Name	Q-Value	Year
BREEDOGE BREEDOGE_010	BREEDOGE - Bella Bridge	Q4-5 "High"	1992
OWENNAFOREESHA OWENNAFOREESHA_010	Bellanagare Bridge	Q4 "Good"	2023
OWENNAFOREESHA BREEDOGE_010	OWENNAFOREESHA - 0.2km d/s Bellanagare Br	Q3-4 "Moderate"	2002
BELLA BREEDOGE_010	Derryagh Bridge	Q4 "Good"	2023

Biological water quality results for locations sampled during the Ground Truthing surveys in Autumn and Spring are shown in Table 4.4. Grid Connection route station GS1 - BREEDOGE_010 and stations 1, 6, 7, 8, 9, 10, 12, 13, and 15 were unable to be sampled on the 23rd of October 2024 and were therefore excluded from the subsequent survey round for reasons outlined in Section 4.2.1, notably because of either lack of safe access or insufficient water flow. Full taxa lists for the sampling periods are found in **Appendix 9.1.**

Wind Farm Sites October 2024 & March 2025

Macroinvertebrate-based Q-values recorded in October 2024 and March 2025 indicate variable water quality across the surveyed stations (**Table 9.7**), with patterns that align closely with physico-chemical conditions (**Section 9.3.2.2**). In autumn, S2 on the Breedoge River achieved moderate status (Q3–4), which corresponds with acceptable dissolved oxygen levels but elevated phosphate concentrations above the 0.035 mg/l threshold. S3 on the Mantua River and S4 on the Breedoge River were classified as bad (Q2–3), and both sites exhibited signs of stress in physico-chemical data: S4 recorded low dissolved oxygen (71.5% saturation; 8.15 mg/l) and high phosphate, while S3 showed elevated phosphate and a silty substrate prone to nutrient retention. S5 on the Breedoge River scored poor (Q3) and had the highest BOD value (10 mg/l), indicating organic loading. S14 on the Carricknabraher River was poor (Q3) and associated with moderate suspended solids, reflecting substrate disturbance. In contrast, S11 on the Breedoge River achieved high status (Q4–5) and showed favourable physico-chemical conditions, including high dissolved oxygen and relatively low suspended solids, despite phosphate enrichment.

By spring, some improvement was observed: S3 improved from bad to poor (Q3), coinciding with higher dissolved oxygen (>90% saturation) and lower BOD, though phosphate remained elevated. S14 improved to moderate (Q3–4), supported by improved oxygen levels and reduced suspended solids. S2 remained moderate (Q3–4) with stable physico-chemical conditions, while S4 and S5 continued to score poorly, reflecting persistent phosphate enrichment and habitat limitations. S8, surveyed for the first time in spring, recorded poor status (Q3) and exhibited high phosphate (0.10 mg/l) and elevated suspended solids, likely linked to riparian encroachment and agricultural runoff. S11 maintained good ecological quality (Q4), correlating with consistently favourable oxygen levels and low BOD.

Overall, the correlation between biological and chemical indicators suggests that phosphate enrichment and low dissolved oxygen during low-flow periods are key drivers of poor Q-values, while stations with higher oxygen and lower organic loading (e.g., S11) support better ecological status. Habitat structure and surrounding land use further influence these patterns, reinforcing the need for integrated management of nutrient inputs and Hydromorphology.

Table 9.7: Results of Q-Value Assessment at Ground Truthing sampling locations (Autumn and Spring)

Location	Q-value 23rd of October 2024	Q-value 31st of March 2025
S1 - BREEDOGE_010	Not surveyed	Not surveyed
S2 - BREEDOGE_010	Q3-4 (Moderate)	Q3-4 (Moderate)
S3 - MANTUA_010	Q2-3 (Bad)	Q3 (Poor)
S4 - BREEDOGE_010	Q2-3 (Bad)	Q2-3 (Bad)
S5 - BREEDOGE_010	Q3 (Poor)	Q3 (Poor)
S6 - BREEDOGE_010	Not surveyed	Not surveyed
S7 - BREEDOGE_010	Not surveyed	Not surveyed
S8 - BREEDOGE_010	Not surveyed	Q3 (Poor)
S9 - BREEDOGE_010	Not surveyed	Not surveyed
S10 - BREEDOGE_010	Not surveyed	Not surveyed
S11 - BREEDOGE_010	Q4-5 (High)	Q4 (Good)
S12 - CARRICKNABRAHER_020	Not surveyed	Not surveyed

Location	Q-value 23rd of October 2024	Q-value 31st of March 2025
S13 - CARRICKNABRAHER_020	Not surveyed	Not surveyed
S14 - CARRICKNABRAHER_020	Q3 (Poor)	Q3-4 (Moderate)
S15 - BREEDOGE_010	Not surveyed	Not surveyed

Grid Connection Route Sites March 2025 & August 2025

Macroinvertebrate-based Q-values recorded in March and August 2025 for Grid Connection route stations reveal seasonal variation and clear links to physico-chemical conditions. In spring, GS2 on the Mantua River scored poor (Q3), which aligns with elevated phosphate levels (above 0.035 mg/l) despite favourable dissolved oxygen (>90% saturation) and low BOD, suggesting nutrient enrichment as the primary stressor. GS3 on the Kinard River achieved good status (Q4) in spring, supported by high oxygen levels and low suspended solids, but declined to moderate (Q3–4) in autumn when phosphate levels rose sharply and hydrocarbons spiked (1170 µg/l), indicating localised pollution.

Stations GS4, GS5, and GS6 on the Killukin River were moderate (Q3–4) in spring, correlating with good oxygen conditions and low BOD, but all deteriorated to poor (Q3) in autumn. This decline coincided with reduced dissolved oxygen (GS5 at 69.1% saturation and 7.17 mg/l, failing salmonid standards) and very high phosphate concentrations (0.56–0.89 mg/l), likely linked to agricultural runoff during low-flow conditions. Suspended solids remained low at these sites, suggesting that nutrient enrichment rather than sediment loading was the dominant factor.

Overall, the correlation between biological and chemical indicators demonstrates that phosphate enrichment and seasonal oxygen stress are key drivers of reduced ecological status, particularly during late summer when low flows limit aeration. GS3's sharp decline in autumn further highlights the impact of localised hydrocarbon contamination on macroinvertebrate communities. All species found are listed in **Appendix 9.1**.

Table 9.8: Results of Q-Value Assessment at Grid Connection sampling locations (Spring and Autumn)

Location	Q-value 27th of March 2025	Q-value 28th of August 2025
GS2 - MANTUA_010	Q3 (Poor)	Q3 (Poor)
GS3 – KINARD_010	Q4 (Good)	Q3-4 (Moderate)
GS4 - KILLUKIN_020	Q3-4 (Moderate)	Q3 (Poor)
GS5 - KILLUKIN_020	Q3-4 (Moderate)	Q3 (Poor)
GS6 - KILLUKIN_020	Q3-4 (Moderate)	Q3 (Poor)

Limitations

Although two sites could not be accessed during the most recent surveys, the availability of historical data, including detailed field surveys conducted in 2022, has provided sufficient ecological information to ensure that the assessment remains comprehensive and supports reasoned conclusions regarding the significance of potential effects. While the Q-value surveys and associated water quality assessments were carried out to a high standard, certain practical constraints limited full spatial coverage. At several Wind Farm Site stations (listed in **Table 9.8**), sampling could not be completed due to physical access issues such as steep banks, deep water, unstable substrates, and dense riparian vegetation, which posed safety risks. Similarly, GS1 on the Grid Connection route was inaccessible for the same reasons. These restrictions resulted in unavoidable data gaps rather than methodological shortcomings.

Seasonal conditions also influenced accessibility, with low flows and heavy vegetation growth during late summer and autumn further restricting sampling at some locations. In addition, macroinvertebrate sampling was not possible at S8 during the autumn survey due to habitat constraints. The surveys that were completed adhered fully to best practice standards, ensuring that the data collected provide a robust and representative basis for assessing water quality and ecological status across the study area.

9.3.2.4 White-clawed Crayfish Survey

White-Clawed Crayfish (WCC) have been recorded at Cavetown Lough, located between the Wind Farm Site survey sites and the Grid Connection route survey sites, and within the Upper Shannon catchments 26B and 26C, which divide the study area. These records include data from the National Crayfish Plague Surveillance Programme

(2020–2021; NPWS, 2022) and updates from the Fish Health Unit at the Marine Institute. Incidental records of WCC were obtained during electrofishing surveys at E Site 1 (BREEDOGE_010), E Site 4 (CARRICKNABRAHER_020), and E Site 7 (BREEDOGE_010), where five, three, and two individuals were recorded respectively. No WCC were recovered from any sites where traps were set. The total number of WCC recorded at each site is summarised, with associated biometrics presented and photographs of captured individuals provided in **Appendix 9.1**.

In addition to targeted surveys undertaken in July, one live male WCC was encountered during kick sampling at GS6 (KILLKUKIN_020) as part of the Grid Connection route (GCR) surveys in August 2025. This individual measured 42 mm carapace length and exhibited no signs of disease. At GS3 (KINARD_010), remains of a WCC exoskeleton, likely from a recent moult, were found in the kick sample, indicating possible presence of WCC in that watercourse. The live individual captured during kick sampling was returned safely to its place of capture.

WCC were confirmed on the River Carricknabaher, River Breedoge, and River Mantua. The presence of WCC on the River Breedoge, approximately 2.5 km downstream from the River Owenaforeesha, aligns with previous findings from the National Crayfish Plague Surveillance Programme. Based on the desk study, there are no previous records of WCC surveys on the River Carricknabaher or River Mantua, making these findings the first confirmed records for these rivers. Crayfish plague caused by the water mould *Aphanomyces astaci* is present within both catchments draining the Wind Farm Site. As WCC are now confirmed on separate rivers in the area, anthropogenic activity may act as a vector for the spread of crayfish plague between watercourses. WCC are protected in Ireland under the Wildlife Acts and at a European level under Annex II and Annex V of the Habitats Directive. Consequently, appropriate mitigation measures are required to avoid disturbance to populations and prevent the spread of crayfish plague.

9.3.2.5 Fisheries Assessment

Seven sites (**Figure 9.3**) were selected for fisheries survey across the Project Study Area, the river catchment names EPA codes and segment codes are presented below:

- E Site 1: BREEDOGE_010 (EPA Code: N/A, Seg Code: 26_2957)
- E Site 2: (EPA Code: N/A, Seg Code: 26_2957)
- E Site 3: MANTUA_010 (EPA Code: 26M01, Seg Code: 26_1019)
- E Site 4: CARRICKNABRAHER_020 (EPA Code: 26C02, Seg Code: 26_13427)
- E Site 5: (EPA Code: 26M01, Seg Code: 26_1388)

- E Site 6: (EPA Code: 25M01, Seg Code: 26_1338)
- E Site 7: BREEDOGE_010 (EPA Code: 26O04, Seg Code: 26_1227)

Electrofishing was conducted in August 2025 to assess fish species presence, population structure, and habitat suitability. A range of habitat types were surveyed, including riffle, run, glide, and pool, with riparian shading between 30–70%, primarily from native tree species. Substrates consisted of cobble, boulder, and exposed hard rock, with undercut banks providing additional cover for fish and white-clawed crayfish (WCC). The full fisheries assessment is supplied in **Appendix 9.1.**

A total of five fish species were recorded: brown trout (*Salmo trutta*), minnow (*Phoxinus phoxinus*), stone loach (*Barbatula barbatula*), three-spined stickleback *(Gasterosteus aculeatus*), and roach (*Rutilus rutilus*). Brown trout were only present at two sites: E Site 4 on the Carricknabraher River and E Site 7 on the Breedoge River. Although brown trout dominated the catch at E Site 4, overall numbers were low (n = 14), with a density of 8.0 per 100 m² (0.08/m²), the highest recorded across all sites.

The population structure at E Site 4 consisted mainly of 1+ fish and older, ranging in length from 65–215 mm. This reflects the deeper, slower-flowing pool habitat preferred by adult trout. In contrast, E Site 7 supported predominantly 0+ to 1+ individuals, consistent with its shallower, faster-flowing conditions and cobble/boulder substrate, which provide suitable shelter for younger trout parr. These habitat differences align with known life-stage preferences of brown trout: eggs require shallow, fast-flowing water; fry favour slack water to avoid high velocities; and adults prefer deeper pools.

Species composition and habitat conditions varied notably across the remaining sites. E Site 7 showed a high abundance of pollution-tolerant species such as minnow, stickleback, and stone loach, which are indicative of deteriorating water quality. Roach were also present but limited in distribution. These species are generally more resilient to eutrophication and siltation, and their presence suggests moderate to poor ecological conditions in parts of the study area.

No salmonids were recorded outside of E Sites 4 and 7, indicating limited suitable habitat and water quality constraints elsewhere. The absence of salmonids from other surveyed sites reflects high siltation and eutrophication pressures, as well as poor hydromorphology due to historical channel modifications and surrounding land use, which includes coniferous forestry, turbary, and improved agricultural land.

Electrofishing was not conducted at certain sites due to prohibitive depths. These unsampled areas, particularly those with deep glide and pool habitats, were considered of high value for salmonid holding and European eel habitat due to the presence of macrophyte refugia and overhanging vegetation. However, spawning suitability was limited by siltation.

European eel (*Anguilla anguilla*) was not recorded during the electrofishing survey, although suitable habitat was identified at deeper pool sites. These areas offered high macrophyte cover and broader prey availability, which are favourable conditions for eel. The European eel is listed as 'critically endangered' at both national and global levels, underscoring the conservation importance of these habitats.

No lamprey ammocoetes were recorded during the survey. Sediment conditions were generally compacted, shallow, and dominated by clay particles, which are suboptimal for lamprey larval burrowing. Poor hydromorphology and siltation further reduced spawning suitability for Lampetra species. Nonetheless, lamprey are known to occur downstream in the Carricknabraher catchment.

Sites that did not support fish at the time of survey were considered to be of no fisheries value due to the absence of fish and poor habitat conditions. Additional electrofishing effort was required at some sites due to low initial catch numbers, with up to four runs conducted to achieve adequate depletion. These results highlight the variable ecological quality across the study area and the need for targeted mitigation to protect sensitive fish populations and habitats.

Table 9.9: Electrofishing Species Abundance (Counts Only)

Site	Species	Common	Count
E1	*Gasterosteus aculeatus*	Three Spined Stickleback	6
E3	*Gasterosteus aculeatus*	Three Spined Stickleback	6
E7	*Austropotamobius pallipes*	White Clawed Crayfish	2
E7	*Barbatula barbatula*	Stone Loach	20
E7	*Barbatula barbatula*	Stone loach	1
E7	Gasterosteus aculeatus	Three Spined Stickleback	6
E7	Gasterosteus aculeatus	Three Spined Sticklebacks	1
E7	Phoxinus Phoxinus	Minnow	73
E7	Rutilus rutilus	Roach	12
E7	Salmo trutta	Brown Trout	8
E7	Salmo trutta	Brown trout	1

Table 9.10: Electrofishing Results - Full Dataset (All Species and Lengths)

Site	Run	Species	Common	Length (mm)
E1	1	*Gasterosteus aculeatus*	Three Spined Stickleback	15-40
E1	1	*Gasterosteus aculeatus*	Three Spined Stickleback	15-40
E1	1	*Gasterosteus aculeatus*	Three Spined Stickleback	15-40
E1	1	*Gasterosteus aculeatus*	Three Spined Stickleback	15-40
E1	1	*Gasterosteus aculeatus*	Three Spined Stickleback	15-40
E1	1	*Gasterosteus aculeatus*	Three Spined Stickleback	15-40
E3	1	*Gasterosteus aculeatus*	Three Spined Stickleback	15-40
E3	1	*Gasterosteus aculeatus*	Three Spined Stickleback	15-40
E3	1	*Gasterosteus aculeatus*	Three Spined Stickleback	15-40

Site	Run	Species	Common	Length (mm)
E3	1	*Gasterosteus aculeatus*	Three Spined Stickleback	15-40
E3	1	*Gasterosteus aculeatus*	Three Spined Stickleback	15-40
E3	1	*Gasterosteus aculeatus*	Three Spined Stickleback	15-40
E4	1	*Salmo trutta*	Brown Trout	190
E4	1	*Salmo trutta*	Brown Trout	165
E4	1	*Salmo trutta*	Brown Trout	145
E4	1	*Phoxinus phoxinus*	Minnow	65
E4	1	*Salmo trutta*	Brown Trout	165
E4	1	*Phoxinus phoxinus*	Minnow	68
E4	1	*Phoxinus phoxinus*	Minnow	60
E4	1	*Barbatula barbatula*	Stone Loach	90
E4	2	*Salmo trutta*	Brown Trout	215
E4	2	*Salmo trutta*	Brown Trout	77
E4	2	*Phoxinus phoxinus*	Minnow	60
E4	2	*Salmo trutta*	Brown Trout	73
E4	2	*Salmo trutta*	Brown Trout	65
E4	3	*Salmo trutta*	Brown Trout	85
E4	3	*Salmo trutta*	Brown Trout	75
E4	3	*Salmo trutta*	Brown Trout	155
E4	3	*Phoxinus phoxinus*	Minnow	65
E4	4	*Salmo trutta*	Brown Trout	170
E4	4	*Salmo trutta*	Brown Trout	80
E4	4	*Salmo trutta*	Brown Trout	80
E4	4	*Phoxinus phoxinus*	Minnow	65

Site	Run	Species	Common	Length (mm)
E4	0	*Austropotamobius pallipes*	White Clawed Crayfish	35
E4	0	*Austropotamobius pallipes*	White Clawed Crayfish	Unknown
E4	0	*Austropotamobius pallipes*	White Clawed Crayfish	Unknown
E7	1	*Phoxinus phoxinus*	Minnow	45
E7	1	*Phoxinus phoxinus*	Minnow	58
E7	1	*Salmo trutta*	Brown Trout	80
E7	1	*Salmo trutta*	Brown Trout	78
E7	1	*Phoxinus phoxinus*	Minnow	53
E7	1	*Phoxinus phoxinus*	Minnow	70
E7	1	*Phoxinus phoxinus*	Minnow	48
E7	1	*Phoxinus phoxinus*	Minnow	55
E7	1	*Phoxinus phoxinus*	Minnow	53
E7	1	*Phoxinus phoxinus*	Minnow	67
E7	1	*Barbatula barbatula*	Stone Loach	76
E7	1	*Phoxinus phoxinus*	Minnow	50
E7	1	*Barbatula barbatula*	Stone Loach	65
E7	1	*Phoxinus phoxinus*	Minnow	40
E7	1	*Rutilus rutilus*	Roach	35
E7	1	*Phoxinus phoxinus*	Minnow	45
E7	1	*Rutilus rutilus*	Roach	29
E7	1	*Gasterosteus aculeatus*	Three Spined Stickleback	30
E7	1	*Phoxinus phoxinus*	Minnow	43
E7	1	*Phoxinus phoxinus*	Minnow	20
E7	1	*Phoxinus phoxinus*	Minnow	47

Site	Run	Species	Common	Length (mm)
E7	1	*Gasterosteus aculeatus*	Three Spined Sticklebacks	20
E7	1	*Phoxinus phoxinus*	Minnow	20
E7	1	*Salmo trutta*	Brown Trout	62
E7	1	*Barbatula barbatula*	Stone Loach	64
E7	1	*Phoxinus phoxinus*	Minnow	57
E7	1	*Barbatula barbatula*	Stone Loach	74
E7	1	*Phoxinus phoxinus*	Minnow	53
E7	1	*Phoxinus phoxinus*	Minnow	20
E7	1	*Phoxinus phoxinus*	Minnow	58
E7	1	*Phoxinus phoxinus*	Minnow	30
E7	1	*Gasterosteus aculeatus*	Three Spined Stickleback	20
E7	1	*Phoxinus phoxinus*	Minnow	48
E7	1	*Salmo trutta*	Brown trout	76
E7	1	*Barbatula barbatula*	Stone Loach	75
E7	1	*Barbatula barbatula*	Stone Loach	93
E7	1	*Barbatula barbatula*	Stone Loach	73
E7	1	*Barbatula barbatula*	Stone Loach	72
E7	1	*Phoxinus phoxinus*	Minnow	57
E7	1	*Phoxinus phoxinus*	Minnow	50
E7	1	*Barbatula barbatula*	Stone Loach	76
E7	1	*Barbatula barbatula*	Stone Loach	78
E7	1	*Barbatula barbatula*	Stone Loach	75
E7	2	*Salmo trutta*	Brown Trout	158
E7	2	*Barbatula barbatula*	Stone Loach	75

Site	Run	Species	Common	Length (mm)
E7	2	*Phoxinus phoxinus*	Minnow	68
E7	2	*Salmo trutta*	Brown Trout	62
E7	2	*Phoxinus phoxinus*	Minnow	50
E7	2	*Phoxinus phoxinus*	Minnow	53
E7	2	*Rutilus rutilus*	Roach	38
E7	2	*Phoxinus phoxinus*	Minnow	54
E7	2	*Phoxinus phoxinus*	Minnow	45
E7	2	*Phoxinus phoxinus*	Minnow	40
E7	2	*Phoxinus phoxinus*	Minnow	40
E7	2	*Phoxinus phoxinus*	Minnow	38
E7	2	*Phoxinus phoxinus*	Minnow	41
E7	2	*Phoxinus phoxinus*	Minnow	41
E7	2	*Phoxinus phoxinus*	Minnow	45
E7	2	*Phoxinus phoxinus*	Minnow	58
E7	2	*Phoxinus phoxinus*	Minnow	65
E7	2	*Phoxinus phoxinus*	Minnow	22
E7	2	*Rutilus rutilus*	Roach	38
E7	2	*Rutilus rutilus*	Roach	38
E7	2	*Phoxinus phoxinus*	Minnow	48
E7	2	*Rutilus rutilus*	Roach	45
E7	2	*Rutilus rutilus*	Roach	45
E7	2	*Gasterosteus aculeatus*	Three Spined Stickleback	35
E7	2	*Phoxinus phoxinus*	Minnow	44
E7	2	*Phoxinus phoxinus*	Minnow	38

Site	Run	Species	Common	Length (mm)
E7	2	*Rutilus rutilus*	Roach	32
E7	2	*Salmo trutta*	Brown Trout	158
E7	2	*Barbatula barbatula*	Stone Loach	96
E7	2	*Barbatula barbatula*	Stone Loach	62
E7	2	*Rutilus rutilus*	Roach	35
E7	2	*Phoxinus phoxinus*	Minnow	48
E7	2	*Phoxinus phoxinus*	Minnow	30
E7	2	*Phoxinus phoxinus*	Minnow	35
E7	2	*Gasterosteus aculeatus*	Three Spined Stickleback	25
E7	2	*Gasterosteus aculeatus*	Three Spined Stickleback	15
E7	2	*Phoxinus phoxinus*	Minnow	32
E7	2	*Phoxinus phoxinus*	Minnow	58
E7	2	*Phoxinus phoxinus*	Minnow	55
E7	2	*Phoxinus phoxinus*	Minnow	58
E7	2	*Phoxinus phoxinus*	Minnow	58
E7	2	*Phoxinus phoxinus*	Minnow	58
E7	2	*Gasterosteus aculeatus*	Three Spined Stickleback	32
E7	2	*Phoxinus phoxinus*	Minnow	43
E7	2	*Salmo trutta*	Brown Trout	82
E7	2	*Barbatula barbatula*	Stone Loach	80
E7	2	*Barbatula barbatula*	Stone Loach	76
E7	2	*Phoxinus phoxinus*	Minnow	64
E7	2	*Phoxinus phoxinus*	Minnow	50
E7	2	*Phoxinus phoxinus*	Minnow	38

Site	Run	Species	Common	Length (mm)
E7	2	*Phoxinus phoxinus*	Minnow	54
E7	2	*Phoxinus phoxinus*	Minnow	34
E7	2	*Phoxinus phoxinus*	Minnow	45
E7	2	*Barbatula barbatula*	Stone loach	73
E7	2	*Barbatula barbatula*	Stone Loach	64
E7	2	*Phoxinus phoxinus*	Minnow	45
E7	3	*Phoxinus phoxinus*	Minnow	70
E7	3	*Phoxinus phoxinus*	Minnow	52
E7	3	*Phoxinus phoxinus*	Minnow	60
E7	3	*Phoxinus phoxinus*	Minnow	49
E7	3	*Phoxinus phoxinus*	Minnow	45
E7	3	*Phoxinus phoxinus*	Minnow	60
E7	3	*Phoxinus phoxinus*	Minnow	44
E7	3	*Phoxinus phoxinus*	Minnow	55
E7	3	*Phoxinus phoxinus*	Minnow	55
E7	3	*Phoxinus phoxinus*	Minnow	53
E7	3	*Rutilus rutilus*	Roach	35
E7	3	*Barbatula barbatula*	Stone Loach	70
E7	3	*Rutilus rutilus*	Roach	35
E7	3	*Barbatula barbatula*	Stone Loach	70
E7	3	*Rutilus rutilus*	Roach	35
E7	3	*Barbatula barbatula*	Stone Loach	70
E7	3	*Phoxinus phoxinus*	Minnow	56
E7	3	*Phoxinus phoxinus*	Minnow	50

Site	Run	Species	Common	Length (mm)
E7	3	*Phoxinus phoxinus*	Minnow	50
E7	3	*Phoxinus phoxinus*	Minnow	45
E7	3	*Phoxinus phoxinus*	Minnow	46
E7	3	*Phoxinus phoxinus*	Minnow	45
E7	3	*Salmo trutta*	Brown Trout	80
E7	2	*Austropotamobius pallipes*	White Clawed Crayfish	19
E7	3	*Austropotamobius pallipes*	White Clawed Crayfish	20

9.4 ASSESSMENT OF LIKELY SIGNIFICANT ENVIRONMENTAL EFFECTS

A more in-depth discussion of water quality is provided in **Chapter 11: Hydrology and Hydrogeology**. This section is focused on the effects on aquatic species and ecology.

9.4.1 The 'Do-Nothing' Scenario

If the Project does not proceed, lands at and in the vicinity of the Project will continue to be used for agricultural, peat harvesting and commercial forestry purposes. This 'do-nothing' scenario would result in no significant change to aquatic ecology and habitats within or downstream of the Project, subject to the continuation of current activities and practices. It should be noted however, that current agricultural and forestry activities (incl. drainage works) are having some effects on water quality within the catchment as evidenced by the results of the surveys undertaken. In the 'Do Nothing' scenario, there may be a slight change in average annual rainfall (AAR) at the Wind Farm Site as a result of climate change. This is discussed in **Chapter 11: Hydrology and Hydrology** and any change in AAR will result in changes in local recharge and runoff volumes.

If the Project were not to proceed, the opportunity to generate renewable energy and electrical supply to the national grid would be lost, as would the opportunity to further contribute to meeting Government and EU targets for the production and consumption of electricity from renewable sources and the reduction of greenhouse gas emissions and compliance with the Climate Change and Low Carbon Emissions Act 2015-21 would be impeded.

9.4.2 Construction Phase Potential Effects

A full description of the Project is given in **Chapter 2: Project Description**. An in-depth assessment of water quality during the construction phased is discussed in **Chapter 11: Hydrology and Hydrogeology**. A summary of potential sources of significant effects on aquatic ecology during the construction phase are:

- Clearance of vegetation (including forestry and associated ground cover) and other earthworks during construction causing the release of suspended solids/nutrients, dissolved substances, concrete and hydrocarbons into the drainage network and site run-off, resulting in adverse effects on water quality within the watercourses onsite and downstream.
- Pollution from debris deposition and sediment mobilisation caused by vehicles during the crossing of watercourses within the Wind Farm Site on the Wind Farm Site Access Roads and at along the Grid Connection route.
- Potential for indirect effects on European sites (Natura 2000 sites) that are

hydrologically connected downstream of the Wind Farm Site and Grid Connection route, arising from accidental release of suspended solids, nutrients, hydrocarbons, concrete washout or other pollutants during construction activities. The potential for effects on site integrity is assessed separately within the Natura Impact Statement (NIS).

- Potential for accidental spillage of hydrocarbons and other pollutants including concrete laitance.
- Risk of chemical carryover in post treatment water from use of Siltbuster which could result in negative effects on downstream water quality.
- The loss of natural watercourses due to 5 no. new major watercourse crossings on the Wind Farm Site and the placement of bridges and culverts.
- Potential indirect impacts from runoff during the proposed HDD works at no. 3 watercourse crossings along the GCR, potentially impacting on water quality.
- Potential for the storage and subsequent mobilisation of excavated soils (including clay-rich subsoil) within spoil storage areas which, if not appropriately managed, could result in sediment-laden runoff entering nearby watercourses. Excavated materials will be managed and stored within designated on-site spoil storage areas in accordance with the measures set out in **Chapter 10: Soils and Geology** and the project **CEMP**/**BEMP** which include measures for stockpile management, drainage control and sediment mitigation.

Unlikely risk of pollution of watercourses via groundwater or surface water pathways arising from accidental leakage or overflow from temporary wastewater holding tanks at construction compounds, in the absence of appropriate containment and management measures.

The principal potential construction phase effects of the Project relate to the release of sediments into the drainage network arising from construction-related works, including the Wind Farm Site Access Road network, turbine foundations and associated hardstands, drainage infrastructure, onsite substation building and permanent spoil storage areas. These effects would be short-term in duration and localised within the Zone of Influence (ZoI).

In the absence of mitigation, the potential effect on downstream surface water quality, and consequently aquatic ecology, would be negative, indirect, short-term and likely, and would be significant at the local scale.

Construction of the Project will require excavation of peat, subsoil and rock associated with turbine foundations, access tracks and associated infrastructure. Excavated materials will be reused on site where possible, with surplus material stored within designated spoil storage areas within the wind farm site. Details of excavation volumes and spoil management are provided in **Chapter 10: Soils & Geology.**

The Wind Farm Site contains c. 233 ha of commercial forestry. Wind Turbines T2, T4, T5, T6, T7, T10, and T11, are located within or adjacent to commercial forestry. Subsequently, tree felling will be required as part of the Project. To facilitate the construction of the Project it is estimated that c. 43.7 ha of commercial coniferous forestry will need to be clear-felled. The felling area proposed is the minimum necessary to construct the Project and to comply with any environmental mitigation. To ensure a tree clearance method that reduces the potential for sediment and nutrient runoff, the construction methodology will follow the specifications set out in the Forest Service Forestry and Water Quality Guidelines (2000) and Forest Harvesting and Environmental Guidelines (2000). The use of existing commercial forestry infrastructure will be maximised to lessen disturbance from machines used for felling. The pre-mitigation potential effect on the downstream surface water quality, and thus the aquatic ecology, is negative, indirect, short-term, and likely and is considered to be significant.

According to EPA data accessed on 11 November 2025, the watercourses in proximity to the project have good to poor status under the WFD. The Breedoge_010 waterbody recorded a Q-value of 4 (Good) in 2023 upstream of its confluence but was previously 3 (Poor) in 2005 at another station nearby. Similarly, the Carricknabraher_020 waterbody showed Moderate status (Q3–4) in 2023 upstream of the Owennaforeesha River, while a station approximately 900 m upstream recorded Poor status (Q3) in 2020, the overall status for this waterbody is listed as 'Poor'. This station was located close to S12 which was too hazardous for kick sampling under the current surveys due to depth. The Carricknabraher_010 waterbody achieved Good status (Q4) at Cloonshanville Bridge in 2023. All groundwater bodies within the Wind Farm site, including Carrick on Shannon and Castlerea Bellanagare, are classified as Good status and Not at Risk under the WFD. In the absence of mitigation, construction activities could temporarily degrade surface water quality through sedimentation and nutrient enrichment, potentially reducing oxygen levels and impacting sensitive species such as brown trout and white-clawed crayfish. However, these effects are expected to be short-term and reversible in nature. In the absence of mitigation, short-term negative impacts on pollution-sensitive macroinvertebrate taxa and fish populations could occur at a local scale. Given the sensitivity of these receptors and the potential for temporary deterioration in water quality, the pre-mitigation impact would be significant at the local scale in accordance with the EPA (2022) significance criteria (**Table 9.3**).

9.4.3 Operational Phase Potential Effects

The applicant is applying for a 35-year operational lifespan for the Project and a permanent permission for the Substation.

An in-depth assessment of water quality during the construction phased is discussed in **Chapter 11: Hydrology and Hydrogeology, Section 11.5.3.** A summary of potential sources of significant effects on aquatic ecology during the Operational Phase can be described as follows:

- Alteration of surface water runoff characteristics.
- Accidental hydrocarbon release during maintenance activities.
- Malfunction or inadequate maintenance of the permanent drainage infrastructure.

It should be noted that the main potential effects on the receiving aquatic environment and sensitive aquatic receptors downstream will occur during the construction phase as detailed above.

This section below is a summary of the Flood Risk Assessment (FRA) undertaken by McCloy Consulting for the Project. The full FRA report is attached in **Appendix 11.1**.

Historic mapping (6" and 25" OSI series) does not identify any lands "liable to flood" within or adjacent to the Wind Farm site.

The OPW Past Flood Events Map (www.floodinfo.ie) records one historic flood event within the Wind Farm site and two recurring flood events in the wider study area. The historic event occurred at Loughbally Bridge on 31 October 1970 (Flood ID 555), where the Breegogue River overtopped its banks, rendering the Frenchpark–Mantua Road impassable for approximately ten days. Recurring flood events are recorded at Kinclare and Kilnamryall (Flood IDs 822 and 1174), associated with turlough activity noted in GSI datasets.

The GSI Winter 2015/2016 Surface Water Flood Map shows indicative surface water flooding coinciding with the Breedoge River floodplain within the Wind Farm site. No critical infrastructure is proposed in these areas.

CFRAM mapping is not available for the Wind Farm site; however, OPW National Indicative Fluvial Mapping (NIFM) identifies areas of Flood Zone A (1% AEP) and Flood Zone B (0.1% AEP) along the Owennaforeesha, Breedoge, and Carricknabraher Rivers. These indicative extents have been superseded by detailed site-specific hydraulic modelling undertaken by McCloy Consulting. The model confirms that the majority of the Wind Farm site lies within Flood Zone C (low probability), with limited low-lying areas adjacent to watercourses affected by Flood Zones A and B.

The Project comprises 11 no. wind turbines, associated hardstands, access tracks, a permanent met mast, onsite substation, underground cabling, and ancillary works. All highly vulnerable infrastructure (turbines and substation) is located in Flood Zone C. One temporary construction compound and a short section of secondary access track within the Western Development Area are located in Flood Zone A/B. A Development Management Justification Test has been completed for these elements.

Climate change (Mid-Range Future Scenario, +20% flows) was assessed. Modelled extents under climate change show marginal increases in floodplain area; however, all critical infrastructure remains outside MRFS flood extents. Therefore, climate change flood risk is considered low.

Design measures to minimise flood risk include:

- Siting all turbines and the substation in Flood Zone C.
- Minimising watercourse crossings and designing culverts in accordance with OPW Section 50 requirements.
- Maintaining existing drainage pathways and implementing a site-specific SuDS-based drainage strategy to attenuate runoff to pre-development rates.
- Phasing temporary works to avoid periods of predicted flooding.
- Preparing a Flood Management Plan (FMP) for construction and operational phases, including emergency procedures and safe muster points.

The Wind Farm site lies within the benefitting lands of the Boyle Major Arterial Drainage Scheme, indicating historic channel modification and ongoing OPW maintenance.

All other key infrastructure, including the permanent substation, site compound, spoil storage areas, and the majority of access tracks, are located in Flood Zone C and therefore at low risk of flooding.

The FRA concludes that the Project can be implemented without increasing flood risk elsewhere. Loss of floodplain storage is negligible and will not significantly affect upstream or downstream flood risk, including at sensitive areas such as Frenchpark or Lough Gara.

9.4.4 Decommissioning Phase Potential Effects

The Decommissioning phase poses similar risks of potential significant effects on the aquatic environment as listed above the construction phase, with the risk of pollution in the waterways causing a reduction in biodiversity of flora and fauna, especially the more sensitive species. Though in view of the presence of the road network and associated infrastructure, the resultant scale of effects is considered to be much lower. After 35 years the Wind Farm Site will be revegetated and natural drainage management will be resumed, it is not expected that the Decommissioning phase will disturb this. The Wind Farm Site Access Roads and associated drainage systems will serve ongoing commercial forestry and agriculture activity in the area. In the absence of mitigation, the potential effect on the aquatic environment is considered much the same as the construction phase, due to the same potential sources to cause a significant short-term adverse effect at the local scale.

The Grid Connection and the Onsite Substation will become an asset of the national grid under the management of ESB and EirGrid and will likely remain in place upon Decommissioning of the Project as required by ESB/EirGrid. Given that no direct discharges to watercourses are proposed and that wastewater from the Onsite Substation will continue to be treated as underlined in **Section 9.5.3**, no significant long-term effects on aquatic habitats or species are anticipated as a result of its permanent retention. However, regular maintenance of the drainage infrastructure will be necessary to ensure ongoing protection of downstream water quality and aquatic ecological receptors.

9.4.5 Effects on Natura 2000 Sites

Effects of the construction, operational and Decommissioning phases on Natura 2000 sites within the ZOI are outlined in the accompanying NIS document.

The European Sites assessed in the accompanying Natura Impact Statement comprise Cloonashanville Bog SAC, Bellanagare Bog SPA and Lough Gara SPA. These sites are hydrologically and/or functionally connected to the Project and have been assessed in detail within the NIS.

There is no potential for direct land-take or physical disturbance to these European Sites, as no part of the Project overlaps with any designated site boundary. Potential impact pathways are indirect and relate primarily to hydrological connectivity and water quality.

The potential indirect effects on European Sites as referenced in the accompanying NIS are listed below.

Construction phase

- Release of suspended solids (and associated nutrients) to drains and surface water discharge routes during earthworks for Project infrastructure including site entrances, access tracks, upgrades to existing access tracks, turbine base/hardstanding construction, substation compound, construction compound constructions, met mast construction and wind farm internal cabling and grid connection excavations.
- Release of cementitious materials from construction works throughout the Wind Farm site, and particularly at turbine bases and the substation compound, into the drainage system and hence to local watercourses. Concrete and other cement-based products are highly alkaline and corrosive and can have significant negative effects on water quality and associated aquatic life.
- Release of hydrocarbons from accidental spillage during refuelling of construction plant with petroleum hydrocarbons and/or from the accumulation of small spills of fuels and lubricants during routine plant use. Hydrocarbons can cause significant pollution risk to groundwater, surface water and associated aquatic ecosystems.

Operational Phase

Although the operational phase presents a lower environmental risk than the construction phase, the potential for residual effects (e.g., via runoff/hydrological pathways and very low-probability pollution events) has been considered in the accompanying NIS. Here is a summary below:

- Residual suspended solids runoff:

  - Disturbed soil surfaces remaining from the construction phase may produce silt-laden runoff during rainfall, particularly before full vegetation re-establishment.
  - Runoff could enter site drains and reach local watercourses, temporarily increasing sediment load.
- Minor maintenance-related impacts:
  - Occasional maintenance of site entrances, internal roads, and turbine hardstands may involve limited ground disturbance.
  - These works, although minor and infrequent, could result in localized suspended sediment releases.
- Low risk of hydrocarbon release:
  - Site vehicles used for maintenance could present a small risk of leakage (e.g., engine oil, lubricants).
  - However, no refuelling will occur on-site, significantly reducing hydrocarbon-related pollution risks.
- Chemical and hydrocarbon storage:
  - A limited amount of chemicals or fuels may be stored on-site during operation (e.g., for turbine maintenance).
  - Without proper storage, accidental leaks could occur and migrate to local watercourses via on-site drainage.
- No recognised pollution from wind farm operation:
  - The wind turbines themselves do not produce wastewater or pollutants and therefore are not considered a direct pollution source.

Decommissioning Phase

- Disturbance to soils and sediment mobilisation:
  - Ground disturbance during turbine removal and minor civil works (e.g. reinstatement, cabling cut-off) could generate suspended solids that enter local drainage routes and watercourses.
- Groundwater and surface water contamination risk:

  Excavation and reinstatement works, if poorly managed, could lead to:
  - Localised contamination of groundwater
  - Release of hydrocarbons from construction plant
  - Increased sediment loads entering watercourses, especially during wet weather conditions

- Potential for soil compaction:
  - Heavy machinery operation could compact soils, leading to reduced infiltration and increased runoff, potentially transporting sediment and pollutants toward aquatic receptors.
- Chemical and hydrocarbon spill risk:
  - Although limited, the use of on-site plant and vehicles still presents a risk of accidental fuel or oil leakage if mitigation is not properly implemented.
- Revegetation and infrastructure left in place:
  - Turbine foundations will remain buried and revegetated, reducing excavation needs and associated runoff risks.
  - Site roads retained for agricultural use and underground cabling left in situ will avoid further soil disturbance, thereby limiting additional impacts.

Conclusion of the Natura Impact Statement

For the reasons set out in detail in the NIS, in the light of the best scientific knowledge in the field, all aspects of the Project, by itself or in combination with other plans or projects, which may affect the relevant European Sites have been considered.

The NIS contains information that the competent authority, may consider in making its own complete, precise and definitive findings and conclusions as to the effects of the Project. It is respectfully submitted that the information contained in this NIS is such that the competent authority will be capable of determining that all reasonable scientific doubt has been removed as to any adverse effects of the Project on the integrity of the relevant European sites.

In conclusion, on the basis of the assessment set out in this NIS, it is respectfully submitted that the competent authority is able to determine that no reasonable scientific doubt remains that the Project will not adversely affect the integrity of any European site, in view of the conservation objectives of that site.

9.5 MITIGATION MEASURES

The following sections describe the appropriate mitigation measures for the potential effects, outlined in the previous section, that will be adopted at the construction, operational and Decommissioning stages of the Project.

9.5.1 Embedded Mitigation

The Project incorporates embedded mitigation aimed at minimising the potential significant effects during the design phase. This includes the design principle of maintaining setbacks of 50m for turbines and associated infrastructure from watercourses (IWEA, 2012) and 10 m from artificial drainage, clear-span bridge crossings, and the use of SuDS and settlement features to manage runoff. These measures are integral to the protection of aquatic receptors and are considered in the assessment.

9.5.2 Construction Phase Mitigation

9.5.2.1 Mitigation by Avoidance

The greatest risk of significant adverse effects on the aquatic environment will occur during the construction phase of the Project. The key to minimising this risk is the siting of all turbine locations and other key infrastructure at a minimum set-back of 50 m from watercourses and 10 m from drains, following best practice guideline of the Irish Wind Energy Authority (IWEA, 2012). The only exception to this rule will be where there are works to Site Access Roads that are located within the 50m buffer zone are required, where unavoidable stream crossings are required. In designing the layout of the Wind Farm Site Access Roads careful consideration has been given to minimise the number of watercourse crossings, and in choosing locations where crossing design can readily achieve the objective of maintaining the potential for unimpeded fish pass and ecological connectivity.

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.

The Project layout was specifically designed to reduce the number of watercourse crossings on the Wind Farm Site to the absolute minimum, with five internal access road watercourse crossings retained within the site [BO38.1]. Where crossings are required, clear-span bridge designs will be implemented where feasible to maintain hydrological and ecological continuity and facilitate unimpeded fish passage.

No construction activity will occur within the active watercourse. All water crossings will be clear-span bridges constructed from the bank using machinery operating outside the channel, thereby avoiding any disturbance to aquatic habitats or sediment release.

9.5.2.2 *Mitigation by Design*

A comprehensive suite of drainage measures has been developed to protect all receiving waters from potential significant effects during the construction of the Project in the catchment, and along the GCR and TDR. They are outlined in full in **Chapter 11: Hydrology and Hydrogeology** and are also referenced in the accompanying NIS document. These measures are aimed at preventing sediments or other pollutants from entering watercourses through the containment and treatment of all surface water run-off from areas of works. The developer will appoint an Ecological Clerk of Works (ECoW) to ensure compliance during the construction stage with all mitigation measures, planning conditions and legislative requirements related to ecology. They will consult and assist with the Client in evaluating compliance with applicable legislation by means of a monthly Environmental Audit.

The mitigation measures have been incorporated into a Construction and Environmental Management Plan (CEMP) in **Appendix 2.1** of the EIAR, for the Project which includes construction method statements for key works. **Appendix 11.2** and **Surface Water Management Plan (MP3)** of the CEMP include a Surface Water Management Plan (SWMP). The CEMP and SWMP will require mandatory adherence by all parties involved in the construction of the Project (including any sub-contractors) in order to protect aquatic conservation interests within the Study Area. The development of the mitigation measures and all method statements for watercourse crossings follows all relevant guidance and current best practice as detailed in:

- CIEEM (2018, Updated 2024) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal. Version 1.3. Chartered Institute of Ecology and Environmental Management. Winchester.
- Construction Industry Research and Information Association (CIRIA) (2006) Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors. CIRIA C532. London.
- CIRIA (2006) Guidance on 'Control of Water Pollution from Linear Construction Projects' (CIRIA Report No. C648, 2006).

- CIRIA (2025) "*Getting SuDS Right from the Start*". Guidance for Early Design Integration. CIRIA Report C823F. London.
- CIRIA (2023) Nutrient Management in SuDS – Nitrogen and Phosphorus Reduction Techniques. CIRIA Reports C815F & C808F. London.
- COFORD (2004) Forest Road Manual – Guidelines for the Design, Construction and Management of Forest Roads.
- CIRIA (2015) SuDS Manual, (CIRIA Report C753, 2015)
- Coillte (2009): Forest Operations & Water Protection Guidelines.
- European Commission (2024) Nature Restoration Law
- Forestry Commission (2004) Forests and Water Guidelines, Fourth Edition. Publ. Forestry Commission, Edinburgh.
- Forest Services (2006) Draft Plan for Forestry and Freshwater Pearl Mussel Requirements – Site Assessment and Mitigation Measures.
- Forest Service (2000) Forestry and Water Quality Guidelines. Forest Service, DAF, Johnstown Castle Estate, Co. Wexford.
- IFI (2016) Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters.
- GPP1 (2020) Understanding your Environmental Responsibilities – Good environmental Practices, NetRegs.
- GPP 5 (2018) Works and Maintenance in or Near Water, NetRegs.
- GPP21 (2021) Pollution Incident Response Planning, NetRegs.
- GPP 22 (2018) Dealing with Spills, NetRegs.
- EU Construction and Demolition Waste Management Protocol - BIBM.
- EPA Best practice guidelines for the preparation of resource & waste management plans for construction & demolition projects.
- IEMA's latest Impact Assessment Guidance, 'A New Perspective on Land and Soil in Environmental Impact Assessment' (Feb 2022).

Prevention of the release of suspended solids/nutrients, dissolved substances, concrete and hydrocarbons into the drainage network and site run-off as a result of clearance of vegetation and other associated earthworks

Nature Based Solutions (NBS) will be implemented on site where possible. These measures aim to mimic natural hydrological processes and restore ecological functions. The use of Sustainable Drainage Systems (SuDS) will be central to water management at the Wind Farm Site and the Grid Connection route and will avoid and minimise the

risk of sedimentation to watercourses during both construction and operational phases. SuDS follows a treatment train approach with design principles that include:
Minimise → Intercept → Treat → Disperse → Dilute.
This system improves water quality, slows down flow rates, and encourages sediment settlement.

Extending or maximising this approach has the potential to deliver net beneficial effects, such as a reduction in overall runoff rates at the Wind Farm Site, improved water quality in receiving watercourses, and a decrease in downstream flood risk. Where feasible, Sustainable Drainage Systems (SuDS) will incorporate features that support water quality improvement and biodiversity enhancement in line with current best practice guidance (e.g. CIRIA C823F). Nature-based drainage and water management measures may include vegetated buffers and riparian planting designed to promote sediment capture, nutrient attenuation and improved runoff filtration. These measures will be implemented in accordance with the **Biodiversity Enhancement and Management Plan (BEMP)**.

Surface water management measures will be implemented early in the construction programme, including installation of silt fencing and implementation of defined hydrological buffer zones in advance of internal Site Access Road construction. Additional measures, as set out in **Chapter 11: Hydrology & Hydrogeology**, include:

- Drainage swales and linear drainage features to collect and treat development-related runoff;
- Upslope cut-off drains to divert clean runoff away from disturbed construction areas;
- Filtration check dams within swales to reduce flow velocity and promote sediment settlement;
- Settlement ponds and temporary settlement or filtration systems (including proprietary systems where required) to provide a treatment train prior to controlled discharge at greenfield runoff rates via vegetated buffer zones.

A combination of source, in-line, and end-of-line controls will be used during all construction activities. These include interceptor drains, check dams, silt fences, sumps, settlement ponds, level spreaders, vegetation filters, and proprietary systems such as Siltbusters. These measures are designed to capture and treat sediment-laden runoff and control flow velocities, reducing the risk of downstream impacts. Clean water diversion drains will also be installed upslope of construction areas to separate uncontaminated water from the treatment system.

Pre-commencement drainage works will include blocking of dry drains downgradient of construction areas, installation of silt traps and check dams, and implementation of a double silt fence system where work occurs within the 50m buffer zone of watercourses.

Pumped water from excavations will pass through silt bags before discharge to ensure sediment removal. All drainage features will be regularly inspected and maintained throughout the construction period.

To prevent sediment transport from spoil storage, temporary stockpiles will be covered or stabilised, and weather forecasts will be used to schedule works, with large-scale soil disturbance avoided during heavy rainfall events. The Wind Farm site team will monitor real-time rainfall data using Met Éireann resources and adjust activities accordingly.

Surface water runoff generated during construction will not be discharged directly to watercourses. All runoff will be directed through a series of SuDS-based sediment control measures, including drainage swales with check dams, settlement ponds and filtration features, prior to controlled discharge via diffuse overland flow through vegetated buffer zones.

To minimise treatment load, clean water drains will divert uncontaminated runoff away from the construction area. This proactive measure reduces the volume of potentially silt-laden water and the risk of suspended solids or dissolved substances entering nearby watercourses.

Contaminated water from construction activities such as excavations, drilling, and temporary stockpiling will be isolated, contained, and appropriately treated prior to any discharge.

Earthworks will be suspended in the event of an orange warning for rainfall. Prior to earthworks being suspended the following further control measures will be completed:

- All open spoil 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.

Prevention of pollution from debris caused by vehicles during the crossing of watercourses within the Wind Farm Site on the Wind Farm site access track

To minimise pollution risks at watercourse crossings, strict movement protocols for machinery will be enforced. There will be no tracking of machinery directly across watercourses. Instead, all plant will remain on designated access routes within the defined working corridor.

This working corridor will be clearly delineated using posts and high-visibility tape to prevent unintentional encroachment into sensitive habitats. The delineation ensures that contractors' plant remains within permitted areas and does not disturb adjacent watercourses or ecological features.

Where working within the 50m buffer is unavoidable, such as at watercourse crossings or upgrades to existing roads, additional controls such as silt fences and sediment barriers will be installed. These will serve to capture sediment and reduce the risk of pollution entering nearby waterbodies.

These measures will ensure that sediment and vehicular debris are retained and treated on-site, thereby protecting downstream aquatic habitats from turbidity spikes and sedimentation.

Potential indirect impacts from runoff during the proposed HDD works at the no. 3 watercourse crossings on the GCR impacting on water quality

Horizontal Directional Drilling (HDD) is the technique that will be used for 3 of the 8 GCR crossings. The remaining GCR crossings will be various types of culvert designs.

- The HDD works are described in detail in **Section 2.5.9.4** of **Chapter 2: Project Description** and **Appendix 2.1**.
- During the HDD processes there is a risk of leakages of drilling fluids which can have toxic effects on aquatic biota (depending on the type of lubricant used).
- For this Project, 'Clearbore' or a similar environmentally friendly drilling fluid product will be used during the HDD process. Clearbore is produced using free flowing polymers and is designed to instantly break down and become chemically

destroyed in the presence of small quantities of calcium hypochlorite. At normal usage, the product is not toxic to aquatic organisms and is biodegradable.

- The following general mitigations will be implemented during the directional drilling works:
  - No in-stream works will be permitted.
  - Works shall not take place at periods of high rainfall and shall be scaled back or suspended if heavy rain is forecast.
  - A floating hydrocarbon boom and spill kit will be available.
  - Plant will travel slowly across bare ground at a maximum of 5 km/hr. If truck rutting is observed, then bog mats or rolling road will be employed.
  - Silt fencing will be erected at a setback distance of 5 m from the works during excavation.
  - Any excess construction material shall be removed from the works areas and disposed of in a fully licensed landfill.
  - No re-fuelling of machinery will take place on site or within 50 metres of any watercourse.
  - All construction workers will be given a toolbox talk addressing the environmental topics concerning the drilling prior to commencement of construction.
  - Also, the Inland Fisheries Ireland published guidelines relating to construction works along water bodies entitled 'Requirements for the Protection of Fisheries Habitats during Construction and Development Works at River Sites" will be adhered to during works at watercourses.

Prevention of pollution to Natura 2000 sites that are hydrologically connected downstream from the Wind Farm site

The Wind Farm Site and Grid Connection route drain to watercourses that are hydrologically connected to downstream European sites (Natura 2000 network). During the construction phase, there is a potential pathway for indirect effects via the mobilisation of suspended solids, nutrients, hydrocarbons, concrete residues or other contaminants.

To prevent deterioration in water quality and avoid indirect effects on downstream European sites, a suite of mitigation measures will be implemented, including the application of Nature Based Solutions and a Sustainable Drainage Systems (SuDS) approach.

Surface water runoff will be managed through a multi-stage treatment train incorporating measures such as check dams, settlement ponds and buffered discharge points. Runoff will not be discharged directly to watercourses without appropriate treatment. These measures are designed to ensure that only appropriately treated surface water leaves the site.

Where necessary, proprietary treatment systems (e.g. Siltbuster or equivalent) will be deployed during higher-risk activities such as excavation and dewatering to further reduce suspended solids prior to discharge.
Consultation with the Office of Public Works (OPW) will also be undertaken to avoid overlap between scheduled drainage maintenance works and construction activities, thereby minimising the potential for cumulative downstream water quality effects.

The potential for effects on the integrity of hydrologically connected European sites is assessed separately in the accompanying Natura Impact Statement (NIS).

Potential for accidental spillage of hydrocarbons and other pollutants including concrete laitance

Accidental spillage of hydrocarbons, concrete, or other pollutants presents a known risk during construction. To mitigate this, robust dewatering and containment protocols will be in place.

Dewatering flow rates will be tightly regulated using inline gate valves or similar infrastructure to prevent sudden surges that could overload drainage and attenuation systems. Pumped water will be directed through an on-site treatment train or discharged to vegetated surfaces via silt bags, always outside designated buffer zones. Continuous monitoring and adaptive management of dewatering operations will be carried out to ensure environmental performance under varying site conditions. Contaminated water resulting from activities like drilling, excavation, and temporary stockpiling will be isolated, treated, and only discharged when safe and compliant.

These preventative measures, along with routine inspections and emergency spill response plans, will ensure no unintentional release of pollutants into surface waters.

Prevention of loss of natural watercourses due to 7 no. new watercourse crossings and the placement of bridges and culverts

Seven new watercourse crossings are proposed within the Wind Farm Site. 5 no. are classified as major watercourses and 2 no.as minor watercourse. These crossings will utilise clear-span bridges and culverts, with mitigation measures to avoid release of pollutants to downstream waters as detailed in **Chapter 11: Hydrology & Hydrogeology**, **Section 11.6.1.7** and associated construction phase mitigation measures detailed in Section **11.8.1.**

There will be no tracking of machinery through any watercourse. Construction plant will operate exclusively within designated routes and the established working corridor.

Where buffer zone encroachments are unavoidable for crossing works, appropriate sediment control measures such as silt fencing and settlement features will be installed to prevent mobilisation of sediment and protect aquatic habitats.

The design avoids in-stream works, thereby preserving channel morphology, flow continuity, and ecological connectivity. As a result, permanent loss or fragmentation of natural watercourses is not likely.

Management of Runoff from Spoil Storage Areas to prevent contamination of watercourses

Spoil generated during construction will be managed in accordance with the Spoil Management Plan contained within **Appendix 2.1 o**f the **Construction Environmental Management Plan (CEMP)** and assessed in **Chapter 10: Soils and Geology.** Excavation associated with the Grid Connection cable trench is estimated to generate approximately 10,480 m^3 of material, consisting primarily of mineral subsoil, with no peat excavation identified along the route.

In accordance with the project spoil management strategy, grid connection excavation arisings will be removed from site and disposed of at a suitably licensed waste facility. As such, this material will not require permanent on-site spoil storage. Temporary storage of excavated material during construction will be minimised and managed in accordance with the procedures outlined in the **CEMP**.

Excavated materials will be segregated by type (e.g. peat, topsoil, mineral soils and rock) during excavation to facilitate reuse where possible and to minimise environmental impacts. Where applicable, the vegetated topsoil layer within temporary spoil storage areas will be rolled back to facilitate the placement of excavated spoil and subsequently reinstated. Where reinstatement is not possible, the spoil surface will be sealed using a digger bucket and seeded as soon as practicable to stabilise the material and reduce sediment entrainment in runoff.

Where temporary storage of excavated material is required during construction, runoff will be managed through the use of appropriate sediment control measures such as silt fences and biodegradable matting. Surface water from these areas will be directed via swales and stilling ponds to a Siltbuster treatment unit with appropriate storage and settlement capacity prior to discharge to onsite watercourses following adequate settlement and treatment.

Prevention of risk of chemical carryover from use of Siltbuster

Measures employed to prevent overdosing and potential chemical carryover:

- Use of an automated dosing system to control the addition of treatment agents and minimise the potential for overdosing.
- Monitoring of treated water to ensure appropriate treatment performance prior to discharge.
- Application of treatment agents at low dosing rates appropriate for sediment settlement, with the majority of the agent binding to and settling with suspended sediment.
- Recycling and retreatment of effluent that does not meet discharge criteria prior to release.
- Use of biodegradable settlement agents where required in environmentally sensitive areas.
- Removal of sludge generated during the treatment process and disposal off-site at an appropriately licensed facility.

Ecological Enhancement Proposals

Ecological enhancement measures associated with the Project are outlined in the **Biodiversity Enhancement and Management Plan (BEMP)** provided in **Appendix 6.1.** The BEMP sets out a range of habitat enhancement and restoration measures designed to improve biodiversity value within the Wind Farm Site. These measures include woodland planting, the establishment of new hedgerow to compensate for the loss of existing hedgerows, and the enhancement and revitalisation of degraded hedgerows within the site.

Riparian planting forms an important component of the proposed ecological enhancements and plays a key role in supporting freshwater ecosystem resilience. Vegetation along watercourse margins provides shading which can help regulate stream temperatures, an increasingly important function as rising air temperatures place additional pressure on temperature-sensitive fish species such as salmonids. The root systems of riparian vegetation also help stabilise banks, reduce erosion and improve water quality by filtering runoff before it enters adjacent watercourses. In addition, leaf litter and woody debris from riparian vegetation provide organic inputs and structural habitat that support aquatic invertebrates, which form an important component of the aquatic food web. Through these functions, riparian vegetation can contribute to improved habitat complexity, ecological connectivity and resilience of freshwater ecosystems.

The proposed ecological enhancement measures are not expected to result in significant impacts on the hydrological or hydrogeological environment. Minor and temporary effects on surface water quality could occur during planting works; however, standard best practice measures will be implemented to minimise potential impacts. These include avoiding planting within drainage channels or highly sensitive wetland habitats and ensuring that works are undertaken in a manner that minimises disturbance to watercourse margins.

Preparatory works in the vicinity of watercourses will be undertaken in accordance with the Construction Environmental Management Plan (CEMP). Method statements for watercourse crossings will be prepared at the construction stage and submitted to the Ecological Clerk of Works (ECoW) for approval prior to works commencing. All disturbed banksides associated with crossing works will be reinstated as soon as practicable using native vegetation appropriate to the local environment.

Overall, the ecological enhancement measures proposed in the BEMP are expected to provide long-term benefits for terrestrial and aquatic habitats within the Wind Farm Site and contribute to improved ecological connectivity and biodiversity value within the wider landscape.

9.5.2.3 *Mitigation by Reduction*

The specified measures detailed below are aimed at protection of instream aquatic biota within the vicinity of any proposed works at watercourses on the Wind Farm Site andthe Grid Connection route but equally with regards to the protection of the downstream population of salmonids and other fish species. These measures are a summary of the principal requirements with full detail being presented in **Chapter 11: Hydrogeology and Hydrology**, which are transposed into the Construction Environmental Management Plan (CEMP). The accompanying NIS deals with the hydrologically linked Natura 2000 sites.

During the construction phase the appointed contractor(s) will ensure that the following mitigation is adhered to in line with IFI (2016) Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters:

- Hydrological buffer zones will be maintained in accordance with **Chapter 11: Hydrology & Hydrogeology** and the CEMP, comprising a minimum 50 m buffer from major watercourses and 10 m from minor drains, except at approved watercourse crossing locations.
- Temporary Construction Compounds and Permanent Spoil Storage areas will be located outside defined hydrological buffer zones. Drainage from these areas will be managed through appropriate sediment control and spill containment measures forming part of the Project's treatment train approach. These measures will be implemented through the Construction Environmental Management Plan (CEMP), including the Surface Water Management Plan (**Appendix 11.2**, and **Surface Water Management Plan (MP3)** of the **CEMP**), which will be further developed and finalised prior to commencement of construction.
- All site drainage, as described in the SWMP (**Appendix 11.2**, and **Surface Water Management Plan (MP3)** of the **CEMP**) and shown on associated drawings (**6575-JOD-CGWF-XX-DR-C-0301** - **6575-JOD-CGWF-XX-DR-C-0303**), will be directed through either sediment traps, settlement ponds and/or buffered drainage outfalls to ensure that total suspended solid levels in all waters discharging to any watercourse will not exceed 25mg/l (IFI, 2016). All construction site run-off will be channelled through a stilling process to allow suspended solids to settle out and through a spill-containment facility prior to discharge.
- Daily monitoring of all sediment traps and settlement ponds will be undertaken by the Environmental Manager or Ecological Clerk of Works to ensure satisfactory operation and/or maintenance requirements. A full specification for the water

quality monitoring is presented in the Water Quality Management Plan (WQMP) **Appendix 2.1 - MP 2**.

- The storage of oils, hydraulic fluids, etc., will be undertaken in accordance with current best practice for oil storage (Enterprise Ireland, BPGCS005).
- All machinery operating at the Wind Farm Site will be fully maintained and routinely checked to ensure no leakage of oils or lubricants occurs Vehicles will be refuelled off-site where possible. For vehicles that require being refuelled on-site, fuels will be stored in the temporary construction compound and bunded to at least 110% of the storage capacity of fuels to be stored. Refuelling will take place via a mobile double skinned fuel bowser. The bowser will be a double axel refuelling trailer which will be towed to the refuelling locations by a 4x4 vehicle. The 4x4 will carry a drip tray, spill kit and absorbent mats in case of any accidental spillages. Only designated competent personnel will refuel plant and machinery on the Wind Farm Site.
- Any extensions to existing drainage culverts on the Wind Farm Site Access Roads will be undertaken in dry conditions and in low flow.
- During the culvert installation and associated construction work, double silt fences shall be installed immediately downgradient and downstream of the construction area for the duration of the construction phase.
- The pouring of concrete, sealing of joints, application of water-proofing paint or protective systems, curing agents, etc., will be completed in the dry to avoid pollution of the freshwater environment (**Chapter 11: Hydrology and Hydrogeology** for further details). There will be no batching or storage of cement in the vicinity of any watercourse crossing construction area.
- Procedures (as detailed in **Chapter 11: Hydrology and Hydrogeology**) will be implemented to ensure the full containment and appropriate disposal of raw or uncured concrete and concrete-contaminated wash water, thereby preventing discharge of alkaline or cementitious materials to surface waters.
- Should there be any incidents of pollution to watercourses, immediate steps as specified in the Emergency Response Plan in the CEMP will be undertaken to resolve the cause of the pollution and where feasible, mitigate against the effect of pollution.Re-seeding / re-vegetation of all areas of bare ground, or the placement of geo-jute (or similar) matting, will take place as soon as practicable following construction to prevent silt-laden run-off. Vegetation reinstatement will be undertaken using locally appropriate species and restoration techniques, including re-turfing of stored vegetation and targeted reseeding (e.g. heather seeding) where required, under the supervision of the Ecological Clerk of Works. Further details

on vegetation restoration methods are provided in the Biodiversity Enhancement and Management Plan (BEMP). Silt traps erected during the construction phase within roadside and artificial drainage will be replaced with stone check dams for the lifetime of the project. These stone check dams will only be placed within artificial drainage systems such as roadside drains and not in natural streams or drainage lines.

- A full review of construction stage temporary drainage will be undertaken by the Developer (in conjunction with the Project Hydrologist/ Site Engineer and the Project Ecologist) following the completion of construction, and drainage removed or appropriately blocked where this will not interfere with infrastructure.

9.5.3 Operational Phase Mitigation

The following measures will be implemented during the operational phase to ensure the ongoing protection of watercourses and water quality at the Wind Farm Site and Grid Connection route and in downstream reaches in regard to the potential operational phase effects (Downstream flood risk, runoff resulting in contamination of surface waters and wastewater contamination):

- The Wind Farm site compound(s) / office(s) will house all potential pollutants within a secure bunded COSSH store for the operational phase of the project.
- All onsite wastewater treatment facilities will function in full compliance with current water quality requirements (Building Regulations 2010 as amended S.R. 66:2015) to prevent nutrient loading entering aquatic environments. It is proposed to install a sealed underground holding tank for effluent (wastewater) from the Onsite Substation compound. The tank shall be routinely emptied by a licensed contractor.
- As discussed further in **Chapter 2: Project Description** design measures have been implemented that minimise both environmental and infrastructure risks associated with the Project. In the event of forecasted extreme flooding, a construction phase and operational phase flood event emergency response procedure has been prepared, further details can be found in **Appendix 11.2** and **Surface Water Management Plan (MP3)** of the **CEMP**. This will be further updated by the appointed contractor to take into consideration any planning conditions prior to construction activities commencing.
- Further details in relation to the flood zones and mitigation measures proposed can be found in **Chapter 11: Hydrology and Hydrogeology** and **Appendix 2.1**.

9.5.4 Decommissioning Phase Mitigation

Decommissioning of the Wind Farm will be scheduled to take place after the proposed 35- year lifespan has expired. Decommissioning phase effects for the Project are likely to be broadly similar to construction phase effects, in terms of potential surface water quality effects from ground disturbance, refuelling and the storage of potentially hazardous materials onsite. A site-specific **Decommissioning Management Plan (MP6)** has been developed and will be amended prior to the commencement of any Decommissioning activities. The implementation of all mitigation measures detailed for the construction phase will be adopted in full during the Decommissioning phase to ensure all such significant effects are avoided.

When the final Decommissioning Plan is prepared prior to Decommissioning and presented as a standalone document for consideration by the relevant authority at that time, all drainage management measures, which will include maintenance of the operational drainage measures, will be included in that document, as required. However, by the time Decommissioning is undertaken following the planned 35-year lifespan of the Project, areas within the Wind Farm Site are expected to be substantially revegetated and stabilised, with drainage patterns likely to be well established. It is therefore anticipated that the Decommissioning phase will not give rise to significant disruption of established drainage patterns. As a minimum measure, areas where freshly placed soil material as part of Turbine Foundation reinstatement works will be surrounded by silt fencing, where necessary, until the area has stabilised.

The Grid Connection and the Onsite Substation will become an asset of the national grid under the management of ESB and EirGrid and will likely remain in place permanently upon Decommissioning of the Project as required by ESB/EirGrid. Wastewater from the Onsite Substation will continue to be treated as underlined in **Section 9.5.3**, therefore no significant long-term effects on aquatic habitats or species are anticipated as a result of its permanent retention. However, regular maintenance of the drainage infrastructure will be necessary to ensure ongoing protection of downstream water quality and aquatic ecological receptors.

Biodiversity enhancement measures outlined in the Biodiversity Enhancement Management Plan (**Appendix 6.1; BEMP**) will become established within the receiving environment and will be managed and maintained throughout the operational lifetime of the Project for the benefit of local biodiversity.

Restoration of the Wind Farm Site following Decommissioning will be informed by a review of environmental conditions at that time and by the updated Decommissioning Plan prepared prior to commencement of works.

9.6 RESIDUAL EFFECTS OF THE PROJECT

The approach to the Project design, the use of SuDS drainage and the suite of comprehensive measures to avoid, reduce or remedy all potential significant effects on water quality will ensure that the receiving water bodies in the catchment of the Project do not suffer any deterioration in water quality, either during construction, operation, or Decommissioning.

A comprehensive assessment of potential residual effects to water quality is carried out in **Chapter 11: Hydrology and Hydrogeology Section 11.7**.

With mitigation measures in place, no significant adverse residual effects on aquatic species, habitats or water quality are predicted at a local or catchment scale as a result of the Project.

9.7 MONITORING

In order to verify the efficacy of pollution prevention and mitigation works during construction, water quality monitoring will be undertaken prior to, during and post completion of construction works. Monitoring will be undertaken in watercourses within the catchment as outlined in the CEMP, and in compliance with any potential conditions of planning consent. Monitoring will be overseen by a qualified and experienced Environmental Manager or Ecological Clerk of Works.

The specific monitoring requirements including frequency and parameters are detailed in the **Chapter 11: Hydrogeology and Hydrology**.

Baseline monitoring undertaken at the Wind Farm Site and the Grid Connection route as part of this study will be repeated periodically *i.e.*, before, during and after construction phase, to measure any deviations from baseline hydrochemistry that occur at the Wind Farm Site, including discharge rates.

9.7.1 Construction Phase Monitoring

The Project Environmental Manager (EM) will have a stop works authority. Weekly site meeting will include for scheduling of works according to weather forecast. Suitable locations (further downstream) for biological Q-Value sampling will be identified by Site EM.

- During the construction phase daily inspection of silt traps, settlement ponds, buffered outfalls and drainage channels will be undertaken. Routine measurement of total suspended solids, electrical conductivity, pH, and water temperature at selected water monitoring locations at the Wind Farm Site and the Grid Connection route will be carried out. Monitoring of locations where excavations are being dewatered (likely high in solids) will be done in real time.
- One baseline monitoring visit (in advance of construction), including upstream and downstream biological Q value sampling and reporting.
- Once daily general visual inspections by site EM at all sample sites identified.
- Weekly grab sample inspections will be undertaken by the Site Environmental Manager. Sample parameters will include suspended solids and on-site measurement of turbidity, pH, temperature and electrical conductivity. Monitoring will be undertaken at two locations within the Wind Farm Site (in man-made drains) and at downstream surface water monitoring locations.
- Water quality monitoring will be undertaken in accordance with **Chapter 11: Hydrology & Hydrogeology** and the **Water Quality Management Plan (MP2)** appended to the CEMP. Monitoring locations (SW01–SW04), as shown in **Figure 11.7**, include upstream and downstream points relative to proposed watercourse crossings. Monitoring will comprise daily visual inspections, weekly suspended solids and turbidity sampling in active catchments, monthly hydrochemistry monitoring, event-based sampling following significant rainfall, and post-construction monitoring.
- An Ecological Clerk of Works ("ECoW") / Environmental Officer with an appropriate level of experience relevant to aquatic ecology will be present to supervise all water crossings
- Monitoring after heavy rain /prolonged rain events will be undertaken particularly downstream of spoil storage areas and drainage swales around the Wind Farm site to assess the ongoing efficacy of the mitigation measures.
- Daily monitoring of excavations by the Geotechnical Engineer will occur during the construction phase. If high levels of seepage inflow occur, excavation work will immediately be stopped, and a geotechnical assessment undertaken.
- During the construction phase of the project, the development areas will be monitored daily for evidence of groundwater seepage, water ponding and wetting of previously dry spots, and visual monitoring of the effectiveness of the constructed drainage and attenuation system so that it does not become blocked, eroded or damaged during the construction process.

9.7.2 Post-construction phase monitoring

- During the operational phase, drainage features including settlement ponds, silt traps and buffered outfalls will be periodically inspected during maintenance visits to the Wind Farm Site.
- Surface water monitoring will be undertaken during and post-construction in accordance with **Chapter 11: Hydrology & Hydrogeology** and **Water Quality Management Plan (MP2)** to confirm that no deterioration in water quality has occurred as a result of construction activities. Where monitoring identifies exceedances or pollution incidents, corrective measures will be implemented in consultation with the relevant statutory authorities.
- Monthly inspections and grab sampling during post construction for 3 months.
- EPA Q-Value biological monitoring will be undertaken at selected watercourse crossing locations (upstream and downstream of instream works) prior to and following construction, in accordance with **Water Quality Management Plan (MP2)**.

9.8 CUMULATIVE OR IN-COMBINATION EFFECTS

The Habitats Directive requires competent authorities to make an Appropriate Assessment of any plan or project which is likely to have a significant effect alone or in-combination with other plans and projects. This is carried out in this chapter in respect to potential significant effects to aquatic ecology.

The greatest potential for cumulative impacts on aquatic ecology arises during the construction phase, when activities such as earthworks, excavation, and the use of cementitious materials pose a heightened risk of sediment runoff, hydrocarbon release, and discharges into nearby watercourses. These impacts could collectively degrade water quality and affect sensitive aquatic habitats, particularly those supporting protected species. In contrast, the operational phase presents a substantially lower risk to aquatic environments, as no open excavations or sediment-generating activities will occur, cement use will cease, and only minimal quantities of fuels or oils will be stored on-site. During the Decommissioning phase, while some risk to aquatic ecology remains, it will be significantly reduced relative to the construction phase due to the limited scale of ground disturbance and the implementation of best-practice mitigation measures developed at that time.

9.8.1 Potential Cumulative Effects with Other Wind Farm Developments and Grid Connections

There are 7 wind farms within 20km of the Wind Farm Site of which 3 are operational, 2 are consented and 2 are proposed. The closest wind farms in operation are Roosky Wind Farm (2 turbines) located approximately 13.6 km to the Northwest of the Wind Farm Site and Largan Hill Wind Farm (13 turbines) located approximately 15.1 km Northwest of the Wind Farm Site. The closest consented wind farms are Leam Wind Farm (2 turbines) located approximately 6.8 km to the Northeast of the Wind Farm Site and Riverstown Single Turbine (1 turbine) located approximately 19.2 km to the Northwest of the Wind Farm Site. The remaining 3 wind farms are located at distances ranging from 15.3 km to 19.4 km from the Wind Farm Site.

While seven wind farms have been identified within a 20 km radius of the Project, the potential for cumulative effects, particularly on aquatic ecology, hydrology, and other environmental receptors, is considered to be low. All of these projects are located at distances greater than 5 km from the Wind Farm Site. **Chapter 11: Hydrology and Hydrogeology** identifies whether any of the nearby wind farms are located within the outlined catchment Study Area for the Project. Only one wind farm, the operational Slieveragh Wind Farm, falls within this area. This site drains to the Loobagh River and is located along the eastern boundary of the aquatic study area. The most recent Q-value assessment in 2023 at monitoring station RS24L010200 (Easting 166554, Northing 124729) located at Ballinanima Bridge (M45) on the IE_SH_24L010200 waterbody recorded a Q-value of 4, indicating Good ecological status under the WFD. Historic biological monitoring data from this station show a consistent Q-value of 4 across all assessment years since 1971, indicating sustained Good ecological status with no evidence of deterioration in water quality following wind farm development in the wider area.

On the basis of this long-term stable biological status and in the absence of any identified hydrological pathway that would result in additive pressures, significant cumulative effects on aquatic ecology are not anticipated.

Given the robust mitigation measures in place, particularly those relating to surface water and sediment control, no significant cumulative effects are anticipated on water quality, aquatic habitats, or species. Furthermore, each development is subject to its own environmental assessment and regulatory control, ensuring that environmental thresholds are not exceeded when considered in combination. Therefore, the cumulative impact of the Project alongside other wind farm projects in the area is not considered to be significant.

9.8.2 Potential Cumulative Effects with Agriculture

The Wind Farm Site is located within a mixed landscape dominated by commercial forestry, peatland, and agricultural land, where existing pressures on local watercourses, particularly the Carricknabraher and Breedoge Rivers, are primarily attributed to forestry operations, peat extraction, and agricultural practices across the catchment. Forestry and peat harvesting are recognised as significant pressures on water quality in Ireland, with activities such as soil disturbance, drainage, and nutrient mobilisation contributing to elevated levels of suspended solids and organic matter in surface waters. Agriculture is recognised as the most significant pressure on water quality in Ireland, with activities such as soil disturbance, livestock access to watercourses, and the use of fertilisers and pesticides contributing to the elevation of nutrient levels, particularly nitrogen and phosphorus, and the entrainment of suspended solids into surface waters. These diffuse pollutants can lead to adverse effects on aquatic ecology, including eutrophication, loss of habitat quality, and impacts on sensitive species and aquatic community structure.

Within the Wind Farm Site itself, peat harvesting is expected to decrease during the construction phase, reducing direct local inputs from peat cutting. However, in an unmitigated scenario, the Project could potentially interact with ongoing peat harvesting pressures in the wider catchment. This could occur via temporary emissions of suspended solids, sediment, or cementitious materials, and the possible release of trace levels of ammonia from ground disturbance or machinery operation. Such interactions could contribute to localised degradation of water quality and pose a risk to aquatic habitats and species, particularly in watercourses that are already considered 'At Risk' under the Water Framework Directive.

In addition, the Grid Connection Route (GCR) traverses agricultural and modified lands within the wider catchment and includes a number of temporary watercourse crossings associated with cabling works. In an unmitigated scenario, construction activities along the GCR could give rise to temporary mobilisation of suspended solids or other contaminants, which could interact cumulatively with existing land-use pressures, including peat harvesting and agricultural runoff. However, these potential interactions would be short-term and localised in nature and will be controlled through the implementation of the surface water management and pollution prevention measures outlined in Chapter 11.

Nevertheless, with the implementation of robust mitigation measures, as outlined in **Section 9.5** during the construction, operation, and Decommissioning phases will ensure that the Project does not result in any deterioration in the status of water bodies. These measures include effective surface water management, sediment control, protection of riparian zones, and pollution prevention protocols, which collectively safeguard water quality and support the ecological integrity of downstream aquatic environments.

Given the reduced peat harvesting activity on-site during construction and the effectiveness of the proposed mitigation, it is concluded that the Project will not contribute to a significant cumulative effect on aquatic ecology in combination with ongoing peat harvesting pressures in the surrounding catchment.

9.8.3 Potential Cumulative Effects with Other Developments and Projects

A list of all other proposed or permitted developments larger than a once-off house within 10 km of the Project are listed in **Appendix 2.4** in this EIAR. A review of planning applications within the surrounding area identified a range of ongoing and permitted developments of varying scale. Notable projects include a proposed solar farm development at Meera and Tullyleague, approximately 2.9 km northwest of the site, and a limestone quarry extraction and processing facility at Drummin Peak, Bellanagare, located 838 m southwest of the Wind Farm. Residential schemes continue to progress in the wider area, including a 20-unit housing development at Carrownageelaun, Tulsk (8.1 km southeast), a 10-unit residential scheme at Millstream, Elphin (2.8 km southwest), and several smaller housing projects in Frenchpark and Carrick-on-Shannon between 1- 4 km from the site. Additional permissions include community and sports amenities - such as Astro Turf pitches at Croghan (3.5 km northwest) and Castleplunkett National School (9.7 km southwest) - and utility and infrastructure upgrades, including a 30 m telecommunications lattice mast at Mullenduff, Mantua, located 1.1 km southeast of the Wind Farm. Numerous commercial refurbishments and service developments have also been granted in Carrick-on-Shannon, Elphin and Frenchpark. None of these projects lie within the catchment-wide aquatic Zone of Influence (ZOI) for the Wind Farm Site. Accordingly, when considered alongside the comprehensive water protection and mitigation measures set out in this assessment, there is no potential for significant cumulative impacts on aquatic receptors arising from the Project during its construction, operation or decommissioning phases.

Mitigation measures outlined for the Project in **Section 9.5** will protect downstream water quality and aquatic habitats during all phases of the project. If a Siltbuster system is used, careful dosing and monitoring will ensure no elevation in COD or other pollutants. With these controls, the Siltbuster is expected to improve water quality. As a result, no significant cumulative effects on aquatic ecology are anticipated in combination with the existing licensed discharge.

The Water Framework Directive Status (2022-2027) was reviewed for all watercourses within the Wind Farm Site and along the Grid Connection route to determine the potential for significant adverse effects on water quality as a result for the Project in combination with other plans and/or projects. The Wind Farm site is located within the Upper Shannon (26B) WFD Catchment and spans the Breedoge_010 and Carricknabraher_020 river sub-basins. According to EPA data accessed on 11 November 2025, the Breedoge_010 waterbody recorded a Q-value of 4 (Good) in 2023 upstream of its confluence, although a previous station recorded 3 (Poor) in 2005. The Carricknabraher_020 waterbody showed Moderate status (Q3–4) in 2023 upstream of the Owennaforeesha River, while a station approximately 900 m upstream recorded Poor status (Q3) in 2020, the overall status for this waterbody is listed as 'Poor'. The Carricknabraher_010 waterbody achieved Good status (Q4) at Cloonshanville Bridge in 2023. Under the most recent Water Framework Directive Risk Cycle 3 (2022–2027), the river Carricknabraher_020 is classified as "At Risk", while Breedoge_010 and Carricknabraher_010 are classified as "Not at Risk". The Mantua_010 is listed for review. All groundwater bodies within the Wind Farm site, including Carrick on Shannon (IE_SH_G_048), Castlerea Bellanagare (IE_SH_G_054), and GWDTE Bellanagare Bog (IE_SH_G_241), are classified as Good status and deemed "Not at Risk" under the WFD Groundwater Body Status Cycle 3 report.

A review of the Water Framework Directive (WFD) status (Cycle 3, 2022–2027) for waterbodies within and adjacent to the Wind Farm Site and Grid Connection route indicates that the Carricknabraher River (CARRICKNABRAHER_020) is currently classified as having Poor status and is deemed 'At Risk' under the WFD 3rd Cycle Risk Assessment, while the Carricknabraher_010 and Breedoge_010 rivers are classified as Good status and 'Not at Risk.' The Mantua River (MANTUA_010), which is crossed by the Grid Connection, is also classified as needing review. Therefore, any deterioration in water quality arising from the Project could have significant implications for compliance with the European Commission Environmental Objectives (Surface Waters) (S.I. No. 272 of 2009, as amended).

Taking this into account, the potential for direct and indirect adverse effects on these watercourses has been carefully assessed. Any negative impacts arising during the construction phase, such as the release of suspended solids, hydrocarbons, or cementitious materials, are considered to be short-term and temporary in nature. These risks will be effectively managed through strict adherence to robust mitigation measures (as outlined in the CEMP), which are specifically designed to protect water quality and ecological integrity.

Furthermore, there is no reasonable likelihood of cumulative long-term adverse effects from the Project, either alone or in combination with other plans or projects, due to the absence of significant nearby developments and the implementation of best-practice environmental controls. The Project has been designed and will be executed in such a way that no deterioration in the status of any surface water or groundwater body will occur, in full compliance with the requirements of S.I. 272 of 2009 (as amended) or is it likely to affect the chemical status of any water bodies or hinder their ability to achieve the objectives set out under the Water Framework Directive and its transposing legislation.

9.9 SUMMARY OF SIGNIFICANT EFFECTS

The potential sources of environmental impact associated with the construction, operational, and Decommissioning phases of the Project have been identified (**Section 9.4**). In the absence of appropriate mitigation, these sources could result in short-term adverse effects on aquatic ecology at the local scale, including possible disturbance to sensitive flora and fauna within watercourses surveyed. There is also a theoretical risk of modification to natural watercourses from proposed crossings and bridge installations; however, the complete loss or fragmentation of natural watercourses is considered highly unlikely due to the use of clear-span bridge designs and avoidance of in-stream works.

Importantly, the project has been designed and will be implemented in accordance with Article 5 of the EC Environmental Objectives (Surface Waters) Regulations 2009, which prohibits any development that would result in a deterioration in the status of a surface water body. The mitigation measures proposed have been specifically developed to ensure that there is no deterioration in the ecological or chemical status of any surface water or groundwater body. Therefore, with these measures fully in place and implemented, no significant effects on aquatic ecology are predicted to occur as a result of the Project.

Furthermore, any potential cumulative or in-combination effects on downstream Natura 2000 sites within the zone of influence (ZoI) have been assessed in the accompanying Natura Impact Statement (NIS). With the proposed mitigation in place, no adverse effects on the integrity of any European site are anticipated, either alone or in combination with other plans or projects.

9.10 STATEMENT OF SIGNIFICANCE

In the absence of mitigation measures, appropriately designed, implemented and managed, there is deemed to be a potential for adverse significant short-term environmental effects from the Project, as listed above. However, it is considered that with the proposed mitigation (outlined in **Section 9.5** and the accompanying **Chapter 2: Project Description** and **Chapter 11: Hydrology and Hydrogeology** of the EIAR) successfully implemented, the Project will result in an overall negligible to low residual effect and therefore no likely significant effects upon the aquatic ecological features that lie within the Zone of Influence for the duration of the construction, operational and Decommissioning phases.