APPENDIX 6-3

Aquatic Baseline Report

Aquatic baseline report for Killoshulan Wind Farm, Co. Kilkenny (2025)

Prepared by Triturus Environmental Ltd. for MKO

January 2026

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1. Introduction

1.1 Background

Triturus Environmental Ltd. were commissioned by MKO to conduct baseline aquatic surveys to inform Environmental Impact Assessment Report (EIAR) preparation for the proposed Killoshulan Wind Farm located near Freshford, Co. Kilkenny (**Figure 2.1**).

Undertaken on a catchment-wide scale, this report provides a baseline assessment of the aquatic ecology including fisheries and biological water quality, as well as protected species and habitats in the vicinity of the Proposed Project. Aquatic surveys were undertaken in August 2025 and would update catchment wide surveys previously completed by Triturus in September 2022 (Triturus, 2023), thus ensuring temporal data validity.

1.2 Development description

A full description of the Proposed Project will be provided in the EIAR used to support consenting applications.

2. Methodology

2.1 Selection of watercourses for assessment

All freshwater watercourses which could be affected directly or indirectly by the Proposed Project and associated infrastructure were considered as part of the current assessment. This included sites in vicinity of the Site boundary and proposed turbine array in addition to the Proposed 110kV Underground Cabling. Thus, a total of 24 no. riverine sites and 4 no. pond sites were selected for detailed aquatic assessment (**Table 2.1, Figure 2.1**). The courses and nomenclature for the watercourses surveyed followed Environmental Protection Agency (EPA) mapping.

Riverine survey sites were present on the Foyle South Stream (EPA code: 15F07), Gorteenahilla River (15G08), Clomantagh Lower Stream (15C91), Nuenna River (15N02), Baunaniska Stream (15B89), Borrisbeg River (15B18), River Goul (15G02), River Erkina (15E01), Coolnacrutta Stream (15C50), Ballyring Upper Stream (15B73), Lisdowney Stream (15L02), Ballyconra Stream (15B86) and the River Nore (15N01) (**Table 2.1**). Three unnamed ponds and The Loughane (a designated turlough) were also surveyed. The aquatic survey sites were located within the Goul_SC_010, Nore_SC_050 and Nore_SC_070 river sub-catchments within hydrometric area 15 (Nore).

The proposed site boundary overlapped with the Spahill and Clomantagh Hill SAC (000849), a site designated for semi-natural dry grasslands (NPWS, 2021). There was potential downstream hydrological connectivity, via several watercourses, with the River Barrow and River Nore SAC (002162), a site designated for numerous aquatic qualifying interests (NPWS, 2011).

Please note this aquatic report should be read in conjunction with the final EIAR prepared for the Proposed Project.

2.2 Aquatic site surveys

Aquatic surveys were conducted on the 12th, 13th, 14th and 15th August 2025. Survey effort focused on both instream and riparian habitats at each aquatic sampling location and included a fisheries assessment (electro-fishing and or fisheries habitat appraisal), white-clawed crayfish survey, otter survey, macrophyte and aquatic bryophyte survey and biological water quality sampling (Q-sampling) or macro-invertebrate sweep sampling (**Figure 2.1**). Environmental DNA samples were also collected from 4 no. riverine sites. This holistic approach informed the overall aquatic ecological evaluation of each site/watercourse in context of the Proposed Wind Farm and ensured that any habitats and species of high conservation value would be detected to best inform mitigation.

In addition to the ecological characteristics of the site, a broad aquatic and riparian habitat assessment was conducted utilising elements of the methodology given in the Environment Agency's 'River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003' (EA, 2003) and the Irish Heritage Council's 'A Guide to Habitats in Ireland' (Fossitt, 2000). This broad characterisation helped define the watercourses' conformity or departure from naturalness. All sites were assessed in terms of:

- Physical watercourse/waterbody characteristics (i.e. width, depth, channel form) including associated evidence of historical drainage

- Substrate type and relative condition, listing substrate fractions in order of dominance (i.e. bedrock, boulder, cobble, gravel, sand, silt etc.)
- Flow type by proportion of riffle, glide and pool in the sampling area
- An appraisal of the macrophyte and aquatic bryophyte community at each site
- Riparian vegetation composition and bordering land use practices

Table 2.1 Location of 28 no. aquatic survey sites in the vicinity of Killoshulan Wind Farm, Co. Kilkenny

Site no.	Watercourse	EPA code	Location	X (ITM)	Y (ITM)
A1	Unmapped stream	n/a	Frankford	634028	667249
A2	Unmapped stream	n/a	Frankford	634121	666966
A3	Foyle South Stream	15F07	Killoshulan	635313	666794
A4	Foyle South Stream	15F07	Foyle South	636148	667322
A5	Foyle South Stream	15F07	Foyle Bridge	636734	667965
A6	Gorteenahilla River	15G08	Tinnascarty	638182	667372
A7	Gorteenahilla River	15G08	Freshford	640292	664974
P1	Unnamed pond	n/a	Killoshulan	635298	665705
P2	Unnamed pond	n/a	Killoshulan	635300	665786
P3	Unnamed pond	n/a	Foyle South	636133	666525
P4	The Loughane	n/a	Balief Lower	631494	663516
B1	Clomantagh Lower Stream	15C91	Clomantagh Lower	635291	663867
B2	Nuenna River	15N02	Barna	636208	663750
B3	Baunaniska Stream	15B89	Kilrush	637891	664785
B4	Nuenna River	15N02	Old Bridge, Freshford	640530	664845
B5	Nuenna River	15N02	Purcellsgarden	644441	664230
C1	Borrisbeg River	15B18	Balief Lower	631576	663273
C2	Borrisbeg River	15B18	Mountfinn	629062	664618
C3	River Goul	15G02	Foulkscourt	628253	666820
C4	River Goul	15G02	Aghmacart Bridge	632981	673995
C5	River Erkina	15 E01	Durrow Bridge	640865	677506
D1	Coolnacrutta Stream	15C50	Tobar na Súl	633758	669412
D2	Coolnacrutta Stream	15C50	Glashare	632392	670970
GCR1	Gorteenahilla River	15G08	Coolcashin	637020	668246
GCR2	Ballyring Upper Stream	15B73	Ballyring Upper	637545	669051
GCR3	Lisdowney Stream	15L02	L1810 road crossing	641403	671017
GCR4	Ballyconra Stream	15B86	L1807 road crossing	642623	670654
GCR5	River Nore	15N01	Ballyconra	643933	671882

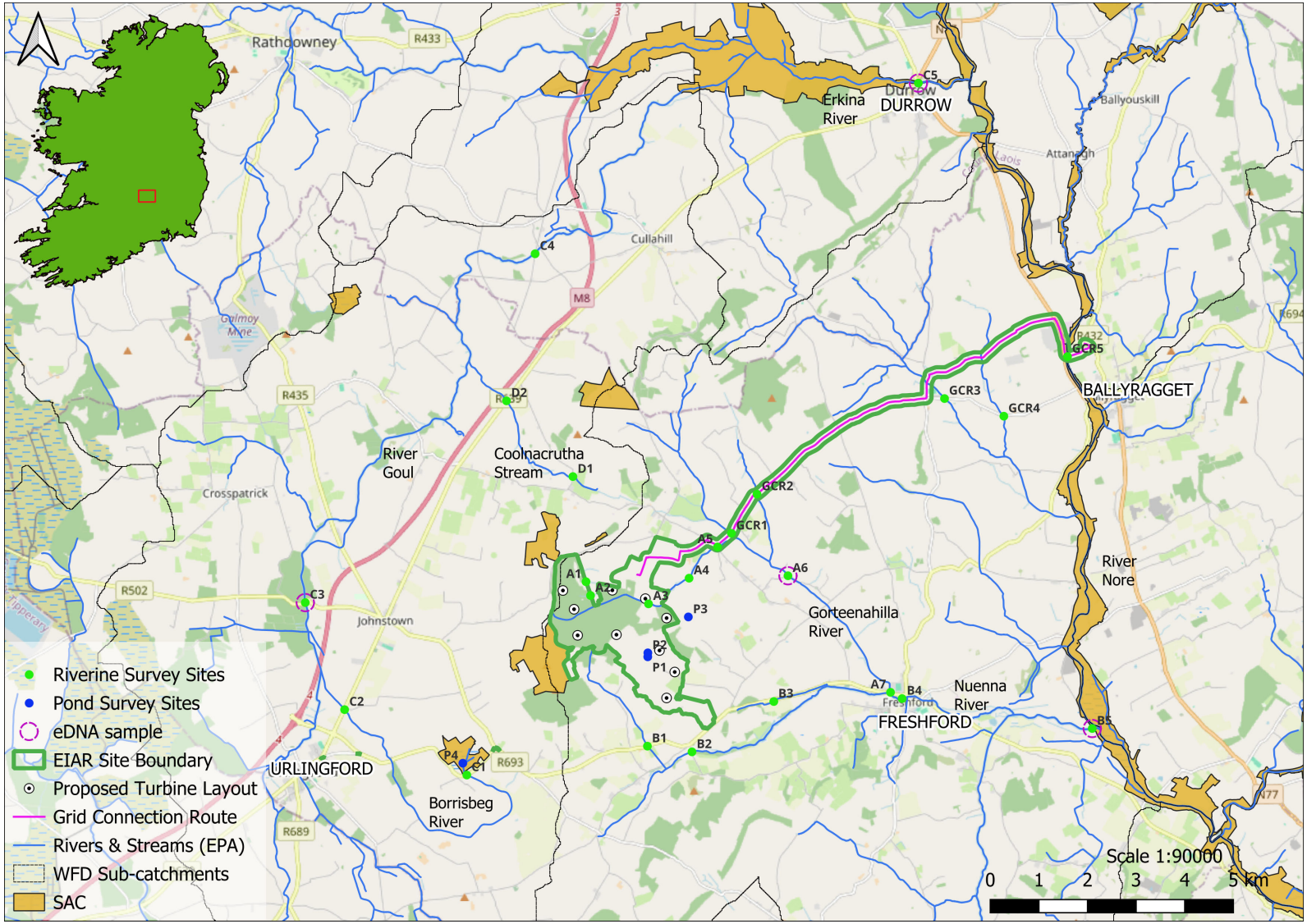


Figure 2.1 Overview of the aquatic survey sites in the vicinity of Killoshulan Wind Farm, August 2025

2.3 Fisheries assessment & habitat appraisal

A single anode Smith-Root LR24 backpack (12V DC input; 300V, 100W DC output) was used to electro-fish sites on riverine watercourses in the vicinity of the Proposed Project in August 2025 (**Table 2.1, Figure 2.1**), following notification to Inland Fisheries Ireland under the conditions of a Department of Climate, Energy and the Environment (DCEE) licence. The survey was undertaken in accordance with best practice (CFB, 2008; CEN, 2003) and licencing requirements.

Furthermore, a fisheries habitat appraisal of all aquatic survey sites was undertaken to establish their importance for salmonid, lamprey, European eel and other fish species. The baseline assessment also considered the quality of fisheries habitats within the vicinity of the survey sites. For detailed survey methodology, please refer to accompanying fisheries assessment report in **Appendix A.**

2.4 White-clawed crayfish survey

White-clawed crayfish (*Austropotamobius pallipes*) surveys were undertaken at the aquatic survey sites in August 2025 under a National Parks and Wildlife (NPWS) open national licence (C164/2025) as prescribed by Sections 9, 23 and 34 of the Wildlife Act (1976-2023), to capture and release crayfish to their site of capture. As per Inland Fisheries Ireland aquatic biosecurity recommendations, the crayfish sampling started at the uppermost site(s) of the Proposed Wind Farm catchment/sub-catchments in the survey area to minimise the risk of transfer invasive propagules (including crayfish plague) in an upstream direction.

Hand-searching of instream refugia and sweep netting was undertaken according to Reynolds et al. (2010). An appraisal of white-clawed crayfish habitat at each site was conducted based on physical habitat attributes (Gammell et al., 2021; Peay, 2003), water chemistry and incidental records in mustelid spraint. Additionally, a desktop review of crayfish records within the wider survey area was completed.

2.5 eDNA sampling

To further validate site surveys and to detect potentially cryptically low populations of high conservation value aquatic species within the survey area, composite water samps were collected from the Gorteenahilla River (Site A6), Nuenna River (B5), River Goul (C3) and River Erkina (C5) on the 15th August 2025 (**Figure 2.1; Table 2.1**). These were analysed for freshwater pearl mussel (*Margaritifera margaritifera*), lamprey (*Lampetra* sp.), white-clawed crayfish and crayfish plague (*Aphanomyces astaci*) eDNA, with the sites strategically chosen to maximise longitudinal (instream) coverage within the catchment (i.e. facilitating a greater likelihood of species detection).

In accordance with laboratory guidance, a composite (500ml) water sample was collected from the sampling point, maximising the geographic spread at the site (20 x 25ml samples at each site), thus increasing the chance of detecting the target species' DNA. The composite sample was filtered and fixed on site using a sterile proprietary eDNA sampling kit. The sample was stored at room temperature and sent to the laboratory for analysis with 48 hours of collection. A total of *n*=12 qPCR replicates were analysed for the site. Given the high sensitivity of eDNA analysis, a single positive qPCR replicate is considered as proof of the species' presence (termed qPCR No Threshold, or qPCR NT). Whilst an eDNA approach is not currently quantitative, the detection of the target species' DNA

indicates the presence of the species at and or upstream of the sampling point. Please refer to **Appendix B** for full eDNA laboratory analysis methodology.

2.6 Biological water quality (Q-sampling)

The 24 no. riverine survey sites were assessed for biological water quality through Q-sampling in August 2025. All samples were taken with a standard kick sampling hand net (250mm width, 500µm mesh size) from areas of riffle/glide utilising a 2-minute kick sample, as per Environmental Protection Authority (EPA) methodology (Feeley et al., 2020). Large cobble was also washed at each site for 1-minute (where present) to collect attached macro-invertebrates (as per Feeley et al., 2020). Samples were elutriated and fixed in 70% ethanol for subsequent laboratory identification to species level. Samples were converted to Q-ratings as per Toner et al. (2005) and assigned to WFD status classes (**Table 2.2**). Any rare invertebrate species were identified from the NPWS Red List publications for beetles (Foster et al., 2009), mayflies (Kelly-Quinn & Regan, 2012), stoneflies (Feeley et al., 2020) and other relevant taxa (i.e. Byrne et al., 2009; Nelson et al., 2011).

Table 2.2 Reference categories for EPA Q-ratings (Q1 to Q5) (Toner et al., 2005)

Q value	WFD status	Pollution status	Condition
Q5 or Q4-5	High status	Unpolluted	Satisfactory
Q4	Good status	Unpolluted	Satisfactory
Q3-4	Moderate status	Slightly polluted	Unsatisfactory
Q3 or Q2-3	Poor status	Moderately polluted	Unsatisfactory
Q2, Q1-2 or Q1	Bad status	Seriously polluted	Unsatisfactory

2.7 Lacustrine macro-invertebrate communities

Pond sites P1, P2, P3 and P4 were sampled for macro-invertebrates via sweep netting. A standard pond net (250mm width, mesh size 500µm) was used to sweep macrophytes to capture macro-invertebrates. The net was also moved along the lake bed to collect epibenthic and epiphytic invertebrates from the substratum (as per Cheal et al., 1993). A 3-minute sampling period was employed. To ensure appropriate habitat coverage, the sampling period was also divided amongst the range of meso-habitats present at the survey site to get a representative sample for sub-habitats.

2.8 Macrophytes and aquatic bryophytes

Surveys of the macrophyte and aquatic bryophyte community were conducted by instream wading at each of the survey sites, with specimens collected (by hand or via grapnel) for on-site identification. An assessment of the aquatic vegetation community helped to identify any rare macrophyte species listed under the Flora (Protection) Order, 2022, Irish Red list for vascular plants (Wyse-Jackson et al., 2016) and or aquatic bryophytes (Lockhart et al., 2012), or habitats corresponding to Annex I habitats, such as floating river vegetation (3260) or hydrophilous tall herb (6430).

2.9 Otter signs

The presence of otter (*Lutra lutra*) was determined through the recording of otter signs within 150m radius of each survey site. Notes on the age and location of signs (ITM coordinates) were made, in addition to the quantity and visible constituents of spraint (i.e. remains of fish, crustaceans, molluscs etc.).

2.10 Aquatic ecological evaluation

The evaluation of aquatic ecological receptors contained within this report uses the geographic scale and criteria defined in the 'Guidelines for Assessment of Ecological Impacts of National Road Schemes' (NRA, 2009).

2.11 Biosecurity

A strict biosecurity protocol following IFI (2010) and the Check-Clean-Dry approach was adhered to during surveys for all equipment and PPE used. Disinfection of all equipment and PPE before and after use with Virkon™ was conducted to prevent the transfer of pathogens or invasive propagules between survey sites. Surveys were undertaken at sites in a downstream order to minimise the risk of upstream propagule mobilisation. Particular cognisance was given towards preventing the spread or introduction of highly virulent crayfish plague. Any aquatic invasive species or pathogens recorded within or adjoining the survey areas were geo-referenced. All Triturus staff are certified in 'Good fieldwork practice: slowing the spread of invasive non-native species' by the University of Leeds.

3. Desktop review

3.1 Survey area description

The Proposed Project is located in an upland area near Clomantagh Hill c.5km west of Freshford, Co. Kilkenny (**Figure 2.1**). The watercourses in the vicinity of Proposed Project are typically historically modified lowland depositing channels (FW2; Fossitt, 2000) and more natural upland eroding channels (FW1) within the Goul_SC_010, Nore_SC_050 and Nore_SC_070 river sub-catchments. Land use practices in the wider survey area are dominated by pastures (CORINE 231). Predominantly, the watercourses flow over areas of Visean limestone & calcareous shale and Tournaisian limestone (Geological Survey of Ireland data). Some areas are karstic and several watercourses flow underground and or run dry during the summer months.

3.2 Fisheries

Fisheries data was available for many of the survey watercourses. The River Goul, a tributary of the River Erkina, is a low-energy limestone river fed from aquifer and ground-water sources (Sullivan, 2007) is known to support Atlantic salmon (*Salmo salar*), brown trout (*Salmo trutta*) and European eel (*Anguilla anguilla*), stone loach (*Barbatula barbatula*) and three-spined stickleback (*Gasterosteus aculeatus*) (Triturus 2021-2024 data; IFI data[1]). The Coolnacrutta Stream, a tributary of the River Goul, is known to support Atlantic salmon, brown trout and European eel (Triturus 2021-2024 data). The Borrisbeg River, another Goul tributary, supports brown trout, lamprey (*Lampetra* sp.) and three-spined stickleback (Triturus 2021-2024 data).

The River Nore in the vicinity of Ballyragget supports a range of fish species including Atlantic salmon, brown trout, *Lampetra* sp., European eel, minnow (*Phoxinus phoxinus*), stone loach and rudd (*Scardinius erythropthalmus*) (Triturus 2021 data).

The Lisdowney Stream, a small alkaline tributary of the River Nore, is known to support Atlantic salmon, brown trout, European eel and three-spined stickleback (Triturus 2023 data; IFI data[1]).

The Nuenna River, a major tributary of the River Nore, is known to support brown trout, three-spined stickleback and low densities of *Lampetra* sp. (Gordon et al., 2021; Matson et al., 2018). This species assemblage has been recorded over multiple years, with brown trout growth identified as 'slow' according to the criteria of Kennedy & Fitzmaurice (1971) (Kelly et al., 2014). The Clomantagh Lower Stream, a Nuenna tributary, suffers from very low summer flows and routinely dries out resulting in a loss of fisheries habitat (pers. obs.).

The Gorteenahilla River, a tributary of the Nuenna River, is known to support Atlantic salmon (*Salmo salar*), brown trout, European eel and three-spined stickleback (Triturus 2021-2024 data; Matson et al., 2018). The Foyle South Stream, a tributary of the Gorteenahilla River, also supports these species (Triturus 2021-2024 data).

[1] Inland Fisheries Ireland data available at https://opendata-ifigis.hub.arcgis.com/datasets/IFIgis::water-framework-directive-fish-ecological-status-2008-2021/

3.3 Protected aquatic species

A comprehensive desktop review of available data from the National Parks and Wildlife Service (NPWS), National Biodiversity Data Centre (NBDC), Inland Fisheries Ireland (IFI), Botanical Society of Britain and Ireland (BSBI), National Crayfish Plague Surveillance Programme (NCPSP), Environmental Protection Agency (EPA) and Triturus databases for the 10km grid squares containing and adjoining the Proposed Project (i.e. S26, S36, S37, S46 & S47) identified records for a low number of rare and or protected aquatic species.

A low number of records for Annex II white-clawed crayfish (*Austropotamobius pallipes*) were available in the wider survey area, with more contemporary records for the River Goul and River Nore (2005-2023 data; **Figure 3.1**). Crayfish remains have previously been identified in otter spraint on the lower reaches of the Coolnacrutta Stream (current survey site D2) and the Borrisbeg River (Triturus 2022 data).

Contemporary Annex II otter (*Lutra lutra*) records were widespread throughout the respective grid squares, with contemporary records available for the Coolnacrutta Stream, River Goul, Gorteenahilla River, Nuenna River, Lisdowney Stream and River Nore (2005-2025 data; **Figure 3.1**).

Smooth newt (*Lissotriton vulgaris*), protected under the Wildlife Acts 1976-2023, were known from several locations in the 2013-2016 period (NBDC data) but none of these directly overlapped with the survey area (data not shown).

Multiple records for the critically endangered hard-water form of the freshwater pearl mussel (*Margaritifera margaritifera*) were available for the River Nore (data not shown). This species has declined significantly in recent years and is now confined to areas upstream of the Erkina confluence, Durrow (NPWS & Triturus data). It has recently been concluded that pearl mussel are no longer present in the River Nore downstream of the Erkina confluence (Sweeney, 2022).

A low number of historical records for opposite-leaved pondweed (*Groenlandia densa*), a macrophyte protected under the Flora (Protection) Order, 2022, were available for the River Goul in the 1975-1991 period (data not shown). No other contemporary NPWS records for macrophytes or aquatic bryophytes protected under the Flora (Protection) Order, 2022 or on national red lists were available for the respective grid squares.

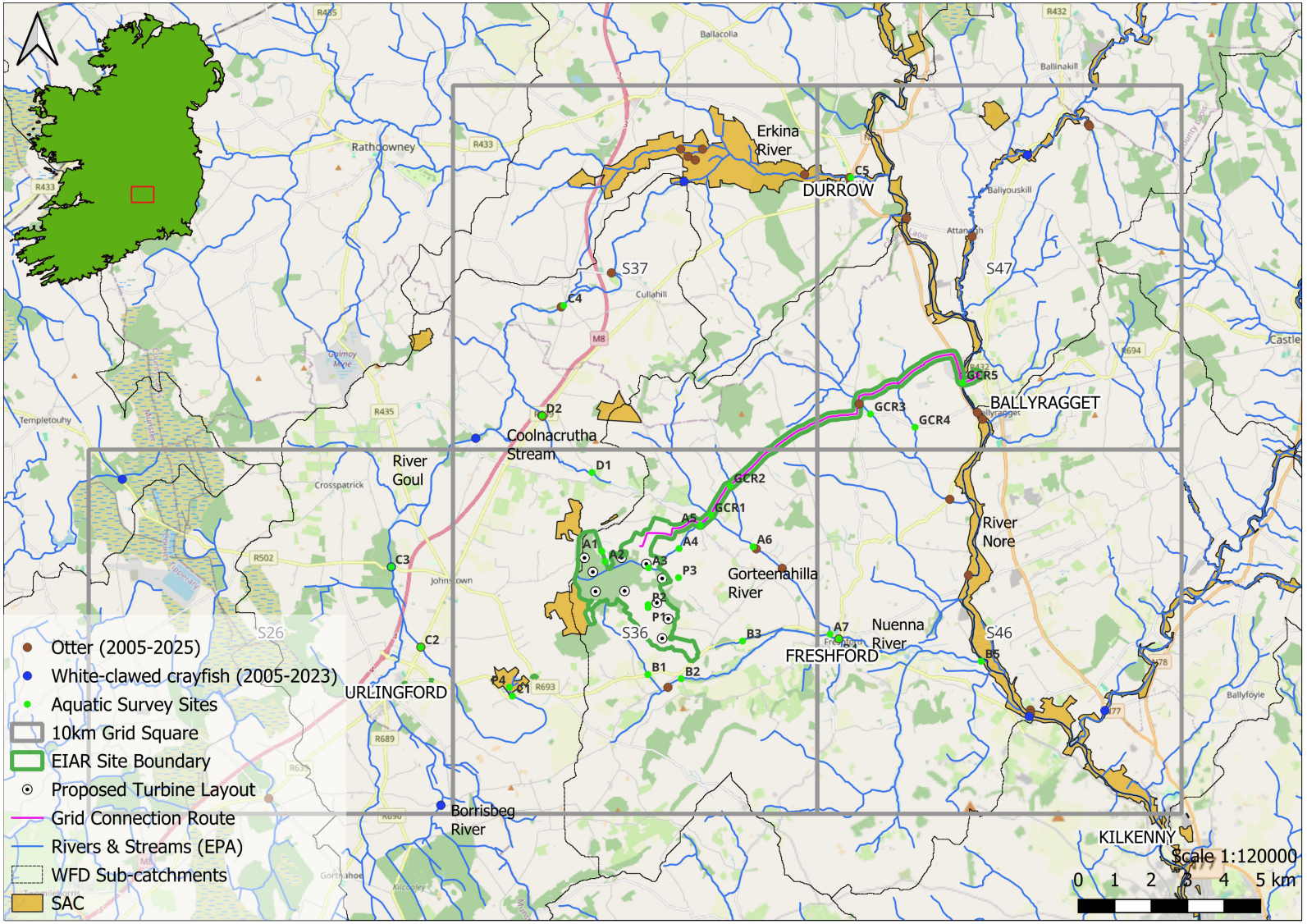


Figure 3.1 Selected protected aquatic species records in the vicinity of the Proposed Project (source: Triturus, NPWS, EPA & NBDC data)

4. Results of aquatic surveys

The following section summarises each of the 28 no. survey sites in terms of aquatic habitats, physical characteristics and overall value for fish and macrophyte/aquatic bryophyte communities. Please refer to **Appendix A** (fisheries assessment report) for more detailed fisheries results. Biological water quality (Q-sample) or macro-invertebrate sweep sampling results are also summarised for each riverine sampling site and in **Appendix B**. A summary of the fish species recorded at each survey site is provided in **Table 4.3**. A summary of the aquatic species and habitats of high conservation concern recorded during the surveys is provided in **Table 4.4**. An evaluation of the aquatic ecological importance of each survey site based on these aquatic surveys is provided and summarised in **Table 4.5**. Habitat codes are according to Fossitt (2000). Scientific names are provided at first mention only. Sites were surveyed in August 2025.

4.1 Aquatic survey site results

4.1.1 Site A1 – Unmapped stream, Frankford

Site A1 was located on an unmapped tributary of the Foyle South Stream within the Site boundary. The small upland stream (FW1) emanated from a coniferous plantation (WD4), flowing along a field boundary before flowing eastwards through improved grassland. The stream had been historically modified with evidence of local straightening. The stream was 0.5-1m wide and 0.05-0.1m deep with minimal flows in a U-shaped and often braided channel. The profile comprised slow-flowing glide and riffle with frequent small pools formed by instream woody debris and (willow) tree roots. Although some fine gravels and sands were present these were superficial and sat atop deep silt deposits. Given high riparian shading, macrophytes were limited to locally frequent water mint (*Mentha aquatica*) in rare open areas and occasional watercress (*Nasturtium officinale*). *Pellia* sp. liverwort grew on exposed areas of muddy bank. The riparian areas supported bramble (*Rubus fruticosus* agg.) scrub with ferns, nettle (*Urtica dioica*) and wild angelica (*Angelica sylvestris*). The stream flowed through a mature sitka spruce (*Picea sitchensis*) plantation (WD4) with scrubby wet borders of grey willow (*Salix cinerea* subsp. *oleifolia*). Extensive, heavily improved pasture (GA1) was present to the west (along with greater channel modifications).

Three-spined stickleback (*Gasterosteus aculeatus*) was the only fish species recorded via electro-fishing at site A1 (**Appendix A**). With the exception of this species, the site was not of fisheries value given the very shallow nature (possibly ephemeral at this location), siltation pressures and poor connectivity with downstream habitats. There was no suitability for white-clawed crayfish. No otter signs were recorded in vicinity of the survey site.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix C**). However, it should be noted that this was a tentative rating given an absence of suitable riffle areas for sampling (Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the absence of aquatic species or habitats of higher conservation value, the aquatic ecological evaluation of site A1 was of **local importance (lower value)** (**Table 4.5**).



Plate 4.1 Representative image of site A1 on an unmapped Foyle South Stream tributary, August 2025

4.1.2 Site A2 – Unmapped stream, Frankford

Site A2 was located on an unmapped tributary of the Foyle South Stream within the Site boundary. The drainage channel emanated from a coniferous plantation (WD4) and was dry at the time of survey with no standing water and a damp muddy base. The stream was joined from the north by a trapezoidal forestry drain which had recently been re-excavated (also dry). The channel was 1-2m wide in a shallow U-shaped channel. The ephemeral site supported abundant common water starwort (*Callitriche stagnalis*) with occasional watercress, water mint and water horsetail (*Equisetum fluviatile*). The site was heavily shaded by a mature coniferous plantation (WD4) with sparse understories. Bramble scrub was scattered along the channel. The site was bordered by intensive pasture (GA1) through which the dry, heavily modified (straightened, deepened) channel flowed.

Given the dry, ephemeral conditions, the site was not capable of supporting resident fish at the time of survey. There was no suitability for white-clawed crayfish. No otter signs were recorded in the vicinity of the site.

It was not possible to collect a biological water quality sample due to the dry nature of the channel.

Given the absence of aquatic species or habitats of higher conservation value, the aquatic ecological evaluation of site A2 was of **local importance (lower value)** (**Table 4.5**).



Plate 4.2 Representative image of site A2 on an unmapped Foyle South Stream tributary, August 2025 (dry, ephemeral channel)

4.1.3 Site A3 – Foyle South Stream, Killoshulan

Site A3 was located on the upper reaches of Foyle South Stream (EPA code: 15F07) immediately downstream of a farm access crossing within the proposed site boundary. The small upland eroding stream (FW1) flowed over a moderate to high gradient in a deeply incised V-shaped valley with bank heights of up to 5m. The stream was 1.5-2.5m wide and 0.05-0.2m deep, with a locally wider channel due to excessive cattle poaching. The stream suffered from low summer flows but the profile comprised swift shallow glide and riffle with frequent small pools and meanders. The substrata were dominated by loose angular cobble, boulder and slate with localised mixed gravels. Bedrock was present in higher gradient areas. Siltation was high downstream of the livestock access point but low upstream (no livestock access). Instream substrata had been historically excavated from the channel upstream of the track crossing. Given high energy conditions and high shading, macrophyte growth was sparse with only localised fool's watercress (*Helosciadium nodiflorum*), watercress and water mint. Aquatic bryophytes were limited to very occasional *Scapania undulata*. The liverwort *Pellia* sp. was locally frequent on exposed banks. The stream was heavily shaded by high banks supporting mature hazel (*Corylus avellana*), holly (*Ilex aquifolium*), ash (*Fraxinus excelsior*), grey willow and abundant bramble-dominated scrub. The site was bordered by sloping improved pasture (GA1) and wet grassland (GS4).

Three-spined stickleback was the only fish recorded via electro-fishing at site A3 (**Appendix A**). Despite some low suitability for salmonids and eel, the site was of poor fisheries value given its small size, low summer flows, naturally high gradients and location in the uppermost reaches of the catchment (i.e. poor connectivity with downstream habitats). Resident fish were limited to ubiquitous stickleback. There was no suitability for white-clawed crayfish. No otter signs were recorded in vicinity of the survey site.

Biological water quality, based on Q-sampling, was calculated as **Q4 (good status)** (**Appendix C**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the absence of aquatic species or habitats of higher conservation value, the aquatic ecological evaluation of site A3 was of **local importance (lower value)** (**Table 4.5**).



Plate 4.3 Representative image of site A3 on the upper reaches of the Foyle South Stream, August 2025

4.1.4 Site A4 – Foyle South Stream, Foyle South

Site A4 was located on the upper reaches of Foyle South Stream (15F07) at a farm access crossing c.1km downstream of site A3. The small upland spate stream (FW1) had been modified in vicinity of the track crossing but retained a natural form elsewhere. The stream flowed over a moderate gradient in an incised valley of bedrock with a profile characteristic of cascade-pool sequences. However, the stream was largely dry at the time of survey with no observable flows and remnant pools of standing water. The stream was 2-4m wide with bank heights up to 2m. The exposed bed was dominated by boulder and cobble with localised areas of bedrock. Typical of a spate channel, mixed gravels and sands were confined to pools. Siltation was high locally (mostly from livestock poaching) although no significant accumulations were present. Given the high energy characteristics and riparian shading, macrophytes were not present. However, the moss *Rhynchostegium riparioides* was locally abundant on larger instream substrata. The riparian areas supported mature treelines/woodland (WN2) dominated by hazel with grey willow, ash and bramble-dominated scrub. The site was bordered by heavily improved pasture (GA1).

Brown trout (*Salmo trutta*) and three-spined stickleback were the only fish species recorded via electro-fishing at site A4 (**Appendix A**). Despite good physical suitability for salmonids in terms of potential holding and spawning areas, only a low number of juvenile trout was recorded and this was

reflective of sub-optimal conditions caused by low summer flows. There was also some low suitability for European eel although none were recorded. The small upland spate channel was unsuitable for lamprey or white-clawed crayfish. No otter signs were recorded in vicinity of the survey site with foraging opportunities limited.

Biological water quality, based on Q-sampling, was calculated as **Q4 (good status)** (**Appendix C**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids, the aquatic ecological evaluation of site A4 was of **local importance (higher value)** (**Table 4.5**).



Plate 4.4 Representative image of site A4 on the Foyle South Stream, August 2025 (semi-dry channel)

4.1.5 Site A5 – Foyle South Stream, Foyle Bridge

Site A5 was located on the lower reaches of the Foyle South River (15F07) at Foyle Bridge, c.1km downstream of site A4. The upland eroding stream (FW1) was semi-natural in profile but had been modified historically in vicinity of the bridge (boulder revetments). The spate channel suffered from low summer flows at the time of survey with a profile of cascading pool habitat. The stream was 3-5m wide in a deeply incised, largely natural valley, with bank heights of 3-6m. The stream flowed over a moderate gradient with frequent cascades over bedrock steps and associated plunge pools to a maximum depth of 1.8m (usually <1m). The substrata were dominated by cobble and boulder with only localised interstitial gravels. Bedrock steps were frequent. Siltation was low overall given the typical high-energy nature and soft sediment accumulations were absent. High riparian shading and the spate nature of the site precluded macrophytes. However, *Rhynchostegium riparoides* was present on instream boulder, with occasional *Fontinalis squamosa* and *Fontinalis antipyretica*. The moss *Thamnobryum alopecurum* and the liverwort *Conocephalum conicum* were present above the

waterline. The red encrusting algae *Hildenbrandia rivularis* was present locally on bedrock. The site was well shaded by mature riparian treelines of ash and sycamore (*Acer psuedoplatanus*). The site was adjoined by improved pasture (GA1).

Brown trout was the only fish species recorded via electro-fishing at site A5 (**Appendix A**). Despite low summer flows, the site was of value for salmonids with a low density of mixed cohort trout captured. Though previously known from the site (Triturus, 2023), no Atlantic salmon were recorded. Plunge pools at cascades provided valuable and well shaded holding areas for any remaining salmonids. Some limited spawning habitat was present between cascades. The site was of some moderate value to European eel, which were not recorded in the current survey (but known from site). There was no suitability for lamprey or white-clawed crayfish given the very high energy characteristics. Despite some suitability, no otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3-4 (moderate status)** (**Appendix C**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids, the aquatic ecological evaluation of site A5 was of **local importance (higher value)** (**Table 4.5**).



Plate 4.5 Representative image of site A5 on the Foyle South Stream at Foyle Bridge, August 2025

4.1.6 Site A6 – Gorteenahilla River, Tinnascarty

Site A6 was located on the Gorteenahilla River (15G08) at a local road crossing. The upland river (FW1) had been historically straightened and deepened with embankments and a trapezoidal channel present in vicinity of the bridge (open box culvert). Although some good instream recovery was evident the river suffered from characteristic low summer flows. The river was 2.5-3m wide and 0.1-

0.3m deep, with occasional deeper pool to 0.5m. The profile comprised slow-flowing glide and stagnating pool with limited riffle areas (under higher flows the site would be dominated by swift glide and riffle). The substrata were dominated by cobble with frequent boulder. Beds of mixed gravels were present locally. Soft sediment accumulations were typically flocculent, where present (e.g. adjoining pools) although some deeper areas of silt were noted. Siltation was moderate overall with a high cover of floc and filamentous algae symptomatic of flow flows. Local water abstraction (agriculture) was also evident at the bridge. Faster flowing areas supported abundant fool's watercress, mint (*Mentha* spp.) and watercress. Lesser water parsnip (*Berula erecta*) was occasional with rare branched bur-reed (*Sparganium erectum*). Cover of aquatic bryophytes was low with *Leptodictyum riparium* (an indicator of enrichment) dominating. *Rhynchostegium riparioides* was also present locally. Narrow riparian buffers supported abundant herbaceous species including great willowherb (*Epilobium hirsutum*), hedge bindweed (*Calystegia sepium*), nettle, marsh woundwort (*Stachys palustris*) with scattered ash and willow. Butterbur (*Petasites hybridus*) was locally abundant. The site was bordered by intensive pasture (GA1).

Atlantic salmon (*Salmo salar*), brown trout, lamprey (*Lampetra* sp.) and three-spined stickleback were recorded via electro-fishing at site A6 (**Appendix A**). Despite low summer flows the site was of good value for salmonids, supporting moderate densities of juvenile Atlantic salmon and brown trout. Holding opportunities (shallow water) were poor for adult salmonids. The site was of highest value as a salmonid nursery, with abundant accessible cobble and boulder refugia in addition to frequent instream macrophyte beds albeit low flows reduced the value. Spawning habitat, whilst present for both salmonids and lamprey, was localised and better suited to Atlantic salmon given the predominance of larger substrata. Lamprey nursery habitat was scarce given the high energy nature of the site although localised patches of organic-rich soft sediment supported low densities of ammocoetes. Despite some moderate value for European eel and white-clawed crayfish, none were recorded. No crayfish were detected via eDNA sampling (**Table 4.1**). Despite some foraging opportunities, no otter signs were recorded in the vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3-4 (moderate status)** (**Appendix C**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids (including Atlantic salmon) and lamprey (*Lampetra* sp.), the aquatic ecological evaluation of site A6 was of **local importance (higher value)** (**Table 4.5**).



Plate 4.6 Representative image of site A6 on the Gorteenahilla River, August 2025

4.1.7 Site A7 – Gorteenahilla River, Freshford

Site A7 was located on the lowermost reaches of the Gorteenahilla River (15G08) at the R693 road crossing immediately upstream of the Nuenna River confluence. The river was dry at this location at the time of survey, despite water being present upstream (e.g. site A6). The lower reaches of the karstic river frequently flow underground in the summer months (pers. obs.). Natural gradients prevented water entering the dry channel from the connecting Nuenna River. The semi-natural upland eroding river (FW1) was 4-6m wide with steep banks of up to 3m in vicinity of the road crossing. Typical of a spate channel, the substrata were dominated by rounded cobble with frequent small boulder and localised coarse gravels. Sand-dominated sediment accumulations were evident on meanders and adjoining putative pool areas. Macrophytes and aquatic bryophytes were not recorded. The river was lined by mature treelines dominated by ash and sycamore. The site was bordered by improved pasture (GA1) and the peri-urban area of Freshford (BL3).

Site A7 was not of fisheries value at the time of survey given its dry, ephemeral nature and absence of aquatic habitats. However, there would be high suitability for salmonids during wetted periods, with abundant spawning substrata present. There was also some good physical suitability for European eel under wetted conditions (e.g. bank scours, pool areas etc.). No otter signs were recorded in the vicinity of the site.

It was not possible to collect a biological water quality sample due to the dry nature of the channel.

Given the absence of aquatic species or habitats of higher conservation value, the aquatic ecological evaluation of site A7 was of **local importance (lower value)** (**Table 4.5**).



Plate 4.7 Representative image of site A7 on the Gorteenahilla River, August 2025 (dry karstic channel)

4.1.8 Site P1 – Unnamed pond, Killoshulan

Site P1 was a small isolated pond located within a circular basin of c.100m^2. Although the pond occasionally holds water (Triturus, 2023), the site was dry at the time of survey. The centre of the pond remained damp and swampy although no standing water was present. The pond bed comprised deep organic-rich silt/mud with localised large boulder scattered along the margins. The pond was unfenced with abundant livestock poaching. The pond supported several macrophytes, reflecting occasional wetted conditions (e.g. winter). Round-leaved crowfoot (*Ranunculus omiophyllus*) was occasional with common water starwort and brooklime (*Veronica beccabunga*). The basin was colonised by rushes (Juncus sp.) and bent grass (*Agrostis* sp.). Whilst scattered hawthorn and bramble scrub encircled the pond, the banks were dominated by improved pasture (GA1).

Site P1 was not of fisheries value given its ephemeral nature. However, the pond was of some value as a breeding and nursery area for common frog (*Rana temporaria*). Suitability for smooth newt (*Lissotriton vulgaris*) was low given the poor quality of the aquatic habitats present, in addition to a lack of suitable terrestrial refugia (hibernacula). No amphibian species were recorded during the site visit. There was no suitability for white-clawed crayfish or otter.

It was not possible to collect an aquatic macro-invertebrate sample due to the dry nature of the pond.

Given the absence of aquatic species or habitats of higher conservation value, the aquatic ecological evaluation of site P1 was of **local importance (lower value)** (**Table 4.5**).



Plate 4.8 Representative image of site P1, August 2025 (dry pond)

4.1.9 Site P2 – Unnamed pond, Killoshulan

Site P2 was a small seasonal pond basin of c.200m^2 located 75m north of site P1. Whilst known to support water occasionally (Triturus, 2023), the pond was dry at the time of survey with a dry mud base. Unlike the neighbouring site P1, macrophytes were not recorded and the circular depression was colonised by bent grass (*Agrostis* sp.), rushes (*Juncus* spp.) and rank grasses. The ephemeral pond was unfenced and livestock grazing had resulted in little vegetation encircling the basin, with scattered nettle, dock (*Rumex* spp.) and thistles (*Cirsium* spp.) only. The site was located in an extensive area of improved pasture (GA1).

Site P2 was not of fisheries value given its ephemeral nature and lack of connectivity to other habitats. However, the pond would be of some value as a breeding and nursery area for common frog in the winter season when holding standing water (none recorded). There was no suitability for smooth newt given the poor quality of the aquatic habitats present, in addition to a lack of suitable terrestrial refugia (hibernacula). There was no suitability for white-clawed crayfish or otter.

It was not possible to collect an aquatic macro-invertebrate sample due to the dry nature of the pond.

Given the absence of aquatic species or habitats of higher conservation value, the aquatic ecological evaluation of site P2 was of **local importance (lower value)** (**Table 4.5**).



Plate 4.9 Representative image of site P2, August 2025 (dry pond)

4.1.10 Site P3 – Unnamed pond, Foyle South

Site P3 was a small quarry pond (FL8) located west of the Site boundary. The clear-water pond covered a surface area of c.800m^2 with an undulating bed ranging from 0.2m in marginal areas to >1m throughout much of the basin (maximum depth 1.5m). The site featured a main, mature basin and a smaller seasonal basin that contained water to a depth of 0.2m at the time of survey. Given its location in a former quarry, the bed comprised loose cobble/slate with only occasional boulder. The bed featured a light covering of argillaceous silt. The pond was well vegetated (50% cover) with dominant broad-leaved pondweed (*Potamogeton natans*) and bulrush (*Typha latifolia*). Branched bur-reed and fan-leaved water crowfoot (*Ranunculus circinatus*) were present but rare. Shallow bars and margins supported occasional blue water speedwell, floating sweet gras (*Glyceria fluitans*) and jointed rush (*Juncus articulatus*). Filamentous algae were frequent on the pond bed. Aquatic bryophytes were not recorded. The steep, loose, slumping banks of the pond supported sparse gorse (*Ulex europaeus*) and willow with rank grasses dominating. The site was bordered by intensive improved pasture (GA1).

Despite suitability for fish species (such as three-spined stickleback), none were recorded or observed during the site visit (as per previous surveys). This likely reflected the isolated nature of the pond and lack of connectivity to fish supporting habitats. However, the pond had highly suitability for smooth newt given the absence of significant fish stocks and amenable vegetation levels. A low number of efts were recorded via sweep sampling (**Figure 4.11**). The site was also suitable for common frog (none recorded). There was low suitability for white-clawed crayfish (none recorded). No otter signs were recorded in the vicinity of the site with the geographic isolation of the site reducing the likelihood of foraging.

No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via sweep sampling (**Appendix C**).

Given the presence of smooth newt, the aquatic ecological evaluation of site P3 was of **local importance (higher value)** (**Table 4.5**).



Plate 4.10 Representative image of site P3, August 2025



Plate 4.11 Smooth newt efts recorded at site P3, August 2025

4.1.11 Site P4 – The Loughane, Balief Lower

Site P4 was located at small pond within The Loughans SAC (000407). Seasonally, the turlough site covers and extensive area (>20ha) but recedes in summer with a small permanent central pond

(NPWS, 2013). At the time of survey, the small, shallow remnant pond covered a surface area of c.50m^2 with a depth of 0.05-0.2m. A heavy (cyanobacterial) algal bloom was evident. The pond bed comprised argillaceous silt with localised boulder around the perimeter. Cover of curled pondweed (*Potamogeton crispus*) was high with occasional broad-leaved pondweed. The damp margins (inundation zone) supported frequent water forget-me-not (*Myosotis scorpioides*), narrow-fruited watercress (*Nasturtium microphyllum*), blue water speedwell (*Veronica anagallis-aquatica*), pink water speedwell (*Veronica catenata*), water mint and spike rush (*Eleocharis palustris*). The outer perimeter also supported abundant reed canary grass (*Phalaris arundinacea*), amphibious bistort (*Persicaria amphibia*) and silverweed (*Potentilla anserina*) with grey willow and hawthorn. The site was bordered by improved pasture (GA1).

Given the receding, isolated and shallow nature of the pond, site P4 was of poor fisheries value. However, sweep netting revealed the presence of three-spined stickleback and ten-spined stickleback (*Pungitius pungitius*) in low densities. The pond had some moderate suitability as a smooth newt habitat, with good suitability for common frog although neither were recorded during the site visit. There was low suitability for white-clawed crayfish (none recorded). No otter signs were recorded in the vicinity of the site with poor foraging opportunities.

No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via sweep sampling (**Appendix C**).

Given the location of the site within The Loughans SAC (000407), the aquatic ecological evaluation of site P4 was of **international importance** (**Table 4.5**).



Plate 4.12 Representative image of site P4 in The Loughans SAC, August 2025

4.1.12 Site B1 – Clomantagh Lower Stream Clomantagh Lower

Site B1 was located on the putative lower reaches of the Clomantagh Lower Stream (15C91) (as mapped by the EPA) at the R693 road crossing. However, the channel had evidently been historically realigned and, despite extensive searching, no trace of a watercourse could be identified (likely culverted underground). The mapped course of the stream was located in heavily improved pasture (GA1) with hedgerows dominated by bramble and hawthorn (*Crataegus monogyna*).

Site B1 was not of fisheries or aquatic value given an absence of aquatic habitats.

Given the dry nature of the site, it was not possible to collected a biological water quality sample at the time of survey.

Given the absence of aquatic habitats, the aquatic ecological evaluation of site B1 was of **local importance (lower value)** (**Table 4.5**).



Plate 4.13 Representative image of site B1 on the Clomantagh Lower Stream at the R693 road crossing, August 2025 (historically realigned channel, likely culverted underground)

4.1.13 Site B2 – Nuenna River, Barna

Site B2 was located on the upper reaches of the Nuenna River (15N02) at a local road crossing. The high energy alkaline river (FW2) had been straightened upstream of the crossing but retained a more natural profile downstream, with mature banks of up to 2m in height. The river was 4-8m wide and 0.1-0.4m deep, with occasional deeper glide and pool to c.1m. The profile comprised swift glide and riffle with occasional pool. The substrata of the high energy site were dominated by cobble and boulder with frequent mixed gravels and sands. Siltation was low although some flocculent soft sediment (silt) accumulations were present near the bridge and adjoining macrophyte stands. Calcification of the bed was evident (i.e. cyanobacterial crusts). The site was heavily vegetated with

abundant water crowfoot (*Ranunculus* sp.) and heterophyllus fool's watercress. Lesser water parsnip and watercress were present but rare overall. Branched bur-reed was present upstream of the bridge (not downstream) with some ivy-leaved duckweed (*Lemna trisulca*). Water mint was frequent along channel margins. Aquatic bryophyte coverage was high with frequent *Fontinalis antipyretica*, *Pellia endiviifolia*, *Chiloscyphus polyanthos* and *Leptodictyum riparium* on larger substrata. Given the presence of several indicator species (EC, 2013), the aquatic vegetation community was representative of Annex I floating river vegetation (3260). Downstream of the bridge the river was heavily shaded by mature treelines dominated by alder (*Alnus glutinosa*) sycamore, grey willow and ash. The site was bordered by improved pasture (GA1).

Brown trout and lamprey (*Lampetra* sp.) were the only fish species recorded via electro-fishing at site B2 (**Appendix A**). Despite low summer water levels the site was of good value for salmonids with a mixed-cohort brown trout population. The typically high energy site was physically more suited to Atlantic salmon but the species was not recorded - this was considered to reflect natural downstream barriers to migration (e.g. falls at Freshford). The site was a good quality salmonid nursery given abundant instream refugia, although only low numbers were recorded. The shallow site was of limited holding value for adult salmonids. Bed calcification reduced the spawning value for salmonids and lamprey but some was present locally. Lamprey nursery habitat was scarce and sub-optimal where present, supporting only a low density of ammocoetes. Despite good suitability for European eel, none were recorded. Suitability for white-clawed crayfish was high but none were recorded. No otter signs were recorded in vicinity of the site despite good foraging opportunities.

Biological water quality, based on Q-sampling, was calculated as **Q4 (good status)** (**Appendix C**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of Annex I floating river vegetation (3260), the aquatic ecological evaluation of site B2 was of **county importance** (**Table 4.5**).



Plate 4.14 Representative image of site B2 on the Nuenna River, August 2025

4.1.14 Site B3 – Baunaniska Stream, Kilrush

Site B3 was located on the Baunaniska Stream (15B89) at a private road crossing adjacent to the R693, c. 1km upstream of the Nuenna River confluence. The small lowland stream (FW2) flowed under the track via a pipe culvert and suffered from low summer flows at the time of survey. The stream had been historically straightened and deepened resulting in a trapezoidal channel that was 1.5-2m wide and 0.05-0.1m deep. The stream was semi-dry with intermittent glide and pools only. The substrata were dominated by deep organic-rich silt with superficial mixed gravels and scattered boulder. Woody debris and leaf litter was abundant instream. Given high riparian shading, macrophytes were limited to rare fool's watercress and water mint. Aquatic bryophytes were not recorded. The liverwort *Conocephalum conicum* was abundant on muddy areas of bank. The steep sided channel was heavily shaded by dense ash, hawthorn and sycamore with abundant bramble. The site was bordered by a residential property (BL3, GA2) and improved pasture (GA1).

Three-spined stickleback was the only fish species recorded via electro-fishing at site B3 (**Appendix A**). With the exception of low numbers of ubiquitous stickleback the site was not of fisheries value given its small size, very shallow nature, low summer flows, heavy siltation and poor hydromorphology. There was no suitability for white-clawed crayfish. No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix C**). However, it should be noted that this was a tentative rating given an absence of suitable riffle areas for sampling (Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the absence of aquatic habitats, the aquatic ecological evaluation of site B1 was of **local importance (lower value)** (**Table 4.5**).



Plate 4.15 Representative image of site B3 on the Baunaniska Stream, August 2025

4.1.15 Site B4 – Nuenna River, Old Bridge

Site B4 was located on the Nuenna River (15N02) upstream of Old Bridge in Freshford. The river (FW1) had been heavily modified within Millenium Park with historical retaining walls present. The typically high energy river suffered from low summer water levels at the time of survey and was 6-8m wide and 0.1-0.8m deep, with occasional deeper pool to 1.4m. The alkaline river substrata were heavily calcified with boulder, cobble and mixed gravels dominating. Siltation was high with a relatively high cover of filamentous algae indicating significant eutrophication pressures. Due to the high energy characteristics and high shading, macrophytes were limited to fool's watercress. Instream boulder and cobble supported abundant calcified *Rhynchostegium riparioides* with occasional *Fissidens* sp. in the margins. The riparian areas supported mature beech (*Fagus sylvatica*), ash, oak (*Quercus* sp.), hawthorn, ash, grey willow, weeping willow (*Salix babylonica*), elder (*Sambucus nigra*), horse chestnut (*Aesculus hippocastanum*) and grey alder (*Alnus incana*). The site was bordered by mixed broadleaved woodland (WD1) on the west bank and scattered trees and parkland (WD5) on the east.

Atlantic salmon and brown trout were the only fish species recorded via electro-fishing at site B5 (**Appendix A**). The site was a good quality salmonid nursery given ample water flows and good flow heterogeneity with healthy mixed cohort populations present. However, high siltation and bed calcification reduced the value of the site considerably both as a nursery and spawning habitat. Deeper pool and bank scours offered high-quality holding areas for adult salmonids. Suitability for lamprey in the survey area was poor given bed calcification and flocculent nature of silt accumulations. Deeper, shaded areas provided some good quality habitat for European eel although none were recorded (but known from site, Triturus data). Despite some suitability for white-clawed crayfish in the highly alkaline river, none were recorded with bed calcification reducing accessibility of instream refugia. No otter signs were recorded in vicinity of the site despite ample prey resources and good foraging opportunities.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix C**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids (including Atlantic salmon), the aquatic ecological evaluation of site B5 was of **local importance (higher value)** (**Table 4.5**).



Plate 4.16 Representative image of site B4 on the Nuenna River upstream of Old Bridge, August 2025

4.1.16 Site B5 – Nuenna River, Purcellsgarden

Site B5 was located on the Nuenna River (15N02) at a local road crossing c.200m upstream of the River Nore confluence. The high energy lowland watercourse (FW2) was natural in profile with naturally steep incised banks of up to 2m in height. Natural scouring of the loamy banks was widespread. The river was 3-5m wide and 0.2-0.4m deep with frequent deeper glide and pool (mostly upstream of bridge) to 1.2m. The profile was dominated by swift-flowing glide and riffle with occasional pool. The substrata comprised abundant clean mixed gravels and small cobble, with only occasional boulder. Some bed calcification was evident. Areas of sand were present in flow refugia. Soft sediment accumulations were scarce and shallow where present. Siltation was low overall. Give high flow rates and mobile substrata, macrophyte growth was limited to occasional fool's watercress, water mint and watercress along channel margins and on exposed gravel bars. Branched bur-reed was rare. The calcicolous liverwort *Pellia endiviifolia* was also occasional on larger instream substrata (locally abundant on banks). The well-developed riparian zones supported abundant grey willow and osier (*Salix viminalis*) with frequent crack willow (*Salix fragilis*), hazel, hawthorn and occasional ash. The understories featured reed canary grass, nettle, hedge bindweed and bramble. The site was bordered by intensive pasture (GA1).

Atlantic salmon, brown trout, lamprey (*Lampetra* sp.) and European eel were recorded via electro-

fishing at site B5 (**Appendix A**). The site was of high value for salmonids, supporting moderate densities of mixed-cohort Atlantic salmon and brown trout. Deeper glide and pool associated with bank scours and debris dams provided high-quality holding areas for adult salmonids. The site was also a high-quality spawning area for both salmonids and lamprey given an abundance of clean mixed gravels and small cobble. Abundant riffle and fast glide areas provided ample nursery areas for salmonids although the value was somewhat reduced given a paucity of larger instream substrata and macrophyte beds. Soft sediment areas were scarce and dominated by sands but supported low densities of *Lampetra* sp. ammocoetes. The was abundant diurnal refugia and deeper holding areas for European eel, with a low number recorded. Despite high suitability, no white-clawed crayfish were recorded although the species as detected via eDNA sampling (**Table 4.1**). No otter signs were recorded in vicinity of the site despite ample prey resources and good foraging opportunities.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix C**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the location of the site within the River Barrow and River Nore SAC (002162) and the River Nore SPA (004233), the aquatic ecological evaluation of site B5 was of **international importance** (**Table 4.5**).



Plate 4.17 Representative image of site B5 on the Nuenna River near the River Nore confluence, August 2025

4.1.17 Site C1 – Borrisbeg River, Balief Lower

Site C1 was located on the uppermost reaches of the Borrisbeg River (15B18) at the R693 road crossing immediately south of the Loughans SAC (000407), a large turlough. The lowland channel had been extensively straightened and deepened historically and was dry at the time of the survey (as per previous surveys). Contained in a deep U-shaped channel, the dry river was a homogenous 3m wide

with bank heights of up to 2m. The bed comprised dry mud with scattered boulder and an abundance of leaf litter and woody debris. The presence of fool's watercress and *Fontinalis antipyretica* indicated occasional water flows. The channel was heavily shaded by mature ash, willow and sycamore treelines. The site was bordered by improved pasture (GA1).

Given the dry, ephemeral conditions, the site was not capable of supporting resident fish at the time of survey. There was no suitability for white-clawed crayfish. No otter signs were recorded in the vicinity of the site.

It was not possible to collect a biological water quality sample due to the dry nature of the channel.

Given the absence of aquatic species or habitats of higher conservation value, the aquatic ecological evaluation of site C1 was of **local importance (lower value)** (**Table 4.5**).



Plate 4.18 Representative image of site C1 on the Borrisbeg River, August 2025 (dry, ephemeral channel)

4.1.18 Site C2 – Borrisbeg River, Mountfinn

Site C2 was located on the Borrisbeg River (15B18) at the R639 road crossing, c.6.5km downstream of site C1. The alkaline river (FW2) at this location had been historically straightened and deepened with some instream recovery. The river suffered from low summer flows at the time of survey and was 2-3m wide (channel width up to 4m) and 0.05-0.2m deep with only localised deeper areas to a maximum of 0.25m. The profile comprised heavily vegetated glide and riffle with localised pool. The substrata were dominated by mixed gravels with localised cobble and boulder. However, these were both heavily silted and heavily calcified. Beds of flocculent soft sediment (silt) and organic-rich sand were present locally, typically adjoining pool slacks. Macrophyte cover was high (>75%) with abundant fool's watercress, watercress, water mint and ivy-leaved duckweed (*Lemna trisulca*). Iris (*Iris psuedacorus*) was rare. Larger instream substrata supported a high cover of aquatic bryophytes with locally frequent

Rhynchostegium riparioides, *Pellia endiviifolia* and *Leptodictyum riparium*. Encroachment of the narrow channel by terrestrial vegetation was high with abundant great willowherb in addition to wild angelica, bittersweet (*Solanum dulcamara*), hedge bindweed and nettle. The riparian areas were heavily scrubbed with abundant bramble, hawthorn with frequent grey willow which often resulted in local tunnelling of the narrow channel. The site was bordered by improved pasture (GA1).

Brown trout was the only fish species recorded via electro-fishing at site C2 (**Appendix A**). The site was of moderate value for salmonids, supporting a low density of juvenile brown trout (no adults). Holding habitat for larger adults was absent given the shallow nature of the site. Salmonid nursery habitat was of moderate value only given the shallow nature of the site, siltation pressures, bedding of substrata and low summer flows. Spawning areas for both brown trout and lamprey were present but highly localised and impacted by siltation and calcification. Although previously recorded from the site (Triturus, 2023), no lamprey ammocetes were captured and suitability was low overall given the shallow nature of soft sediment deposits. Despite some good suitability, no European eel were recorded. The site was considered of moderate suitability for white-clawed crayfish given a paucity of accessible refugia, calcification of the bed and an absence of suitable burrowing areas - none were recorded. However, crayfish remains (including some very fresh) were previously recorded at the site in 2022 (Triturus, 2023). An old otter spraint site was recorded under the road bridge.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix C**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids, the aquatic ecological evaluation of site C2 was of **local importance (higher value)** (**Table 4.5**).



Plate 4.19 Representative image of site C2 on the Borrisbeg River, August 2025

4.1.19 Site C3 – River Goul, Foulkscourt

Site C3 was located on the River Goul (15G02) at the R502 road crossing. The lowland river (FW2) had been extensively straightened and deepened historically, resulting in a deep U-shaped homogenous channel with poor hydromorphology. Old embankments were evident. The canalised river was 6-8m wide with a high average depth of >1.5m (typically >2m). The profile was of slow-flowing depositional glide and pool with no riffles. The substrata were dominated by deep silt with scattered boulder. The rendered bridge apron supported scattered cobble and boulder. The site was very heavily vegetated with abundant branched bur-reed, unbranched bur-reed (*Sparganium emersum*), fool's watercress various-leaved water starwort (*Callitriche platycarpa*) and common duckweed (*Lemna minor*). Stands of bulrush, common clubrush (*Schoenoplectus lacustris*), iris, water forget-me-not, water mint and common reed (*Phragmites australis*) were occasional. Aquatic bryophytes were limited to *Fontinalis antipyretica* on instream structure. The liverwort *Marchantia polymorpha* was present on the bridge abutment and submerged on instream structure. The sloping banks supported a nitrophilous herbaceous community dominated by reed canary grass with nettle, hedge bindweed, bittersweet, purple loosestrife (*Lythrum salicaria*), angelica and scattered bramble. The channel was bordered by a mature willow-dominated treeline to the south-east and an area of riparian woodland (WN5) to the north-west supporting ash, hawthorn, alder, willow and privet (*Ligustrum vulgare*). Improved pasture (GA1) was present to the east.

Electro-fishing was not undertaken at site C3 due to prohibitive depths of >1.5m. The site was of some suitability as an adult salmonid holding area albeit sub-optimal due to restricted flows. The nursery value was moderate, at best, with an absence of spawning areas (no hard substrata). Soft sediment accumulations with some suitability for lamprey ammocoetes were present at a depth of 1-1.5m under the bridge arches (lamprey detected via eDNA sampling, **Table 4.1**). The site was also of high suitability for European eel and a range of coarse fish species such as pike (*Esox lucius*) and perch (*Perca fluviatilis*). Suitability for white-clawed crayfish was high given an abundance of instream refugia. Although none were recorded during the survey the species was detected via eDNA sampling (**Table 4.1**). Despite good foraging opportunities, no otter signs were recorded in vicinity of the site with marking areas limited.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix C**). However, it should be noted that this was a tentative rating given an absence of suitable riffle areas for sampling (Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the detection of lamprey (*Lampetra* sp.) and white-clawed crayfish via eDNA sampling, the aquatic ecological evaluation of site C3 was of **local importance (higher value)** (**Table 4.5**).



Plate 4.20 Representative image of site C3 on the River Goul, August 2025

4.1.20 Site C4 – River Goul, Aghmacart Bridge

Site C4 was located on the River Goul (15G02) upstream of Aghmacart Bridge. The lowland river (FW2) had been straightened and modified historically with a defunct weir (no fish pass) located 75m upstream of the bridge. The river was 8-10m wide and 0.2-0.4m deep, with localised deeper pool areas to 0.75m. A deep plunge pool (to 2m) was located at the weir, with deeper (>1.5m) glide predominating upstream in the impounded section. The profile downstream of the weir comprised swift shallow glide and riffle with occasional pool. The substrata were dominated by cobble and mixed gravels with frequent small boulder. Bed calcification was widespread. Beds of sand were present locally. Siltation was high overall although no significant accumulations were noted downstream of the weir (dominant upstream). Macrophyte growth was sparse in open glide habitat with marginal stands of fool's watercress, water mint and common water starwort. Branched bur-reed was frequent in depositional habitat upstream. Aquatic bryophyte coverage was high with abundant *Marchantia polymorpha* on instream substrata in addition to frequent *Fontinalis antipyretica* and occasional *Pellia endiviifolia*. The mosses *Leptodictyum riparium*, *Rhynchostegium riparioides* and *Fissidens* sp. were frequent. The riparian areas supported a mature treeline of ash, sycamore, Scot's pine (*Pinus sylvestris*) and alder with bramble scrub on the north bank. To the south, a nitrophilous community of reed canary grass and nettle-dominated scrub lined the channel. The site was bordered by a small mixed woodland (WD3) block, an immature alder plantation (WS2) and improved pasture (GA1).

Atlantic salmon and brown trout were the only fish species recorded via electro-fishing at site C4 (**Appendix A**). Despite modifications and pressures, the site was of high value for salmonids, supporting a moderate density of mixed-cohort salmon and trout. Riffle and glide habitat with ample boulder and cobble refugia were of value to juvenile salmonids with good quality spawning habitat for both salmonids and lamprey was also present (reduced by calcification & siltation). Deep pool and glide provided with overhanging vegetation provided good quality holding areas for adult salmonids.

The site was of poor quality as a lamprey nursery due to a paucity of suitable soft sediment areas. The weir was a considerable but navigable barrier to salmonids and European eel (but not lamprey). Good quality European eel habitat was present but none were recorded. Suitability for white-clawed crayfish was high although none were recorded via hand searching of instream refugia. No otter signs were recorded in vicinity of the site despite ample foraging opportunities.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix C**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids (including Atlantic salmon), the aquatic ecological evaluation of site C4 was of **local importance (higher value)** (**Table 4.5**).



Plate 4.21 Representative image of site C4 on the River Goul at Aghmacart Bridge, August 2025 (facing upstream to weir)

4.1.21 Site C5 – River Erkina, Durrow Bridge

Site C5 was located on the River Erkina (15E01) at Durrow Bridge (N77). The large lowland river (FW2) had been modified in vicinity of the two bridges with boulder revetment and retaining walls present. However, good instream recovery had occurred. The swift-flowing alkaline river was 12-15 wide and 0.3-0.6m deep, with frequent deeper glide to 1.2m. The substrata were dominated by stable cobble with frequent boulder and interstitial mixed gravels. These were partially bedded due to high flow rates and calcification (cyanobacterial crusts). Beds of finer mixed gravels and sand were present in pool slacks, especially under the bridge arches. Soft sediment accumulations were also present under the outermost bridge arches but these were largely flocculent. Siltation was low overall. The site supported a wide diversity of macrophytes with water crowfoot (*Ranunculus* sp.) and heterophyllus fool's watercress dominating. Various-leaved water starwort, common water starwort, branched bur-reed, hemlock water dropwort (*Oenanthe crocata*), watercress, ivy-leaved duckweed and common

duckweed were occasional with rare mare's-tail (*Hippuris vulgaris*). The margins supported narrow fringes of water mint, blue water speedwell and water forget-me-not. Cover of aquatic bryophytes was also high with abundant *Fontinalis antipyretica* in addition to occasional *Leptodictyum riparium*, *Rhynchostegium riparioides* and *Cinclidotus fontinaloides*. The liverwort species *Pellia endiviifolia* and *Marchantia polymorpha* were locally frequent on instream substrata. Given the presence of several key indicator species (EC, 2013), the aquatic vegetation community was representative of Annex I floating river vegetation (3260). Cover of filamentous algal mats was high locally, indicating significant eutrophication. The margins also supported a nitrophilous herbaceous community of reed canary grass, great willowherb, bittersweet, hedge bindweed and nettle. Whilst the south bank featured amenity grassland (GA2) and built land (BL3), the north bank supported a mature treeline of sycamore, grey willow, birch and aspen (*Populus tremula*) with abundant dogwood (*Cornus* sp.). The invasive terrestrial plant Traveller's joy (*Clematis vitalba*) was scattered in treelines.

Atlantic salmon, brown trout, lamprey (*Lampetra* sp.), European eel and minnow (*Phoxinus phoxinus*) were recorded via electro-fishing at site C5 (**Appendix A**). The site was of very high value for salmonids, supporting high densities of juvenile Atlantic salmon and mixed-cohort brown trout. The site was an excellent quality nursery with abundant *Ranunculus* and other macrophyte beds providing high-quality refugia, in addition to bryophyte-rich cobble and boulder. These areas, located typically in deep fast-flowing glide, also provided excellent quality holding habitat for adult salmonids. Furthermore, overhanging marginal vegetation (reed canary grass etc.) also provided high-quality holding areas off the main flow. Good quality spawning habitat, for both salmonids and lamprey, was present near the bridges. Soft sediment accumulations suitable for ammocoetes were scarce but present underneath the southernmost arches, supporting a low density of *Lampetra* sp. Suitability for European eel was high, with abundant instream refugia supporting a low density. White-clawed crayfish suitability was very high and although none were recorded via hand searching the fresh remains of a juvenile were identified (**Plate 4.23**) – likely predated by an otter. Fresh otter prints were abundant in muddy littorals under the road bridge.

Biological water quality, based on Q-sampling, was calculated as **Q3-4 (moderate status)** (**Appendix C**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the location of the site within the River Barrow and River Nore SAC (002162) and the River Nore SPA (004233), the aquatic ecological evaluation of site C5 was of **international importance** (**Table 4.5**).



Plate 4.22 Representative image of site C5 on the River Erkina at Durrow, August 2025



Plate 4.23 Recently predated/killed juvenile white-clawed crayfish recorded at site C5 on the River Erkina, August 2025

4.1.22 Site D1 – Coolnacrutta Stream, Tobar na Súl

Site D1 was located on the uppermost reaches of the Coolnacrutta Stream (15C50) at a local road crossing, c. 50m downstream of Tobar na Súl (source of the stream). The small lowland stream (FW2) suffered from very low summer flows at the time of survey, resulting in poor quality aquatic and fisheries habitats – a known occurrence on the watercourse. The stream was 1-1.5m and 0.05-0.15m

deep with minimal flows in a profile dominated by slow-flowing vegetated glide and stagnating pool. The substrata were dominated by cobble, mixed gravels and sand with occasional small boulder. Some calcification was evident, causing local bedding. However, given un-fenced banks and excessive livestock poaching, the stream suffered from gross siltation at this location. Abundant flocculent silt deposits were present throughout with deep deposits (to 0.3m) present upstream of the masonry box culvert. The site was heavily vegetated with near total cover of fool's watercress (much of which had been grazed by livestock). Blue water speedwell and water mint were present but occasional. The aquatic bryophyte community was limited to *Leptodictyum riparium* (an indicator of enrichment). The riparian areas had been cleared historically and recently, with no remaining tree cover and sparse herbaceous vegetation present. The site was bordered by low-intensity semi-improved grassland (GA1) with mosaics of wet grassland (GS4).

Three-spined stickleback was the only fish species recorded via electro-fishing at site D1 (**Appendix A**). In contrast to previous surveys (when water levels/flows were significantly higher), no brown trout, European eel or *Lampetra* sp. were recorded, reflecting gross siltation pressures and low summer flows which created seasonal conditions inimical to these species. Despite some suitability, no white-clawed crayfish were recorded. No otter signs were recorded in vicinity of the site with foraging opportunities limited.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix C**). However, it should be noted that this was a tentative rating given an absence of suitable riffle areas for sampling (Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the absence of aquatic habitats, the aquatic ecological evaluation of site D1 was of **local importance (lower value)** (**Table 4.5**).



Plate 4.24 Representative image of site D1 on the Coolnacrutta Stream, August 2025

4.1.23 Site D2 – Coolnacrutta Stream, Glashare

Site D2 was located on the Coolnacrutta Stream (15C50) at the R639 road crossing c.2.4km downstream of site D1. The lowland channel (FW2) had been historically straightened and deepened in vicinity of the road crossing, with a mostly trapezoidal channel and bank heights of up to 2m. The stream suffered from very low summer flows at the time of survey resulting in a profile of slow-flowing glide and stagnating pool. The stream was 2-2.5m wide and 0.1-0.2m deep. The substrata comprised heavily silted boulder and cobble with localised mixed gravels. Soft sediment deposits were present in vicinity of the pipe culvert with abundant leaf litter and woody debris. Given high shading, macrophytes were limited to sparse fool's watercress and water mint with rare brooklime. Larger substrata supported *Rhynchostegium riparioides*, infrequent *Leptodictyum riparium* and rare *Fontinalis antipyretica*. The stream at this location was heavily shaded by mature riparian treelines of sycamore, ash, hazel, grey willow, elder and hawthorn with scrubby understories supporting bramble and ivy (*Hedera helix*). The site was bordered by improved pasture (GA1).

Brown trout, lamprey (*Lampetra* sp.) and three-spined stickleback were recorded via electro-fishing at site D2 (**Appendix A**). The value of the site was significantly reduced over previous surveys due to very low summer flows and water levels resulting in a very low density of fish. The site is known to occasionally support Atlantic salmon and European eel (Triturus 2021 & 2023 data). Given evident siltation and hydrological pressures, a very low density of juvenile trout were recorded with no adults (having likely migrated downstream). The quality of salmonid nursery, spawning and holding habitat was poor. The pipe culvert under the road was impassable to salmonids and lamprey at low flows. Soft sediment areas were abundant but only a single *Lampetra* sp. ammocoete was recorded, again reflecting poor flows and unfavourable conditions. The site provided some physical suitability for white-clawed crayfish, with abundant instream refugia, but none were recorded. An old otter spraint site was recorded on an instream boulder 5m downstream of the culvert – this did not contain crayfish remains.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix C**). However, it should be noted that this was a tentative rating given an absence of suitable riffle areas for sampling (Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids and lamprey (*Lampetra* sp.), the aquatic ecological evaluation of site D2 was of **local importance (higher value)** (**Table 4.5**).



Plate 4.25 Representative image of site D2 on the Coolnacrutta Stream, August 2025

4.1.24 Site GCR1 – Gorteenahilla River, Coolcashin

Site GCR1 was located on the Gorteenahilla River (15G08) at a local road and Proposed 110kV Underground Cabling crossing, with a farm access rendered ford downstream. The lowland river (FW2) had been extensively straightened but retained some semi-natural characteristics. As elsewhere in the catchment, the river suffered from low summer water levels and reduced flows and was 2-2.5m wide and 0.1-0.2m deep, with only very localised shallow pool to 0.3m. The substrata were dominated by bedded cobble and boulder, with localised mixed gravels. These were moderately silted although no significant accumulations were noted. Filamentous algal cover was high, indicating significant eutrophication. Due to high shading of the narrow channel, macrophytes were restricted to localised fool's watercress and water mint, with some common water starwort and common duckweed in pool areas. Aquatic bryophytes were rare, with occasional *Pellia endiviifolia* and *Leptodictyum riparium* on larger substrata. The banks had been historically cleared downstream with scattered trees only. Encroachment of terrestrial grasses and low diversity herbaceous vegetation was high, providing valuable shading to the channel. The site was bordered by intensive pasture (GA1) on both banks, with narrow buffers only.

Atlantic salmon, brown trout and three-spined stickleback were recorded via electro-fishing at site GCR1 (**Appendix A**). Low summer flows had significantly reduced the quality of the fisheries habitats although a low density of salmonids remained. Under higher flows (e.g. winter) the site evidently provides some good quality salmonid spawning and nursery habitat, despite siltation and hydromorphological pressures. Holding opportunities for adult salmonids were limited in the narrow shallow channel. Shallow, flocculent soft sediment areas were sub-optimal for lamprey ammocoetes and did not support ammocoetes at the time of survey (although *Lampetra* sp. are known from the site, Triturus 2021 data). Some limited gravel spawning areas for lamprey were present. Despite some low suitability, no European eel or white-clawed crayfish were recorded with poorly accessible refugia

due to siltation and bedding. No otter signs were recorded in vicinity of the site with foraging opportunities limited in the summer months.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix C**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids (including Atlantic salmon), the aquatic ecological evaluation of site GCR1 was of **local importance (higher value)** (**Table 4.5**).



Plate 4.26 Representative image of site GCR1 on the Gorteenahilla River, August 2025

4.1.25 Site GCR2 – Ballyring Upper Stream, Ballyring Upper

Site GCR2 was located on the Ballyring Upper Stream (15B73) at a local road and Proposed 110kV Underground Cabling crossing. The Gorteenahilla River tributary suffered from very low summer water levels at the time of survey, resulting in a semi-dry channel with no flows and scattered stagnating pools between putative riffle zones. The cobbled apron under the road crossing was dry. The substrata (indicative of regular spate conditions) were dominated by angular cobble and boulder with only very localised interstitial gravels and coarse sands. Siltation was high with abundant livestock poaching both sides of the bridge. Due to high shading, macrophytes were limited to occasional small stands of fool's watercress and watercress. Larger substrata supported rare *Leptodictyum riparium* and *Rhynchostegium riparioides*. Filamentous algal mats were abundant in stagnating pools. The channel was heavily shaded by mature riparian treelines of ash, hazel and hawthorn with dense bramble-dominated scrub. The site was bordered by intensive pasture (GA1) with narrow buffers.

Three-spined stickleback was the only fish species recorded via electro-fishing at site GCR2 (**Appendix A**). With the exception of stickleback (highly tolerant to low oxygen conditions), the site was not of value to resident fish given an absence of flows and ephemeral conditions. Physically the site was

suitable for salmonids and European eel and both would likely be present under higher water levels. The site was unsuitable for lamprey (no nursery areas) and irregular flows precluded white-clawed crayfish. No otter signs were recorded in vicinity of the site with foraging opportunities evidently limited.

Biological water quality, based on Q-sampling, was calculated as **Q3-4 (moderate status)** (**Appendix C**). However, it should be noted that this was a tentative rating given an absence of suitable riffle areas for sampling (Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the absence of aquatic species or habitats of higher conservation value, the aquatic ecological evaluation of site GCR2 was of **local importance (lower value)** (**Table 4.5**).



Plate 4.27 Representative image of site GCR2 on the Ballyring Upper Stream, August 2025 (semi-dry channel)

4.1.26 Site GCR3 – Lisdowney Stream, L1810 road crossing

Site GCR3 was located on the Lisdowney Stream (15L02) at the L1810 road downstream of the Proposed 110kV Underground Cabling. The River Nore tributary suffered from very low summer water levels with a largely dry channel, no flows and isolated stagnating pools only. The stream had been historically straightened and deepened although some instream recovery had occurred with a bed dominated by heavily bedded and calcified cobble and boulder. Mixed gravels and sands were present locally. The semi-dry channel was 2.5-3m wide with mostly steep, scoured banks. Under wetted conditions, the site would be dominated by riffle and glide habitat. Riparian shading was relatively high and macrophytes were restricted to scattered watercress and fool's watercress. *Rhynchostegium riparioides* was occasional on larger substrata. Stagnating pools featured a high cover of filamentous algae. The stream was lined by mature treelines of ash with elder, hawthorn and bramble scrub. The site was bordered by intensive improved pasture (GA1).

Brown trout, lamprey (*Lampetra* sp.) and three-spined stickleback were recorded via electro-fishing at site GCR3 (**Appendix A**). Low summer flows had significantly reduced the quality of the fisheries habitats although a low density of salmonids remained in isolated pools. Under higher flows (e.g. winter) the site evidently provides some good quality salmonid spawning and nursery habitat, despite siltation and hydromorphological pressures. Holding opportunities for adult salmonids were limited in the narrow shallow channel. Atlantic salmon and European eel are known to utilise the site and wider channel (Triturus data). Suitability for lamprey ammocoetes was low given a paucity of deeper soft sediment accumulations. However, a single (large) ammocoete was recorded. Despite some physical suitability, no European eel or white-clawed crayfish were recorded. No otter signs were recorded in vicinity of the site with foraging opportunities limited in the summer months.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix C**). However, it should be noted that this was a tentative rating given an absence of suitable riffle areas for sampling (Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids and lamprey (*Lampetra* sp.), the aquatic ecological evaluation of site GCR3 was of **local importance (higher value)** (**Table 4.5**).



Plate 4.28 Representative image of site GCR3 on the Lisdowney Stream, August 2025 (semi-dry, intermittent channel with dry bridge apron)

4.1.27 Site GCR4 – Ballyconra Stream, L1807 road crossing

Site GCR4 was located on the Ballyconra Stream (15B86) at the L1807 road downstream of the Proposed 110kV Underground Cabling, c.1km upstream of the Lisdowney Stream confluence. The channel had been extensively straightened and deepened historically, resulting in a homogenous U-shaped channel that was 1.5-2m wide with similar bank heights. The stream was dry at the time of survey and routinely dries up in the summer months (pers. obs.). The bed comprised damp mud/silt

with localised mixed gravels and scattered angular boulder. Damp areas under shade supported fool's watercress, watercress and water mint. Aquatic bryophytes were not recorded. The banks had been cleared historically with only localised patches of scrub dominated by ash, hawthorn and bramble with rank grasses. The site was bordered by intensive pasture (GA1) with very narrow buffers.

Given the dry, ephemeral conditions, the site was not capable of supporting resident fish at the time of survey. There was no suitability for white-clawed crayfish. No otter signs were recorded in the vicinity of the site.

It was not possible to collect a biological water quality sample due to the dry nature of the channel.

Given the absence of aquatic species or habitats of higher conservation value, the aquatic ecological evaluation of site GCR4 was of **local importance (lower value)** (**Table 4.5**).



Plate 4.29 Representative image of site GCR4 on the Ballyconra Stream, August 2025 (dry, ephemeral channel)

4.1.28 Site GCR5 – River Nore, Ballyconra

Site GCR5 was located on the River Nore (15N01) at a Proposed 110kV Underground Cabling horizontal directional drilling (HDD) crossing c. 1km upstream of Ballyragget Bridge. The large lowland depositing channel (FW2) was 15-18m wide and 1-1.8m deep with a profile comprising deep glide and pool (no riffle). The substrata were dominated by shallow compacted silt atop of localised cobble with scattered boulder. Deeper, organic rich silt deposits with some sands were frequent along the depositing littorals and in pools. Given the high average depth, macrophyte growth was sparse with some small stands of unbranched bur-reed. Aquatic bryophytes were limited to rare Fontinalis antipyretica on submerged structure. Filamentous algal cover weas high, indicative of significant eutrophication. The river was lined on both banks by mature treelines of grey willow, crack willow,

sycamore, alder and ash with abundant scrub. The site was bordered by intensive pasture (GA1) and dry meadows habitat (GS2) with only narrow buffers.

Electro-fishing was not undertaken at site GCR5 due to prohibitive depths and water volumes. The site was of some suitability as an adult salmonid holding with deeper pools under cover of riparian trees offering flow refugia for migratory fish. Salmonid spawning habitat was absent with poor nursery conditions. Deep depositing glide was of high value for a range of coarse fish species and European eel. Frequent soft sediment accumulations along channel margins were of value to lamprey ammocoetes with suitable spawning areas known to be present c.250m upstream (pers. obs.). Suitability for white-clawed crayfish was relatively poor given a paucity of instream refugia and none were recorded. No otter signs were recorded in vicinity of the site although the area was of high value for the species given ample prey resources and mature riparian vegetation.

Biological water quality, based on Q-sampling, was calculated as **Q3-4 (moderate status)** (**Appendix C**). However, it should be noted that this was a tentative rating given an absence of suitable riffle areas for sampling (Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the location of the site within the River Barrow and River Nore SAC (002162) and the River Nore SPA (004233), the aquatic ecological evaluation of site GCR5 was of **international importance** (**Table 4.5**).



Plate 4.30 Representative image of site GCR5 on the River Nore, August 2025

4.2 White-clawed crayfish survey

No white-clawed crayfish were recorded via hand-searching or sweep netting of instream refugia at any of the aquatic survey sites in August 2025. Furthermore, inspection of otter spraint on the Borrisbeg River (C2) and the Coolnacrutta Stream (D2) did not reveal the presence of crayfish remains.

However, a freshly deceased (likely otter predated) juvenile crayfish was recorded at site C5 on the River Erkina at Durrow Bridge (**Plate 4.23**). Furthermore, environmental DNA sampling detected the presence of white-clawed crayfish on the Nuenna River, River Goul and River Erkina (**Table 4.1**).

4.3 eDNA sampling

In support of the current survey and other available data, all 4 no. sampling sites on the Gorteenahilla River, Nuenna River, River Goul and River Erkina were positive for lamprey (*Lampetra* sp.) (2 positive qPCR replicates out of 12, respectively) (**Table 4.1; Appendix B**).

Although no white-clawed crayfish eDNA was detected at site A6 on the Gorteenahilla River, the species was detected at the Nuenna River, River Goul and River Erkina sites (**Table 4.1; Appendix B**). These results were considered as evidence of the species' presence at and or upstream of the sampling locations.

In keeping with available data for the survey catchment, no freshwater pearl mussel eDNA was detected at the 4 no. sites. No crayfish plague was detected either.

Table 4.1 2025 eDNA results in the vicinity of the Proposed Project (positive qPCR replicates out of 12 in parentheses)

Site	Watercourse	Freshwater pearl mussel	White-clawed crayfish	Crayfish plague	Lamprey (*Lampetra* sp.)
A6	Gorteenahilla River	Negative (0/12)	Negative (0/12)	Negative (0/12)	**Positive (2/12)**
B5	Nuenna River	Negative (0/12)	**Positive (8/12)**	Negative (0/12)	**Positive (2/12)**
C3	River Goul	Negative (0/12)	**Positive (1/12)**	Negative (0/12)	**Positive (2/12)**
C5	River Erkina	Negative (0/12)	**Positive (1/12)**	Negative (0/12)	**Positive (2/12)**

4.4 Biological water quality & macro-invertebrates

No rare or protected macro-invertebrate species (according to national red lists) were recorded in the biological water quality samples taken from a total of 19 no. wetted riverine sites or sweep samples from 2 no. pond sites in August 2025 (**Appendix C**). Whilst not protected, the nationally uncommon water stick insect *Ranatra linearis*, a recent discovery in Ireland (Nelson, 2018), was recorded at pond site P3 (**Plate 4.31**).

Sites A3 and A4 on the Foyle South Stream and site B2 on the Nuenna River achieved **Q4 (good status)** water quality (**Figure 4.1**). The good status rating was given the presence of at least one group A taxa

in fair numbers, namely the mayflies *Ecdyonurus dispar, Electrogena lateralis* and or *Rhithrogena semicolorata* (**Appendix C**).

A total of 5 no. sites on the Foyle South Stream (A5), Gorteenahilla River (A6), River Erkina (C5), Ballyring Upper Stream (GCR2) and River Nore (GCR5) achieved **Q3-4 (moderate status)** water quality (**Figure 4.1**). Despite the presence of the EPA group A mayfly species *Ecdyonurus dispar, Electrogena lateralis, Heptagenia sulphurea* and or *Ephemera danica,* these were only recorded in low numbers (<5% of total sample) and thus did not meet the qualifying criteria for good status as set out by Toner et al. (2005).

The remaining 11 no. sites on an unmapped stream (A1), Baunaniska Stream (B3), Nuenna River (B4, B5), Borrisbeg River (C2), River Goul (C3, C4), Coolnacrutta Stream (D1, D2), Gorteenahilla River (GCR1) and the Lisdowney Stream (GCR3) achieved **Q3 (poor status)** based on an absence of group A species, low numbers of group B species and a dominance of group C species such as the mayflies *Baetis rhodani* and *Seratella ignita* and freshwater shrimp (*Gammarus duebeni*) (**Appendix C**).

The mature quarry pond at site P3 supported a good diversity of macro-invertebrates (taxon richness = 24), with the community dominated by water boatmen (*Hesperocorixa linnaei*), lake olive (*Cloeon simile*), freshwater hoglouse (*Asellus aquaticus*) and Coenagrionidae species damselflies. Pond site P4 was more heavily enriched and supported a lower diversity (taxon richness = 18) of pollution tolerant species dominated by wandering snail (*Ampullacaena balthica*) and Dipteran larvae.



Plate 4.31 The water stick insect (*Ranatra linearis*) recorded from pond site P3 in August 2025

Table 4.2 Comparison of 2022 and 2025 biological water quality (Q-ratings) at sites in vicinity of the Proposed Project

Site no.	Watercourse	EPA code	Sept 2022		August 2025	
			Q-rating	WFD class	Q-rating	WFD class
A1	Unmapped stream	n/a	Q3*	Poor	Q3*	Poor
A2	Unmapped stream	n/a	Q2-3*	Poor	n/a – dry channel	n/a
A3	Foyle South Stream	15F07	Q3	Poor	Q4	Good
A4	Foyle South Stream	15F07	Q4	Good	Q4	Good
A5	Foyle South Stream	15F07	Q3-4	Moderate	Q3-4	Moderate
A6	Gorteenahilla River	15G08	Q4	Good	Q3-4	Moderate
A7	Gorteenahilla River	15G08	n/a – dry channel	n/a	n/a – dry channel	n/a
P1	Unnamed pond	n/a	n/a	n/a	n/a	n/a
P2	Unnamed pond	n/a	n/a	n/a	n/a	n/a
P3	Unnamed pond	n/a	n/a	n/a	n/a	n/a
P4	The Loughane	n/a	n/a	n/a	n/a	n/a
B1	Clomantagh Lower Stream	15C91	n/a – dry channel	n/a	n/a – dry channel	n/a
B2	Nuenna River	15N02	Q3-4	Moderate	Q4	Good
B3	Baunaniska Stream	15B89	Q3*	Poor	Q3*	Poor
B4	Nuenna River	15N02	Q3	Poor	Q3	Poor
B5	Nuenna River	15N02	Q3-4	Moderate	Q3	Poor
C1	Borrisbeg River	15B18	n/a – dry channel	n/a	n/a – dry channel	n/a
C2	Borrisbeg River	15B18	Q3	Poor	Q3	Poor
C3	River Goul	15G02	Q3*	Poor	Q3*	Poor
C4	River Goul	15G02	Q3-4	Moderate	Q3	Poor
C5	River Erkina	15 E01	Q3-4	Moderate	Q3-4	Moderate
D1	Coolnacrutta Stream	15C50	Q2-3	Poor	Q3*	Poor
D2	Coolnacrutta Stream	15C50	Q3	Poor	Q3*	Poor
GCR1	Gorteenahilla River	15G08	Not surveyed		Q3	Poor
GCR2	Ballyring Upper Stream	15B73	Not surveyed		Q3-4*	Moderate
GCR3	Lisdowney Stream	15L02	Not surveyed		Q3*	Poor
GCR4	Ballyconra Stream	15B86	Not surveyed		n/a – dry channel	n/a
GCR5	River Nore	15N01	Not surveyed		Q3-4*	Moderate

* tentative Q-rating given poor flows and or an absence of suitable riffle areas for sampling (Toner et al., 2005)

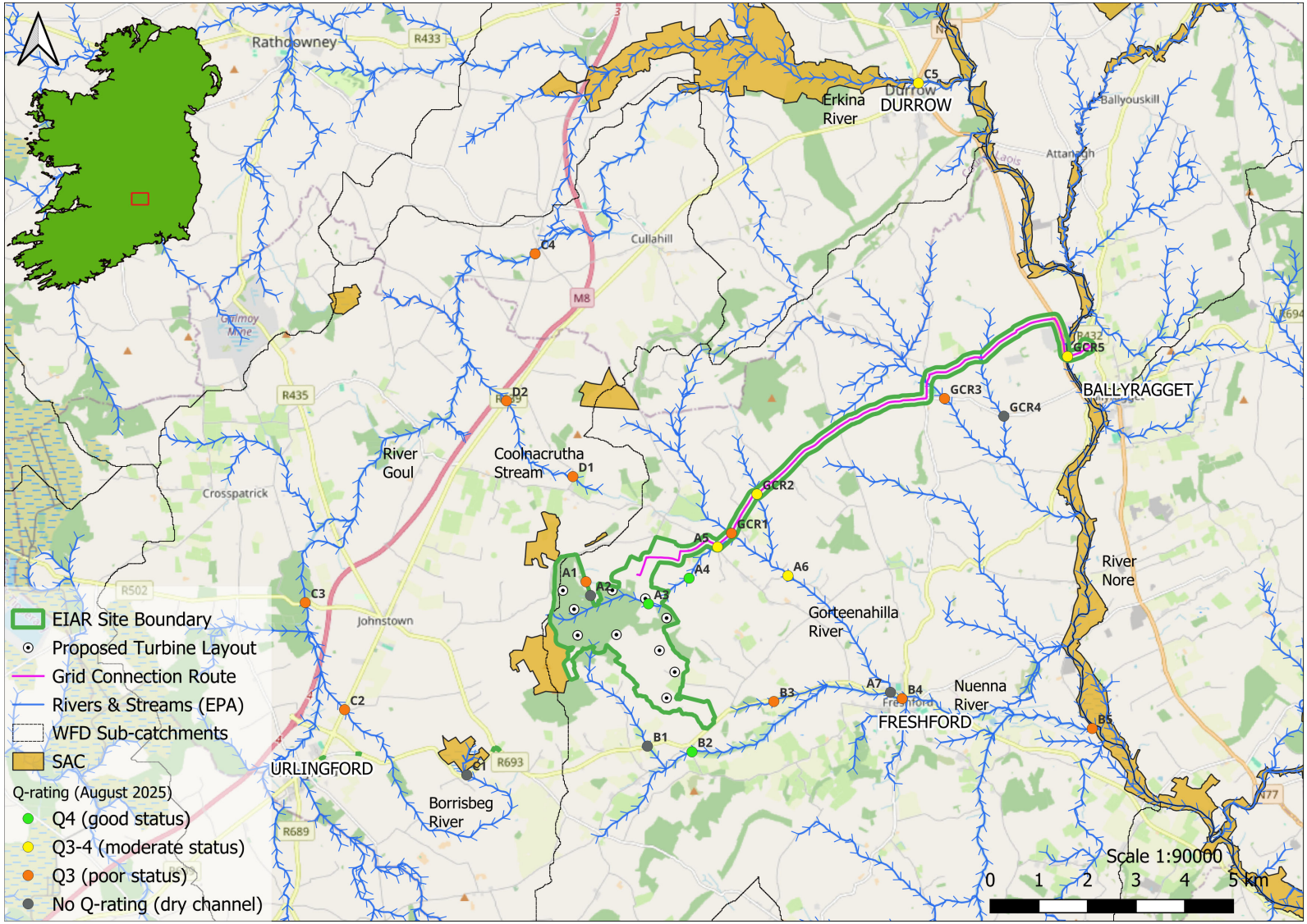


Figure 4.1 Overview of the biological water quality status in the vicinity of the Proposed Project, August 2025

Table 4.3 Relative abundance of fish species of higher conservation value recorded via **electro-fishing** in the vicinity of Killoshulan wind farm, August 2025 (blank cell = none recorded)

Site	Watercourse	Atlantic salmon	Brown trout	*Lampetra* sp.	European eel	Other species
A1	Unmapped stream					Three-spined stickleback
A2	Unmapped stream	No fish recorded				
A3	Foyle South Stream					Three-spined stickleback
A4	Foyle South Stream					Three-spined stickleback
A5	Foyle South Stream		Low			
A6	Gorteenahilla River	Medium	Medium	Low		Three-spined stickleback
A7	Gorteenahilla River	No fish recorded – dry, ephemeral channel reach				
P1	Unnamed pond	Fisheries appraisal only (dry pond)				
P2	Unnamed pond	Fisheries appraisal only (dry pond)				
P3	Unnamed pond	Fisheries appraisal only				
P4	The Loughane	Fisheries appraisal only – three-spined and ten-spined stickleback recorded in sweep samples				
B1	Clomantagh Lower Stream	n/a – channel underground or dry (not accessible for survey)				
B2	Nuenna River		Medium	Low		Three-spined stickleback
B3	Baunaniska Stream					Three-spined stickleback
B4	Nuenna River	Medium	High			
B5	Nuenna River	High	High	Low	Low	
C1	Borrisbeg River	n/a - dry, ephemeral channel reach				
C2	Borrisbeg River		Low			
C3	River Goul	n/a - too deep for electro-fishing				
C4	River Goul	Medium	Medium			
C5	River Erkina	Very high	Medium	Medium	Low	Minnow
D1	Coolnacrutta Stream					Three-spined stickleback
D2	Coolnacrutta Stream		Low	Low		Three-spined stickleback
GCR1	Gorteenahilla River	Low	Low			Three-spined stickleback
GCR2	Ballyring Upper Stream					Three-spined stickleback
GCR3	Lisdowney Stream		Medium	Low		
GCR4	Ballyconra Stream	n/a - dry, ephemeral channel reach				
GCR5	River Nore	n/a - too deep for electro-fishing				

Table 4.4 Summary of aquatic species and habitats of higher conservation value recorded in the vicinity of the Proposed Project, August 2025

Site	Watercourse	White-clawed crayfish	Otter signs within 150m radius	Annex I aquatic habitats	Rare or protected macrophytes/ aquatic bryophytes	Rare or protected macro-invertebrates	Other species/habitats of high conservation value
A1	Unmapped stream	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
A2	Unmapped stream	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
A3	Foyle South Stream	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
A4	Foyle South Stream	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
A5	Foyle South Stream	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
A6	Gorteenahilla River	None recorded	No signs recorded	Not present	None recorded	None recorded	**Atlantic salmon, lamprey (*Lampetra* sp.)**
A7	Gorteenahilla River	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
P1	Unnamed pond	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
P2	Unnamed pond	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
P3	Unnamed pond	None recorded	No signs recorded	Not present	None recorded	None recorded	**Smooth newt**
P4	The Loughane	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
B1	Clomantagh Lower Stream	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
B2	Nuenna River	None recorded	No signs recorded	**Floating river vegetation (3260)**	None recorded	None recorded	**Lamprey (*Lampetra* sp.)**
B3	Baunaniska Stream	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
B4	Nuenna River	None recorded	No signs recorded	Not present	None recorded	None recorded	**Atlantic salmon**
B5	Nuenna River	**Positive eDNA**	No signs recorded	Not present	None recorded	None recorded	**Atlantic salmon, lamprey (*Lampetra* sp.), European eel**
C1	Borrisbeg River	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
C2	Borrisbeg River	None recorded	**Old spraint**	Not present	None recorded	None recorded	None recorded

Site	Watercourse	White-clawed crayfish	Otter signs within 150m radius	Annex I aquatic habitats	Rare or protected macrophytes/ aquatic bryophytes	Rare or protected macro-invertebrates	Other species/habitats of high conservation value
C3	River Goul	**Positive eDNA**	No signs recorded	Not present	None recorded	None recorded	**Lamprey (*Lampetra* sp.) (eDNA)**
C4	River Goul	None recorded	No signs recorded	Not present	None recorded	None recorded	**Atlantic salmon**
C5	River Erkina	**Single predated juvenile & positive eDNA**	No signs recorded	**Floating river vegetation (3260)**	None recorded	None recorded	**Atlantic salmon, lamprey (*Lampetra* sp.), European eel**
D1	Coolnacrutta Stream	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
D2	Coolnacrutta Stream	None recorded	**Old spraint**	Not present	None recorded	None recorded	**Lamprey (*Lampetra* sp.)**
GCR1	Gorteenahilla River	None recorded	No signs recorded	Not present	None recorded	None recorded	**Atlantic salmon**
GCR2	Ballyring Upper Stream	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
GCR3	Lisdowney Stream	None recorded	No signs recorded	Not present	None recorded	None recorded	**Lamprey (*Lampetra* sp.)**
GCR4	Ballyconra Stream	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
GCR5	River Nore	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded but Atlantic salmon, lamprey (*Lampetra* sp.) & otter known from reach

Conservation value: Atlantic salmon (*Salmo salar*), *Lampetra* spp., white-clawed crayfish (*Austropotamobius pallipes*) and otter (*Lutra lutra*) are all listed under Annex II of the Habitats Directive [92/42/EEC]. Furthermore, Atlantic salmon & *Lampetra* spp. are also listed under Annex V of the Habitats Directive [92/42/EEC] while otter are also listed on under Annex IV of the Habitats Directive [92/42/EEC]. Otters (along with their breeding and resting places) are also protected under provisions of the Irish Wildlife Acts 1976 to 2023. European eel are 'critically endangered' according to most recent ICUN red list (Pike et al., 2020) and listed as 'critically engendered' in Ireland (King et al., 2011). With the exception of the Inland Fisheries Acts 1959 to 2017, brown trout and coarse fish species have no legal protection in Ireland. Smooth newt (*Lissotriton vulgaris*) and common frog (*Rana temporaria*) are protected under the Irish Wildlife Acts 1976-2021.

Table 4.5 Aquatic ecological evaluation summary of the survey sites according to NRA (2009) criteria

Site no.	Watercourse	EPA code	Evaluation of importance	Rationale summary
A1	Unmapped stream	n/a	Local importance (lower value)	No aquatic species or habitats of high conservation value
A2	Unmapped stream	n/a	Local importance (lower value)	No aquatic species or habitats of high conservation value
A3	Foyle South Stream	15F07	Local importance (lower value)	No aquatic species or habitats of high conservation value
A4	Foyle South Stream	15F07	**Local importance (higher value)**	Brown trout recorded
A5	Foyle South Stream	15F07	**Local importance (higher value)**	Brown trout recorded
A6	Gorteenahilla River	15G08	**Local importance (higher value)**	Atlantic salmon, brown trout & lamprey (*Lampetra* sp.) recorded
A7	Gorteenahilla River	15G08	Local importance (lower value)	No aquatic species or habitats of high conservation value (ephemeral, karstic channel reach)
P1	Unnamed pond	n/a	Local importance (lower value)	No aquatic species or habitats of high conservation value
P2	Unnamed pond	n/a	Local importance (lower value)	No aquatic species or habitats of high conservation value
P3	Unnamed pond	n/a	**Local importance (higher value)**	Smooth newt recorded
P4	The Loughane	n/a	**International importance**	Located within The Loughans SAC (000407)
B1	Clomantagh Lower Stream	15C91	Local importance (lower value)	No aquatic species or habitats of high conservation value (channel dry and or culverted underground)
B2	Nuenna River	15N02	**County importance**	Annex I floating river vegetation (3260) present
B3	Baunaniska Stream	15B89	Local importance (lower value)	No aquatic species or habitats of high conservation value
B4	Nuenna River	15N02	**Local importance (higher value)**	Atlantic salmon & brown trout recorded
B5	Nuenna River	15N02	**International importance**	Located within the River Barrow And River Nore SAC (002162) and the River Nore SPA (004233)
C1	Borrisbeg River	15B18	Local importance (lower value)	No aquatic species or habitats of high conservation value (dry, ephemeral channel)
C2	Borrisbeg River	15B18	**Local importance (higher value)**	Brown trout recorded

Site no.	Watercourse	EPA code	Evaluation of importance	Rationale summary
C3	River Goul	15G02	**Local importance (higher value)**	Lamprey (*Lampetra* sp.) & white-clawed crayfish detected via eDNA
C4	River Goul	15G02	**Local importance (higher value)**	Atlantic salmon & brown trout recorded
C5	River Erkina	15 E01	**International importance**	Located within the River Barrow And River Nore SAC (002162) and the River Nore SPA (004233)
D1	Coolnacrutta Stream	15C50	Local importance (lower value)	No aquatic species or habitats of high conservation value
D2	Coolnacrutta Stream	15C50	**Local importance (higher value)**	Brown trout & lamprey (*Lampetra* sp.) recorded
GCR1	Gorteenahilla River	15G08	**Local importance (higher value)**	Atlantic salmon & brown trout recorded
GCR2	Ballyring Upper Stream	15B73	Local importance (lower value)	No aquatic species or habitats of high conservation value
GCR3	Lisdowney Stream	15L02	**Local importance (higher value)**	Brown trout & lamprey (*Lampetra* sp.) recorded
GCR4	Ballyconra Stream	15B86	Local importance (lower value)	No aquatic species or habitats of high conservation value (dry, ephemeral channel)
GCR5	River Nore	15N01	**International importance**	Located within the River Barrow And River Nore SAC (002162) and the River Nore SPA (004233)

Conservation value: Atlantic salmon (*Salmo salar*), *Lampetra* spp., white-clawed crayfish (*Austropotamobius pallipes*) and otter (*Lutra lutra*) are all listed under Annex II of the Habitats Directive [92/42/EEC]. Furthermore, Atlantic salmon & *Lampetra* spp. are also listed under Annex V of the Habitats Directive [92/42/EEC] while otter are also listed on under Annex IV of the Habitats Directive [92/42/EEC]. Otters (along with their breeding and resting places) are also protected under provisions of the Irish Wildlife Acts 1976 to 2023. European eel are 'critically endangered' according to most recent ICUN red list (Pike et al., 2020) and listed as 'critically engendered' in Ireland (King et al., 2011). With the exception of the Inland Fisheries Acts 1959 to 2017, brown trout and coarse fish species have no legal protection in Ireland. Smooth newt (*Lissotriton vulgaris*) and common frog (*Rana temporaria*) are protected under the Irish Wildlife Acts 1976-2021.

5. Discussion

The watercourses surveyed in the vicinity of the Proposed Project were typically small upland and lowland channels which had been historically straightened and or deepened. Whilst good instream recovery was evident across most modified survey sites, siltation and eutrophication pressures were considerable and had impacted aquatic habitats and resulted in a reduction of biological water quality. Low summer flows, very much characteristic of this region, significantly reduced the quality of aquatic habitats, particularly on the on the Foyle South Stream, Coolnacrutta Stream, Ballyring Upper Stream and the Lisdowney Stream. Nearly half of the riverine survey sites were of low fisheries and aquatic value and were evaluated as **local importance (lower value)** given an absence of aquatic species or habitats of high conservation value (**Table 4.5**). A number of sites were on dry, ephemeral reaches of the Gorteenahilla River (A7), Clomantagh Lower Stream (B1), Borrisbeg River (C1) and Ballyconra Stream (GCR4).

Nevertheless, as per previous surveys, a range of high conservation value species were recorded during the surveys including Annex II Atlantic salmon, lamprey (*Lampetra* sp.), white-clawed crayfish and otter in addition to Red-listed European eel. Pond site P3 supported a smooth newt population, a species protected under the Wildlife Acts 1976-2023. The presence of one or more of these species resulted in most sites being evaluated as **local importance (higher value)** in terms of their aquatic ecology (**Table 4.5**). Site B5 on the Nuenna River, C5 on the Erkina River and GCR5 on the River Nore were of **international importance** given their locations within the River Barrow and River Nore SAC (002162) and the River Nore SPA (004233) sites. Pond site P4, whilst not of particularly high aquatic value, was also of **international importance** given its location within The Loughans SAC (000407). Site B2 on the Nuenna River supported Annex I floating river vegetation (3260) and was thus of **county importance** (as per NRA, 2009 guidance).

No rare or protected macrophytes/aquatic bryophytes, rare or protected macro-invertebrates (except white-clawed crayfish), otter breeding/resting areas or aquatic invasive species were recorded during the current survey. Broadly speaking, the highest value watercourses in terms of aquatic ecology within vicinity of the Proposed Project were the River Goul, Gorteenahilla River, Nuenna River, River Erkina and River Nore.

5.1 Fisheries

A typical diversity of fish for the surveyed sub-catchments (Triturus 2021-2023 data; Gordon et al., 2021; Matson et al., 2018; Kelly et al., 2014) was recorded, with Atlantic salmon, brown trout, lamprey (*Lampetra* sp.), European eel, minnow and three-spined stickleback captured in July 2025 (**Table 4.3**). A total of 7 no. sites did not support resident fish at the time of survey, primarily given low summer flows and or an absence of aquatic habitats.

Salmonid populations were widespread in the survey area although the distribution were more restricted compared with the previous survey given low summer flows and fish passage issues. Atlantic salmon were recorded from a total of 6 no. sites on the Gorteenahilla River (A6, GCR1), Nuenna River (B4, B5), River Goul (C4) and the River Erkina (C5). Brown trout were also present at these sites as well as sites on the Foyle South Stream (A5), Nuenna River (B2), Borrisbeg River (C2), Coolnacrutta Stream (D2) and the Lisdowney Stream (GCR3). Salmonid densities were typically low to medium, reflecting the significant hydrological and water quality impacts throughout the survey area, with the highest

numbers present on the Nuenna River and River Erkina (**Appendix A**). Lamprey habitat was restricted in the survey area given the higher energy conditions at many sites plus siltation, eutrophication and hydrological pressures. However, *Lampetra* sp. ammocoetes were recorded in low densities from a total of 6 no. sites on the Gorteenahilla River (A6), Nuenna River (B5), River Erkina (C5), Coolnacrutta Stream (D2) and Lisdowney Stream (GCR3). The species was also detected from the River Goul via eDNA sampling (**Appendix B**). In keeping with available data, Red-listed European eel were also restricted in the survey area, being recorded from sites B5 on the Nuenna River and C5 on the River Erkina (**Appendix A**).

5.2 White-clawed crayfish (eDNA detection)

Whilst no live white-clawed crayfish were recorded during the targeted surveys, the species was detected via eDNA sampling at site B5 the Nuenna River, site C3 on the River Goul and site C5 on the River Erkina (**Table 4.1; Appendix B**). Additionally, a freshly deceased juvenile crayfish (likely predated by an otter) was recorded at site C5 on the River Erkina at Durrow Bridge (**Plate 4.23**). Although both historical and contemporary crayfish records are available for the River Goul and River Erkina (**Figure 3.1**), none are available for the Nuenna River. Our results indicates a previously unrecorded crayfish population within this highly alkaline river system that may be of considerable conservation value given the decline of the species in the downstream connecting River Nore.

Outbreaks of the highly-infectious crayfish plague (*Aphanomyces astaci*) - a pathogen which causes mass mortality in white-clawed crayfish populations - was confirmed on the River Nore in Kilkenny in 2019 and the pathogen has likely impacted populations throughout the Nore catchment since. Environmental DNA monitoring as part of the National Crayfish Plague Surveillance Programme has since detected and confirmed the spread of crayfish plague in the wider Nore catchment (e.g. Swords & Griffin, 2022; Swords et al., 2021) although none was recorded in the current survey (**Table 4.1; Appendix B**). Crayfish plague is listed at one of the world's 100 worst invasive species (GISD, 2025).

5.3 Otter

Despite widespread suitability at many survey sites in terms of foraging habitat, otter signs (spraint sites) were only recorded at 2 no. sites during the current survey. These were identified on the Borrisbeg River at site C2 and the Coolnacrutta Stream at site D2. The latter site regularly features an otter spraint site (Triturus data). Otters are known to be present on other watercourses in the vicinity of the Proposed Project (**Figure 3.1**) and are a qualifying interest of the River Barrow and River Nore SAC (002162) with which a number of survey watercourses share hydrological connectivity.

The paucity of signs recorded primarily reflects the low summer flows experienced during the surveys which evidently impacted fish diversity, distribution and abundance of fish in the survey area. Fish are the main component of otter diet (Krawczyk et al., 2016; Reid et al., 2013) and otter activity in the wider survey area would be more frequent on watercourses supporting more substantial fish during the summer months. No breeding (holts) or resting (couch) areas were identified in the vicinity of the survey sites in August 2025 or the previous September 2022 surveys.



Plate 5.1 Old otter spraint on a prominent boulder at site D2 on the Coolnacrutta Stream, August 2025

5.4 Biological water quality & macro-invertebrates

No rare or protected macro-invertebrate species (according to national red lists) were recorded in the biological water quality samples taken from a total of 19 no. wetted riverine sites or sweep samples from 2 no. pond sites in August 2025, i.e. none of greater than Least Concern (**Appendix C**). Whilst not protected, the nationally uncommon water stick insect *Ranatra linearis*, a recent discovery in Ireland (Nelson, 2018), was recorded at pond site P3 (**Plate 4.31**).

Biological water quality was similar to the previous 2022 surveys although a slight downward trend was observed at several sites (**Table 4.1**). This would reflect the particularly low summer flows and water levels experienced in summer 2025, impacting invertebrate habitat and dissolved oxygen levels.

With the exception of site A3 and A4 on the Foyle South Stream and site B2 on the Nuenna River achieved **Q4 (good status)** water quality all riverine sites failed to meet the target good status (≥Q4) requirements of the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 and the Water Framework Directive (2000/60/EC) (**Figure 4.1**). The biological water quality of the survey area was unsatisfactory (i.e. ≤Q3-4) and typically of poor status (Q3) with significant siltation, eutrophication and hydrological impacts evidently contributing to a reduction in water quality. Agriculture is known to be the major water quality pressure within the wider survey area (EPA data) and this was supported by observations made during the aquatic surveys.

6. References

Byrne, A. W., Moorkens, E. A., Anderson, R., Killeen, I. J., & Regan, E. (2009). Ireland Red List no. 2: Non-marine molluscs. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government.

CEN (2003). Water Quality - Sampling of Fish with Electricity. Document CEN EN 14011:2000.

CFB (2008). Methods for the Water Framework Directive. Electric Fishing in Wadeable Reaches. Central Fisheries Board. Unpublished report.

EA (2003). River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003. Environment Agency, UK.

EC (2013). Interpretation Manual of European Union Habitats, version EUR 28. European Commission. Available at: http://ec.europa.eu/environment/nature/legislation/habitatsdirective/docs/Int_Manual_EU28.pdf

Feeley, H. B., Baars, J. R., Kelly-Quinn, M., & Nelson, B. (2020). Ireland Red List No. 13: Stoneflies (Plecoptera). National Parks and Wildlife Service.

Fossitt, J. (2000). A Guide to Habitats in Ireland. The Heritage Council, Ireland.

Foster, G. N., Nelson, B. H. & O Connor, Á. (2009). Ireland Red List No. 1 – Water beetles. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.

Gammell, M., McFarlane, A., Brady, D., O'Brien, J., Mirimin, L., Graham, C., Lally, H., Minto, C. & O'Connor, I. (2021). White-clawed Crayfish *Austropotamobius pallipes* survey in designated SACs in 2017. Irish Wildlife Manuals, No. 131. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland.

GISD (2025). Global Invasive Species Database downloaded from http://www.iucngisd.org/gisd/100_worst.php

Gordon, P., Donovan, R., Matson, R., Corcoran, W.and Kelly, F.L. (2021). Sampling Fish in Rivers 2020 – River Nore Catchment. Factsheet No. 2020/03. National Research Survey Programme. Inland Fisheries Ireland

IFI (2010). Biosecurity Protocol for Field Survey Work. Available at http://www.fisheriesireland.ie/Invasive-Species/biosecurity-protocol-for-field-survey-work.html

Kelly, F.L., Matson, R., Connor, L., Feeney, R., Morrissey, E., Coyne, J. & Rocks, K. (2014). Water Framework Directive Fish Stock Survey of Rivers in the South Eastern River Basin District. Inland Fisheries Ireland, 3044 Lake Drive, Citywest Business Campus, Dublin 24, Ireland.

Kelly-Quinn, M. & Regan, E.C. (2012). Ireland Red List No. 7: Mayflies (Ephemeroptera). National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

King, J.L., Marnell, F., Kingston, N., Rosell, R., Boylan, P., Caffrey, J.M., FitzPatrick, Ú., Gargan, P.G., Kelly, F.L., O'Grady, M.F., Poole, R., Roche, W.K. & Cassidy, D. (2011). Ireland Red List No. 5: Amphibians, Reptiles & Freshwater Fish. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

Krawczyk, A. J., Bogdziewicz, M., Majkowska, K., & Glazaczow, A. (2016). Diet composition of the Eurasian otter *Lutra lutra* in different freshwater habitats of temperate Europe: a review and meta-analysis. Mammal Review, 46(2), 106-113.

Lockhart, N., Hodgetts, N. & Holyoak, D. (2012). Ireland Red List No.8: Bryophytes. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

Matson, R., Delanty, K., Gordon, P., O'Briain, R., Garland, D., Cierpal, D., Connor, L., Corcoran, W., Coyne, J., McLoone, P., Morrisey-McCaffrey, E., Brett, T., Ní Dhonnabhain, L. and Kelly, F.L., (2018). Sampling Fish in Rivers 2017 – Nuenna & Arigna, Factsheet No. 14. National Research Survey Programme. Inland Fisheries Ireland.

Nelson, B. (2018). *Ranatra linearis* (Linnaeus) (Hemiptera, Nepidae) and *Berytinus clavipes* (Fabricius) (Hemiptera, Berytidae) two species of Heteroptera new to Ireland. The Irish Naturalists' Journal, 36(1), 48-49.

Nelson, B., Ronayne, C. & Thompson, R. (2011). Ireland Red List No.6: Damselflies & Dragonflies (Odonata). National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.

NRA (2009). Guidelines for Assessment of Ecological Impacts of National Road Schemes. National Roads Authority, Dublin.

NPWS (2020). Site synopsis: The Loughans SAC 000407. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.

NPWS (2021). Conservation Objectives: Spahill and Clomantagh Hill SAC 000849. Version 1. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.

NPWS (2011). Conservation objectives for River Barrow and River Nore SAC [002162]. Department of Housing, Local Government and Heritage.

O'Grady, M.F. (2006). Channels and challenges: enhancing Salmonid rivers. Irish Fresh- water Fisheries Ecology and Management Series: Number 4. Central Fisheries Board, Dublin.

Peay, S. (2003). Monitoring the white-clawed crayfish Austropotamobius pallipes. Conserving Natura 2000 Rivers Monitoring Series No. 1, English Nature, Peterborough.

Pike, C., Crook, V. & Gollock, M. (2020). *Anguilla anguilla*. The IUCN Red List of Threatened Species 2020: e.T60344A152845178. https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T60344A152845178.en.

Reid, N., Thompson, D., Hayden, B., Marnell, F., & Montgomery, W. I. (2013). Review and quantitative meta-analysis of diet suggests the Eurasian otter (*Lutra lutra*) is likely to be a poor bioindicator. Ecological indicators, 26, 5-13.

Sullivan, A. (2007). Assessment of Fish Passage and the Ecological Impact of Migration Barriers on the River Nore Catchment. Report prepared for the Nore Suir Rivers Trust.

Sweeney, P. (2022). Survey of the Freshwater Pearl Mussel (*Margaritifera margaritifera*) in the River Nore Downstream of the R. Erkina Confluence. Report prepared by Pascal Sweeney on behalf of Triturus Environmental Ltd. September 2022.

Swords, F. & Griffin, B. (2022). The National Crayfish Plague Surveillance Programme, Ireland – 2020-2021. Report compiled by the Marine Institute for the National Parks and Wildlife Service. August 2022.

Swords, F. White, S. & Griffin, B. (2021). Crayfish plague in Ireland - the Irish National Crayfish Plague surveillance programme 2020-2021. Marine Institute presentation given at the 12th Annual Workshop for the National Reference Laboratories for Crustacean Diseases, in collaboration with National Parks and Wildlife Services (NPWS). Online conference, 2nd June 2021

Toner, P., Bowman, J., Clabby, K., Lucey, J., McGarrigle, M., Concannon, C., ... & MacGarthaigh, M. (2005). Water quality in Ireland. Environmental Protection Agency, Co. Wexford, Ireland.

Triturus (2023). Aquatic baseline report for Killoshulan wind farm, Co. Kilkenny. Report prepared by Triturus Environmental Ltd. for MKO. June 2023.

Wyse-Jackson, M., FitzPatrick, Ú., Cole, E., Jebb, M., McFerran, D., Sheehy Skeffington, M., & Wright, M. (2016). Ireland red list no. 10: Vascular plants. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs, Dublin, Ireland.

7. Appendix A – Fisheries assessment report

Please see accompanying fisheries assessment report

Fisheries assessment for the proposed Killoshulan Wind Farm, Co. Kilkenny

Prepared by Triturus Environmental Ltd. for MKO

January 2026

Please cite as:

Triturus (2026). Fisheries assessment for the proposed Killoshulan Wind Farm, Co. Kilkenny. Report prepared by Triturus Environmental Ltd. for MKO. January 2026.

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1. Introduction

1.1 Background

Triturus Environmental Ltd. were commissioned by MKO to undertake a baseline fisheries assessment of numerous watercourses in the vicinity of the proposed Killoshulan Wind Farm located near Freshford, Co. Kilkenny.

The survey was undertaken to establish baseline fisheries data used in the preparation of the EIAR for the Proposed Project. In order to gain an accurate overview of the existing and potential fisheries value of the watercourses within the vicinity of the Proposed Project a catchment-wide electro-fishing survey across 24 no. riverine sites was undertaken (**Table 2.1; Figure 2.1**). A fisheries appraisal of 4 no. pond sites were also undertaken. Electro-fishing helped to identify the importance of the watercourses as nurseries and habitats for salmonids, lamprey (*Lampetra* sp.) and European eel (*Anguilla anguilla*). Other species of lower conservation value were also recorded. The presence and or absence of fish populations and or associated supporting habitat would help inform impact assessment and any subsequent mitigation for the Proposed Project.

Triturus Environmental Ltd. made an application under Section 14 of the Fisheries (Consolidation) Act, 1959 as substituted by Section 4 of the Fisheries (Amendment) Act, 1962, to undertake a catchment-wide electro-fishing survey in the vicinity of the Proposed Project. The surveys were undertaken in August 2025 and would update catchment-wide surveys previously completed by Triturus in September 2022 (Triturus, 2023), thus ensuring temporal data validity.

1.2 Fisheries (desktop review)

Fisheries data was available for many of the survey watercourses. The River Goul, a tributary of the River Erkina, is a low-energy limestone river fed from aquifer and ground-water sources (Sullivan, 2007) is known to support Atlantic salmon (*Salmo salar*), brown trout (*Salmo trutta*) and European eel (*Anguilla anguilla*), stone loach (*Barbatula barbatula*) and three-spined stickleback (*Gasterosteus aculeatus*) (Triturus 2021-2024 data; IFI data[1]). The Coolnacrutta Stream, a tributary of the River Goul, is known to support Atlantic salmon, brown trout and European eel (Triturus 2021-2024 data). The Borrisbeg River, another Goul tributary, supports brown trout, lamprey (*Lampetra* sp.) and three-spined stickleback (Triturus 2021-2024 data).

The River Nore in the vicinity of Ballyragget supports a range of fish species including Atlantic salmon, brown trout, *Lampetra* sp., European eel, minnow (*Phoxinus phoxinus*), stone loach and rudd (*Scardinius erythropthalmus*) (Triturus 2021 data).

The Lisdowney Stream, a small alkaline tributary of the River Nore, is known to support Atlantic salmon, brown trout, European eel and three-spined stickleback (Triturus 2023 data; IFI data[1]).

The Nuenna River, a major tributary of the River Nore, is known to support brown trout, three-spined stickleback and low densities of *Lampetra* sp. (Gordon et al., 2021; Matson et al., 2018). This species

[1] Inland Fisheries Ireland data available at https://opendata-ifigis.hub.arcgis.com/datasets/IFIgis::water-framework-directive-fish-ecological-status-2008-2021/

assemblage has been recorded over multiple years, with brown trout growth identified as 'slow' according to the criteria of Kennedy & Fitzmaurice (1971) (Kelly et al., 2014). The Clomantagh Lower Stream, a Nuenna tributary, suffers from very low summer flows and routinely dries out resulting in a loss of fisheries habitat (pers. obs.).

The Gorteenahilla River, a tributary of the Nuenna River, is known to support Atlantic salmon (*Salmo salar*), brown trout, European eel and three-spined stickleback (Triturus 2021-2024 data; Matson et al., 2018b). The Foyle South Stream, a tributary of the Gorteenahilla River, also supports these species (Triturus 2021-2024 data).

2. Methodology

2.1 Fisheries assessment (electro-fishing)

A single anode Smith-Root LR24 backpack (12V DC input; 300V, 100W DC output) was used to electro-fish riverine sites on Tuesday 12th, Wednesday 13th, Thursday 14th and Friday 15th August 2025 following notification to Inland Fisheries Ireland and under the conditions of a Department of Climate, Energy and the Environment (DCEE) licence. To collate a more accurate baseline of the proposed receiving watercourse, the electro-fishing survey was undertaken across 24 no. riverine sites (see **Table 2.1, Figure 2.1**).

Both river and holding tank water temperature was monitored continually throughout the survey to ensure temperatures of 20°C were not exceeded, thus minimising stress to the captured fish due to low dissolved oxygen levels. A portable battery-powered aerator was also used to further reduce stress to any captured fish contained in the holding tank. Salmonids, European eel and other captured fish species were transferred to a holding container with oxygenated fresh river water following capture. To reduce fish stress levels, anaesthesia was not applied to captured fish. All fish were measured to the nearest millimetre and released in-situ following a suitable recovery period.

As three primary species groups were targeted during the survey, i.e., salmonids, lamprey, and eel, the electro-fishing settings were tailored for each species. By undertaking electro-fishing using the rapid electro-fishing technique (see methodology below), the broad characterisation of the fish community at each sampling reach could be determined as a longer representative length of channel was surveyed. Electro-fishing methodology followed accepted European standards (CEN, 2003) and adhered to best practice (e.g., CFB, 2008).

2.1.1 Salmonids and European eel

For salmonid species and European eel, as well as all other incidental species, electro-fishing was carried out in an upstream direction for a 10-minute CPUE, an increasingly common standard approach for wadable streams (Matson et al., 2018a). A total of approximately 30-75m channel length was surveyed at each site, where feasible, in order to gain a better representation of fish stock assemblages.

Relative conductivity of the water at each site was checked in-situ with a conductivity meter and the electro-fishing backpack was energised with the appropriate voltage and frequency to provide enough draw to attract salmonids and European eel to the anode without harm. For the high conductivity waters of the sites a voltage of 200-240v, frequency of 35-40Hz and pulse duration of 3.5-4ms was utilised to draw fish to the anode without causing physical damage.

2.1.2 Lamprey

Electro-fishing for lamprey ammocoetes was conducted using targeted quadrat-based electro-fishing (as per Harvey & Cowx, 2003) in objectively suitable areas of sand/silt, where encountered. As lamprey take longer to emerge from silts and require a more persistent approach, they were targeted at a lower frequency (30Hz) burst DC pulse setting which also allowed detection of European eel in sediment, if present. Settings for lamprey followed those recommended and used by Harvey & Cowx

(2003), APEM (2004) and Niven & McAuley (2013). Using this approach, the anode was placed under the water's 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.

Lamprey species were identified to species level, where possible, with the assistance of a hand lens, through external pigmentation patterns and trunk myomere counts as described by Potter & Osborne (1975) and Gardiner (2003).

2.2 Fisheries habitat

A fisheries habitat appraisal of 20 no. sites was undertaken to establish their importance for salmonid, lamprey, European eel and other fish species. The appraisals of salmonids and lamprey were cognisant of species-specific habitat requirements and preferences as outlined in O'Grady (2006), Hendry et al. (2003), Armstrong et al. (2003), Harvey & Cowx (2003), Maitland (2003) and Hendry & Cragg-Hine (1997). River habitat surveys and fisheries assessments were also carried out utilising elements of the approaches in the River Habitat Survey Methodology (EA, 2003) and Fishery Assessment Methodology (O'Grady, 2006) to broadly characterise the riverine sites (i.e. channel profile, substrata etc.).

2.3 Biosecurity

A strict biosecurity protocol following IFI (2010) and the Check-Clean-Dry approach was adhered to during surveys for all equipment and PPE used. Disinfection of all equipment and PPE before and after use with Virkon™ was conducted to prevent the transfer of pathogens or invasive propagules between survey sites. Surveys were undertaken at sites in a downstream order to minimise the risk of upstream propagule mobilisation. Particular cognisance was given towards preventing the spread or introduction of highly virulent crayfish plague (*Aphanomyces astaci*). Any aquatic invasive species or pathogens recorded within or adjoining the survey areas were geo-referenced. All Triturus staff are certified in 'Good fieldwork practice: slowing the spread of invasive non-native species' by the University of Leeds.

Table 2.1 Location of 28 no. electro-fishing & fisheries appraisal survey sites in the vicinity of the Proposed Project

Site no.	Watercourse	EPA code	Location	X (ITM)	Y (ITM)
A1	Unmapped stream	n/a	Frankford	634028	667249
A2	Unmapped stream	n/a	Frankford	634121	666966
A3	Foyle South Stream	15F07	Killoshulan	635313	666794
A4	Foyle South Stream	15F07	Foyle South	636148	667322
A5	Foyle South Stream	15F07	Foyle Bridge	636734	667965
A6	Gorteenahilla River	15G08	Tinnascarty	638182	667372
A7	Gorteenahilla River	15G08	Freshford	640292	664974
P1*	Unnamed pond	n/a	Killoshulan	635298	665705
P2*	Unnamed pond	n/a	Killoshulan	635300	665786
P3*	Unnamed pond	n/a	Foyle South	636133	666525
P4*	The Loughane	n/a	Balief Lower	631494	663516
B1	Clomantagh Lower Stream	15C91	Clomantagh Lower	635291	663867
B2	Nuenna River	15N02	Barna	636208	663750
B3	Baunaniska Stream	15B89	Kilrush	637891	664785
B4	Nuenna River	15N02	Old Bridge, Freshford	640530	664845
B5	Nuenna River	15N02	Purcellsgarden	644441	664230
C1	Borrisbeg River	15B18	Balief Lower	631576	663273
C2	Borrisbeg River	15B18	Mountfinn	629062	664618
C3	River Goul	15G02	Foulkscourt	628253	666820
C4	River Goul	15G02	Aghmacart Bridge	632981	673995
C5	River Erkina	15 E01	Durrow Bridge	640865	677506
D1	Coolnacrutta Stream	15C50	Tobar na Súl	633758	669412
D2	Coolnacrutta Stream	15C50	Glashare	632392	670970
GCR1	Gorteenahilla River	15G08	Coolcashin	637020	668246
GCR2	Ballyring Upper Stream	15B73	Ballyring Upper	637545	669051
GCR3	Lisdowney Stream	15L02	L1810 road crossing	641403	671017
GCR4	Ballyconra Stream	15B86	L1807 road crossing	642623	670654
GCR5	River Nore	15N01	Ballyconra	643933	671882

* fisheries appraisal only

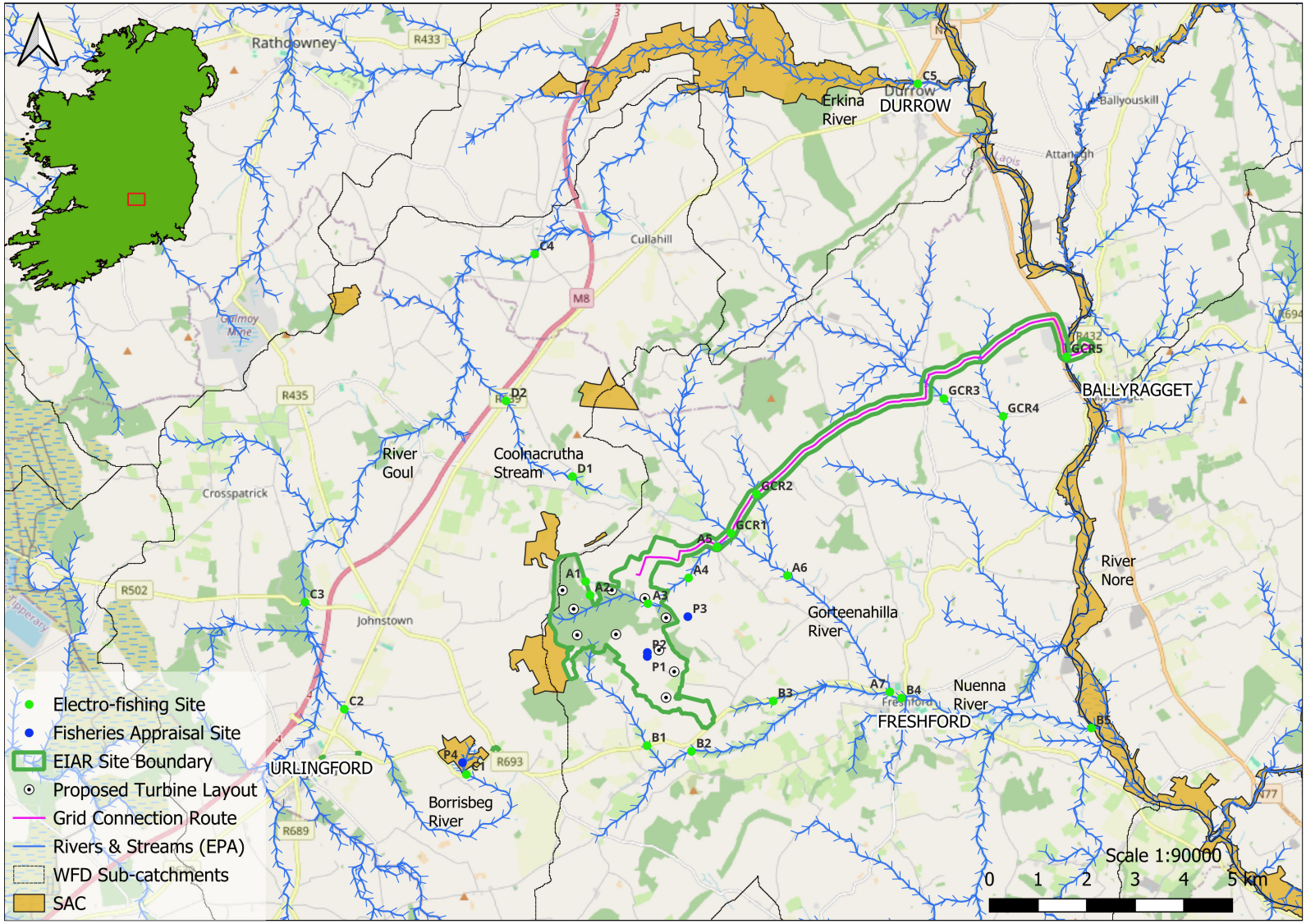


Figure 2.1 Overview of the electro-fishing & fisheries appraisal survey sites in vicinity of the Proposed Project

3. Results

A catchment-wide fisheries survey of 24 no. riverine and 4 no. pond sites in the vicinity of the Proposed Wind Farm was conducted on Tuesday 12th, Wednesday 13th, Thursday 14th and Friday 15th August 2025 following notification to Inland Fisheries Ireland. The results of the survey are discussed below in terms of fish population structure, population size and the suitability and value of the surveyed areas as nursery and spawning habitat for salmonids, European eel and lamprey species. Scientific names are provided at first mention only.

3.1 Fisheries assessment & appraisal

3.1.1 Site A1 – Unmapped stream, Frankford

Three-spined stickleback (*Gasterosteus aculeatus*) (*n*=7) was the only fish species recorded via electro-fishing at site A1 on an unmapped tributary of the Foyle South Stream within the Site boundary. (**Figure 3.1**). With the exception of this species, the site was not of fisheries value given the very shallow nature (possibly ephemeral at this location), siltation pressures and poor connectivity with downstream habitats.

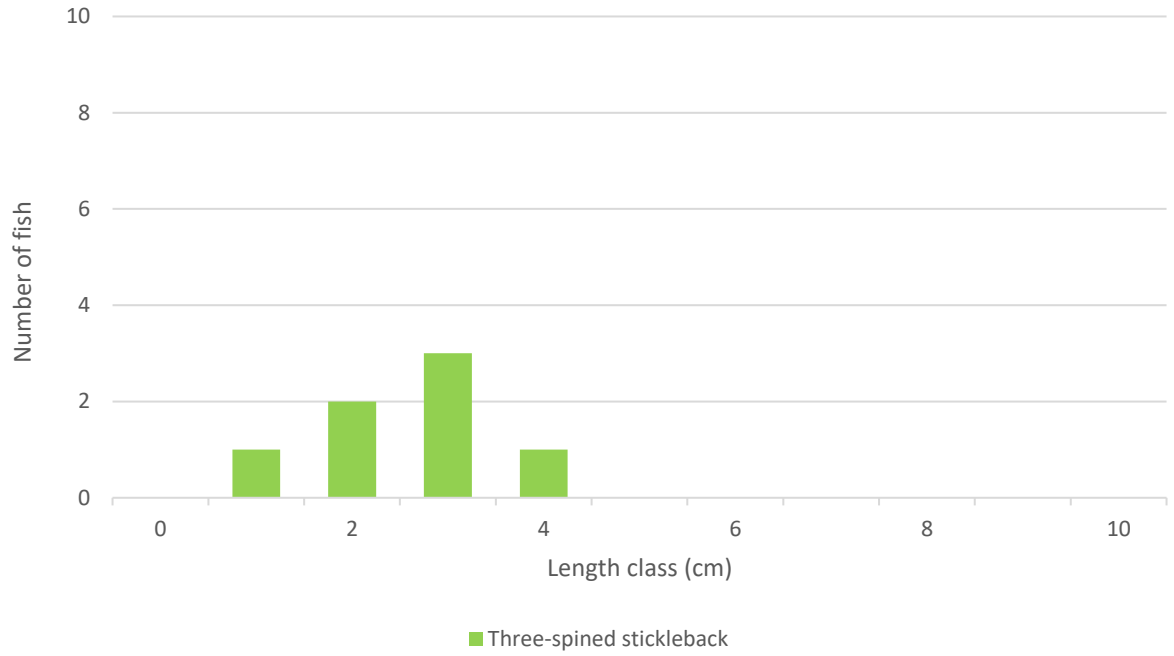


Figure 3.1 Length frequency distribution recorded via electro-fishing at site A1, August 2025



Plate 3.1 Three-spined stickleback recorded at site A1 on an unmapped Foyle South Stream tributary, August 2025

3.1.2 Site A2 – Unmapped stream, Frankford

Site A2 was located on an unmapped tributary of the Foyle South Stream within the Site boundary. The drainage channel was dry at the time of survey with no standing water and a damp muddy base. Given the dry, ephemeral conditions, the site was not capable of supporting resident fish at the time of survey (three-spined stickleback were recorded previously; Triturus, 2023).



Plate 3.2 Representative image of site A2, August 2025 (dry, ephemeral channel)

3.1.3 Site A3 – Foyle South Stream, Killoshulan

Three-spined stickleback (*n*=3) was the only fish recorded via electro-fishing at site A3 on the upper reaches of Foyle South Stream (EPA code: 15F07) within the Site boundary (**Figure 3.2**).

Despite some low suitability for salmonids and eel, the site was of poor fisheries value given its small size, low summer flows, naturally high gradients and location in the uppermost reaches of the catchment (i.e. poor connectivity with downstream habitats). Resident fish were limited to ubiquitous stickleback.

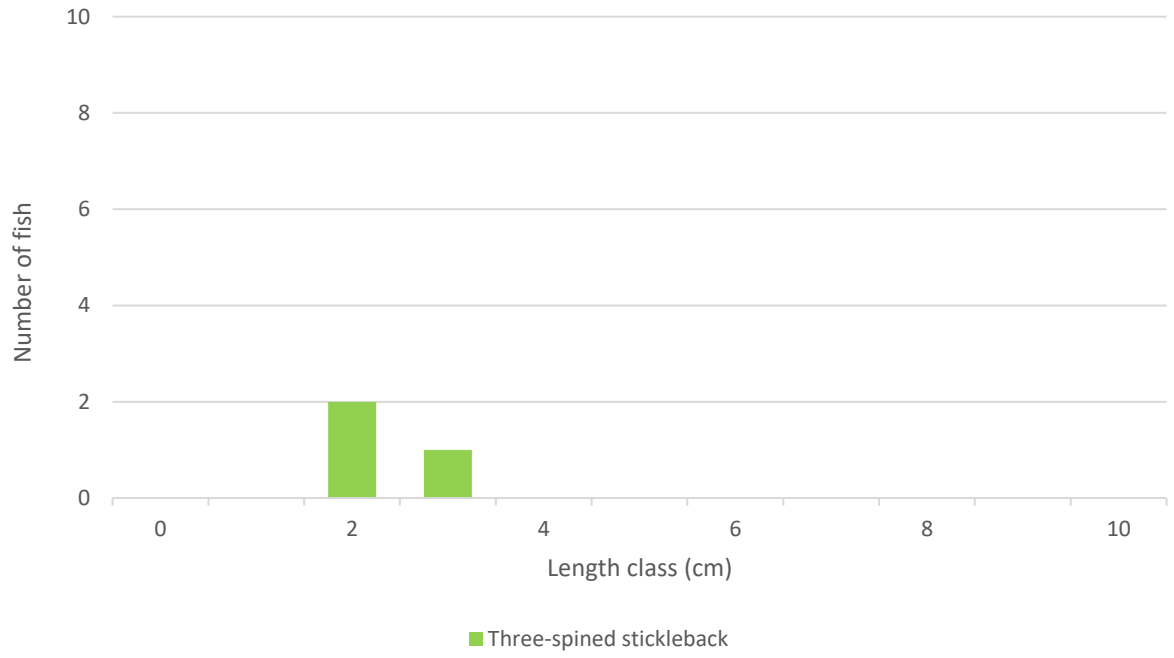


Figure 3.2 Length frequency distribution recorded via electro-fishing at site A3, August 2025



Plate 3.3 Representative image of site A3 on the upper reaches of the Foyle South Stream, August 2025

3.1.4 Site A4 – Foyle South Stream, Foyle South

Brown trout (*Salmo trutta*) (*n*=2) and three-spined stickleback (*n*=5) were the only fish species recorded via electro-fishing at site A4 on the upper reaches of Foyle South Stream (15F07) (**Figure 3.3**).

Despite good physical suitability for salmonids in terms of potential holding and spawning areas, only a low number of juvenile trout was recorded and this was reflective of sub-optimal conditions caused by low summer flows. There was also some low suitability for European eel although none were recorded. The small upland spate channel was unsuitable for lamprey.

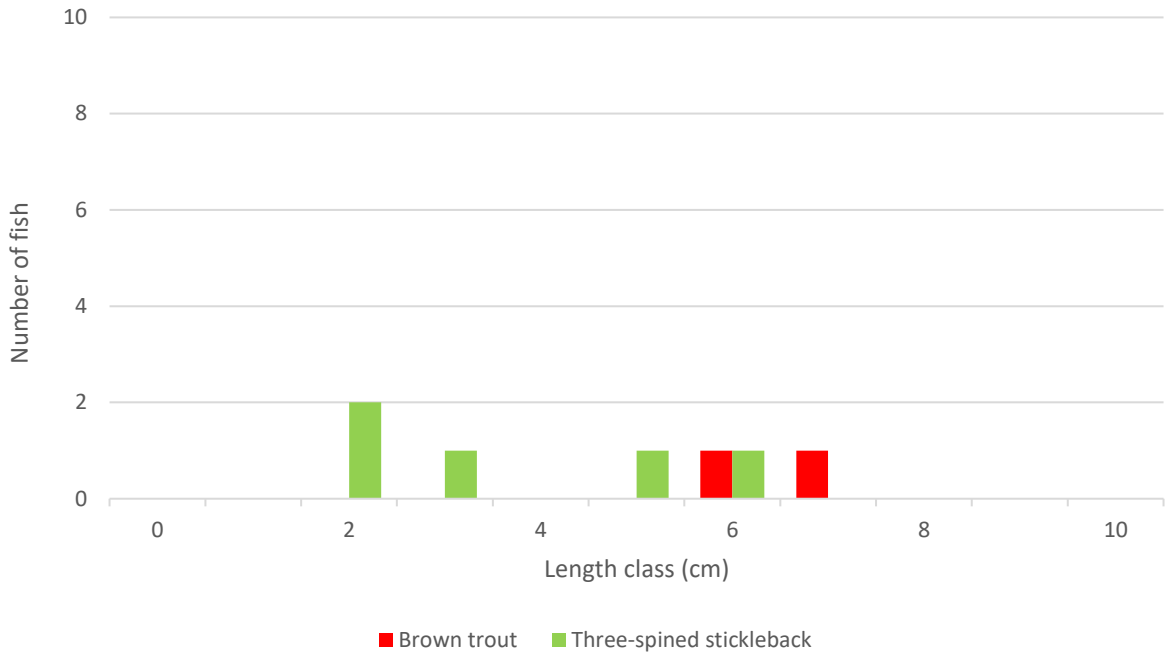


Figure 3.3 Length frequency distribution recorded via electro-fishing at site A4, August 2025



Plate 3.4 Representative image of site A4 on the Foyle South Stream, August 2025 (semi-dry channel)

3.1.5 Site A5 – Foyle South Stream, Foyle Bridge

Brown trout (*n*=9) was the only fish species recorded via electro-fishing at site A5 on the lower reaches of the Foyle South River (15F07) at Foyle Bridge (**Figure 3.4**).

Despite low summer flows, the site was of value for salmonids with a low density of mixed cohort trout captured. Though previously known from the site (Triturus, 2023), no Atlantic salmon were

recorded. Plunge pools at cascades provided valuable and well shaded holding areas for any remaining salmonids. Some limited spawning habitat was present between cascades. The site was of some moderate value to European eel, which were not recorded in the current survey (but known from site). There was no suitability for lamprey given the very high energy characteristics.

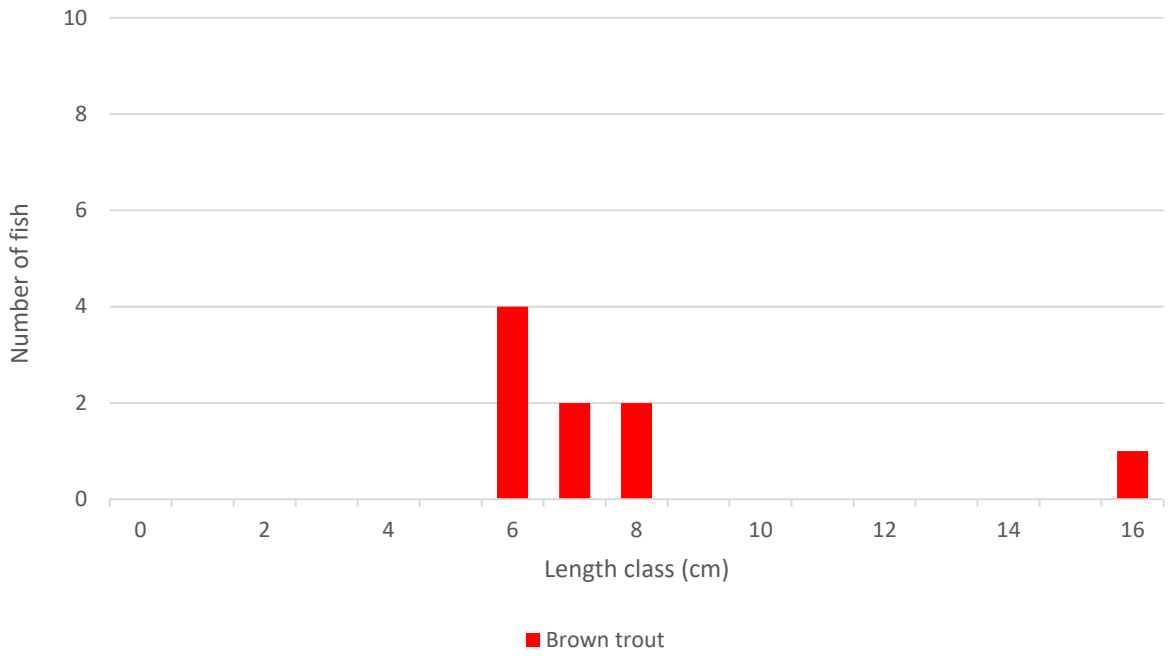


Figure 3.4 Length frequency distribution recorded via electro-fishing at site A5, August 2025



Plate 3.5 Adult brown trout recorded at site A5 on the Foyle South Stream at Foyle Bridge, August 2025

3.1.6 Site A6 – Gorteenahilla River, Tinnascarty

Atlantic salmon (*Salmo salar*) (*n*=17), brown trout (*n*=26), lamprey (*Lampetra* sp.) (*n*=3) and three-spined stickleback (*n*=27) were recorded via electro-fishing at site A6 on the Gorteenahilla River (15G08) at a local road crossing (**Figure 3.5**).

Despite low summer flows the site was of good value for salmonids, supporting moderate densities of juvenile Atlantic salmon and brown trout. Holding opportunities (shallow water) were poor for adult salmonids. The site was of highest value as a salmonid nursery, with abundant accessible cobble and boulder refugia in addition to frequent instream macrophyte beds albeit low flows reduced the value. Spawning habitat, whilst present for both salmonids and lamprey, was localised and better suited to Atlantic salmon given the predominance of larger substrata. Lamprey nursery habitat was scarce given the high energy nature of the site although localised patches of organic-rich soft sediment supported low densities of ammocoetes. Despite some moderate value for European eel, none were recorded.

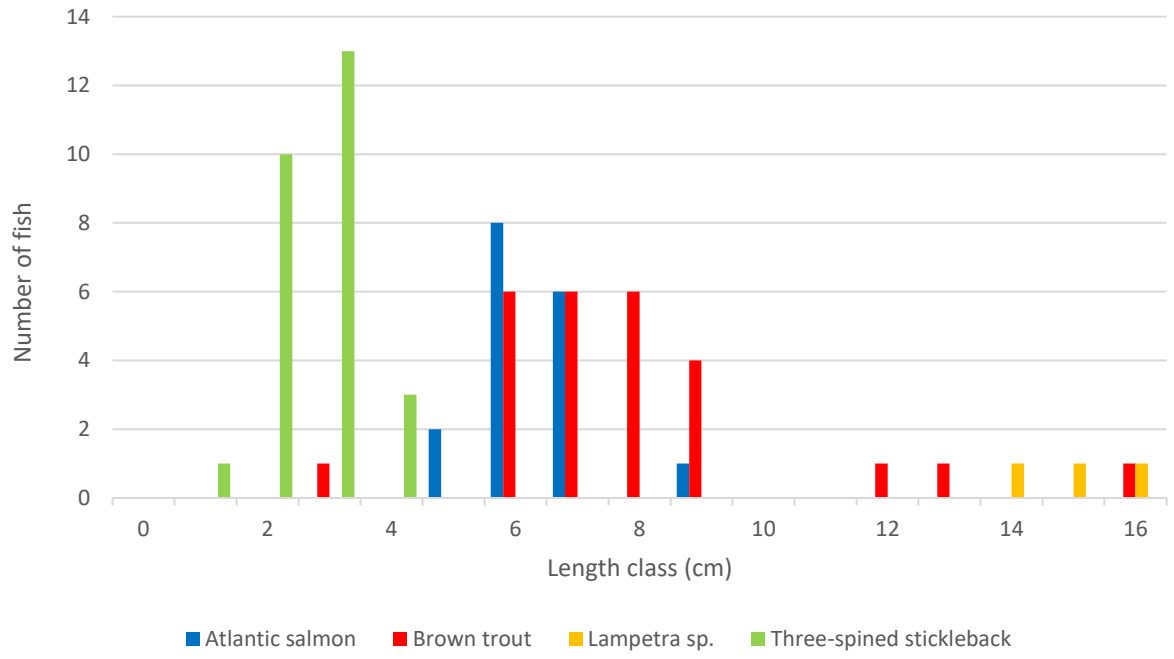


Figure 3.5 Length frequency distribution recorded via electro-fishing at site A6, August 2025



Plate 3.6 Large *Lampetra* sp. ammocoete recorded at site A6 on the Gorteenahilla River, August 2025

3.1.7 Site A7 – Gorteenahilla River, Freshford

Site A7 was located on the lowermost reaches of the Gorteenahilla River (15G08) at the R693 road crossing immediately upstream of the Nuenna River confluence. The river was dry at this location at the time of survey, despite water being present upstream (e.g. site A6). The lower reaches of the karstic river frequently flow underground in the summer months (pers. obs.). Thus, the site was not of fisheries value at the time of survey given its dry, ephemeral nature and absence of aquatic habitats. However, there would be high suitability for salmonids during wetted periods, with abundant spawning substrata present. There was also some good physical suitability for European eel under wetted conditions (e.g. bank scours, pool areas etc.).



Plate 3.7 Representative image of site A7 on the Gorteenahilla River, August 2025 (dry karstic channel)

3.1.8 Site P1 – Unnamed pond, Killoshulan

Site P1 was a small isolated pond located within a circular basin of c.100m^2. Although the pond occasionally holds water (Triturus, 2023), the site was dry at the time of survey. Therefore, the site was not of fisheries value given its ephemeral nature.



Plate 3.8 Representative image of site P1, August 2025 (dry pond)

3.1.9 Site P2 – Unnamed pond, Killoshulan

Site P2 was a small seasonal pond basin of c.200m^2 located 75m north of site P1. Whilst known to support water occasionally (Triturus, 2023), the pond was dry at the time of survey with a dry mud base. Therefore, the site was not of fisheries value given its ephemeral nature.



Plate 3.9 Representative image of site P2, August 2025 (dry pond)

3.1.10 Site P3 – Unnamed pond, Foyle South

Site P3 was a small quarry pond (FL8) located western of the Site boundary. Despite suitability for fish species (such as three-spined stickleback), none were recorded or observed during the site visit (as per previous surveys). This likely reflected the isolated nature of the pond and lack of connectivity to fish supporting habitats.



Plate 3.10 Representative image of site P3, August 2025

3.1.11 Site P4 – The Loughane, Balief Lower

Site P4 was located at small pond within The Loughans SAC (000407). Seasonally, the turlough site covers and extensive area (>20ha) but recedes in summer with a small permanent central pond (NPWS, 2013). At the time of survey, the small, shallow remnant pond covered a surface area of c.50m^2 with a depth of 0.05-0.2m. Given the receding, isolated and shallow nature of the pond, site P4 was of poor fisheries value. However, sweep netting revealed the presence of three-spined stickleback and ten-spined stickleback (*Pungitius pungitius*) in low densities.



Plate 3.11 Representative image of site P4 in The Loughans SAC, August 2025

3.1.12 Site B1 – Clomantagh Lower Stream Clomantagh Lower

Site B1 was located on the putative lower reaches of the Clomantagh Lower Stream (15C91) (as mapped by the EPA) at the R693 road crossing. However, the channel had evidently been historically realigned and, despite extensive searching, no trace of a watercourse could be identified (likely culverted underground). Site B1 was therefore not of fisheries value given an absence of aquatic habitats.



Plate 3.12 Representative image of site B1 on the Clomantagh Lower Stream at the R693 road crossing, August 2025 (historically realigned channel, likely culverted underground)

3.1.13 Site B2 – Nuenna River, Barna

Brown trout (*n*=25) and lamprey (*Lampetra* sp.) (*n*=2) were the only fish species recorded via electro-fishing at site B2 on the upper reaches of the Nuenna River (15N02) (**Figure 3.6**).

Despite low summer water levels the site was of good value for salmonids with a mixed-cohort brown trout population. The typically high energy site was physically more suited to Atlantic salmon but the species was not recorded - this was considered to reflect natural downstream barriers to migration (e.g. falls at Freshford). The site was a good quality salmonid nursery given abundant instream refugia, although only low numbers were recorded. The shallow site was of limited holding value for adult salmonids. Bed calcification reduced the spawning value for salmonids and lamprey but some was present locally. Lamprey nursery habitat was scarce and sub-optimal where present, supporting only a low density of ammocoetes. Despite good suitability for European eel, none were recorded.

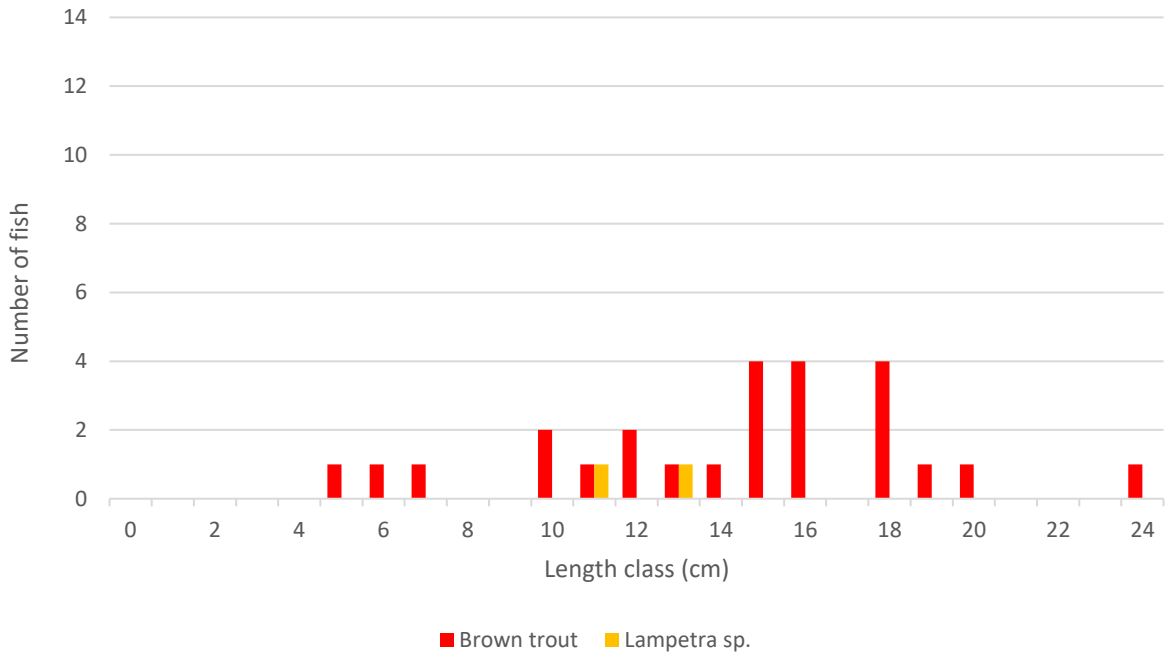


Figure 3.6 Length frequency distribution recorded via electro-fishing at site B2, August 2025



Plate 3.13 Adult brown trout recorded at site B2 on the Nuenna River, August 2025

3.1.14 Site B3 – Baunaniska Stream, Kilrush

Three-spined stickleback (*n*=7) was the only fish species recorded via electro-fishing at site B3 on the Baunaniska Stream (15B89), c. 1km upstream of the Nuenna River confluence (**Figure 3.7**). With the exception of low numbers of ubiquitous stickleback the site was not of fisheries value given its small size, very shallow nature, low summer flows, heavy siltation and poor hydromorphology.

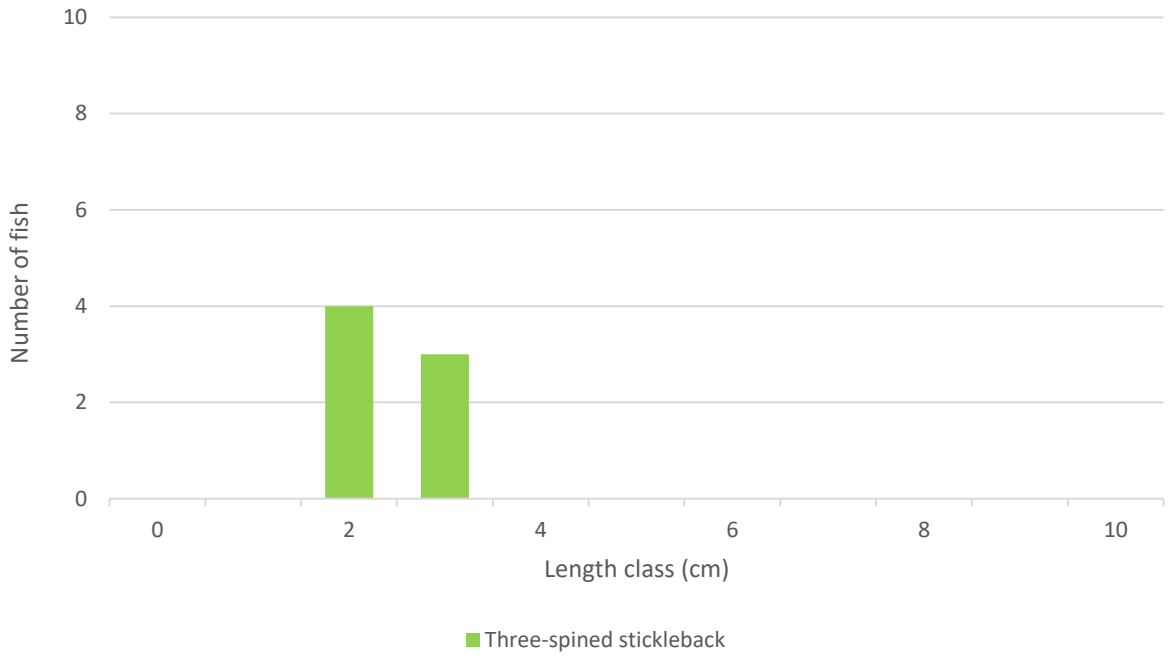


Figure 3.7 Length frequency distribution recorded via electro-fishing at site B3, August 2025



Plate 3.14 Representative image of site B3 on the Baunaniska Stream, August 2025

3.1.15 Site B4 – Nuenna River, Old Bridge

Atlantic salmon (*n*=11) and brown trout (*n*=42) were the only fish species recorded via electro-fishing at site B5 on the Nuenna River (15N02) upstream of Old Bridge in Freshford (**Figure 3.8**).

The site was a good quality salmonid nursery given ample water flows and good flow heterogeneity with healthy mixed cohort populations present. However, high siltation and bed calcification reduced

the value of the site considerably both as a nursery and spawning habitat. Deeper pool and bank scours offered high quality holding areas for adult salmonids. Suitability for lamprey in the survey area was poor given bed calcification and flocculent nature of silt accumulations. Deeper, shaded areas provided some good quality habitat for European eel although none were recorded (but known from site, Triturus data).

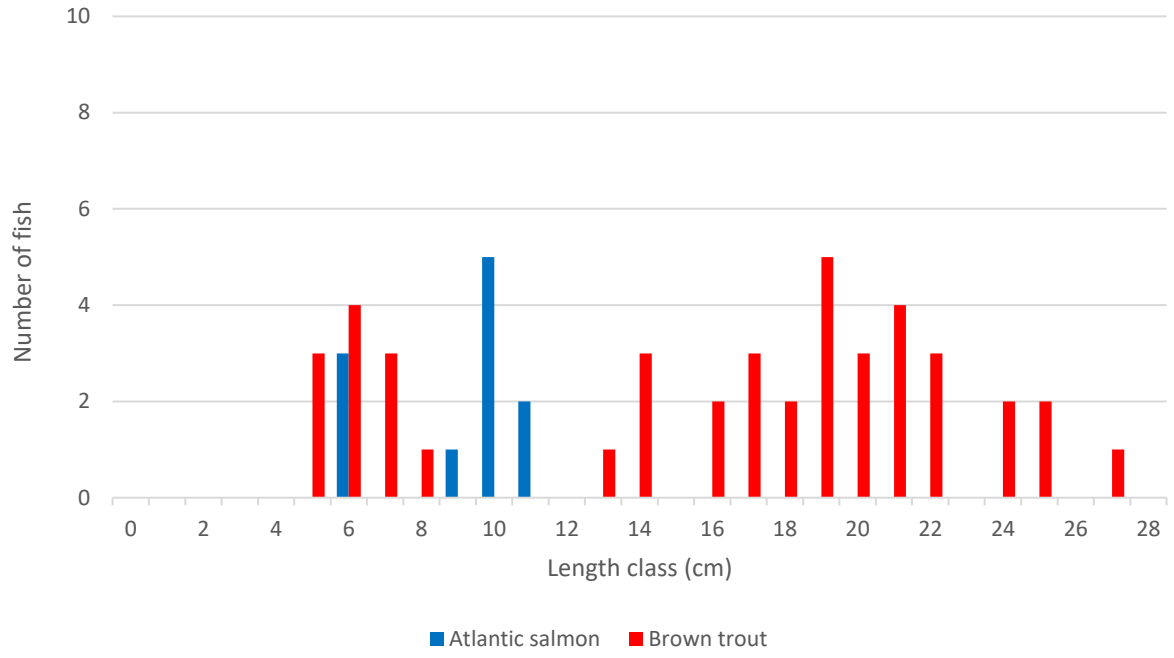


Figure 3.8 Length frequency distribution recorded via electro-fishing at site B4, August 2025



Plate 3.15 Representative image of site B4 on the Nuenna River upstream of Old Bridge, August 2025

3.1.16 Site B5 – Nuenna River, Purcellsgarden

Atlantic salmon (*n*=32), brown trout (*n*=36), lamprey (*Lampetra* sp.) (*n*=1) and European eel (*n*=3) were recorded via electro-fishing at site B5 on the Nuenna River (15N02) c.200m upstream of the River Nore confluence (**Figure 3.9**).

The site was of high value for salmonids, supporting moderate densities of mixed-cohort Atlantic salmon and brown trout. Deeper glide and pool associated with bank scours and debris dams provided high quality holding areas for adult salmonids. The site was also a high quality spawning area for both salmonids and lamprey given an abundance of clean mixed gravels and small cobble. Abundant riffle and fast glide areas provided ample nursery areas for salmonids although the value was somewhat reduced given a paucity of larger instream substrata and macrophyte beds. Soft sediment areas were scarce and dominated by sands but supported low densities of *Lampetra* sp. ammocoetes. The was abundant diurnal refugia and deeper holding areas for European eel, with a low number recorded.

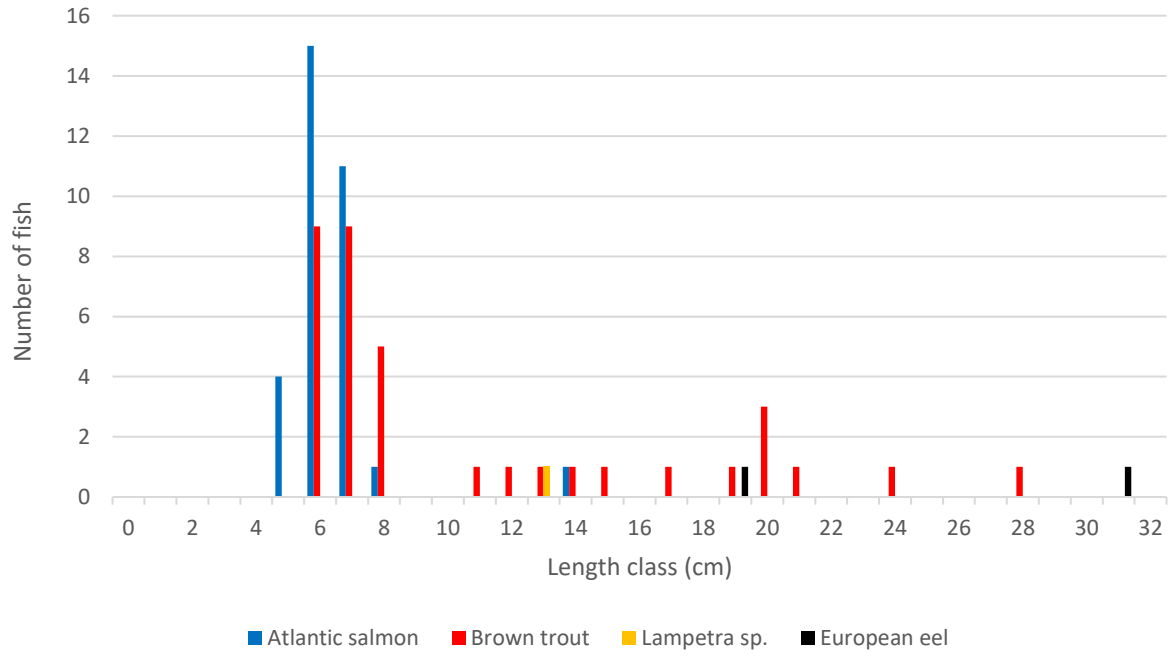


Figure 3.9 Length frequency distribution recorded via electro-fishing at site B5, August 2025



Plate 3.16 ≥1+ Atlantic salmon parr recorded at site B5 on the Nuenna River near the River Nore confluence, August 2025

3.1.17 Site C1 – Borrisbeg River, Balief Lower

Site C1 was located on the uppermost reaches of the Borrisbeg River (15B18) at the R693 road crossing immediately south of the Loughans SAC (000407), a large turlough. The channel was dry at the time of the survey (as per previous surveys). Given the dry, ephemeral conditions, the site was not capable of supporting resident fish at the time of survey.



Plate 3.17 Representative image of site C1 on the Borrisbeg River, August 2025 (ephemeral channel)

3.1.18 Site C2 – Borrisbeg River, Mountfinn

Brown trout (*n*=9) was the only fish species recorded via electro-fishing at site C2 on the Borrisbeg River (15B18) at the R639 road crossing (**Figure 3.10**).

The site was of moderate value for salmonids, supporting a low density of juvenile brown trout (no adults). Holding habitat for larger adults was absent given the shallow nature of the site. Salmonid nursery habitat was of moderate value only given the shallow nature of the site, siltation pressures, bedding of substrata and low summer flows. Spawning areas for both brown trout and lamprey were present but highly localised and impacted by siltation and calcification. Although previously recorded from the site (Triturus, 2023), no lamprey ammocetes were captured and suitability was low overall given the shallow nature of soft sediment deposits. Despite some good suitability, no European eel were recorded.

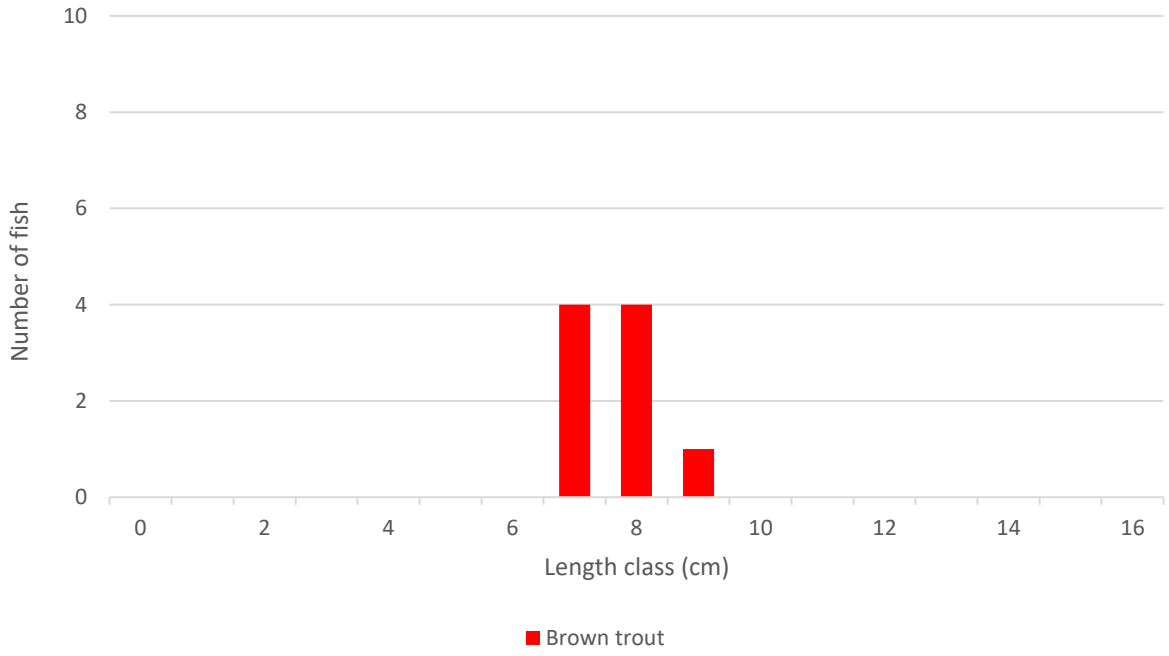


Figure 3.10 Length frequency distribution recorded via electro-fishing at site C2, August 2025



Plate 3.18 Juvenile brown trout recorded at site C2 on the Borrisbeg River, August 2025

3.1.19 Site C3 – River Goul, Foulkscourt

Electro-fishing was not undertaken at site C3 on the River Goul (15G02) at the R502 road crossing due to prohibitive depths of >1.5m. The site was of some suitability as an adult salmonid holding area albeit sub-optimal due to restricted flows. The nursery value was moderate, at best, with an absence of spawning areas (no hard substrata). Soft sediment accumulations with some suitability for lamprey ammocoetes were present at a depth of 1-1.5m under the bridge arches (lamprey detected via eDNA sampling, **Appendix B**). The site was also of high suitability for European eel and a range of coarse fish species such as pike (*Esox lucius*) and perch (*Perca fluviatilis*).



Plate 3.19 Representative image of site C3 on the River Goul, August 2025 (fisheries appraisal only)

3.1.20 Site C4 – River Goul, Aghmacart Bridge

Atlantic salmon (*n*=18) and brown trout (*n*=26) were the only fish species recorded via electro-fishing at site C4 on the River Goul (15G02) upstream of Aghmacart Bridge (**Figure 3.11**).

Despite modifications and pressures, the site was of high value for salmonids, supporting a moderate density of mixed-cohort salmon and trout. Riffle and glide habitat with ample boulder and cobble refugia were of value to juvenile salmonids with good quality spawning habitat for both salmonids and lamprey was also present (reduced by calcification & siltation). Deep pool and glide provided with overhanging vegetation provided good quality holding areas for adult salmonids. The site was of poor quality as a lamprey nursery due to a paucity of suitable soft sediment areas. The weir was a considerable but navigable barrier to salmonids and European eel (but not lamprey). Good quality European eel habitat was present but none were recorded.

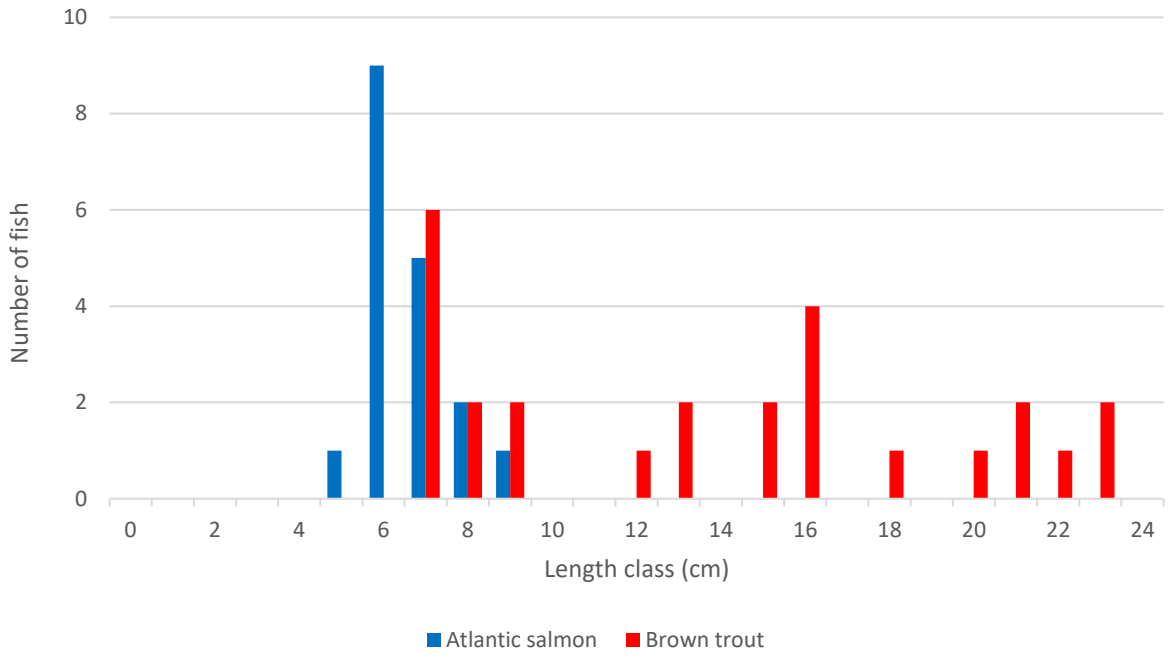


Figure 3.11 Length frequency distribution recorded via electro-fishing at site C4, August 2025



Plate 3.20 Adult brown trout recorded at site C4 on the River Goul at Aghmacart Bridge, August 2025

3.1.21 Site C5 – River Erkina, Durrow Bridge

Atlantic salmon (*n*=80), brown trout (*n*=27), lamprey (*Lampetra* sp.) (*n*=6), European eel (*n*=2) and minnow (*Phoxinus phoxinus*) (*n*=5) were recorded via electro-fishing at site C5 on the River Erkina (15E01) at Durrow Bridge (**Figure 3.12**).

The site was of very high value for salmonids, supporting high densities of juvenile Atlantic salmon and mixed-cohort brown trout. The site was an excellent quality nursery with abundant *Ranunculus* and other macrophyte beds providing high-quality refugia, in addition to bryophyte-rich cobble and boulder. These areas, located typically in deep fast-flowing glide, also provided excellent quality holding habitat for adult salmonids. Furthermore, overhanging marginal vegetation (reed canary grass etc.) also provided high-quality holding areas off the main flow. Good quality spawning habitat, for both salmonids and lamprey, was present near the bridges. Soft sediment accumulations suitable for ammocoetes were scarce but present underneath the southernmost arches, supporting a low density of *Lampetra* sp. Suitability for European eel was high, with abundant instream refugia supporting a low density.

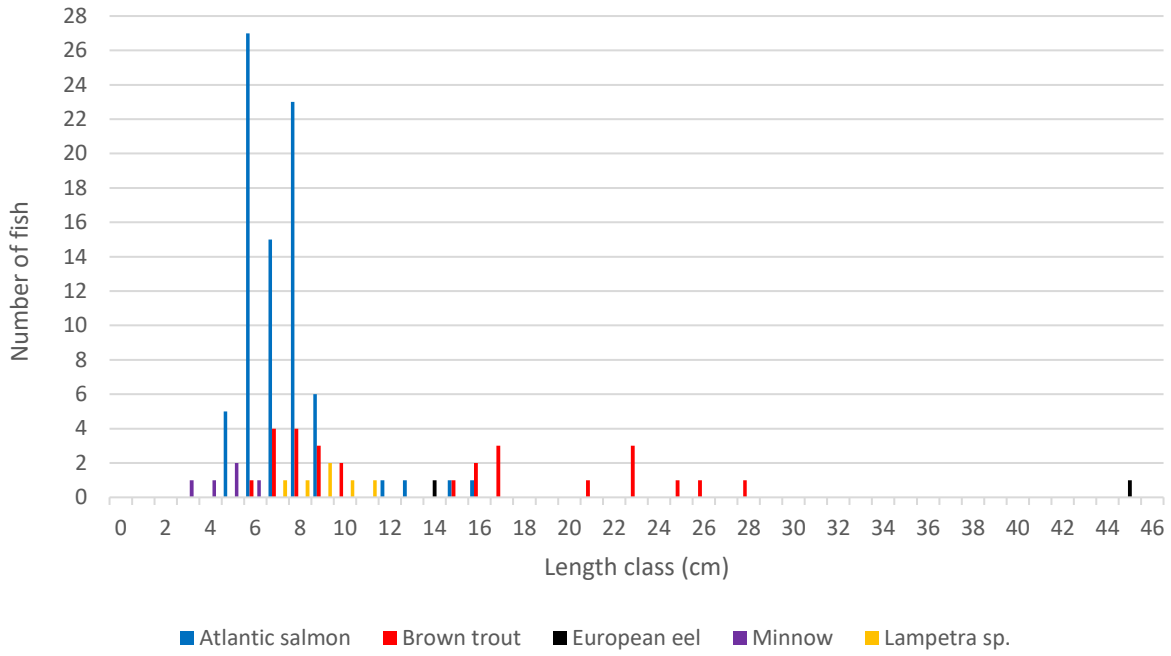


Figure 3.12 Length frequency distribution recorded via electro-fishing at site C5, August 2025



Plate 3.21 Atlantic salmon parr recorded at site C5 on the River Erkina at Durrow, August 2025

3.1.22 Site D1 – Coolnacrutta Stream, Tobar na Súl

Three-spined stickleback (*n*=6) was the only fish species recorded via electro-fishing at site D1 on the uppermost reaches of the Coolnacrutta Stream (15C50) (**Figure 3.13**). In contrast to previous surveys (when water levels/flows were significantly higher), no brown trout, European eel or *Lampetra* sp. were recorded, reflecting gross siltation pressures and low summer flows which created seasonal conditions inimical to these species.

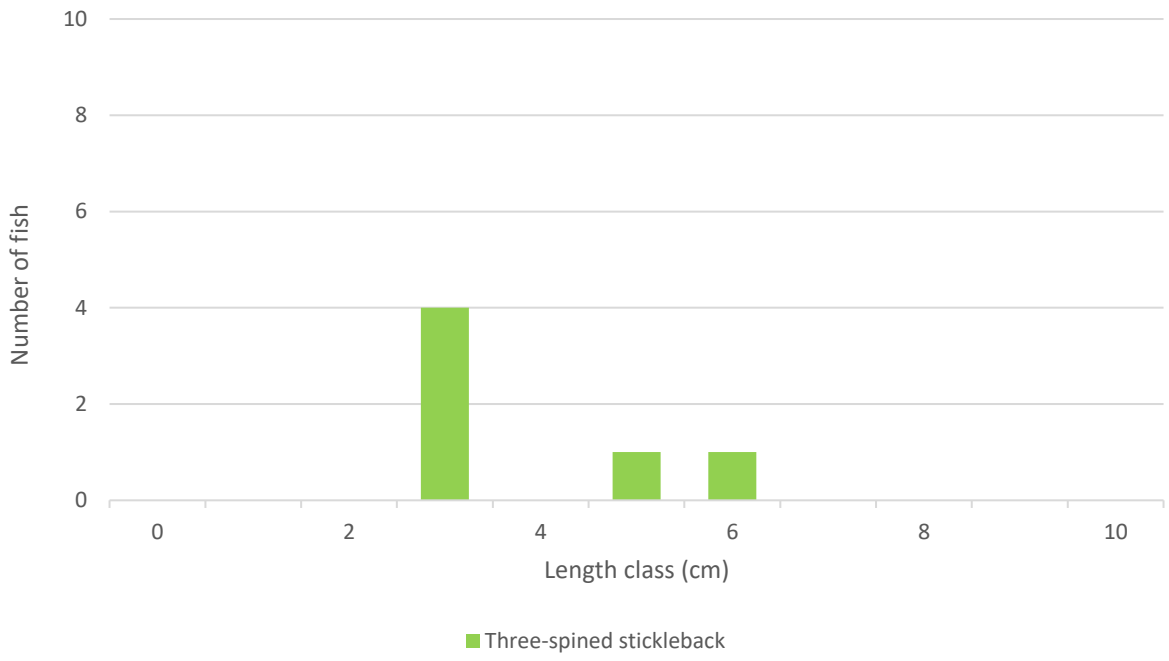


Figure 3.13 Length frequency distribution recorded via electro-fishing at site D1, August 2025



Plate 3.22 Representative image of site D1 on the Coolnacrutta Stream, August 2025

3.1.23 Site D2 – Coolnacrutta Stream, Glashare

Brown trout (*n*=2), lamprey (*Lampetra* sp.) (*n*=1) and three-spined stickleback (*n*=9) were recorded via electro-fishing at site D2 on the Coolnacrutta Stream (15C50) c.2.4km downstream of site D1 (**Figure 3.14**).

The value of the site was significantly reduced over previous surveys due to very low summer flows and water levels resulting in a very low density of fish. The site is known to occasionally support Atlantic salmon and European eel (Triturus 2021 & 2023 data). Given evident siltation and hydrological pressures, a very low density of juvenile trout were recorded with no adults (having likely migrated downstream). The quality of salmonid nursery, spawning and holding habitat was poor. The pipe culvert under the road was impassable to salmonids and lamprey at low flows. Soft sediment areas were abundant but only a single *Lampetra* sp. ammocoete was recorded, again reflecting poor flows and unfavourable conditions.

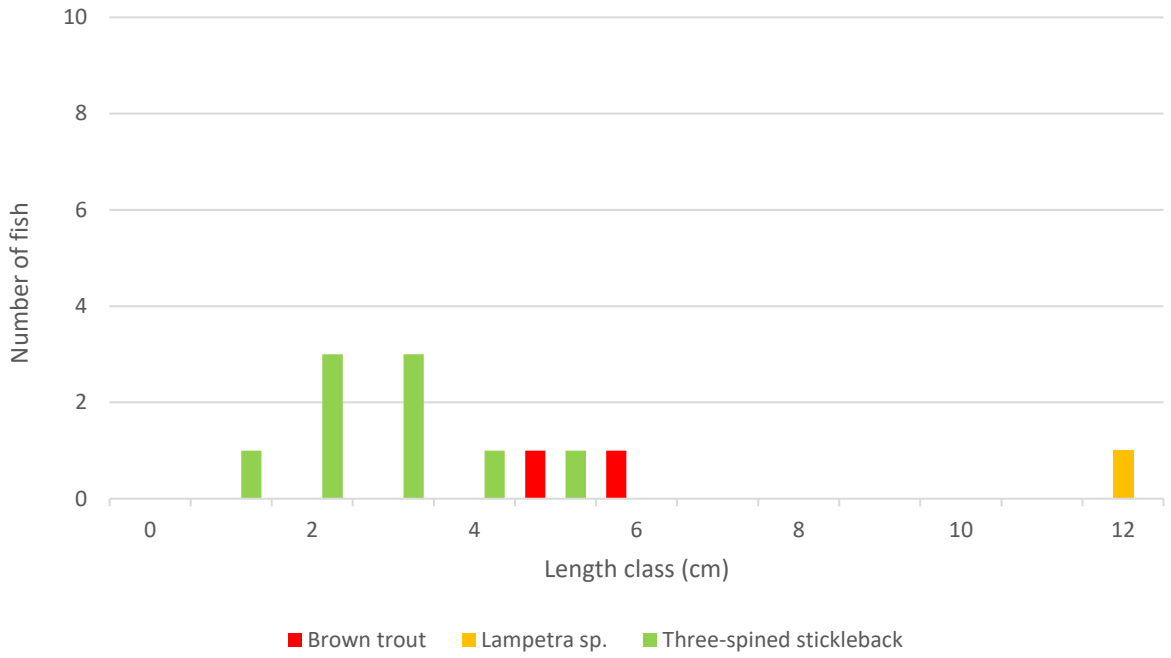


Figure 3.14 Length frequency distribution recorded via electro-fishing at site D2, August 2025



Plate 3.23 Juvenile brown trout recorded at site D2 on the Coolnacrutta Stream, August 2025

3.1.24 Site GCR1 – Gorteenahilla River, Coolcashin

Atlantic salmon (*n*=2), brown trout (*n*=3) and three-spined stickleback (*n*=6) were recorded via electro-fishing at site GCR1 on the Gorteenahilla River (15G08) at a local road and Proposed 110kV Underground Cabling crossing (**Figure 3.15**).

Low summer flows had significantly reduced the quality of the fisheries habitats although a low density

of salmonids remained. Under higher flows (e.g. winter) the site evidently provides some good quality salmonid spawning and nursery habitat, despite siltation and hydromorphological pressures. Holding opportunities for adult salmonids were limited in the narrow shallow channel. Shallow, flocculent soft sediment areas were sub-optimal for lamprey ammocoetes and did not support ammocoetes at the time of survey (although *Lampetra* sp. are known from the site, Triturus 2021 data). Some limited gravel spawning areas for lamprey were present. Despite some low suitability, no European eel were recorded with poorly accessible refugia due to siltation and bedding.

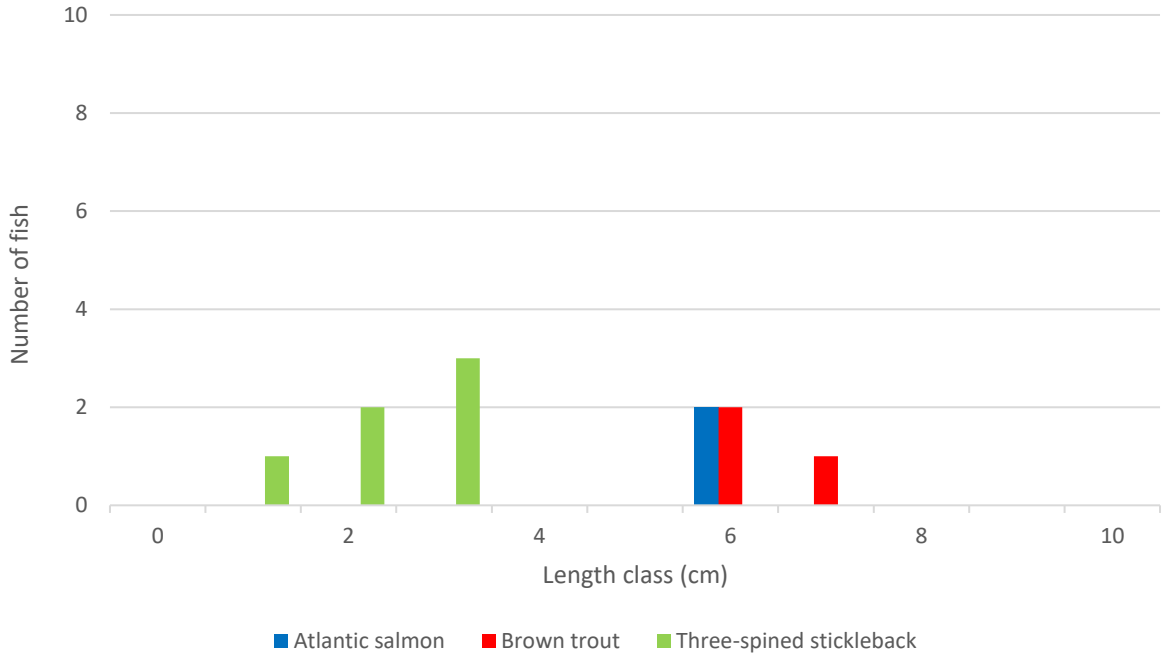


Figure 3.15 Length frequency distribution recorded via electro-fishing at site GCR1, August 2025



Plate 3.24 Juvenile Atlantic salmon (left) and brown trout recorded at site GCR1 on the Gorteenahilla River, August 2025

3.1.25 Site GCR2 – Ballyring Upper Stream, Ballyring Upper

Three-spined stickleback (*n*=14) was the only fish species recorded via electro-fishing at site GCR2 n the Ballyring Upper Stream (15B73) at a local road and Proposed 110kV Underground Cabling crossing (**Figure 3.16**).

With the exception of stickleback (highly tolerant to low oxygen conditions), the site was not of value to resident fish given an absence of flows and ephemeral conditions. Physically the site was suitable for salmonids and European eel and both would likely be present under higher water levels. The site was unsuitable for lamprey (no nursery areas).

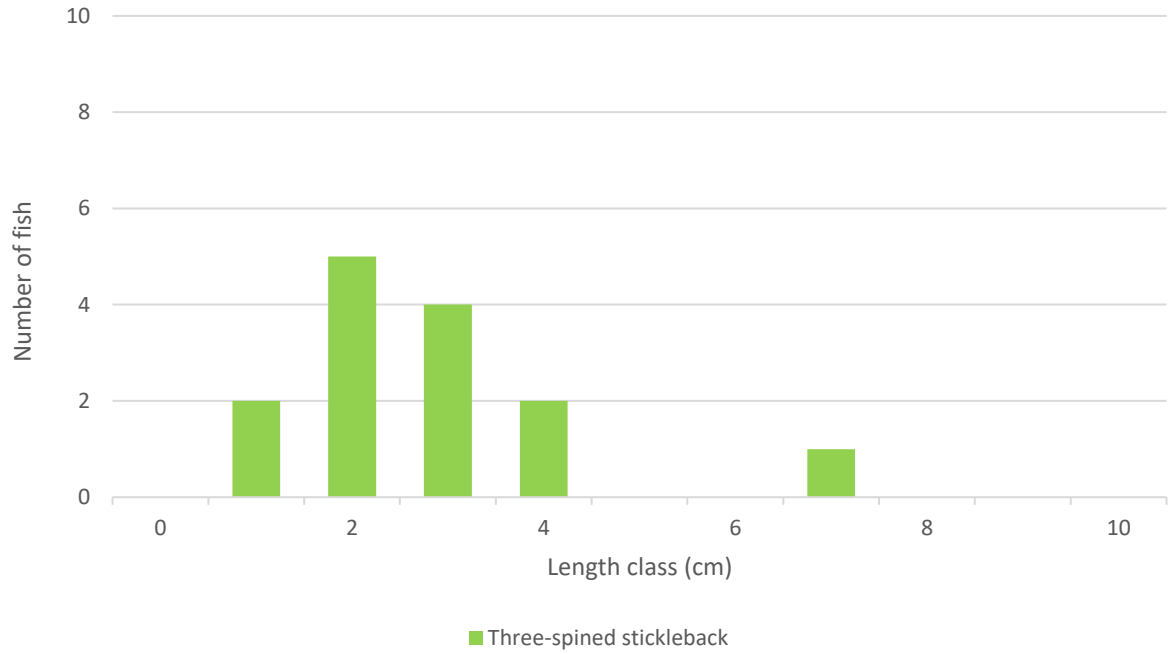


Figure 3.16 Length frequency distribution recorded via electro-fishing at site GCR2, August 2025



Plate 3.27 Representative image of site GCR2 on the Ballyring Upper Stream, August 2025 (semi-dry channel)

3.1.26 Site GCR3 – Lisdowney Stream, L1810 road crossing

Brown trout (*n*=11), lamprey (*Lampetra* sp.) (*n*=1) and three-spined stickleback (*n*=5) were recorded via electro-fishing at site GCR3 on the Lisdowney Stream (15L02) at the L1810 road downstream of the Proposed 110kV Underground Cabling (**Figure 3.17**).

Low summer flows had significantly reduced the quality of the fisheries habitats although a low density of salmonids remained in isolated pools. Under higher flows (e.g. winter) the site evidently provides some good quality salmonid spawning and nursery habitat, despite siltation and hydromorphological pressures. Holding opportunities for adult salmonids were limited in the narrow shallow channel. Atlantic salmon and European eel are known to utilise the site and wider channel (Triturus data). Suitability for lamprey ammocoetes was low given a paucity of deeper soft sediment accumulations. However, a single (large) ammocoete was recorded. Despite some physical suitability, no European eel were recorded.

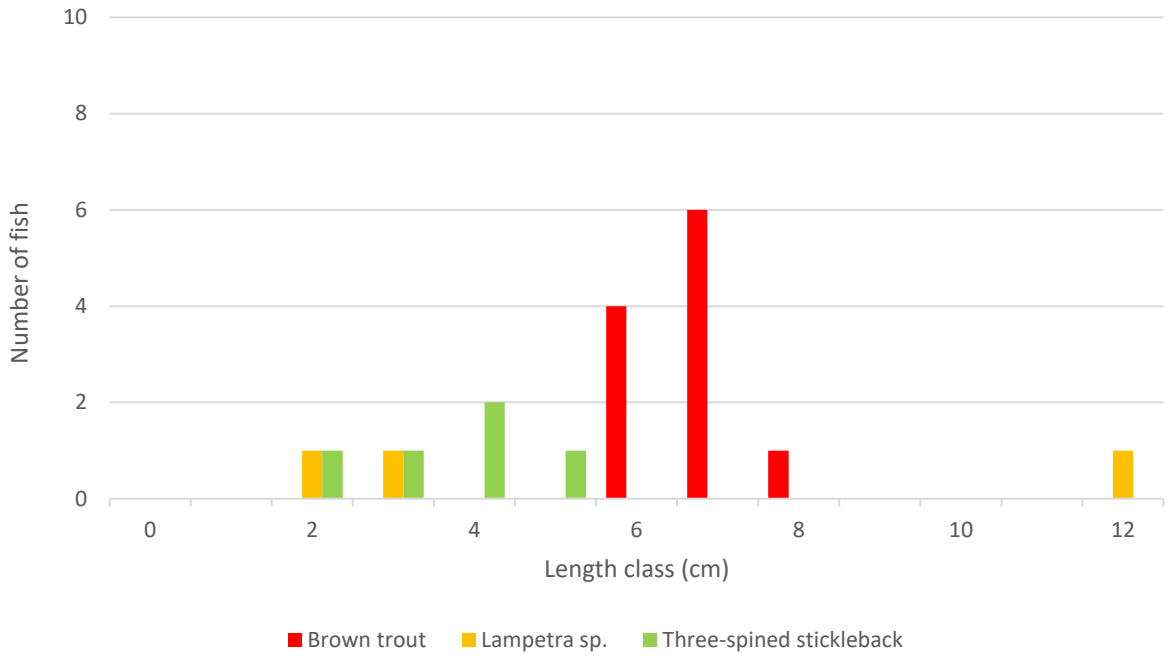


Figure 3.17 Length frequency distribution recorded via electro-fishing at site GCR3, August 2025



Plate 3.26 *Lampetra* sp. ammocoete recorded at site GCR3 on the Lisdowney Stream, August 2025

3.1.27 Site GCR4 – Ballyconra Stream, L1807 road crossing

Site GCR4 was located on the Ballyconra Stream (15B86) at the L1807 road downstream of the Proposed 110kV Underground Cabling, c.1km upstream of the Lisdowney Stream confluence. The stream was dry at the time of survey and routinely dries up in the summer months (pers. obs.). Given the dry, ephemeral conditions, the site was not capable of supporting resident fish at the time of survey.



Plate 3.27 Representative image of site GCR4 on the Ballyconra Stream, August 2025 (dry, ephemeral channel)

3.1.28 Site GCR5 – River Nore, Ballyconra

Electro-fishing was not undertaken at site GCR5 on the River Nore (15N01) at a Proposed 110kV Underground Cabling horizontal directional drilling (HDD) crossing c. 1km upstream of Ballyragget Bridge due to prohibitive depths and water volumes. The site was of some suitability as an adult salmonid holding with deeper pools under cover of riparian trees offering flow refugia for migratory fish. Salmonid spawning habitat was absent with poor nursery conditions. Deep depositing glide was of high value for a range of coarse fish species and European eel. Frequent soft sediment accumulations along channel margins were of value to lamprey ammocoetes with suitable spawning areas known to be present c.250m upstream (pers. obs.).



Plate 3.28 Representative image of site GCR5 on the River Nore, August 2025

Table 3.1 Fish species densities per m^2 recorded at sites in the vicinity of the Proposed Project via electro-fishing in August 2025 (values in **bold** represent the highest densities recorded for each species, respectively)

Site	Watercourse	CPUE (elapsed time)	Approx. area fished (m^2)	Atlantic salmon	Brown trout	*Lampetra* sp.	European eel	Three-spined stickleback	Minnow
A1	Unmapped stream	5	40	0.000	0.000	0.000	0.000	0.150	0.000
A2	Unmapped stream	n/a	Dry channel	n/a	n/a	n/a	n/a	n/a	n/a
A3	Foyle South Stream	5	10	0.000	0.000	0.000	0.000	0.300	0.000
A4	Foyle South Stream	5	25	0.000	0.080	0.000	0.000	0.200	0.000
A5	Foyle South Stream	5	75	0.000	0.120	0.000	0.000	0.000	0.000
A6	Gorteenahilla River	10	220	0.077	0.118	1.5 per m2	0.000	0.123	0.000
A7	Gorteenahilla River	n/a	Dry channel	n/a	n/a	n/a	n/a	n/a	n/a
B1	Clomantagh Lower Stream	n/a	Dry channel	n/a	n/a	n/a	n/a	n/a	n/a
B2	Nuenna River	10	250	0.000	0.100	1 per m^2	0.000	0.000	0.000
B3	Baunaniska Stream	5	15	0.000	0.000	0.000	0.000	**0.467**	0.000
B4	Nuenna River	10	220	0.050	**0.191**	0.000	0.000	0.000	0.000
B5	Nuenna River	10	250	0.128	0.144	1 per m^2	**0.012**	0.000	0.000
C1	Borrisbeg River	n/a	Dry channel	n/a	n/a	n/a	n/a	n/a	n/a
C2	Borrisbeg River	10	180	0.000	0.050	0.000	0.000	0.056	0.000
C3	River Goul	n/a	Too deep for electro-fishing	n/a	n/a	n/a	n/a	n/a	n/a
C4	River Goul	10	250	0.072	0.104	n/a	n/a	n/a	n/a
C5	River Erkina	10	180	**0.444**	0.150	**3 per m^2**	0.011	0.000	**0.028**

Site	Watercourse	CPUE (elapsed time)	Approx. area fished (m^2)	Atlantic salmon	Brown trout	*Lampetra* sp.	European eel	Three-spined stickleback	Minnow
D1	Coolnacrutta Stream	10	200	0.000	0.000	0.000	0.000	0.030	0.000
D2	Coolnacrutta Stream	10	140	0.000	0.014	0.33 per m^2	0.000	0.064	0.000
GCR1	Gorteenahilla River	5	80	0.025	0.038	0.000	0.000	0.075	0.000
GCR2	Ballyring Upper Stream	5	40	0.000	0.000	0.000	0.000	0.350	0.000
GCR3	Lisdowney Stream	5	80	0.000	0.138	1 per m^2	0.000	0.000	0.000
GCR4	Ballyconra Stream	n/a	Dry channel	n/a	n/a	n/a	n/a	n/a	n/a
GCR5	River Nore	n/a	Too deep for electro-fishing	n/a	n/a	n/a	n/a	n/a	n/a

Table 3.2 Relative abundance of fish species of higher conservation value recorded via **electro-fishing** in the vicinity of the Proposed Project, August 2025

Site	Watercourse	Atlantic salmon	Brown trout	*Lampetra* sp.	European eel	Other species
A1	Unmapped stream					Three-spined stickleback
A2	Unmapped stream	No fish recorded				
A3	Foyle South Stream					Three-spined stickleback
A4	Foyle South Stream					Three-spined stickleback
A5	Foyle South Stream		Low			
A6	Gorteenahilla River	Medium	Medium	Low		Three-spined stickleback
A7	Gorteenahilla River	No fish recorded – dry, ephemeral channel reach				
P1	Unnamed pond	Fisheries appraisal only (dry pond)				
P2	Unnamed pond	Fisheries appraisal only (dry pond)				
P3	Unnamed pond	Fisheries appraisal only				
P4	The Loughane	Fisheries appraisal only – three-spined and ten-spined stickleback recorded in sweep samples				
B1	Clomantagh Lower Stream	n/a – channel underground or dry (not accessible for survey)				
B2	Nuenna River		Medium	Low		Three-spined stickleback
B3	Baunaniska Stream					Three-spined stickleback
B4	Nuenna River	Medium	High			
B5	Nuenna River	High	High	Low	Low	
C1	Borrisbeg River	n/a - dry, ephemeral channel reach				
C2	Borrisbeg River		Low			
C3	River Goul	n/a - too deep for electro-fishing				
C4	River Goul	Medium	Medium			
C5	River Erkina	Very high	Medium	Medium	Low	Minnow
D1	Coolnacrutta Stream					Three-spined stickleback
D2	Coolnacrutta Stream		Low	Low		Three-spined stickleback
GCR1	Gorteenahilla River	Low	Low			Three-spined stickleback
GCR2	Ballyring Upper Stream					Three-spined stickleback
GCR3	Lisdowney Stream		Medium	Low		
GCR4	Ballyconra Stream	n/a - dry, ephemeral channel reach				
GCR5	River Nore	n/a - too deep for electro-fishing				

Table 3.3 Comparison of fish recorded via electro-fishing in 2023 and 2025 at sites in vicinity of the Proposed Project

			Fish species recorded	
Site no.	Watercourse	EPA code	September 2022	August 2025
A1	Unmapped stream	n/a	No fish recorded	Three-spined stickleback
A2	Unmapped stream	n/a	No fish recorded	No fish recorded
A3	Foyle South Stream	15F07	Three-spined stickleback	Three-spined stickleback
A4	Foyle South Stream	15F07	Three-spined stickleback	Three-spined stickleback
A5	Foyle South Stream	15F07	Atlantic salmon, brown trout, European eel, three-spined stickleback	Brown trout
A6	Gorteenahilla River	15G08	Atlantic salmon, brown trout, *Lampetra* sp., three-spined stickleback	Atlantic salmon, brown trout, *Lampetra* sp., three-spined stickleback
A7	Gorteenahilla River	15G08	No fish recorded – dry channel	No fish recorded – dry channel
P1	Unnamed pond	n/a	No fish recorded	No fish recorded – dry pond
P2	Unnamed pond	n/a	No fish recorded	No fish recorded – dry pond
P3	Unnamed pond	n/a	No fish recorded	No fish recorded
P4	The Loughane	n/a	Three-spined stickleback, ten-spined stickleback	Three-spined stickleback, ten-spined stickleback
B1	Clomantagh Lower Stream	15C91	No fish recorded – dry channel	No fish recorded – dry channel
B2	Nuenna River	15N02	Brown trout, *Lampetra* sp.	Brown trout, *Lampetra* sp., three-spined stickleback
B3	Baunaniska Stream	15B89	Three-spined stickleback	Three-spined stickleback
B4	Nuenna River	15N02	Atlantic salmon, brown trout, European eel	Atlantic salmon, brown trout
B5	Nuenna River	15N02	Atlantic salmon, brown trout, *Lampetra* sp., European eel, minnow	Atlantic salmon, brown trout, *Lampetra* sp., European eel
C1	Borrisbeg River	15B18	No fish recorded – dry channel	No fish recorded – dry channel
C2	Borrisbeg River	15B18	Brown trout, *Lampetra* sp., three-spined stickleback	Brown trout
C3	River Goul	15G02	n/a – fisheries appraisal only	*Lampetra* sp. (eDNA)
C4	River Goul	15G02	Atlantic salmon, brown trout, European eel	Atlantic salmon, brown trout
C5	River Erkina	15 E01	Atlantic salmon, brown trout, *Lampetra* sp., European eel, three-spined stickleback	Atlantic salmon, brown trout, *Lampetra* sp., European eel, minnow
D1	Coolnacrutta Stream	15C50	Brown trout, *Lampetra* sp., European eel, three-spined stickleback	Three-spined stickleback
D2	Coolnacrutta Stream	15C50	Atlantic salmon, brown trout	Brown trout, *Lampetra* sp., three-spined stickleback
GCR1	Gorteenahilla River	15G08	Not previously surveyed	Atlantic salmon, brown trout, three-spined stickleback
GCR2	Ballyring Upper Stream	15B73	Not previously surveyed	Three-spined stickleback
GCR3	Lisdowney Stream	15L02	Not previously surveyed	Brown trout, *Lampetra* sp.
GCR4	Ballyconra Stream	15B86	Not previously surveyed	No fish recorded – dry channel
GCR5	River Nore	15N01	Not previously surveyed	n/a – fisheries appraisal only

4. Discussion

The watercourses surveyed in the vicinity of the Proposed Project were typically small upland and lowland channels which had been historically straightened and or deepened. Whilst good instream recovery was evident across most modified survey sites, siltation and eutrophication pressures were significant and had impacted fisheries habitats. More impactful were the very low summer flows in the survey area which significantly reduced the quality of fisheries habitats and restricted fish distributions, especially on the Foyle South Stream, Coolnacrutta Stream, Ballyring Upper Stream and the Lisdowney Stream. Low water levels and ephemeral conditions are a characteristic of the upper Nore catchment (pers. obs.). A total of 7 no. sites did not support resident fish at the time of survey. Intermittent flows result in degraded fisheries habitat, particularly due to high thermal stress (O'Briain et al., 2020, 2019, 2017) and agricultural (siltation and eutrophication) pressures (Kelly-Quinn et al., 2020; O'Callaghan et al., 2019; Davis et al., 2018; Conroy et al., 2016). The Nore catchment features a relatively high number of instream barriers (Atkinson et al., 2018; Sullivan, 2007), particularly for non-salmonid species (Gargan et al., 2011; IFI National Barriers dataset) and this also influenced fish distributions. Pond sites P1, P2 and P3 were not of fisheries value due to their ephemeral and or isolated nature.

However, in keeping with the previous 2022 surveys, a number of high conservation value fish species were recorded in August 2025. A typical diversity of fish for the surveyed sub-catchments (Triturus 2021-2024 data; Gordon et al., 2021; Matson et al., 2018b; Kelly et al., 2014) was recorded, with Atlantic salmon, brown trout, lamprey (*Lampetra* sp.), European eel, minnow and three-spined stickleback captured in August 2025 (**Table 3.1, 3.2**). The same species assemblage was recorded during the previous survey (Triturus, 2023). Fish abundances and distributions were lower and more restricted in 2025 due to lower flows (**Table 3.3**).

Salmonid populations were widespread in the survey area although the distribution were more restricted compared with the previous (2022) survey given low summer flows and fish passage issues. For example, salmon were not recorded from sites on the Foyle South Stream, Coolnacrutta Stream or Lisdowney Stream despite their known presence in recent years (Triturus data). Atlantic salmon were, however, recorded from a total of 6 no. sites on the Gorteenahilla River (A6, GCR1), Nuenna River (B4, B5), River Goul (C4) and the River Erkina (C5). Brown trout were also present at these sites as well as sites on the Foyle South Stream (A5), Nuenna River (B2), Borrisbeg River (C2), Coolnacrutta Stream (D2) and the Lisdowney Stream (GCR3). The number of adult trout recorded was lower than previous surveys, reflecting the paucity of deeper holding water in watercourses suffering from low summer flows. Salmonid densities were typically low to medium, reflecting the significant hydrological and water quality impacts throughout the survey area, with the highest numbers present on the Nuenna River and River Erkina (**Table 3.1**). Siltation of spawning habitat was evident throughout the survey area, with hydrological and hydromorphological pressures reducing habitat heterogeneity and the quality of available nursery areas.

Overall, lamprey habitat was poor across the survey area and the abundances and distribution of *Lampetra* sp. ammocoetes reflected the often low summer flows (impacting food supplies & oxygenation) and a general paucity of suitable nursery areas. The higher energy characteristics of most sites discourages the settlement of organic rich fines required for larval burial (Aronsuu & Virkkala, 2014; Goodwin et al., 2008; Gardiner, 2003). Given that *Lampetra* spp. require fine, clean gravels for

spawning (Dawson et al., 2015; Rooney et al., 2013; Lasne et al., 2010; Kelly & King, 2001), siltation significantly impacted spawning opportunities in the survey area, with bed calcification and eutrophication also additional pressures. Channel gradients and instream barriers (both natural and anthropogenic) further restricted lamprey populations given their poor ability to navigate even low head obstacles and higher flow velocities. Lamprey ammocoetes were recorded in low to medium densities (0.33 to 3 per m^2) from sites on the 6 no. sites on the Gorteenahilla River (A6), Nuenna River (B5), River Erkina (C5), Coolnacrutta Stream (D2) and Lisdowney Stream (GCR3) (**Table 3.1, 3.2**). The species was also detected from the River Goul via eDNA sampling (**Appendix B**). Site C5 on the River Erkina supported higher ammocoete densities given the frequency of suitable soft sediment accumulations not typically encountered elsewhere. Some larger lamprey ammocoetes were recorded from sub-optimal habitats (e.g. site GCR3), being present in mixed gravel or cobble refugia. These larger non-sediment substrate can be utilised by larger classes of ammocoetes, particularly when low water levels influence nursery habitat availability and quality (Melchior & Madsen, 2025; Aronsuu & Virkkala, 2014).

European eel are 'critically endangered' in Ireland (King et al., 2011) and on a global scale (Pike et al., 2020). Despite widespread suitability, European eel were only recorded in low numbers at sites B5 on the Nuenna River and C5 on the River Erkina (**Table 3.1, 3.2**). Sites beyond the scope of electro-fishing on the River Goul (C3) and River Nore (C5) provided good quality eel habitat and likely supported the species. The low eel numbers and absence from many physically suitable sites likely reflects the high number of barriers to fish passage present in the Nore catchments, as well as widespread low summer flow conditions which influence and restrict fish distribution. Eel penetration into many Nore tributaries is low (Gargan et al., 2011), primarily due to the high number of aforementioned instream barriers within the catchment. As eel occurrence decreases significantly with increasing distance from the sea (Degerman et al., 2019), the paucity of eel observed in the survey sub-catchments can be further explained by the distance between the survey area and marine habitats (Matondo et al., 2021; Chadwick et al., 2007) (c. 90km nearest instream distance).

5. References

APEM (2004). Assessment of sea lamprey distribution and abundance in the River Spey: Phase II. Scottish Natural Heritage Commissioned Report No. 027 (ROAME No. F01AC608).

Armstrong, J. D., Kemp, P. S., Kennedy, G. J. A., Ladle, M., & Milner, N. J. (2003). Habitat requirements of Atlantic salmon and brown trout in rivers and streams. Fisheries research, 62(2), 143-170.

Aronsuu, K. & Virkkala, P. (2014). Substrate selection by subyearling European river lampreys (*Lampetra fluviatilis*) and older larvae (*Lampetra* spp.). Ecology of Freshwater Fish, 23: 644–655

Atkinson, S., Bruen, M., Turner, J. N., Ball, B., Bullock, C., O'Sullivan, J. J., ... & Kelly-Quinn, M. (2018). The value of a desk study for building a national river obstacle inventory. River Research and Applications, 34(8), 1085-1094.

CEN (2003). Water Quality - Sampling of Fish with Electricity. Document CEN EN 14011:2000.

CFB (2008). Methods for the Water Framework Directive. Electric Fishing in Wadeable Reaches. Central Fisheries Board. Unpublished report.

Chadwick, S., Knights, B., Thorley, J. L., & Bark, A. (2007). A long-term study of population characteristics and downstream migrations of the European eel *Anguilla anguilla* (L.) and the effects of a migration barrier in the Girnock Burn, north-east Scotland. Journal of Fish Biology, 70(5), 1535-1553.

Conroy, E., Turner, J. N., Rymszewicz, A., O'Sullivan, J. J., Bruen, M., Lawler, D., ... & Kelly-Quinn, M. (2016). The impact of cattle access on ecological water quality in streams: Examples from agricultural catchments within Ireland. Science of the Total Environment, 547, 17-29.

Davis, S. J., Mellander, P. E., Kelly, A. M., Matthaei, C. D., Piggott, J. J., & Kelly-Quinn, M. (2018). Multiple-stressor effects of sediment, phosphorus and nitrogen on stream macroinvertebrate communities. Science of the Total Environment, 637, 577-587.

Dawson, H. A., Quintella, B. R., Almeida, P. R., Treble, A. J., & Jolley, J. C. (2015). The ecology of larval and metamorphosing lampreys. In Lampreys: biology, conservation and control (pp. 75-137). Springer, Dordrecht.

Degerman, E., Tamario, C., Watz, J., Nilsson, P. A., & Calles, O. (2019). Occurrence and habitat use of European eel (*Anguilla anguilla*) in running waters: lessons for improved monitoring, habitat restoration and stocking. Aquatic ecology, 53(4), 639-650.

EA (2003). River Habitat Survey in Britain and Ireland: Field Survey Guidance Manual: 2003 Version. Forest Research. Environment Agency, UK.

Gardiner, R. (2003). Identifying lamprey. A field key for sea, river and brook lamprey. Conserving Natura 2000 Rivers, Conservation techniques No. 4. Peterborough. English Nature.

Gargan, P. G., Roche, W. K., Keane, S., King, J. J., Cullagh, A., Mills, P., & O'Keeffe, J. (2011). Comparison of field- and GIS-based assessments of barriers to Atlantic salmon migration: a case study in the Nore Catchment, Republic of Ireland. Journal of Applied Ichthyology, 27, 66-72.

Goodwin, C.E., Dick, J.T.A. & Elwood, R.W. (2008). A preliminary assessment of the distribution of the sea lamprey (*Petromyzon marinus* L), river lamprey (*Lampetra fluviatilis* (L.)) and brook lamprey (*Lampetra planeri* (Bloch)) in Northern Ireland. Biology and Environment: Proceedings of the Royal Irish Academy 109B, 47-52.

Gordon, P., Donovan, R., Matson, R., Corcoran, W. & Kelly, F.L. (2021). Sampling Fish in Rivers 2020 – River Nore Catchment. Factsheet No. 2020/03. National Research Survey Programme. Inland Fisheries Ireland.

Harvey, J. & Cowx, I. (2003). Monitoring the River, Sea and Brook Lamprey, *Lampetra fluviatilis, L. planer*i and *Petromyzon marinus*. Conserving Natura 2000 Rivers Monitoring Series No. 5, English Nature, Peterborough.

Hendry, K., & Cragg-Hine, D. (1997). Restoration of Riverine Salmon Habitats: A Guidance Manual. Environment Agency.

Hendry, K., Cragg-Hine, D., O'Grady, M., Sambrook, H., & Stephen, A. (2003). Management of habitat for rehabilitation and enhancement of salmonid stocks. Fisheries Research, 62(2), 171-192.

IFI (2010). Biosecurity Protocol for Field Survey Work. Available at http://www.fisheriesireland.ie/Invasive-Species/biosecurity-protocol-for-field-survey-work.html

Kelly, F. L., & King, J. J. (2001) A review of the ecology and distribution of three lamprey species, *Lampetra fluviatilis* (L.), *Lampetra planeri* (Bloch) and *Petromyzon marinus* (L.): a context for conservation and biodiversity considerations in Ireland. In Biology and Environment: Proceedings of the Royal Irish Academy (pp. 165-185). Royal Irish Academy.

Kelly, F.L., Matson, R., Connor, L., Feeney, R., Morrissey, E., Coyne, J. & Rocks, K. (2014). Water Framework Directive Fish Stock Survey of Rivers in the South Eastern River Basin District. Inland Fisheries Ireland, 3044 Lake Drive, Citywest Business Campus, Dublin 24, Ireland.

Kelly-Quinn, M., Feeley, H., & Bradley, C. (2020). Status of freshwater invertebrate biodiversity in Ireland's rivers–time to take stock. In Biology and Environment: Proceedings of the Royal Irish Academy (Vol. 120, No. 2, pp. 65-82). Royal Irish Academy.

Kennedy, M. & Fitzmaurice, P. (1971) Growth and food of Brown Trout Salmo Trutta (L.) in Irish Waters. Proceedings of the Royal Irish Academy, 71 (B) (18), 269-352.

King, J.L., Marnell, F., Kingston, N., Rosell, R., Boylan, P., Caffrey, J.M., FitzPatrick, Ú., Gargan, P.G., Kelly, F.L., O'Grady, M.F., Poole, R., Roche, W.K. & Cassidy, D. (2011). Ireland Red List No. 5: Amphibians, Reptiles & Freshwater Fish. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.

Lasne. E., Sabatie, M-R. & Evanno, G. (2010) Communal spawning of brook and river lampreys (*Lampetra planeri* and *L. fluviatilis*) is common in the Oir River (France). Ecology of Freshwater Fish 2010: 19: 323–325.
Maitland, P.S. (2003). Ecology of the River, Brook and Sea Lamprey. Conserving Natura 2000 Rivers Ecology Series No. 5. English Nature, Peterborough.

Matondo, B. N., Benitez, J. P., Dierckx, A., Renardy, S., Rollin, X., Colson, D., ... & Ovidio, M. (2021). What are the best upland river characteristics for glass eel restocking practice?. Science of the Total Environment, 784, 147042.

Matson, R., Delanty, K., Shephard, S., Coghlan, B., & Kelly, F. (2018a). Moving from multiple pass depletion to single pass timed electrofishing for fish community assessment in wadeable streams. Fisheries Research, 198, 99-108.

Matson, R., Delanty, K., Gordon, P., O'Briain, R., Garland, D., Cierpal, D., Connor, L., Corcoran, W., Coyne, J., McLoone, P., Morrisey-McCaffrey, E., Brett, T., Ní Dhonnabhain, L. and Kelly, F.L., (2018b). Sampling Fish in Rivers 2017 – Nuenna & Arigna, Factsheet No. 14. National Research Survey Programme. Inland Fisheries Ireland.

Melchior, M., & Madsen, N. (2025). Distribution of brook lamprey (*Lampetra planeri*) ammocoetes in the sediment of a brook. Environmental Biology of Fishes, 1-13.

Niven, A.J. & McCauley, M. (2013). Lamprey Baseline Survey No2: River Faughan and Tributaries SAC. Loughs Agency, 22, Victoria Road, Derry.

O'Briain, R., Coghlan, B., Shephard, S., & Kelly, F. L. (2019). River modification reduces climate resilience of brown trout (*Salmo trutta*) populations in Ireland. Fisheries Management and Ecology.

O'Briain, R., Shephard, S., & Coghlan, B. (2017). River reaches with impaired riparian tree cover and channel morphology have reduced thermal resilience. Ecohydrology, 10(8)

O'Briain, R., Shephard, S., Matson, R., Gordon, P., & Kelly, F. L. (2020). The efficacy of riparian tree cover as a climate change adaptation tool is affected by hydromorphological alterations. Hydrological Processes, 34(11), 2433-2449.

O'Callaghan, P., Kelly-Quinn, M., Jennings, E., Antunes, P., O'Sullivan, M., Fenton, O., & Huallachain, D. O. (2019). The environmental impact of cattle access to watercourses: A review. Journal of Environmental Quality, 48(2), 340-351.

O'Grady, M.F. (2006). Channels and challenges: enhancing Salmonid rivers. Irish Fresh- water Fisheries Ecology and Management Series: Number 4. Central Fisheries Board, Dublin.

Pike, C., Crook, V. & Gollock, M. (2020). *Anguilla anguilla*. The IUCN Red List of Threatened Species 2020: e.T60344A152845178. https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T60344A152845178.en.

Potter, I. C., & Osborne, T.S. (1975). The systematics of British larval lampreys. Journal of Zoology, 176(3), 311-329.

Rooney, S.M., O'Gorman, N. & King, J.J. (2013). Aspects of brook lamprey (*Lampetra planeri*) spawning in Irish waters. Biology and Environment: Proceedings of the Royal Irish Academy 113B: 1-13

Sullivan, A. (2007). Assessment of Fish Passage and the Ecological Impact of Migration Barriers on the River Nore Catchment. Report prepared for the Nore Suir Rivers Trust.



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8. Appendix B – eDNA lab report

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eDNA Report

Technical Report

SureScreen Scientifics

Triturus

Folio No: 4017-2025
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SureScreen Scientifics

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
FK3482	C5		Brook/River lamprey (Lampetra planeri/ Lampetra fluviatilis)	Pass	Positive	2
			Crayfish plague (Aphanomyces astaci)	Pass	Negative	0
			Freshwater pearl mussel (Margaritifera margaritifera)	Pass	Negative	0
			White-clawed crayfish (Austropotamobius pallipes)	Pass	Positive	1
FK3483	A6		Brook/River lamprey (Lampetra planeri/ Lampetra fluviatilis)	Pass	Positive	2
			Crayfish plague (Aphanomyces	Pass	Negative	0

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		astaci)			
		Freshwater pearl mussel (Margaritifera margaritifera)	Pass	Negative	0
		White-clawed crayfish (Austropotamobius pallipes)	Pass	Negative	0
FK3484	C3	Brook/River lamprey (Lampetra planeri/ Lampetra fluviatilis)	Pass	Positive	2
		Crayfish plague (Aphanomyces astaci)	Pass	Negative	0
		Freshwater pearl mussel (Margaritifera margaritifera)	Pass	Negative	0
		White-clawed crayfish (Austropotamobius pallipes)	Pass	Positive	1
FK3485	B5	Brook/River lamprey (Lampetra planeri/ Lampetra fluviatilis)	Pass	Positive	2
		Crayfish plague (Aphanomyces astaci)	Pass	Negative	0
		Freshwater pearl mussel (Margaritifera margaritifera)	Pass	Negative	0
		White-clawed crayfish (Austropotamobius pallipes)	Pass	Positive	8

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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.

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9. Appendix C – Biological water quality & macro-invertebrate communities

Table 9.1 Macro-invertebrate Q-sampling results for the Killoshulan Wind Farm A, B, C & D sites, August 2025

Group	Family	Species	A1	A3	A4	A5	A6	B2	B3	B4	B5	C2	C3	C4	C5	D1	D2	EPA group
Ephemeroptera	Ephemeridae	*Ephemera danica*													1			**A**
Ephemeroptera	Heptageniidae	*Ecdyonurus dispar*					3	2										**A**
Ephemeroptera	Heptageniidae	*Electrogena lateralis*		4	3													**A**
Ephemeroptera	Heptageniidae	*Heptagenia sulphurea*				1	6											**A**
Ephemeroptera	Heptageniidae	*Rhithrogena semicolorata*						1										**A**
Ephemeroptera	Baetidae	*Alainites muticus*			1		2	2		5		5		4	6	1	1	**B**
Plecoptera	Leuctridae	*Leuctra fusca*		3	4	6	20			1	6			2				**B**
Trichoptera	Limnephilidae	*Potamophylax cingulatus*	2	8	9	2		1		1								**B**
Trichoptera	Cased caddis pupa	sp. indet.									3	1						**B**
Trichoptera	Glossosomatidae	*Agapetus fuscipes*			1			5			2						2	**B**
Trichoptera	Hydroptilidae	*Hydroptila* sp.												3				**B**
Trichoptera	Lepidostomatidae	*Lepidostoma hirtum*									1							**B**
Trichoptera	Leptoceridae	*Athripsodes aterrimus*													1			**B**
Trichoptera	Limnephilidae	*Drusus annulatus*					1										1	**B**
Trichoptera	Limnephilidae	*Halesus radiatus*				1		1									1	**B**
Trichoptera	Limnephilidae	sp. indet.	1															**B**
Trichoptera	Sericostomatidae	*Sericostoma personatum*	3	1	2		1	2			1			2			3	**B**
Odonata	Aeshnidae	sp. indet.											1					**B**
Odonata	Calopterygidae	*Calopteryx splendens*											1					**B**
Ephemeroptera	Baetidae	*Baetis rhodani*				1	17	12		3	7	6		8	40	22		**C**
Ephemeroptera	Ephemerellidae	*Serratella ignita*				1	25	3		8	37	8		7	34	3	2	**C**
Trichoptera	Hydropsychidae	*Hydropsyche instabilis*									27			21	2			**C**
Trichoptera	Hydropsychidae	*Hydropsyche siltalai*									5			3	1			**C**
Trichoptera	Polycentropodidae	*Plectrocnemia conspersa*	4	1	2		1											**C**
Trichoptera	Polycentropodidae	*Polycentropus kingi*				2	4			1				3	1			**C**

Group	Family	Species	A1	A3	A4	A5	A6	B2	B3	B4	B5	C2	C3	C4	C5	D1	D2	EPA group
Trichoptera	Rhyacophilidae	*Rhyacophila dorsalis*			1		5	2			1	1		1	5			C
Arachnida	Hydrachnidiae	sp. indet.									1					1		C
Coleoptera	Dytiscidae	Dytiscidae larva					1											C
Coleoptera	Dytiscidae	*Hydroporus tessellatus*											1					C
Coleoptera	Dytiscidae	*Ilybius fuliginosus*														1		C
Coleoptera	Dytiscidae	*Oreodytes sanmarkii*					1											C
Coleoptera	Dytiscidae	*Stictotarsus duodecimpustulatus*				1												C
Coleoptera	Elmidae	*Elmis aenea*								12	22	4	1	4	2		10	C
Coleoptera	Elmidae	*Limnius volckmari*			1	1	3	1		1	34			2	1		3	C
Coleoptera	Haliplidae	*Brychius elevatus*												1	3		1	C
Coleoptera	Haliplidae	*Haliplus* sp.											1					C
Coleoptera	Hydrophilidae	*Laccobius minutus*											1					C
Coleoptera	Scirtidae	Scirtidae larva	3						1									C
Crustacea	Gammaridae	*Gammarus duebeni*	59	14	27	1	135	38	23	85	210	80	2	25	36	280	60	C
Diptera	Chironomidae	Non-*Chironomus* spp.		1	1	2	21	2	2	1		1		2	1	3	1	C
Diptera	Pediciidae	*Dicranota* sp.						1			2							C
Diptera	Simuliidae	sp. indet.			2		1			2		3		3	5	1		C
Diptera	Stratiomyidae	sp. indet.	2									1						C
Gastropoda	Bithnyiidae	*Bithynia tentaculata*											5		6			C
Gastropoda	Planorbidae	*Gyraulus albus*													1			C
Gastropoda	Planorbidae	*Planorbis planorbis*											42					C
Gastropoda	Valvatidae	*Valvata piscinalis*												1				C
Gastropoda	Tateidae	*Potamopyrgus antipodarum*					3						3	2				C
Hemiptera	Gerridae	*Gerris* sp.												27				C
Hemiptera	Hydrometridae	*Hydrometra stagnorum*											2					C
Hemiptera	Veliidae	*Velia caprai*		5	2	4			2				1			1		C

Group	Family	Species	A1	A3	A4	A5	A6	B2	B3	B4	B5	C2	C3	C4	C5	D1	D2	EPA group
Crustacea	Asellidae	*Asellus aquaticus*				1	27	1				13		1		23	6	**D**
Gastropoda	Lymnaeidae	*Ampullacaena balthica*					4						26	4	1		1	**D**
Gastropoda	Physidae	*Physa fontinalis*											9					**D**
Hirudinidae	Glossiphoniidae	sp. indet.							1					1			1	**D**
Hirudinidae	Erpobdellidae	sp. indet.		1	1													**D**
Mollusca	Sphaeriidae	sp. indet.													1			**D**
Diptera	Chironomidae	*Chironomus* spp.		4		1	3		1					1		1		**E**
Annelidae	Oligochaeta	sp. indet.						2			1	2						**n/a**
Abundance			**74**	**42**	**57**	**25**	**284**	**76**	**30**	**120**	**360**	**125**	**96**	**128**	**148**	**337**	**93**	
Q-rating			**Q3***	**Q4**	**Q4**	**Q3-4**	**Q3-4**	**Q4**	**Q3***	**Q3**	**Q3**	**Q3**	**Q3***	**Q3**	**Q3-4**	**Q3***	**Q3***	
WFD class			Poor	Good	Good	Mod	Mod	Good	Poor	Poor	Poor	Poor	Poor	Poor	Mod	Poor	Poor	

* tentative Q-rating given poor flows and or an absence of suitable riffle areas for sampling (Toner et al., 2005)

Table 9.2 Macro-invertebrate Q-sampling results for the Killoshulan Wind Warm Proposed 110kV Underground Cabling (GCR) sites, August 2025

Group	Family	Species	GCR1	GCR2	GCR3	GCR5	EPA group
Ephemeroptera	Ephemeridae	*Ephemera danica*				3	**A**
Ephemeroptera	Heptageniidae	*Ecdyonurus dispar*					**A**
Ephemeroptera	Heptageniidae	*Electrogena lateralis*					**A**
Ephemeroptera	Heptageniidae	*Heptagenia sulphurea*		1			**A**
Ephemeroptera	Heptageniidae	*Rhithrogena semicolorata*					**A**
Ephemeroptera	Baetidae	*Alainites muticus*	1			1	**B**
Plecoptera	Leuctridae	*Leuctra fusca*	3	1	1	4	**B**
Trichoptera	Limnephilidae	*Potamophylax cingulatus*	3	4			**B**
Trichoptera	Cased caddis pupa	sp. indet.					**B**
Trichoptera	Glossosomatidae	*Agapetus fuscipes*					**B**
Trichoptera	Hydroptilidae	Hydroptila sp.					**B**
Trichoptera	Lepidostomatidae	*Lepidostoma hirtum*					**B**
Trichoptera	Leptoceridae	*Athripsodes aterrimus*					**B**
Trichoptera	Limnephilidae	*Drusus annulatus*			1		**B**
Trichoptera	Limnephilidae	*Halesus radiatus*	2	1	1		**B**
Trichoptera	Limnephilidae	sp. indet.					**B**
Trichoptera	Sericostomatidae	*Sericostoma personatum*			10		**B**
Odonata	Aeshnidae	sp. indet.					**B**
Odonata	Calopterygidae	*Calopteryx splendens*				1	**B**
Ephemeroptera	Baetidae	*Baetis rhodani*			1	3	**C**
Ephemeroptera	Caenidae	*Caenis horaria*			1		**C**
Ephemeroptera	Ephemerellidae	*Serratella ignita*	16		1	25	**C**
Trichoptera	Hydropsychidae	*Hydropsyche instabilis*				4	**C**
Trichoptera	Polycentropodidae	*Polycentropus kingi*	4			2	**C**
Arachnida	Hydrachnidiae	sp. indet.				1	**C**

Group	Family	Species	GCR1	GCR2	GCR3	GCR5	EPA group
Coleoptera	Dytiscidae	*Ilybius fuliginosus*		1			**C**
Coleoptera	Dytiscidae	*Oreodytes sanmarkii*	1				**C**
Coleoptera	Dytiscidae	*Stictotarsus duodecimpustulatus*	6				**C**
Coleoptera	Elmidae	*Elmis aenea*	2			1	**C**
Coleoptera	Elmidae	*Limnius volckmari*				1	**C**
Coleoptera	Haliplidae	*Brychius elevatus*	1		2	8	**C**
Crustacea	Gammaridae	*Gammarus duebeni*	13	1	25	10	**C**
Diptera	Chironomidae	Non-*Chironomus* spp.		1	1	4	**C**
Diptera	Dixidae	sp. indet.	1				**C**
Diptera	Tipuliidae	sp. indet.	1				**C**
Gastropoda	Bithnyiidae	*Bithynia tentaculata*				8	**C**
Gastropoda	Planorbidae	*Planorbis planorbis*				2	**C**
Gastropoda	Tateidae	*Potamopyrgus antipodarum*				20	**C**
Hemiptera	Gerridae	*Gerris* sp.			42	7	**C**
Crustacea	Asellidae	*Asellus aquaticus*	34	21	3	1	**D**
Gastropoda	Lymnaeidae	*Ampullacaena balthica*	6		3		**D**
Hirudinidae	Glossiphoniidae	sp. indet.	2	1		1	**D**
Mollusca	Sphaeriidae	sp. indet.				4	**D**
Diptera	Chironomidae	*Chironomus* spp.	2	4	4	1	**E**
Abundance			**98**	**36**	**96**	**112**	
Q-rating			**Q3**	**Q3-4***	**Q3***	**Q3-4***	
WFD class			Poor	Mod	Poor	Mod	

* tentative Q-rating given poor flows and or an absence of suitable riffle areas for sampling (Toner et al., 2005)

Table 9.3 Macro-invertebrate sweep sampling results for pond sites P3 & P4, August 2025

Group	Family	Species	P3	P4
Hemiptera	Corixidae	*Hesperocorixa linnaei*	32	1
Ephemeroptera	Baetidae	*Cloeon simile*	19	3
Crustacea	Asellidae	*Asellus aquaticus*	15	1
Odonata	Coenagrionidae	sp. indet.	10	1
Hemiptera	Notonectidae	*Notonecta viridis*	7	
Hemiptera	Corixidae	*Corixa punctata*	6	1
Hemiptera	Corixidae	Corixidae nymph	6	
Diptera	Chaoboridae	Chaoboridae pupa	4	
Ephemeroptera	Caenidae	*Caenis horaria*	4	
Odonata	Aeshnidae	sp. indet.	4	
Hemiptera	Corixidae	*Sigara lateralis*	3	
Diptera	Chironomidae	*Chironomus* spp.	2	5
Diptera	Chironomidae	Non-*Chironomus* spp.	2	10
Diptera	Culicidae	sp. indet.	2	1
Trichoptera	Phryganeidae	*Agrypnia obsoleta*	2	
Annelidae	Oligochaeta	sp. indet.	1	
Coleoptera	Dytiscidae	Dytiscidae larva	1	
Coleoptera	Gyrinidae	*Gyrinus* sp.	1	
Hemiptera	Gerridae	*Gerris* sp.	1	
Hemiptera	Corixidae	*Callicorixa praeusta*	1	2
Hemiptera	Nepidae	*Ranatra linearis*	1	
Mollusca	Sphaeriidae	sp. indet.	1	
Trichoptera	Polycentropodidae	*Plectrocnemia conspersa*	1	
Trichoptera	Polycentropodidae	*Polycentropus kingi*	1	
Coleoptera	Dytiscidae	*Hydroporus sp.*		1
Coleoptera	Dytiscidae	*Hygrotus inaequalis*		3
Coleoptera	Dytiscidae	*Hygrotus* sp.		2
Coleoptera	Halipliidae	*Haliplus* sp.		1
Coleoptera	Hydrophilidae	*Laccobius minutus*		1
Coleoptera	Noteridae	*Noterus clavicornis*		2
Diptera	Ceratopogonidae	sp. indet.		1
Gastropoda	Lymnaeidae	*Ampullacaena balthica*		66
Hemiptera	Pleidae	*Plea minutissima*		1
Abundance			**127**	**103**
Taxon richness			24	18



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