

# TOBIN

**RWE**

**Ballincor Wind Farm**

**Appendix 6-3**

**Aquatic Ecology Survey  
Report**

**RWE**

**BUILT ON KNOWLEDGE**

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## Table of Contents

1.	Introduction .....	1
1.1	Relevant Legislation .....	2
1.2	Consultation and Licence Application .....	3
1.3	Statement of Authority .....	3
2.	Methodology.....	4
2.1	Desktop Review .....	4
2.2	Aquatic Field Study.....	4
3.	Results.....	15
3.1	Desktop Review .....	15
3.2	Aquatic Field Survey Results.....	16
4.	Discussion .....	31
4.1	Fish and Fisheries Habitat.....	31
4.2	Alpine Newt.....	33
4.3	Invertebrates.....	34
4.4	Water Quality.....	35
5.	References.....	36

## Appendices

- Appendix A Biotic Index Scoring System For The Q-Scheme
- Appendix B Physical Characteristics of Watercourses within the Study Area
- Appendix C Electrofishing Data
- Appendix D eDNA Laboratory Report
- Appendix E Photograph of Each Aquatic Sampling Site

## List of Figures

- Figure 2-1 Watercourses and Survey Sites Within the Study Area of the proposed project ..... 7



## List of Plates

Plate 3-1 Brown Trout (Left) and Lamprey Sp., (Right) Recorded at Site 7 .....	24
Plate 3-2 Juvenile and Adult Brown Trout Recorded at Site 4 (Left) and Three-Spined and Nine-Spined Stickleback Recorded at Site 9 (Right) .....	25

## List of Tables

Table 2-1 Aquatic Ecological Survey Site Locations on Watercourses Within the Study Area of the proposed project.....	8
Table 3-1 Results of Fish Species and Quantity Recorded at Each Site During Electrofishing Surveys.....	23
Table 3-2 Alpine Newt eDNA Results.....	25
Table 3-3 Macroinvertebrates Recorded During Biological Sampling on Watercourses Within the Study Area of the proposed project .....	27
Table 3-4: Biological Water Quality and Interpretations at Study Sites on Watercourses Draining the proposed project.....	30
Table A-1 Biotic Index Scoring System For The Q-Scheme and Equivalent WFD Water Quality Status Classes.....	39

## 1. INTRODUCTION

RWE Ireland (hereafter referred to as the Applicant), proposes to develop the Ballincor Wind farm (hereafter referred to as the proposed project).

The proposed project will consist of

- The proposed wind farm;
- Grid Connection Route (GCR); and
- Turbine Delivery Route (TDR)/ Haul Route.

A full description is included in Chapter 2 (Description of the proposed project). This report outlines the aquatic surveys carried out to inform the biodiversity chapter (Chapter 6) of the Environmental Impact Assessment Report (EIAR).

The proposed wind farm will have an electrical power output of between 61.6 MW – 77 MW. proposed project It is proposed to supply the power from the proposed project to the electricity network via 110 kV underground cables (approximately 12.23 km cable length of which approximately 11.1 km of which is on the public road corridor) to the existing Dallow 110 kV substation in the townland of Clondallow, Co. Offaly. proposed project

The proposed project also comprises facilitating works on the public road network and at private properties to accommodate the delivery of turbine components.

A full description of the proposed project is provided in Chapter 2 (Description of the Proposed project) of the EIAR.

Key impacts associated with the proposed project (in the absence of mitigation), relevant to the evaluation of ecological impacts, are summarised hereunder:

### ***Construction Phase (timeframe ca. 24 months)***

The following are key activities that will be undertaken during the construction phase and could potentially cause significant effects on the environment. They therefore need to be given consideration in the evaluation of ecological impacts:

- Site clearance, excavation and any drainage requirements at turbine locations, BESS and substation location to facilitate construction;
- Construction of the proposed project and associated infrastructure including; access tracks/routes, temporary compounds, turbine hardstanding, onsite BESS, underground grid connection, bridges, culverts and construction works associated with the turbine delivery route
- The use of heavy machinery and associated disturbance within the works area during construction;
- The excavation of soils and peat for the installation of turbines, BESS base, substation base, associated hard standing areas and any associated drainage requirements;
- The excavation of soils, peat and rock at the burrow pit locations;
- The excavation of soils and rock for the grid connection route trenching, joint bays and directional drilling reception pits;



- The use of concrete and other potentially harmful substances at each works area;
- Management, storage and re-use of excavated material during the construction phase;
- All related site works and ancillary development including landscaping, and soil excavation; and
- Forestry felling to facilitate construction and operation of the proposed project and any onsite forestry replanting at the temporary construction compounds

***Operational Phase (timeframe: 35 years)***

The operational phase of the proposed project will include the following key activities, which could potentially cause significant effects on the environment, and will therefore need to be considered in the evaluation of ecological impacts:

- Rotating blades of operating turbines (noise and collision risk for bats) within the wind farm envelope
- Maintenance of turbines and site infrastructure throughout the lifetime of the proposed project
- Noise and disturbance due to operational activities and maintenance works

***Decommissioning Phase (timeframe ca. 12 months)***

The decommissioning phase of the proposed project will include the following key activities, that could potentially cause significant effects on the environment, and will therefore need to be given consideration in the evaluation of ecological impacts:

- Decommissioning will include the dismantling of infrastructure, minor excavation activities and the removal of waste offsite which may result in the release of sediment-laden water or pollutants into local watercourses and disturbance impacts for local wildlife
- Impacts during decommissioning are expected to be of similar type and magnitude to those anticipated during the construction phase, but generally of a shorter duration

**1.1 RELEVANT LEGISLATION**

The assessment was carried out with regard to the following legislation:

- Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment, as amended by Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014, hereafter referred to as the EIA Directive
- Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, hereafter referred to as the Habitats Directive
- Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds, hereafter referred to as the Birds Directive
- European Communities Environmental Objectives (Surface Waters) Regulations 2009 (S.I. No. 272/2009) and (Amendment) Regulations 2012 and 2015
- European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477/2011) (as amended)



- European Union (EU) Water Framework Directive (2000/60/EC) (WFD), transposed into Irish law in 2009 (S.I. 792 of 2009, European Communities Environmental Objective (Surface Water) Regulations 2009 as amended; hereafter referred to as the WFD Regulations
- Wildlife Act 1976 (as amended)
- Inland Fisheries Acts 1959 to 2017, hereafter referred to as the Fisheries Acts.

The European Communities Environmental Objectives (Surface Waters) Regulations 2009 (S.I. 272 of 2009) and (Amendment) Regulations 2012 and 2015 establish legally binding quality objectives for all surface waters and environmental quality standards for pollutants for the purpose of implementing provisions of EU legislation on protection of surface waters. These regulations clarify the role of public authorities in the protection of surface waters and also concern the protection of designated habitats.

Relevant guidance published by the National Roads Authority (NRA), and applicable to assessing watercourses in Ireland were followed, including '*Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes*' (NRA, 2008a). Inland Fisheries Ireland (IFI) (2016) '*Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters*', the '*Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes*' (NRA, 2008b) '*Control of water pollution from construction sites - Guidance for consultants and contractors*' (Masters-Williams *et al.* 2001) and '*Control of water pollution from linear construction projects*' (Murnane *et al.* 2006) were also all consulted.

## 1.2 CONSULTATION AND LICENCE APPLICATION

Consultation with various state agencies and environmental Non-Governmental Organisations (NGO's) was undertaken to inform the Environmental Impact Assessment (EIA). All project consultations are detailed in Chapter 1 (Introduction). Consultees were informed of updates to the proposed project proposed project as it developed.

TOBIN obtained a Section 14 Authorisation on the 18<sup>th</sup> of April 2024, under the Fisheries Consolidation Act 1959, as substituted by section 4 of the Fisheries (Amendment) Act 1952, to conduct an electrofishing assessment of the WFD waterbody Little Brosna\_040 River (WFD waterbody code: IE\_SH\_25L020700) and selected aforementioned tributaries in Shinrone, County Offaly.

## 1.3 STATEMENT OF AUTHORITY

Sinead O'Reilly (M.Res.) is a Senior Ecologist with TOBIN. Sinead holds an honours degree in Zoology from University College Dublin and a Research master's in science in Freshwater Ecology from the University of Glasgow. Ms. O' Reilly has over 15 years of professional experience in scientific research in freshwater ecology and environmental consultancy specialising in fisheries. Sinead has a strong technical background as a freshwater ecologist and has extensive field survey experience in all freshwater and terrestrial habitats across Ireland. Sinead has prepared and delivered annual fisheries research and technical reports, fisheries research papers, Appropriate Assessment (AA) screenings, Natura Impact Statements (NIS), invasive species reports, mammal survey reports and other ecological reports.



## 2. METHODOLOGY

### 2.1 DESKTOP REVIEW

An ecological desktop review was carried out to collate information on aquatic species and to identify features of aquatic ecological importance within the study area (refer to Section 2.2.1 and 2.2.2) of the proposed project. This information was obtained by accessing the available online data of the National Parks and Wildlife Service (NPWS)<sup>1</sup>, IFI<sup>2</sup> and the database of the National Biodiversity Data Centre (NBDC)<sup>3</sup>. The document '*Quantification of the Freshwater Salmon Habitat Asset in Ireland*' by McGinnity *et al.* (2003) was also reviewed to classify salmonid habitats in the study area.

Characteristics of river sites were confirmed on Ordnance Survey (OS) maps prior to each survey. Existing data on the presence and distribution of white-clawed crayfish (*Austropotamobius pallipes*) was consulted on the NBDC mapping portal when selecting survey sites. A search of the NBDC database was carried out for freshwater species protected under the EU Habitats Directive and for invasive non-native species (INNS) listed under the Third Schedule of S.I No. 477/2011 - European Communities (Birds and Natural Habitats) Regulations 2011. Protected species included white-clawed crayfish, Atlantic salmon (*Salmo salar*) and lamprey sp., (*Lampetra sp*), as well as invasive aquatic species within the 10km grid square, S09 within which the proposed project proposed wind farm site is situated.

### 2.2 AQUATIC FIELD STUDY

The objective of the aquatic surveys was to provide the baseline conditions of the existing freshwater ecology and potential fisheries value of the riverine watercourses, specifically in terms of their importance for species of conservation importance, such as Atlantic Salmon lamprey species, white-clawed crayfish and otter (*Lutra lutra*).

Survey effort focused on both instream and riparian habitats at each aquatic sampling location. This approach informed the overall aquatic ecological evaluation of each site in the context of the proposed project and ensured that any habitats and species of high conservation value would be detected to best inform mitigation measures.

The aquatic field surveys comprised of an evaluation of the aquatic habitats, a biotic assessment using aquatic macroinvertebrates (Q-sampling), fisheries assessment (fisheries habitat appraisal, salmonid nursery and spawning habitat), INNS presence and electrofishing for the presence/absence of protected species.

Field surveys were carried out by TOBIN ecologists during base flow conditions, where the flow of water within the stream or river has not increased from the contribution of direct runoff from rainfall. Aquatic field surveys were undertaken between the 2<sup>nd</sup> and 3<sup>rd</sup> of August 2022 and 26<sup>th</sup> and 30<sup>th</sup> of June 2023. Electrofishing surveys were carried out by TOBIN ecologists between the 8<sup>th</sup> and 10<sup>th</sup> of July 2024. Environmental DNA (eDNA) sampling for Alpine newt was carried out on 27<sup>th</sup> of August 2024 – See appendix D.

<sup>1</sup> <https://www.npws.ie/maps-and-data> [Accessed February 2026]

<sup>2</sup> <https://www.fisheriesireland.ie/> [Accessed February 2026]

<sup>3</sup> <http://www.biodiversityireland.ie/> [Accessed February 2026]



## 2.2.1 Watercourse Survey Site Selection

Representative survey locations on watercourses within the study area were selected for surveying using expert judgement and consideration of the proposed project proposed project preliminary site layout.

- Sites within the proposed project – field survey sites along watercourses within the proposed works areas, including installation sites for turbines and road crossings, were, where feasible, selected. These sites were selected based on the proposed wind farm preliminary site layout.
- Sites downstream of the proposed wind farm – the morphology, gradient, size and flow type in terms of the potential downstream export of pollution and sedimentation through mixing zones, were considered during the selection of sites downstream of the proposed project. While survey sites downgradient of the proposed project may be influenced by external factors not related to the proposed project, downstream biota are nonetheless receptors for the proposed project. and acquisition of baseline information at these locations is considered relevant to provide a complete understanding of the receiving environment and aquatic sensitivities.
- Sites upstream of the proposed wind farm – representative control sites not impacted by the proposed project were also selected (i.e. typically sites located immediately upstream of the proposed project). These control sites represent watercourses of similar morphology, gradient, size, and flow type as located within or downstream of the proposed project.

Sites were also selected based on safe accessibility, previous Q-Value status from Environmental Protection Agency (EPA) surveys, stream order, and providing a good representation of the overall aquatic ecology throughout the study area.

A baseline aquatic ecological assessment was carried out within the WFD LittleBrosna\_SC\_020 subcatchment (25B\_7), on the Little Brosna\_040 River and selected tributaries of the Little Brosna\_040 within and downstream of the proposed project, including control sites not hydrologically connected to the proposed project. These streams were all located on the northwestern side of the proposed project within proximity to the proposed turbine locations. A total of 12 field survey sites were selected within the study area, on known watercourses mapped by the EPA/Ordnance Survey Ireland (OSI). All aquatic survey sites were accessed using public roadways, forest tracks and across lands where permitted. A list of survey types and location of sites is provided in Table 2-1. A map of the entire study area and the survey locations within the study area is shown on Figure 2-1. Photographs of each site (1-12) are provided in Appendix E.

## 2.2.2 Description of Watercourses in the Study Area

The study area was defined as surface waters potentially affected by the proposed project, including watercourses within the proposed wind farm site and those downstream. There was no fixed distance applied for the study area downstream, as site specific conditions determine the potential for pollution generation, downstream transport, and any consequential effects.

The study area is located within the Water Framework Directive (WFD) catchments/ Hydrometric Area 25B within the Lower Shannon catchment and LittleBrosna\_SC\_020



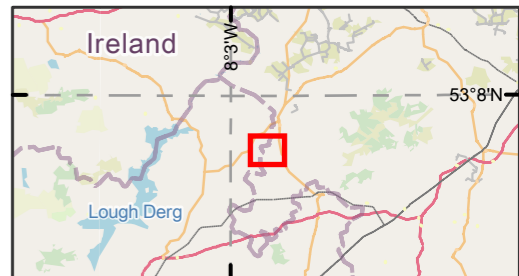
subcatchment. The study area includes one watercourse, the Little Brosna\_040 River located within both the proposed project site and adjacent or downstream of the site. The water features in the study area are illustrated in Figure 2-1.

The Little Brosna\_040\_040, comprises of tributaries that rise in the southern and western part of Shinrone, Co. Offaly. The Little Brosna\_040 flows north westerly into the Incherky\_010 before entering the Shannon (Lower)\_030 River, approximately 22km from the site boundary.

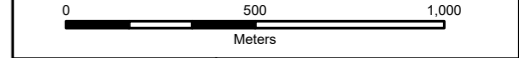
The Little Brosna\_040 River has a low gradual sloping gradient with a slow to moderate flow rate and represent natural watercourses typical of depositing/lowland rivers (FW2) (Fossitt 2000). This watercourse across the study area ranges from 2<sup>nd</sup> order streams to 3<sup>rd</sup> order rivers. The watercourses are generally moderate flowing with some sections completely stagnant due to drainage activities. All of these waterbodies are of gradual sloping gradient and represent an actively depositing, with stable and undercut banks, where there is deposition of fine sediment.

The upper catchment of the LittleBrosna\_040 river drains an elevated area of peat, much of which has been planted with commercial coniferous forestry. The waterbodies surrounding the proposed project show evidence of historic modification. Drainage associated with afforestation and commercial forestry in the catchment and directly within the study area may be affecting the flow regime of the watercourse, as there is evidence of heavily modified streams and drainage ditches directly connected to the main Brosna River.





- Legend**
- Wind Farm Site Boundary
  - Proposed Turbine locations
  - Proposed Grid Connection Route
  - Aquatics Survey Locations**
  - ▲ eDNA - eDNA sample
  - ▲ EF | eDNA | HA - Electrofishing, eDNA sample, Riverine Habitat Assessment
  - ▲ EF | HA - Electrofishing, Riverine Habitat Assessment
  - ▲ HA - Riverine Habitat Assessment
  - ▲ KS | EF | HA - Kick sample, Electrofishing, Riverine Habitat Assessment
  - ▲ KS | HA - Kick sample, Riverine Habitat Assessment
  - ▲ KS | HA | eDNA - Kick sample, Riverine Habitat Assessment



**Spatial Reference**  
 Datum: IRENET95  
 EPSG: 2157

**Copyrights:**  
 Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community,

Rev	Date	Description	By	Chkd.
A	28/11/2025	First issue	S.P	J.D

Client:

Project: **Ballincor Wind Farm**

Title: **Figure 2-1:  
 Aquatic Survey Locations  
 within the proposed wind farm site**

Scale @ A3: 1:20,000

Prepared by: S.Pezzetta      Checked by: J.Dillon      Date: November 2025

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Map Ref: 11333-021-Aq.Hab-TBD-TOB-A      Draft: **A**

53°13'0"N

7°55'0"W

606000

Table 2-1 Aquatic Ecological Survey Site Locations on Watercourses Within the Study Area of the proposed project

Site Number	Survey type: Kick Sampling (KS) Electrofishing (EF) Habitat Assessment (HA) eDNA	WFD River Sub-Catchment	WFD River Waterbody Code	EPA Name	EPA Code	EPA Segment Code	ITM (X)	ITM (Y)
Site 1	KS   EF   HA	LittleBrosna_SC_020	LittleBrosna_040	Little Brosna	25L02	25_13147	605615	696505
Site 2	HA			Little Brosna	25L02	25_13147	605154	697074
Site 3	KS   HA   eDNA			Wingfield 25	25W41	25_1084	602878	698284
Site 4	EF   HA			Wingfield 25	25W41	25_1084	602646	698687
Site 5	HA			Wingfield 25	25W41	25_1084	602706	699253
Site 6	EF   HA   eDNA			Holy Well Clohaskin	25H28	25_3276	603113	699520
Site 7	EF   HA   eDNA			Holy Well Clohaskin	25H28	25_3276	603430	699426
Site 8	EF   eDNA   HA			Pallas 25	25P26	25_3692	603798	699367
Site 9	EF   HA			Kylenamuck	25I33	25_739	603583	700075
Site 10	KS   HA			Little Brosna	25L02	25_13147	604077	699284
Site 11	KS   HA			Pallas Kylenamuck	25P56	25_634	604060	700092
Site 12	eDNA			N/A	N/A	N/A	603129	699260



### 2.2.3 Riverine Habitat Assessment

The aquatic ecological assessment included a habitat assessment of the receiving watercourses within the study area. The habitat assessment of the watercourses followed methodologies outlined in the Environment Agency's '*River Habitat Survey in Britain and Ireland Field Survey Guidance Manual*' (EA, 2003) and the Irish Heritage Council's '*A Guide to Habitats in Ireland*' (Fossitt, 2000).

Aquatic surveys were conducted along the selected sites and consisted of kick sampling for invertebrates to assess water quality.

All watercourse survey locations were assessed in terms of physical habitat variables:

- Stream width and depth, bank height and width and other physical characteristics including associated evidence of historical drainage;
- Substrate type, listing substrate fractions in order of dominance, i.e. bedrock, boulder, cobble, gravel, sand, silt etc;
- Flow type and rate, listing percentage of riffle, glide and pool in the sampling area;
- In-stream macrophyte and bryophytes occurring and their percentage coverage at the sampling sites; and
- Riparian vegetation composition on banksides and percentage of overhead shade.

Each sampling site along the watercourse was described in terms of the important aquatic habitats and species recorded (i.e. based on their conservation value). This determined the ecological evaluation of each aquatic survey site and informed site-specific mitigation for the proposed project.

Watercourses were photographed at survey site locations throughout the study area (refer to Appendix E). Anthropogenic and livestock influences on fluvial and riparian habitats were also noted along the surveyed stretches.

### 2.2.4 General Fisheries Assessment

A fisheries assessment was carried out at each watercourse utilising elements of the approaches in the Fishery Assessment Methodology (O'Grady, 2006) and '*Ecology of the Atlantic Salmon*' (Hendry & Cragg-Hine, 2003) to broadly characterise the river sites (i.e. channel profiles, substrata etc.).

A broad appraisal/overview of the upstream and downstream habitat at each site was undertaken to evaluate the wider contribution to salmonid and lamprey spawning, to assess if the watercourse could support salmonids and to assess the general fisheries habitat.

An assessment was made on the suitability of the habitat to support aquatic species of conservation concern (e.g. white-clawed crayfish, river lamprey [*Lampetra fluviatilis*], brook lamprey [*Lampetra planeri*], Atlantic salmon and freshwater pearl mussel [*Margaritifera margaritifera*]).

The identification of the overall habitat diversity provided by natural features in the channel and river corridor was assessed. The presence of features such as point, side and mid-channel bars, eroding riverbanks, large woody debris, waterfalls, backwaters and floodplain wetlands were



noted if present. Additionally, channel substrata, flow-types, in-channel vegetation, and also the distribution of bank-side trees and hedgerows and the extent of near-natural land-use adjacent to the river were accessed. It was also noted if there was evidence of artificial modification to the river channel morphology. This information provided a broad assessment of the naturalness of the channel and its ability to support these species.

An evaluation of potential lamprey habitats within the study area was made with reference to methodologies outlined in '*Ecology of the River, Brook, and Sea Lamprey*' (Maitland, 2003) and also NPWS Irish Wildlife Manuals lamprey surveys (O'Connor, 2007). A visual assessment was carried out on the habitat suitability for lamprey such as slower flowing water, nursery areas of sandy silt beds, an assessment on potential barriers on migration route, potential spawning areas, suitable hiding places and clean spawning gravels over stretches of running water. Juvenile lamprey habitat was identified from the descriptions given in Maitland (2003). Substrate depth and composition was examined for potential ammocoete habitat, especially focusing on the composition of mud, silt, or silt and sand and its suitability for ammocoetes. Areas where suitable spawning gravels may occur, were searched, especially at tails of pools where the gravels have been deposited from upstream and the scouring of pools were examined for potential spawning habitats for adults.

## 2.2.5 Macrophytes

Aquatic plants as well as rare and/or protected plant species and non-native flora were identified and recorded at each site where present. Plant species nomenclature followed '*New Flora of the British Isles*' (Stace, 2019). An assessment of the aquatic vegetation community to identify any rare macrophyte species (Flora Protection Order [2022] and Wyse-Jackson *et al.*, 2016) or habitats corresponding to the Annex I habitats, e.g., 'Water courses of plain to montane levels, with submerged or floating vegetation of the *Ranunculion fluitantis* and *Callitriche-Batrachion* (low water level during summer) or aquatic mosses [3260]' (more commonly referred to as 'floating river vegetation').

## 2.2.6 Biological Water Quality Sampling

The biological water quality establishment provides baseline readings against which future water quality targets can be gauged. These values should not deteriorate as a result of the proposed project. According to the WFD (2000/60/EC) target 'Good' status (i.e. Q4) is required in all Irish rivers. The water quality within each site was obtained from Q-values obtained at each accessible site from kick sampling as part of additional aquatic surveys in relation to the proposed project.

### 2.2.6.1 Kick Sampling

Semi-quantitative sampling of benthic (or bottom dwelling) macroinvertebrates was undertaken at four sites using standard EPA kick-sampling methods (Toner *et al.*, 2005) – See Figure 2-1. Due to the size and depth of this section of river or excessive vegetation, instream kick sample was not feasible at a number of locations. A two-minute kick-sample was collected from the riverbed from the faster flowing riffle habitats where possible. A standard 500µm mesh D-shaped kick net was submerged on the riverbed with the mouth of the net directed upstream. The substrate just upstream of the net was disturbed (with the foot, in a kicking motion) in order



to dislodge invertebrates into the net. The surveyor moved in a diagonal direction upstream to ensure that different micro-habitats in the waterbody, such as fast-moving riffles, glides and pools were included in the sample during the two minutes.

A further one-minute hand search was carried out to locate macroinvertebrates that may have remained attached to the underside of the cobbles (Toner *et al.*, 2005). This sampling approach is sufficient to achieve a suitable representation of taxa for bioassessment. Occasionally, when the substratum (e.g. bedrock) or flow conditions made kick-sampling difficult, or the abundance of macroinvertebrates collected was extremely low, it was necessary to spend a longer amount of time sampling the river to accumulate a sufficient diversity and abundance of macroinvertebrates. This sampling approach requires avoidance of obvious localized disturbance (e.g. cattle access points) which may adversely influence the sample taken. Stone washings were also undertaken to ensure a representative sample of the fauna present at each site was collected. Large cobbles collected within the net from the riverbed were gently wash inside the net to remove anything macroinvertebrates attached. Once a live sample was collected, the macroinvertebrate assemblages of each sample were placed in a white tray and identified and counted on the riverbank. Once all taxa and their relative abundance were recorded, the sample was returned to the river.

#### **2.2.6.2 Biotic Indices**

The Biological River Quality Classification System Quality Rating (Q) System (Toner *et al.*, 2005) was used to obtain a water quality rating and risk status for each site.

The Biotic Index is a quality measurement for freshwater bodies. 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 macroinvertebrate data were used to derive a Biotic Index value Q-value to the sampled streams using the EPA methodology (McGarrigle *et al.*, 2002) and assigned to WFD status classes. This involved recording the taxa present at a suitable and attainable taxonomic resolution and their categorical relative abundance determined using approximate counts. This Q-value system is a five point scale (Q1-Q5: with intermediate scores obtainable, e.g. Q3-4) based on the proportions of five groups of macroinvertebrates, with different pollution tolerances with Q1 being of poorest quality and Q5 being pristine/unpolluted (see Appendix B). The system facilitates rapid and effective assessment of the water quality of rivers and streams. Each site was assigned a biological status on a scale of High-Good-Moderate-Poor-Bad.

### **2.2.7 Fish Stock Assessment**

#### **2.2.7.1 Methodology**

A single anode Smith-Root LR24 backpack (12V DC input; 300V, 100W DC output) and electrofishing dip nets were used to electrofish sites on watercourses in the vicinity of the proposed project. Electrofishing was conducted under licence following a Section 14 application to the Department of the Environment, Climate and Communications (DECC) to conduct the surveys. Ten-minute electrofishing surveys were carried out following the methodology set out by Beaumont (2016) and Matson *et al.*, (2018). The electrofishing methodology and technique also complied with the European Committee for Standardisation (CEN) guidelines for fish stock



assessment in wadable rivers (CEN, 2003) and Section 14 licensing requirements. Water temperature and conductivity were measured at each site and habitat characteristics were recorded, including sediment type, water depth, flow type, shading, channel modification etc.

For salmonids, electro-fishing was conducted in an upstream direction at each site for a standard ten-minute fishing (Matson *et al.*, 2018) Catch Per Unit Effort (CPUE). Approximately 50-75m of channel was surveyed at each site, where feasible. Lamprey species were specifically targeted in areas of low/reduced flow and with a higher proportion of soft sediment.

### **2.2.7.2 Electrofishing Settings**

Two separate electrofishing methodologies were employed, incorporating different settings based on target species i.e. lamprey and salmonids, during the electro-fishing surveys.

The threshold values for different fish responses to electric current differ based on the level of water conductivity in the water and the resistance to the passage of an electric current through it (Zalewski and Cowx, 1990). Conductivity ( $\mu\text{s}$ ) was therefore measured on-site with a conductivity meter prior to any electro-fishing activity. The appropriate voltage and frequency settings were applied based on conductivity readings.

In order to minimise potential damage and undue stress, electrofishing settings were modified to target specific species at the site.

For salmonids, a voltage of approximately 200-220V, frequency of 40-45Hz and pulse duration of ten minutes was used to draw fish to the anode without causing physical damage.

Electrofishing for lamprey sp., ammocoetes was conducted within a defined area ( $1\text{m}^2$ ) as per Harvey & Cowx (2003), where sand/silt were encountered. As lamprey take longer to emerge from silt, a low frequency (20-30Hz) setting was used within soft sediment areas. Settings for lamprey followed those recommended and used by Harvey & Cowx (2003), APEM (2004) and Niven & McAuley (2013).

The anode was placed under the water surface, approximately 10–15cm above the sediment, to prevent immobilising lamprey ammocoetes within the sediment. The anode was energised with 100V of pulsed DC for 15-20 seconds and then turned off for approximately five seconds to allow ammocoetes to emerge from their burrows. The anode was switched on and off in this way for approximately two minutes. Immobilised ammocoetes were collected by a second operator using a fine mesh hand net as they emerged.

### **2.2.7.3 Fish Handling and Processing**

Once immobilised, salmonids, lamprey sp., and other captured fish species were transferred to a holding container with oxygenated water following capture. To reduce stress on the captured fish and aid processing and recovery times, anaesthesia (clove oil) was applied. All fish were speciated and measured to the nearest centimetre (standard length [SL] for eel and lamprey; fork length [FL] for all other species).

Any fish captured during biological sampling were identified and recorded with reference to the Freshwater Biological Association's publication '*Key to British Freshwater Fish with notes on their ecology and distribution*' (Maitland, 2004) and other referenced sources.



Lamprey ammocoetes were identified as lamprey sp., as they could not be differentiated onsite by eye. Fish were then placed into a freshly oxygenated bucket of water to recover and allowed sufficient time to recover before being returned to the river. Any fish that struggled to recover, were given additional time to do so until they were able to swim. Lamprey were returned to the silt habitat they were removed from. Handling of live fish was kept to a minimum when processing any captured individuals.

Fish are only humanely euthanised if showing no sign of recovery. This is carried out with blunt force to the top of the head.

### 2.2.8 Protected Aquatic Species Survey

White-clawed Crayfish habitat and presence was assessed at each survey site. An assessment of the habitat to support White-clawed Crayfish was undertaken following methodologies outlined in '*Guidance on Habitat for White-clawed Crayfish*' (Peay, 2002). This include and visual and hand search for suitable refuge such as boulders, crevices, burrows in the bank, the presence of a partial, or even a complete barrier, food source including leaf litter, instream macrophytes, aquatic invertebrates and fish and good water quality absent of pollution.

A broad appraisal / overview of the upstream and downstream habitat at each aquatic survey site was undertaken to evaluate the wider contribution to FWPM and the potential for this species to be present within the proposed project. An assessment of habitat to support FWPM was undertaken following methodologies outlined '*Monitoring Populations of the Freshwater Pearl Mussel *Margaritifera margaritifera* Stage 3 and Stage 4 Survey*' (Moorkens & Killeen, 2020) and '*Guidance standard on monitoring Freshwater Pearl Mussel (*Margaritifera margaritifera*) populations and their environment*' (National Standards Authority of Ireland, 2017). This included a visual assessment of 1m<sup>2</sup> areas with each site on the habitat condition of the river including river substratum: physical substrate parameters (assessment of the substrate surface composition), aquatic plants cover (presence of excessive filamentous algae and presence/absence of macrophytes) and coarse decomposing organic matter.

Otter surveys were undertaken along accessible waterbodies (which included rivers and drainage ditches) within the proposed wind farm site plus a 150m buffer of the site (including upstream and downstream of waterbodies), to account for noise disturbance impacts, following methodologies outlined within the NRA (2008c) guidelines and Chanin (2003) '*Monitoring the Otter *Lutra Lutra**'. The survey comprised examining all visual evidence of otter habitation or use, within suitable areas. Any evidence of otter such as tracks, spraints, couches, slides, feeding remains or holts, were recorded.

### 2.2.9 Alpine Newt eDNA Sampling

Environmental DNA sampling was carried out at five of these 11 sites with an additional site (Site 12) selected at a drainage ditch within the study area.

An aquatic eDNA sampling survey was carried out at five sites within and upstream of the proposed project to detect the presence of the non-native species Alpine newt (*Ichthyosaura alpestris*) which was originally recorded in 2022 during a TOBIN ecological survey of Ballincor bog. The surveyed site lies within one of two known areas for this species to occur in Ireland according to the NBDC<sup>3</sup>.



Approximately 20 water samples were collected using single-use nitrile gloves, plastic sample bag and a 30ml ladle supplied in the eDNA kit. After collecting the complete water sample (min. 600ml) in the sample bag, the sample bag was agitated to mix the sample. After mixing, 500ml was filtered using a 50ml syringe and filter element. If a lesser amount of water was filtered, due to water with high particulate matter which can block the filter, this was noted on the eDNA form and the lab analysis was adjusted accordingly.

The samples were taken mostly from stagnant, deep bog drains and were therefore obtained from the bank side at a representative number of accessible locations. One eDNA sample (site 6) was taken against the flow of the river in a diagonal pattern ensuring no disturbed sediment and organic matter was collected in the sample. Each sample was taken from the middle of the water column (where possible) and at least 10cm below surface water level. All samples were labelled and sent to a laboratory for analysis where twelve replicates of each sample were tested for Alpine newt eDNA. The number of replicates that show a positive result may indicate a lower or higher amount of eDNA presence in the water body. However, even a score as low as 1/12 is a positive result indicating species present. A negative result, where eDNA was not detected or may be present below the threshold detection level, should be considered as evidence of species absence. A negative result does not exclude the potential for species presence below the limit of detection.

The Alpine newt is a known carrier of the chytrid fungus *Batrachochytrium dendrobatidis* (chytridiomycosis) which can be a threat to native amphibians as it can affect their skeleton and skin<sup>4</sup>. To mitigate the potential spread, no access was gained to waterbodies, except for Site 6, and the sample sites were visited in an upstream to downstream order (3, 6, 7, 8, 12). Before leaving the site, all sample materials and waters were treated and disinfected with Virkon Aquatic (see Section 2.2.10).

### 2.2.10 Biosecurity

A biosecurity protocol, recommended by IFI, was also adhered to during the surveys. All equipment and Personal Protection Equipment (PPE) was disinfected with Virkon® prior to and post-survey completion, and best practice precautions were employed to prevent the potential spread of INNS and water-borne pathogens between sites, according to standard IFI biosecurity protocols (IFI 2010).

### 2.2.11 Survey Limitations

Conditions on site meant that some areas were difficult to access. Due to the topography of the site, high density of bog land and deep drainage ditches, there was limited access to drains with the proposed wind farm site boundary however the potential fisheries value is low. Due to the deep water of the main Little Brosna\_040 channel, electrofishing surveys could not be carried out on this main channel with the exception of Site 1. All locations were assessed in terms of fisheries potential as detailed in section 3.2 of this report.

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<sup>4</sup> [https://www.nonnativespecies.org/assets/Uploads/ID\\_Mesotriton\\_alpestris\\_Alpine\\_newt-v2.pdf](https://www.nonnativespecies.org/assets/Uploads/ID_Mesotriton_alpestris_Alpine_newt-v2.pdf)



### 3. RESULTS

This section provides the results of the baseline aquatic surveys within the study area for the proposed project.

#### 3.1 DESKTOP REVIEW

##### 3.1.1 Invasive Aquatic Species

Results from the NBDC show records of Third Schedule aquatic plant species within the S09 grid square., namely that of Canadian Waterweed (*Elodea canadensis*) which was recorded on occasion in 2008 from the River Biologists' Database (EPA).

The aquatic mollusc Jenkins' spire snail (*Potamopyrgus antipodarum*) has ten records in 2017 from the national macroinvertebrate dataset collected for the biomonitoring of Ireland's river network, 2007–2018 (EPA) database. These species are listed as Medium Impact Invasive species.

The bank vole (*Myodes glareolus*) has five records in 2013 from the Atlas of Mammals in Ireland 2010-2015. There is also one record of American mink (*Mustela vison*) in 2017 from the Mammals of Ireland 2016-2025 database.

The Alpine newt (*Ichthyosaura alpestris*) has recently been recorded within the grid square with 11 records in 2023 from the National Invasive Species Database.

##### 3.1.2 Fisheries

IFI assessed the status of fish stocks in the Little Brosna\_040 as part of a catchment-wide survey of the Little Brosna catchment in August 2021<sup>5</sup> undertaken in 2021. A total of seven species were recorded at 35 sites. These were salmon, brown trout, minnow (*Phoxinus phoxinus*), European eel (*Anguilla anguilla*), lamprey sp., three-spined stickleback (*Gasterosteus aculeatus*) and stone loach (*Barbatula barbatula*). Brown trout were the most common and abundant species throughout the catchment with low number of salmon. A fish ecological status of 'Moderate' was assigned to the Little Brosna\_040 based on the stock assessment results.

A review of the current barrier atlas map of Europe<sup>6</sup> and IFI National Barriers Dataset<sup>7</sup> was undertaken across the study site. There is no evidence of barriers located within the study site.

##### 3.1.3 Protected Aquatic Species

A comprehensive desktop review of available data (NPWS, NBDC, BSBI and other data) within the 10km grid square containing and adjoining the proposed project (S09) was carried out and identified records for a low number of rare and or protected aquatic species within the vicinity of the proposed project. The results of the available data are summarised hereunder.

<sup>5</sup> [https://www.fisheriesireland.ie/sites/default/files/2023-03/little-brosna\\_2021.pdf](https://www.fisheriesireland.ie/sites/default/files/2023-03/little-brosna_2021.pdf) [Accessed February 2026]

<sup>6</sup> <https://amber.international/european-barrier-atlas/> [Accessed June 2023, July 2024 & February 2026]

<sup>7</sup> <https://opendata-ifigeo.hub.arcgis.com/datasets/ifigeo::national-barriers-programme-dataset/explore?filters=eyJCYXJyaWVvYlJpblllcyIsIlVua25vd24iLCJZZXM0UmV0dXJuVG9Bc3Nlc3MpliwiFlIcyhSZXR1cm5Ub0Fzc2VzcykiXX0%3D&location=53.995716%2C-7.343604%2C11.82> [Accessed June 2023, July 2024 & February 2026]



### 3.1.3.1 White Clawed Crayfish

Current records from the NBDC database<sup>8</sup> show two records of white-clawed crayfish present within the Little Brosna\_040 watercourse in 2021, approximately 4km downstream of the study area. Additionally, records from Article 17 spatial data (NPWS) were also reviewed and show their presence within the catchment.

### 3.1.3.2 Freshwater Pearl Mussel

Neither the Little Brosna\_040 River nor the Little Brosna\_SC\_020 subcatchment have previous records of freshwater pearl mussel (FWPM). The study area is not located within a *Margaritifera* Sensitive Area. Records from Article 17 spatial data (NPWS) were also reviewed and show their complete absence within the catchment.

### 3.1.3.3 Otter

The NBDC recorded otter on one occasion in 2010 from Atlas of Mammals in Ireland 2010-2015 dataset approximately 4km south of the proposed project.

## 3.1.4 Existing Water Quality Records

### 3.1.4.1 EPA Water Quality Data

The EPA carries out biological monitoring at various locations on the watercourses draining the proposed project. A search of the EPA online maps<sup>9</sup> and the EPA Catchments database<sup>10</sup> was conducted for the Little Brosna\_SC\_040 waterbody and its water quality. There are six WFD monitoring stations located on the Little Brosna\_040 River. One monitoring station is located along the Little Brosna\_040 within close proximity to the proposed project. The monitoring station, Sharavogue Br (SW of S. Ho) (d/s on RHS) (station code: RS25L020600) is located on the southern boundary of the proposed project.

The most recent EPA biological water quality results at this station show the Little Brosna\_040 achieved a Q4 'Good' status in 2023, which indicates it is meeting the requirements of the WFD (2000/60/EEC). Overall, the EPA noted that of the six stations surveyed in the Little Brosna\_040, only two were in satisfactory condition in August 2023. Poor ecological conditions continue with a high percentage of filamentous green algae covering the substrate. The paucity of pollution sensitive macroinvertebrate taxa and dominance of pollution tolerant taxa indicated a decline from 'Good' to 'Moderate' and 'Moderate' to 'Poor' ecological conditions along the Little Brosna\_040.

## 3.2 AQUATIC FIELD SURVEY RESULTS

This section provides a description of the aquatic habitats, INNS, physical characteristics, overall fisheries habitats, fish species, white-clawed crayfish, macroinvertebrates and macrophyte communities recorded in the study area at the 11 survey sites examined (Section 3.2.1 to 3.2.8). Biological water quality (Q-sample), eDNA and electrofishing results are presented in Table 3-3 and Table 3-4. The results of the general physical habitat assessment are

<sup>8</sup> <https://maps.biodiversityireland.ie/Map/Terrestrial/Species/17487> [Accessed February 2026]

<sup>9</sup> <https://gis.epa.ie/EPAMaps/> [Accessed February 2026]

<sup>10</sup> <https://www.catchments.ie/> [Accessed February 2026].



presented in Appendix B. This gives the physical characteristics of the aquatic sites and the substrate composition at each site. Please refer to Appendix C for the full fisheries capture data from electrofishing.

### 3.2.1 Aquatic Invasive Plant Species

There were two invasive aquatic macrophytes recorded at sampling site 6, Canadian pondweed (*Elodea canadensis*) and parrot's feather (*Myriophyllum aquaticum*). No invasive aquatic fauna species were recorded at any of the sampling sites.

### 3.2.2 Fisheries Habitats

Due to the low elevation of the proposed wind farm site and its location in the environs of the catchments' watershed, the watercourses within the proposed project are no larger than 3<sup>rd</sup> order rivers and are categorised as depositing/lowland rivers (FW2) (Fossitt, 2000). Sections of the natural watercourses draining the proposed project are typically low-medium gradient channels over unbedded lime-mudstone dark limestone and shale (calp) bedrock. The watercourses are stable and actively depositing with a large amount of deposition of fine sediment.

The channels have been modified as part of drainage to divert water from the surrounding bogs and land. The natural physical and ecological features of the river corridor have been removed in areas resulting in an imbalance in the natural hydromorphology of the river, thus affecting the flow regime of the watercourses in the study area.

### 3.2.3 Riverine Assessment

#### 3.2.3.1 Site 1

Site 1 was located on the EPA river Little Brosna (EPA code 25L02) directly upstream of the R492 bridge. This depositing/lowland river (FW2) had been historically deepened and was heavily sedimented, except for a small area under and upstream of the bridge where it has maintained its natural flow and meander.

The site was bordered by improved agricultural grassland (GA1) on the right-hand bank and a conifer plantation (WD4) on the left-hand bank.

The channel was U-shaped and had an average width of 11.5m, a wetted width of 9m, and an estimated average depth of 0.8m. The bank height was variable between 1.0m and 1.5m on both sides. It was of moderate flow over a gradual gradient (refer to Appendix E for survey photos). Given the gentle gradient of this river, its profile was glide dominant with a few deep pools present.

A visual assessment was made on the substrate at the shallower section of the river. The substrata were dominated by boulder (25%) and cobble (20%) with smaller quantities of coarse, medium and fine gravel (20% combined), sand (10%) and marginal areas of mud/silt (25%).

Riparian species included willow (*Salix* sp.), hazel (*Corylus avellana*), elder (*Sambucus nigra*), ivy (*Hedera hibernica*), hawthorn (*Crataegus monogyna*), bramble (*Rubus fruticosus* agg.), ash (*Fraxinus excelsior*), thistle (*Cirsium*), nettle (*Urtica dioica*), canary grass (*Phalaris arundinacea*),



broadleaved dock (*Rumex obtusifolius*), blackthorn (*Prunus spinosa*) and meadowsweet (*Filipendula ulmaria*).

Macrophytes included water mint (*Mentha aquatica*), ivy-leaved duckweed (*Lemna trisulca*), branched bur-reed (*Sparganium erectum*) water crow foot (*Ranunculus aquatilis*) and the moss *Fontinalis antipyretica* was also recorded. Aquatic liverworts, *Ricardia* sp. and *Pellia* sp., were recorded on the riverbed. There was a large presence of filamentous algae present within the watercourse indicating a sign of nutrient enrichment likely resulting from the adjacent conifer plantation.

Site 1 was determined to be of moderate value for salmonids due to the pressures on water quality, including siltation, which reduced the value of spawning and nursery habitat. The overall depth of the river provided good holding habitat for migratory adults in the pool and glide areas.

As the watercourse could not be accessed, the sediment could not be sampled for lamprey, however there is potential for lamprey to be present within the areas of sediment which were visually recorded. The sparse coarse sand and silt deposits behind boulders and along the margins provided moderate habitat potential for lamprey ammocoetes.

The site was of good value for European eel, with frequent refugia present. The larger boulders in the run-habitat had some potential for white-clawed crayfish; however, no crayfish were recorded during a refuge search and sweep netting.

Kingfisher (*Alcedo atthis*) was observed flying along the Little Brosna river. This section of river holds good feeding and resting habitat for kingfisher just north of the R492 bridge. A cormorant (*Phalacrocorax carbo*) was also recorded swimming in the river. No otter signs were recorded in the vicinity of the survey site 1 however there is foraging and resting habitat present.

### 3.2.3.2 Site 2

Site 2 (depositing/lowland river [FW2]) was located 4.2km downstream of Site 1 on the same watercourse (EPA river Little Brosna [EPA code 25L02]). The channel is in its natural form and meandering in nature. The surrounding lands were improved agricultural land (GA1), wet grassland (GS4) and conifer plantation (WD4). Due to the size and depth of this section of river, an instream kick sample and substrate assessment was not possible.

The channel was U-shaped and had an average width of 10m, a wetted width of 7m, an estimated average depth of 1.5m and steep bank height of 2m on both sides. It was moderate flow of water, flowing over a gradual gradient (see Plate 4-5). Given the gentle gradient of this river, it was glide dominant (100%) with no riffle and pool present.

The riparian habitat contained species including broadleaved dock, thistle, meadow buttercup (*Ranunculus acris*), silverweed (*Potentilla anserina*) and canary grass. Instream macrophyte included branched bur reed, foals water cress (*Helosciadium nodiflorum*), ivy-leaved duckweed and pondweed (*Potamogeton* sp.).

There is a substantial amount of bank subsidence's due to cattle trampling causing heavy sedimentation within the river. There was a large presence of filamentous algae present within the watercourse indicating a sign of nutrient enrichment likely due to cattle access and the adjacent conifer plantation. As the river could not be accessed, the substrate could not be assessed for its potential to provide spawning and nursery habitat for salmonids, nor was it possible to assess its suitability to support lamprey nor its habitat suitability for crayfish.



Sections of this survey site had deep pools, which are suitable holding areas for salmonids. This section of river holds good feeding and resting habitat for kingfisher. There was no evidence of otter recorded, however there is foraging and resting habitat present.

### 3.2.3.3 Site 3

Site 3 was present on the EPA river Wingfield 25 (EPA code 25W41) and represented a small depositing/lowland watercourse (FW2) with natural meanders that flowed through an area of improved agricultural grassland (GA1) and conifer plantation (WD4).

The stream had an averaging depth of 7cm and was 3m wide with a wetted width of 1m. The bank height on both the left and right banks was 1m. The site featured 35% gravel, 20% sand and 45% mud/silt substrata. The stream had a sinuous natural form with bank undercutting on both sides. Glide habitat dominated (70%) with localised riffle (20%). There was heavy siltation also present.

Riparian species included ash, ivy, bindweed (*Calystegia sepium*), broadleaved dock, nettle, bramble, and guelder rose (*Viburnum opulus*).

No instream vegetation or filamentous algae was recorded. There was no evidence of INNS present. The river was heavily shaded due to tunnelling which resulted in heavy detritus and blockage to be present within the channel.

A scoop test was carried out to assess the presence of lamprey, however none were recorded. The site has the potential to support salmonids and lamprey with suitable spawning and nursery habitat present due to the presence of gravels and silt, however, this substrate was limited due to heavy siltation, poor water quality and heavy shading.

There was no evidence of otter or kingfisher, and the site did not have suitable habitat due to the heavy siltation, poor water quality and heavy shading.

### 3.2.3.4 Site 4

Site 4 was present on the EPA river Wingfield 25 (EPA code 25W41) and represented a small depositing/lowland watercourse (FW2) which was 3m in width and had a bank height of 0.5m and average water depth of 10cm. It was bordered by arable crops (BC1), hedgerows (WL1) and (mixed) broadleaved woodland (WD2). The river had a natural meandering profile with a riffle (40%), pool (40%) and glide (20%) sequence and slow flow. Its substrate contained 40% boulder, 30% cobble, 10% gravel 10% sand and 10% silt.

Riparian vegetation included hazel, ash, nettle, bramble and common holly (*Ilex aquifolium*) providing heavy shading across the channel. There was no instream vegetation or filamentous algae present.

This section of river provided very good spawning and nursery habitat for salmonids and holding pools for adults and juvenile fish. It also contained spawning gravels for lamprey, however there was no suitable fine sediment for lamprey ammocetes. There was no evidence of white-clawed crayfish or otter present, however it provided good foraging and refuge habitat for crayfish and resting and foraging habitat for otter.



### 3.2.3.5 Site 5

Site 5 (depositing/lowland river [FW2]) is located along the northern boundary of the proposed project on the EPA river Wingfield 25 (EPA code 25W41) between two areas of conifer plantation. The channel was modified, straightened, widened and uniformed as it passed through the plantation. In addition to the conifer plantation on the left-bank, the sites riparian vegetation contained willow, hazel, birch (*Betula pubescens*), blackthorn, bramble, willowherb (*Chamaenerion angustifolium*), soft rush (*Juncus effusus*), hogweed (*Heracleum mantegazz*), nettle, and Yorkshire fog (*Holcus lanatus*). Instream vegetation included Watermint (*Mentha aquatica*), bulrush (*Typha latifolia*), branched bur-reed, duckweed, and common reed (*Phragmites*). There was no evidence of INNS present. There was evidence of light shading present along the channel.

This survey site had an average width of 2.5m, wetted width of 1.5m and average depth of 40cm. The bank height was 1m on both sides. Water flow within the channel was stagnant and heavily blocked with instream vegetation. It did not hold any riffle, pool or glide features due to modification and enrichment. An assessment of the substrate or a kick sample was not carried out due to the dense instream vegetation. It is evident that this enrichment is a barrier to fish migration. This section of river did not present evidence of fish, crayfish, otter or kingfisher nor did this site have potential habitat for these species. Overall, this section of river is currently in poor quality.

### 3.2.3.6 Site 6

Located 450m downstream of site 5, site 6 is an unmodified section of the EPA river Holy Well Clohaskin (EPA code 25H28) with natural meandering bends and moderate flow (depositing/lowland river [FW2]). The channel was U-shaped and had an average width of 8m, a wetted width of 5.5m, an estimated average depth of 1m and a steep bank height of 2m on both sides. It was moderate flow of water, flowing over a gradual gradient (refer to Appendix E for survey photos).

The riparian habitat supported nettle, hawthorn, willow, bindweed, canary grass, willowherb and meadow sweet. There was moderate shading present (<50%). There was no evidence of INNS present.

The instream vegetation present contained duckweed, water mint, fool's watercress and branched bur-reed. There was a large quantity of filamentous algae present within the river indicating a sign of nutrient enrichment likely due to the conifer plantation.

Due to the size and depth of this section of river, an instream kick sample and substrate assessment was not possible. Given the gentle gradient of this river, it was glide dominant (100%) with no riffle or pool present.

There was no evidence of otter or kingfisher, however it does have the potential for suitable feeding, resting and commuting habitat for these species.

As the survey site could not be accessed, the substrate could not be assessed for its potential to provide spawning and nursery habitat for salmonids or to assess if there was suitable sediment present for lamprey. Sections of this site had deep pools, which provide suitable holding areas for salmonids.



### 3.2.3.7 Site 7

Site 7 (depositing/lowland river [FW2]) is located on the along an unmodified section of the EPA river Holy Well Clohaskin (EPA code 25H28), surrounded by improved agricultural grassland (GA1) and scrub (WS1). The river at the survey site was approximately 6m wide, with a bank height of 1.5m and an average depth of 95cm. It had a U-shaped channel, glide dominant, with holding pools present and an absence of riffles. The substrate consisted of boulder (10%), cobble (20%), gravel (10%) and mud/silt (60%). This section of river was heavily silted with a slow flow.

Riparian habitat contained canary grass, meadow sweet, willow and bramble providing light shading to the watercourse. The macrophytes present included duckweed and branched bur-reed.

It provided good holding habitat for salmonids but lacked any spawning or nursery habitat for young salmonids. The high volume of fine sediment along the banks of this watercourse provided good habitat for lamprey ammocetes. There was no evidence of white-clawed crayfish or otter present. It lacked suitable refuge and foraging habitat for European eel and white-clawed crayfish. The site provided good foraging and resting habitat for otter.

### 3.2.3.8 Site 8

Site 8 (depositing/lowland river [FW2]) is located located 1.50km southeast of the L1071 Loughkeen Cross Roads. This site is located along a modified section of the EPA river Pallas 25 (EPA code 25P26), where the channel has been straightened and deepened and no riffle, pool or glide present. This section of river is stagnant due to the presence of a man-made structure within the channel which provides a land crossing for cattle.

The channel was heavily vegetated with over 70% instream vegetation present containing duckweed, branched bur-reed and water horsetail (*Equisetum fluviatile*). There was also a large amount of filamentous algae present. The substrate only contained peat soil and mud (100%) and was heavily peat stained. The riparian vegetation included silverweed, canary grass and hawthorn which provided very light shading to the channel. This section of river is blocked from the main channel and does not have any fisheries or white-clawed crayfish potential. It also lacks foraging and resting habitat for otter.

### 3.2.3.9 Site 9

This site (depositing/lowland river [FW2]) is located 950m southeast of the L1071 local road at the headwater of a tributary of the EPA river Kyleneamuck (EPA code 25I33). This channel runs through improved agricultural grassland (GA1) and is located immediately downstream of a culvert. This section of river has also been modified via straightening and deepening with a V-shaped channel. It has a very slow flow with a glide profile and contained peat stained water. It is approximately 0.75m wide with a bank height of 1m each side and an average water depth of 75cm. This channel was heavily silted (90%) with minimal gravel present (10%).

The channel had 40% instream macrophyte cover including, water horsetail, duckweed, branched bur-reed, waterweed (*Elodea*) and water forget-me-not (*Myosotis scorpioides*). The riparian vegetation included willow, canary grass, meadowsweet, bramble, hard rush (*Juncus inflexus*) and willowherb which provided moderate shading to the channel.



This headwater does not contain suitable spawning or nursery habitat for salmonids or holding pools for adults. It also had limited potential for other smaller fish species such as minnow and stickleback. It lacked suitable habitat for white-clawed crayfish and European eel and does not provide suitable foraging or resting habitat for otter.

### **3.2.3.10 Site 10**

Site 10 was located on a tributary of the EPA river Little Brosna (EPA code 25L02) approx. 2.4km east of the L1072 and 1.4km south of site 11. The depositing lowland river (FW2) had a U-shape and was historically straightened. At the survey site the river averaged 6m width and 0.6m deep. Bank heights were 1.5m on both sides. The profile comprised moderate flowing deep glide throughout with occasional deeper pools (>1m). The substrate of the river comprised occasional large boulders, cobbles and areas of marginal sediment. At the sample site there was little evidence of direct pressures of siltation and no cattle was able to access the river as it was fenced off. Macrophyte growth was abundant due to the low riparian shading, with foals watercress, water forget-me-not and mares tail present on the margins and algae *Batrachospermum* sp., starworts (*Callitriche* sp.) and ivy-leaved duckweed throughout. The river flowed through an area of improved agricultural grassland (GA1) and set-back from the conifer plantations (WD4) with some scattered riparian trees, therefore shading was approx. 20%. Riparian species included reed canary-grass, willowherb, common reed and bindweed.

Site 10 was of moderate value for salmonids due to the homogenisation of the channel; only deep glide and pools were present. The site comprised good holding habitat for adults, but no spawning habitat was present. The silt deposits along the margins of the river at the sample site provided moderate to good potential habitat for lamprey ammocoetes. The site was of good value for European eel, with abundant refugia present. The boulders and cobbles had some potential for white-clawed crayfish; however, no crayfish were recorded during a refuge search and sweep netting. Kingfisher was recorded commuting over the site three times during the survey. Otter spraints (n=3) were recorded on a large boulder located on the bank and contained mainly fish bones.

### **3.2.3.11 Site 11**

Site 11 was located on the Pallas Kylesnamuck Stream (EPA Code 25P56) approx. 600m to the southeast of the L1071 road and approx. 25m upstream of the confluence with the Little Brosna River. This section of eroding/upland river (FW1) has been modified, straightened and deepened as part of land drainage and as a result is now a stagnant channel.

This section of river averaged 6m width and 0.3m deep with bank heights of 1m on either side. The profile comprised U-shaped channel of stagnant water with no natural meander profile containing riffles, pools or glides. The substrate was dominated by marl/mud with occasional cobbles. The channel was heavily silted due to its high modification and lack of flow. The channel was heavily impacted by riparian vegetation with canary grass and meadow sweet encroaching from the banks. There was occasional fool's watercress recorded within the channel. No aquatic mosses or liverworts were recorded.

Site 11 was of low value for salmonids and lamprey ammocoetes due to the evident pressures on water quality, stagnant flow, lack of gravels and cobbles, and absence of riffle, glide or pools. The site was of low value for European eel and white-clawed crayfish as it lacked large cobble and boulders for refugia. This section of channel was not suitable for adult salmonids or lamprey to spawn as it does not contain spawning or nursery habitat. No crayfish were recorded during



a refuge search and sweep netting. No otter signs were recorded in the vicinity of the survey site.

### 3.2.4 Electrofishing Survey

The characteristics of the electrofishing survey sites (sites 1, 4, 6 to 9) examined for the proposed project are provided in Appendix B.

A total of 27 fish of five species were recorded during the electrofishing surveys, brown trout (*Salmo trutta*) (n=10), three-spined stickleback (*Gasterosteus aculeatus*) (n= 11), nine-spined stickle back (*Pungitius pungitius*) (n=2), Lampetra sp, (n=2) and stone loach (*Barbatula barbatula*) (n=2). The lengths of the fish caught during the electrofishing can be seen in Appendix C. The overall results of fish caught at each site is presented in

Table 3-1 below.

**Table 3-1 Results of Fish Species and Quantity Recorded at Each Site During Electrofishing Surveys**

Site No.	1	4	6	7	8	9	Total
Brown trout	0	7	0	3	0	0	10
Three-spined stickleback	4	3	0	0	0	4	12
Nine-spined stickleback	0	0	0	0	0	2	1
Lamprey sp	0	0	0	2	0	0	2
Stone loach	2	0	0	0	0	0	2



Three-spined stickle back were the most abundant species recorded during electrofishing surveys, with a total of 12 individuals captured at three out of the six sites (50%), followed by brown trout (two sites; 33%), lamprey sp., stone loach and nine-spined stickleback (all only recorded at one site; 16%). The highest number of three-spined stickle back were captured at Site nine and the highest number of brown trout were captured at Site 4. Plate 3-1 and Plate 3-2 provide examples of fish species caught during the survey.

Site 4 had the highest abundance of fish species (n=10), followed by Site 1 (n=6) and Site 7 (n=7). No fish were present in Site 6 or Site 8. Brown trout were recorded at Site 4 and Site 7 and notably absent from Site 1, 6, 8 and 9. Brown trout ranged in length from 4.4cm to 29.8cm. Brown trout in the length range 5.5cm – 7cm are considered 0+ (age in years) fish, 7.5cm - 9cm are deemed 1+ fish, while those in the 9cm – 12cm division are likely 2+ group juveniles. Three cohorts of brown trout are apparent in this population of fish, 0+, 2+ and 3+. These represent the juvenile fish from adults that have spawned in these watercourses likely in 2023-24, 2021-22 and 2019-20 winter season. There is an absence of the 1+ cohort from the survey. This could be attributed to a number of factors including lower spawning activity in the earlier 2022-23 season but more likely it is linked to predation and natural mortalities.

The moderate flowing low gradient nature of watercourses in the study area provided suitable conditions for lamprey larvae, which require soft substrates into which they can burrow. Suitable silt habitat was recorded present at Site 1, 6, 7 and 9. An area of 1m<sup>2</sup> of each of these sites were surveyed for lamprey. Lamprey were only detected within the proposed wind farm site. A total of two lamprey was captured across the survey area, at Site 7. The lamprey were 7cm and 14cm in length. The lack of lamprey recorded within the three suitable lamprey habitat sites shows a lack of recruitment which may be due to poor spawning grounds, or an absence of suitable silt habitat for this species within the majority of survey sites on these modified channels sites or a potential barrier to migration.

There was no fish mortalities recorded during the electrofishing survey.



Plate 3-1 Brown Trout (Left) and Lamprey Sp., (Right) Recorded at Site 7





Plate 3-2 Juvenile and Adult Brown Trout Recorded at Site 4 (Left) and Three-Spined and Nine-Spined Stickleback Recorded at Site 9 (Right)

### 3.2.5 eDNA

Samples were collected at five sites across the Little Brosna\_040 on the EPA waterbodies Wingfield 25 (25W41), Holy Well Clohaskin (25H28), Pallas 25 (25P26) and an unnamed bog drain.

An overview of the eDNA laboratory analysis results is provided in Table 3-2 (the full report can be found in Appendix E). Results showed that Site 12, the stagnant bog drain where Alpine newt was first recorded, had a strong positive result where all twelve replicates were positive. Site 6, 7 and 8 also tested positive. Site 3 showed a negative result.

Table 3-2 Alpine Newt eDNA Results

Corresponding Site Number	EPA Watercourse name and code	Result	Positive Replicates (out of 12)
12	Bog Drain	Positive	12
7	Holy Well Clohaskin (25H28)	Positive	5
3	Wingfield 25 (25W41)	Negative	0
6	Holy Well Clohaskin (25H28)	Positive	5
8	Pallas 25 (25P26)	Positive	6

### 3.2.6 Invertebrates

A habitat assessment and manual search was carried out at all accessible sites for the presence of white-clawed crayfish. No white-clawed crayfish were recorded present at any of the sites, nor were any white-clawed crayfish captured during kick sampling or electrofishing surveys. There were also no evidence of white-clawed crayfish carapace or claw remains recorded on the riverbanks or bridge ledges in the form of otter scat or remains from predation. Suitable habitat to potentially support white-clawed crayfish was recorded at Site 1, Site 4 and Site 10 where



refuge and detritus was present with moderate water quality, however as previously stated, no individuals were recorded.

### 3.2.7 Macroinvertebrates

Biological water quality, as prescribed by the EPA (Toner *et al.* 2005), groups invertebrates into classes whereby species which are highly intolerant to pollution and low dissolved oxygen levels, are denoted Class A, and species with greater tolerance to pollution and dissolved oxygen levels, fall into the successive Classes B through E, respectively. As such the presence or absence of these groups and their relative abundances facilitates an assessment of biological river health. The results from these sites are discussed in this context in order to interpret potential changes in the riverine community composition.

The macroinvertebrate communities recorded at the survey sites (1, 3, 10 and 11) comprised a wide range of macroinvertebrate taxa. A detailed list of the macroinvertebrate taxa recorded at each survey location with the classification of macroinvertebrate species recorded in terms of their pollution sensitivity is provided in Table 3-3. The species listed are separated by the EPA taxonomic classes as prescribed above and colour coded for clarity.



Table 3-3 Macroinvertebrates Recorded During Biological Sampling on Watercourses Within the Study Area of the proposed project

Group/organism	1	3	10	11	EPA Class Pollution sensitivity group
<b>Mayfly (Ephemeroptera)</b>					
<b>Baetidae</b>					<b>C</b>
<i>Baetidae sp.</i>	50		1		
<b>Ephemerellidae</b>					
<i>Serratella ignita</i>	7		3		<b>A</b>
<b>Ephemeridae</b>					
<i>Ephemera danica</i>	2				
<b>Caenidae</b>					<b>C</b>
<i>Caenidae sp.</i>			7		
<b>Cased Caddisflies (Tricoptera)</b>					
<b>Hydropsychidae</b>					<b>C</b>
<i>Hydropsyche sp.</i>		20			
<b>Lepidostomatidae</b>					<b>B</b>
<i>Lepidostoma hirtum</i>	3				
<b>Hydropsychidae</b>					<b>C</b>
<i>Hydropsyche sp.</i>	15				
<b>Polycentropidae</b>					
<i>Polycentropidae sp.</i>	14		1		
<b>Beetle (Coleoptera)</b>					
<b>Dytiscidae</b>					



Group/organism	1	3	10	11	EPA Class Pollution sensitivity group
<i>Dytiscidae sp.</i>	1		2		C
<b>Elminthidae</b>					
<i>Elmis</i>	10				
<b>Haliplidae</b>					
<i>Haliplidae sp.</i>	1				
<b>Hemiptera</b>					
Hemiptera sp.			1		
<b>Pleidae</b>					
<i>Pleidae sp.</i>			1		
<b>Two Winged Flies (Diptera)</b>					
<b>Chironomidae</b>					C
<i>Chironomus sp.</i>	1		1		
<b>Crustaceans</b>					
<b>Gammaridae</b>					C
<i>Gammarus pulex</i>	20	100	20		
<b>Asellidae</b>					D
<i>Asellus aquaticus</i>				50	
<b>Snails and Limpets (Gastropoda)</b>					
<b>Potamopyrgus</b>					C
<i>Potamopyrgus antipodarum</i>	50		100		



Group/organism	1	3	10	11	EPA Class Pollution sensitivity group
<b>Ancylidae</b>					
<i>Ancylidae sp</i>	1				
<b>Physidae</b>					
<i>Physella sp</i>	2		50		
<b>Lymnaeidae</b>					
<i>Lymnaea sp</i>			2		



### 3.2.8 Biological Water Quality

The Q-ratings and the ecological status derived from the diversity and relative abundance of the macroinvertebrates at detailed survey sites (i.e. Sites 1, 3, 10 and 11) are given in Table 3-4.

The macroinvertebrate communities recorded at survey sites comprised of a range of macroinvertebrate taxa. Of the four sites sampled, the target of Q4 unpolluted water was not achieved at any of the sampling sites. Site 1 received a Q3-Q4 status, slightly polluted water. Sites 3 and 10 received a Q3 status of moderately polluted water due to the paucity of pollution sensitive taxa, as well as the degree of siltation (considerable) and algal growth (luxuriant). Site 11 received a Q2 status, a site dominated by Group D taxa.

The current survey results indicate that the overall biological water quality in the watercourses draining the proposed wind farm site is poor and moderately polluted. The sampled watercourses do not provide water of a quality adequate to support a range of pollution sensitive mayfly and stonefly larvae, as well as salmonids.

**Table 3-4: Biological Water Quality and Interpretations at Study Sites on Watercourses Draining the proposed project.**

Site	Q-value	WFD Ecological Status
1	3-4	Moderate status (Slightly Polluted)
3	3	Poor status (Moderately Polluted)
10	3	Poor status (Moderately Polluted)
11	2	Bad status (Seriously Polluted)



## 4. DISCUSSION

### 4.1 FISH AND FISHERIES HABITAT

Due to the low elevation of the proposed wind farm site, and its location in the environs of the catchments' watershed, the watercourses within the proposed project are depositing and slow flowing in nature. The watercourses located within the proposed project are surrounded by cutover bog, agricultural fields, scrub and conifer plantation. It is likely that the drainage associated with the surrounding agricultural lands, afforestation and commercial forestry and peat in the catchments may be affecting the flow regime of these watercourses.

Fisheries suitability and value was taken into account during the aquatic surveys. Suitable spawning and nursery habitat for salmonids was assessed in addition to the potential for lamprey (river and brook) habitat.

The watercourses comprised of low gradient habitat within the main Little Brosna\_040 channel within the proposed wind farm site boundary, with a dominant glide profile with spawning gravels, riffles and holding pools providing suitable nursery and spawning habitat. The watercourse has been historically deepened and modified, changing its natural morphology to a dominant glide profile offering some holding pools for larger fish, however, overall it has decreased the habitat value and quality. The Little Brosna\_040 tributaries also show similar habitat where drainage and maintenance have occurred, however, there is evidence that there is suitable spawning and nursery habitat within these upper sections where they still remain in natural form.

The abundance of riffle (broken water), instream boulders, and overhanging banks and dappled shade, or combinations was absent within the upper reaches of the watercourses within the proposed project with the exception of Site 4.

Within the 11 survey sites (site 12 for eDNA sampling only) located within the proposed wind farm site boundary, the substrate comprised mainly of sediment with minimal amounts of boulders, cobbles and gravels. There was limited evidence of good spawning habitat within the upper reaches of the watercourses studied with the exception of Site 3 that contained 35% gravels. Spawning and nursery habitat in the lower reaches of streams within the proposed project were impacted by siltation and filamentous algae due to the adjacent peat and forestry influences and cattle access to the rivers. The remaining sites (1, 4, 7 and 9) located within, outside and downstream of the proposed wind farm site boundary ranged from 5-25% gravel.

The distribution of fish in the study area are likely to be affected by drainage, lack of suitable habitat, and/or potential blockages from collapsed peat or heavy vegetation. There was a general poor distribution of fish observed during the electrofishing surveys, where fish were only present in four out of the six sites in very low numbers, ranging from five to ten fish per site.

There was also poor fish species richness, whereby only five species were present in total with only one to two species recorded to be present at each site. At the time of surveying, the water levels were normal and whilst the watercourse had suitable fisheries habitat present, they were heavily silted with evidence of enrichment.

#### *Salmonids*



The Little Brosna\_040 contained one salmonid species, brown trout. Brown trout were the second most dominant fish species occurring within the proposed wind farm site however it was noted they were only present at two sites, one which contained spawning and nursery habitat at Site 4 and one that contained holding pools at Site 7. The findings show some recruitment numbers of brown trout for this year where there is evidence of young parr 0+ age present which is a good indication of good spawning and nursery conditions in this watercourse (Site 4). However, there is an absence of age class of 1+ and 2+ year of brown trout (9-15cm) within the Little Brosna\_040 River in general, and this may be related to a recruitment failure over the last few years as it would be expected that this species is present within the 1<sup>st</sup> order streams upstream of the proposed project unless inaccessible due to barriers.

There is good holding habitat for salmonids within the main Little\_Bronsa\_040 channel, given the high energy flows and channel depth. There was a limited number of holding pools with suitable boulders present in the upper watercourses for larger fish.

Based on the habitats present at the sites surveyed, as well as the observed water quality, the watercourses draining the site are considered optimal for the early life stages of salmonids. However, due to the modification, drainage, active deforestation and cattle access of the watercourses within the proposed project, fisheries spawning or nursery habitat suitability is limited.

No salmon were recorded within any of the electrofishing sites across the survey area.

### *Lamprey*

Four lamprey ammocoete burial areas were identified within the study area, with one site (Site 7) testing positive for lamprey during electrofishing surveys. This concurs with survey results by IFI indicating their presence in the EPA river Little Brosna<sup>11</sup>.

Lamprey have similar habitat requirements for spawning to trout. There is limited lamprey spawning habitat by way of finer, unbedded gravels present at all sites upstream of the proposed project, with the exception of Site 4. There is an abundance of sand/silt deposits, a requirement for lamprey larvae. Finer sediment accumulations suitable for larval (ammocoete) settlement was present throughout the main Little Brosna\_040 channel, however the remaining streams lacked suitable sediment and were dominated by a heavy peat base lacking the fine-grained sediment required for this species.

Generally, lowland watercourses are considered suitable for lamprey species. The majority of sites surveyed represented lowland depositing, slow flowing watercourses and naturally such sites encourage the deposition of fine, organic rich sediment required by larval lamprey which they can burrow (Goodwin *et al.*, 2008; Aronsuu & Virkkala, 2014).

However, tributaries of the Little Brosna\_040 River that have been modified and the natural hydromorphology of the channels have been altered, resulting in peat stained, stagnant, fragmented, polluted and enriched channels. The main channel which remained in its natural meandering form, provides good sediment for lamprey however the channel is heavily silted and there is very limited spawning gravels for this species. Lamprey may occur in low densities in the

<sup>11</sup> [WFD 2015 Report 2017.04.12 kd.pdf \(fisheriesireland.ie\)](#) [ Accessed February 2026]



mid to upper reaches and lower reaches of the main channel, where flows are sufficiently slow to allow accumulation of fine substrates.

No sea lamprey were recorded within any of the electrofishing sites across the survey area and there is no suitable habitat for this species to spawn within the watercourses in the study area.

### *European eel*

Suitable habitat for this species occurs in the smallest of watercourses affected by the proposed project. No European eel were recorded at any of the electrofishing sites. The watercourses offered sub optimal eel habitat given the presence of minimal instream refugia such as large boulders and cobble, and the majority lacking large woody vegetation and macrophyte beds which offer vital diurnal refugia for eel populations (Laffaille *et al.*, 2003)

As such, the main channel of the Little Brosna\_040 watercourse likely serves more as a migratory pathway for European eel than for foraging and nursery habitats. Furthermore, even small channels with poor or little overall fisheries value offer limited value as potential European eel migratory pathways, provided they maintain downstream connectivity to larger watercourses and catchments such as the Brosna catchment (e.g. adult migration seawards, usually from September/October onwards).

Overall, all watercourses in the study area have the potential to support European eel. The European eel is subject to European Council Regulation 1100/2007 '*Establishing measures for the recovery of the stock of European eel*'. European eel is listed as 'Critically endangered' and is now 'Red Listed' according to 'Red List No. 5: Amphibians, Reptiles & Freshwater Fish' (King *et al.*, 2011).

### *Other Fish Species*

All coarse fish captured during the electrofishing, (i.e. three-spined stickleback and stone loach) are likely to occur in most of the watercourses within and downstream of the proposed project, particularly in the lower gradient reaches of these watercourses as previously recorded by IFI.

## 4.2 ALPINE NEWT

Four out of the five eDNA sampling sites tested positive for the presence of Alpine newt. This indicates that Alpine newt is present in the larger surrounding area and upstream of the proposed project, with the exception of Site 3. Alpine newt is therefore likely to be present in two bogs/wetland areas within the proposed wind farm site boundary; the bog surrounding Site 12 and the bog upstream of Site 8. Alpine newt is also likely present in one bog/wetland area outside of the proposed wind farm site boundary; the bog upstream of Site 6. These findings correspond with data available on NBDC web viewer<sup>12</sup> where Alpine newt was recorded in grid square S09 which overlaps with the proposed project. It is unknown how Alpine newt has started to colonise wetland habitat in Ireland, but in the UK this species spread after populations were released into gardens and parks<sup>13</sup>. Care must be taken when operating in areas with Alpine newt as the disease they carry (chytridiomycosis) can potentially cause great harm to native amphibian populations and strict biosecurity measures must be adhered to.

<sup>12</sup> <https://maps.biodiversityireland.ie/Map> [Accessed February 2026]

<sup>13</sup> [https://www.nonnativespecies.org/assets/Uploads/ID\\_Mesotriton\\_alpestris\\_Alpine\\_newt-v2.pdf](https://www.nonnativespecies.org/assets/Uploads/ID_Mesotriton_alpestris_Alpine_newt-v2.pdf) [Accessed February 2026]



## 4.3 INVERTEBRATES

### 4.3.1 Macroinvertebrates

The biological water quality survey provided baseline data for future reference. These values must not deteriorate as a result of the proposed project. According to the WFD (2000/60/EC) target 'Good Status' (i.e. Q4) is required in all Irish rivers.

The habitats for macroinvertebrates in the watercourses draining the proposed project are generally suboptimal for macroinvertebrate production. This is a function of their depositing nature (beds dominated by silt and peat substrates) and small pool size.

Macroinvertebrate assemblage's characteristic of moderately polluted lowland oligotrophic streams were recorded. The poor representation of pollution sensitive macroinvertebrate taxa and dominance of pollution tolerant taxa was evident across the surveys sites.

The macroinvertebrate compositions are indicative of watercourses that require an external supply of organic matter (allochthonous organic matter) for biological sustenance. The naturally low nutrient concentrations of surface waters in the study area, coupled, in some instances with their peaty nature, mean that benthic life and therefore higher organisms are highly dependent on terrestrial energy sources for survival, rather than primary production instream.

Plecoptera were absent from all sample sites. Plecoptera are herbivores and are generally found in cold, well oxygenated, fast-moving streams. Ephemeroptera was recorded in two out of the four sites surveyed and Tricoptera present in three of the four sites surveyed.

Along with Plecoptera, both Ephemeroptera and Tricoptera are often good indicators of cool, well oxygenated waters and are sensitive to pollution. In fact, these taxa are used as indicators of high water quality, and their abundance is quantified as the EPT index (Ephemeroptera, Plecoptera, Tricoptera)<sup>14</sup>. It is likely that the particularly low abundance or absence of Ephemeroptera and Tricoptera in sites is due to both the riverbed and a water quality issue.

### 4.3.2 White-clawed Crayfish

The streams located within the proposed project did not have potential habitat for white-clawed crayfish due to the presence of peatland and afforested catchments and the absence of suitable substrate habitat, especially gravels for white-clawed crayfish hatchlings. There was also a lack of instream vegetation and suitable burrowing habitat required for white-clawed crayfish. As such there is no suitable availability of refuges for this species.

In most of its range, white-clawed crayfish is found most commonly in first-order streams, but in Ireland it has a much wider habitat range occurring in small and medium-sized lakes, large rivers, streams and drains wherever there is sufficient lime (Lucey and McGarrigle, 1987). White-clawed crayfish have not been recorded in any of the watercourses within or downstream of the proposed project. This species is not expected to occur in the other watercourses draining the proposed project. considering the siliceous underlying geology.

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<sup>14</sup>Ecology and Classification of North American Freshwater Invertebrates (Second Edition) 2001, Pages 733-775



### 4.3.3 Freshwater Pearl Mussel

A broad appraisal/overview of the upstream and downstream habitat at each aquatic survey site was undertaken to evaluate the wider contribution to FWPM and the potential for this species to be present within the proposed project. Based on the general riverine habitat, topography, low gradient, substrate, water quality and surrounding habitat, the potential for this species to be present within and downstream of the proposed project was considered to be poor as the Little Brosna Catchment does not contain suitable habitat.

## 4.4 WATER QUALITY

### 4.3.1 Biological

The latest EPA biological monitoring of watercourses in the study area, show water quality to be moderate to good as indicated by the latest EPA ratings, however it is noted that there is a decline in water quality outside of the study area. The EPA also recorded the Little Brosna\_040 River to be 'At Risk' of failing to meet 'Good' ecological status as required under the WFD.

The biotic indices derived at the survey sites (See Appendix A) also indicate that the water quality of the watercourses within and downstream of the proposed project is achieving Q values that range from Q2, Q3 and Q3-4. These ratings indicate a range from unpolluted to moderately polluted water quality and range from 'Poor to Moderate' ecological status.

As such the majority of the sites have moderate status, with none achieving the target Q4 'Good' status water quality required under the WFD. These sampling sites are all located adjacent to agricultural fields and bogs, and within proximity to Sitka spruce plantations. All of these habitats have been heavily drained and flow into the Little Brosna\_040 River.

It is likely that diffuse agricultural and forestry enrichment are contributing to the localised declines in water quality. Macroinvertebrate diversity corresponded with habitat suitability, with greater diversity recorded in areas of better habitat. In the Irish context, biological water quality in the study area is considered moderate, considering the range of pressures on surface waters at a national level, such as nutrient, organic, chemical, and sediment pollution.



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**Appendix A BIOTIC INDEX SCORING SYSTEM FOR THE Q-SCHEME**

**Table A-1 Biotic Index Scoring System For The Q-Scheme and Equivalent WFD Water Quality Status Classes**

Biotic Index	Quality Status	Quality Class
Q5 or 4-5	High status (Unpolluted)	Class A
Q4	Good status (Unpolluted)	Class B
Q3-4,	Moderate status (Slightly Polluted)	Class C
Q3, 2-3	Poor status (Moderately Polluted)	Class D
Q2, 1-2, 1	Bad status (Seriously Polluted)	Class E



Appendix B PHYSICAL CHARACTERISTICS OF WATERCOURSES WITHIN THE STUDY AREA

Table B-1 Physical Characteristics of the Study Sites

Site	Mean Dept (cm)	Bank Height (m)	Bank Width (m)	Riffle (%)	Glide (%)	Pool (%)	Shade (%)	Bedrock (%)	Boulder (%)	Cobble (%)	Gravel (%)	Sand (%)	Silt (%)	Velocity	Macrophyte	Algae (%)
1	80	1.25	11.5	0	100	0	0	0	25	20	20	10	25	Moderate	Water mint ( <i>Mentha aquatica</i> ), ivy-leaved duckweed ( <i>Lemna trisulca</i> ), branched bur reed ( <i>Sparganium erectum</i> ), water crow foot ( <i>Ranunculus aquatilis</i> ).	None Present
2	150	2.0	10	0	100	0	0	0	N/A	N/A	N/A	N/A	N/A	Moderate	Bur reed, foos water cress, duck weed, ( <i>Potamogeton sp.</i> ).	75
3	7	1	3	25	75	0	75	0	0	0	35	20	45	Slow	None Present	None Present
4	10	1	5	40	20	40	75	0	40	30	10	10	10	Moderate	None Present	None Present
5	40	1	2.5	N/A	N/A	N/A	25	0	N/A	N/A	N/A	N/A	N/A	Stagnant	Watermint, bulrush ( <i>Typha latifolia</i> ), bur reed and common reed ( <i>Phragmites</i> ).	None Present
6	1	2	5	0	100	0	50	0	5	25	10	0	60	Very slow	Duckweed, water mint, fool's watercress	None Present



Site	Mean Dept (cm)	Bank Height (m)	Bank Width (m)	Riffle (%)	Glide (%)	Pool (%)	Shade (%)	Bedrock (%)	Boulder (%)	Cobble (%)	Gravel (%)	Sand (%)	Silt (%)	Velocity	Macrophyte	Algae (%)
															( <i>Apium nodiflorum</i> ) and bur reed	
7	95	2	6	0	100	0	25	0	10	20	10	0	60	Slow	ivy-leaved duckweed, branched bur-reed	None Present
8	90	.5	2	N/A	N/A	N/A	0	0	0	0	0	0	100	Stagnant	Water milfoil and bur-reed	85
9	75	1	1	0	100	0	25	0	0	10	0	0	90	Very slow	Marestail, burreed sparganium, lemna elodea, forget me not.	None Present
10	60	1.5	6	0	100	0	25	0	5	20	10	0	40	Slow	Fools watercress, water forget me not, <i>Batrachospermum spp</i> , starwort, <i>Lemna trisulca</i>	50
11	30	1	6	0	100	0	25	0	0	0	0	0	100	Very slow	Common reed	None Present



Appendix C ELECTROFISHING DATA

Table B-2 Electrofishing Site Characteristics at Survey Sites Examined for the proposed project

Site	Length Fished (m)	Width Fished (m)	Area Fished (M <sup>2</sup> )	Time Fished (mins)	Mean Depth (cm)	Max Depth (cm)	Voltage	Current (Amp)	Pulse (Hz)	Temp (C°)	Conductivity (µ/s)	pH
1	25	10	250	10	80	130	200	0.20	40	13.4	684	8.4
4	20	5	100	10	10	40	250	0.50	40	13.8	631	8.8
6	20	5	100	10	80	120	250	0.2	40	14.8	775	8.5
7	10	6	60	10	95	130	250	0.2	40	13	750	8.3
8	10	2	20	10	90	95	150	0.2	40	17.7	718	8.7
9	5	1	5	10	75	90	180	0.2	40	15.8	718	7.9

Table B-3 Fish Species and Lengths Captured Within Survey Sites of the Study Area

Site No	Fish_ID	River Name	Species	Length (CM)
1	25L02_a_00001	Little Brosna, River	Three-spined stickleback	5.6
1	25L02_a_00002	Little Brosna, River	Three-spined stickleback	5.1
1	25L02_a_00003	Little Brosna, River	Three-spined stickleback	4.9
1	25L02_a_00004	Little Brosna, River	Three-spined stickleback	4.5
1	25L02_a_00005	Little Brosna_040, River	Stone loach	9.6



Site No	Fish_ID	River Name	Species	Length (CM)
1	25L02_a_00006	Little Brosna, River	Stone loach	9.6
4	25W41_a_00001	Wingfield 25	Brown Trout	5.3
4	25W41_a_00002	Wingfield 25	Brown Trout	14.6
4	25W41_a_00003	Wingfield 25	Brown Trout	4.4
4	25W41_a_00004	Wingfield 25	Brown Trout	5.4
4	25W41_a_00005	Wingfield 25	Brown Trout	5.3
4	25W41_a_00006	Wingfield 25	Brown Trout	6.1
4	25W41_a_00007	Wingfield 25	Brown Trout	5.9
4	25W41_a_00008	Wingfield 25	Three-spined stickleback	4.6
4	25W41_a_00009	Wingfield 25	Three-spined stickleback	4
4	25W41_a_00010	Wingfield 25	Three-spined stickleback	4.6
7	25H28_a_00001	Holy Well Clohaskin	Brown Trout	29.8
7	25H28_a_00002	Holy Well Clohaskin	Brown Trout	17.6
7	25H28_a_00003	Holy Well Clohaskin	Brown Trout	16.6
7	25H28_a_00004	Holy Well Clohaskin	Brook lamprey	14
7	25H28_a_00005	Holy Well Clohaskin	Brook lamprey	7



Site No	Fish_ID	River Name	Species	Length (CM)
9	25133_a_00001	Kylenamuck	Three-Spined Stickleback	3.6
9	25133_a_00002	Kylenamuck	Three Spined Stickleback	3.5
9	25133_a_00003	Kylenamuck	Three-Spined Stickleback	3.5
9	25133_a_00004	Kylenamuck	Three-Spined Stickleback	4.5
9	25133_a_00005	Kylenamuck	Three-Spined Stickleback	4.2
9	25133_a_00006	Kylenamuck	Nine-Spined Stickleback	5



## Appendix D EDNA LABORATORY REPORT



**Folio No:** 3417-2024  
**Purchase Order:** POP001612  
**Contact:** Tobin Consulting Engineers  
**Issue Date:** 16.09.2024  
**Received Date:** 02.09.2024

# eDNA Report

Technical Report



SureScreen Scientifics

Folio No: 3417-2024  
Purchase Order: POP001612  
Contact: Tobin Consulting Engineers  
Issue Date: 16.09.2024  
Received Date: 02.09.2024

# eDNA Analysis

## Summary

When aquatic organisms inhabit a waterbody such as a pond, lake or river they continuously release small amounts of their DNA into the environment. By collecting and analysing water samples, we can detect these small traces of environmental DNA (eDNA) to confirm the presence or absence of the target species within the waterbody.

## Results

Lab ID	Site Name	OS Reference	Target Species	Sample Integrity Check	Result	Positive Replicates
FK2224	Site 3		Alpine newt	Pass	Negative	0
FK2225	Site 1		Alpine newt	Pass	Positive	12
FK2226	Site 4		Alpine newt	Pass	Positive	5
FK2227	Site 2		Alpine newt	Pass	Positive	5
FK2228	Site 5		Alpine newt	Pass	Positive	6

Matters affecting result: none

Reported by: Vanessa Hind

Approved by: Christopher Troth



## Methodology

Samples have been analyzed for the presence of target species eDNA following readily available and scientifically published eDNA assays and protocols.

The analysis is conducted in two phases. The sample first goes through an extraction process where the filter is incubated in order to obtain any DNA within the sample. The extracted sample is then tested via real-time PCR (also called q-PCR) for each of the selected target species. This process uses species-specific molecular markers (known as primers) to amplify a select part of the DNA, allowing it to be detected and measured in 'real time' as the analytical process develops. qPCR combines amplification and detection of target DNA into a single step. With qPCR, fluorescent dyes specific to the target sequence are used to label targeted PCR products during thermal cycling. The accumulation of fluorescent signals during this reaction is measured for fast and objective data analysis. The primers used in this process are specific to a part of mitochondrial DNA only found in each individual species. Separate primers are used for each of the species, ensuring no DNA from any other species present in the water is amplified. If target species DNA is present, the DNA is amplified up to a detectable level, resulting in positive species detection. If target DNA is not present then amplification does not occur, and a negative result is recorded.

Analysis of eDNA requires scrupulous attention to detail to prevent the risk of false positive and false negative results. True positive controls, negative controls, and spiked synthetic DNA are included in every analysis and these have to be correct before any result is declared. Stages of the analysis are also conducted in different buildings at our premises for added security. SureScreen Scientifics Ltd is ISO9001 accredited and participates in Natural England's proficiency testing scheme for GCN eDNA testing.

## Interpretation of Results

### **Sample Integrity Check: Laboratory Arrival:**

When samples are received in the laboratory, they are inspected for any tube leakage, suitability of sample (not too much mud or weed etc.) and absence of any factors that could potentially lead to inconclusive results. Any samples which fail this test are rejected and eliminated before analysis.

### **Degradation and Inhibition check:**

Analysis of the spiked DNA marker to see if there has been degradation or inhibition of the kit or sample, between the date it was made to the date of analysis. Degradation of the spiked DNA marker may indicate a risk of false negative results. If inhibition is detected, samples are purified and re-analyzed. Inhibitors cannot always be removed, if the inhibition check fails, the sample should be re-collected.

### **Result: Presence of eDNA (Positive/Negative/Inconclusive)**

**Positive:** DNA was identified within the sample, indicative of species presence within the sampling location at the time the sample was taken or within the recent past.

**Positive Replicates:** Number of positive qPCR replicates out of a series of 12. If one or more of these are found to be positive the pond is declared positive for species presence. It may be assumed that small fractions of positive analyses suggest low level presence, but this cannot currently be used for population studies. Even a score as low as 1/12 is declared positive. 0/12 indicates negative species presence.

**Negative:** eDNA was not detected or is below the threshold detection level and the test result should be considered as evidence of species absence, however, does not exclude the potential for species presence below the limit of detection.

**Inconclusive:** Controls indicate inhibition or degradation of the sample, resulting in the inability to provide conclusive evidence for species presence or absence.

**Appendix E PHOTOGRAPH OF EACH AQUATIC SAMPLING SITE**



**Figure D 1: Representative Image of Site 1 (Facing Downstream) and Site 2 (Facing Upstream), a Medium, Cascading Low-Energy Little Brosna River Flowing North-West Through the proposed project.**



**Figure D 2: Site 3, a Small Stream Located within Agricultural Land and Site 4, a Natural Unmodified Stream**



**Figure D 3: Site 5, a Low Energy Modified Section of the Little Brosna River Along the Boundary of a Conifer Plantation and Site 6 (Facing Upstream), the Little Brosna River Along the Site Boundary.**





Figure D 4: Site 7 and Site 8, Both Low Energy Modified Sections of the Little Brosna River



Figure D 5: Representative Image of Site 9 and 10 (Left Photo)



Figure D 6: Site 11, a Modified Heavily Vegetated Tributary of the Little Brosna and Site 12, a Bog Drain Located Within the Centre of the Proposed wind farm (northwest of T4)



