APPENDIX 6-3

AQUATIC BASELINE REPORT

Aquatic Baseline Report: Ballydermot, Co. Kildare and Co. Offaly

Prepared by Triturus Environmental Ltd. for MKO

July 2026

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1. Introduction

1.1 Background

Triturus Environmental Ltd. were commissioned by MKO to conduct baseline aquatic surveys to inform EIAR preparation for the proposed Ballydermot Wind Farm development located within the Application Site at Ballydermot, Co. Kildare and Co. Offaly (**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 Application Site. Aquatic surveys were undertaken in July and August 2024 and would update those previously completed by Triturus in the vicinity of the Application Site in July 2021 (Triturus, 2021). Please note that whilst the surveys were conducted to inform the Environmental Impact Assessment Report (EIAR) for the proposed wind farm application, the aquatic baseline conditions observed are applicable/relevant to the site boundary for the Substitute Consent Application. As such, this report has been used to establish the aquatic baseline within Chapter 6 of the Remedial Environmental Impact Assessment Report (rEIAR), used to support the substitute consent application for Peat Extraction and Ancillary Activities at Ballydermot, Co. Kildare and Co. Offaly.

1.2 Development description

A full description of the Application Site is provided in Chapter 4 of the Remedial Environmental Impact Assessment Report (rEIAR) used to support the substitute consent application.

2. Methodology

2.1 Selection of watercourses for assessment

All freshwater watercourses which could be affected directly or indirectly by the proposed Ballydermot wind farm development and associated infrastructure were considered as part of this assessment. This included sites in vicinity of the Application Site boundary, within which the proposed wind farm is located. Thus, a total of *n*=22 sites were selected for detailed aquatic assessment (see **Table 2.1, Figure 2.1** below). The courses and nomenclature for the watercourses surveyed followed Environmental Protection Agency (EPA) mapping.

Survey sites were present on the Codd River (EPA code: 14C44) and two unnamed tributaries, Cloncant Stream (14C41), Abbeylough Stream (14A01), Figile River (14F01), Lullybeg Stream (14L13), Lullymore East River (14L11) and an unnamed tributary (14C32), Clonbulloge River (14C53), Ballygarrett River (14B30), Clonkeen Stream (07C36), River Boyne (07B04), Drumsru Stream (14D19) and the Slate River (14S01) (**Table 2.1**).

None of the survey sites were located within European sites. However, a single site (A4) on the Codd River was contiguous with the boundary of The Long Derries, Edenderry SAC (000925), a site designated for calcareous grassland (NPWS, 2021). There was potential downstream hydrological connectivity (via several watercourses) with the River Barrow and River Nore SAC (002162), Ballynafagh Lake SAC (001387), Ballynafagh Bog SAC (000391), Pollardstown Fen SAC (000396) and Mouds Bog SAC (002231).

Please note this aquatic report should be read in conjunction with the final rEIAR prepared for the development. More specific aquatic methodology is outlined below and in the appendices of this report.

2.2 Aquatic site surveys

Aquatic surveys were conducted on the 31st July and between the 1st to 3rd August 2024. 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, macrophyte and aquatic bryophyte survey and biological water quality sampling (Q-sampling) or macro-invertebrate sweep sampling (where applicable) (**Figure 2.1**). This holistic approach informed the overall aquatic ecological evaluation of each site/watercourse in context of the Application Site 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 *n*=22 aquatic survey sites in the vicinity of the Application Site, Co. Kildare and Co. Offaly

Site no.	Watercourse	EPA code	Location	X (ITM)	Y (ITM)
A1	Unnamed stream	n/a	Derries	665752	729939
A2	Unnamed stream	n/a	Derries	666710	729706
A3	Codd River	14C44	Derries	666119	729187
A4	Codd River	14C44	Codd	664647	728006
A5	Cloncant Stream	14C41	Derries	666402	729057
A6	Cloncant Stream	14C41	Cushaling	663787	727511
A7	Abbeylough Stream	14A01	Kilpatrick	670827	728735
A8	Figile River	14F01	Ticknevin	666719	727796
A9	Unnamed stream	n/a	Lullybeg	667604	725885
A10	Lullybeg Stream	14L13	Lullybeg	667108	724788
A11	Lullymore East River	14L11	Lullybeg	666815	725833
A12	Lullybeg Stream	14L33	Cushaling	665668	725039
A13	Clonbrown River	14C32	Cushaling	665055	725590
A14	Figile River	14F01	Cushaling Bridge	665011	725882
A15	Figile River	14F01	Kilcumber Bridge	661004	726833
A16	Clonbulloge River	14C53	Clonmel	661405	723666
A17	Ballygarrett River	14B30	Clonmel	662374	723087
A18	Figile River	14F01	Millgrove Bridge	659896	719047
B1	Clonkeen Stream	07C36	Cloncanon	665410	731179
B2	River Boyne	07B04	Kishawanny Bridge	664528	733464
C1	Drumsru Stream	14D19	Barnaran	670840	724189
C2	Slate River	14S01	Agar Bridge	670272	721700

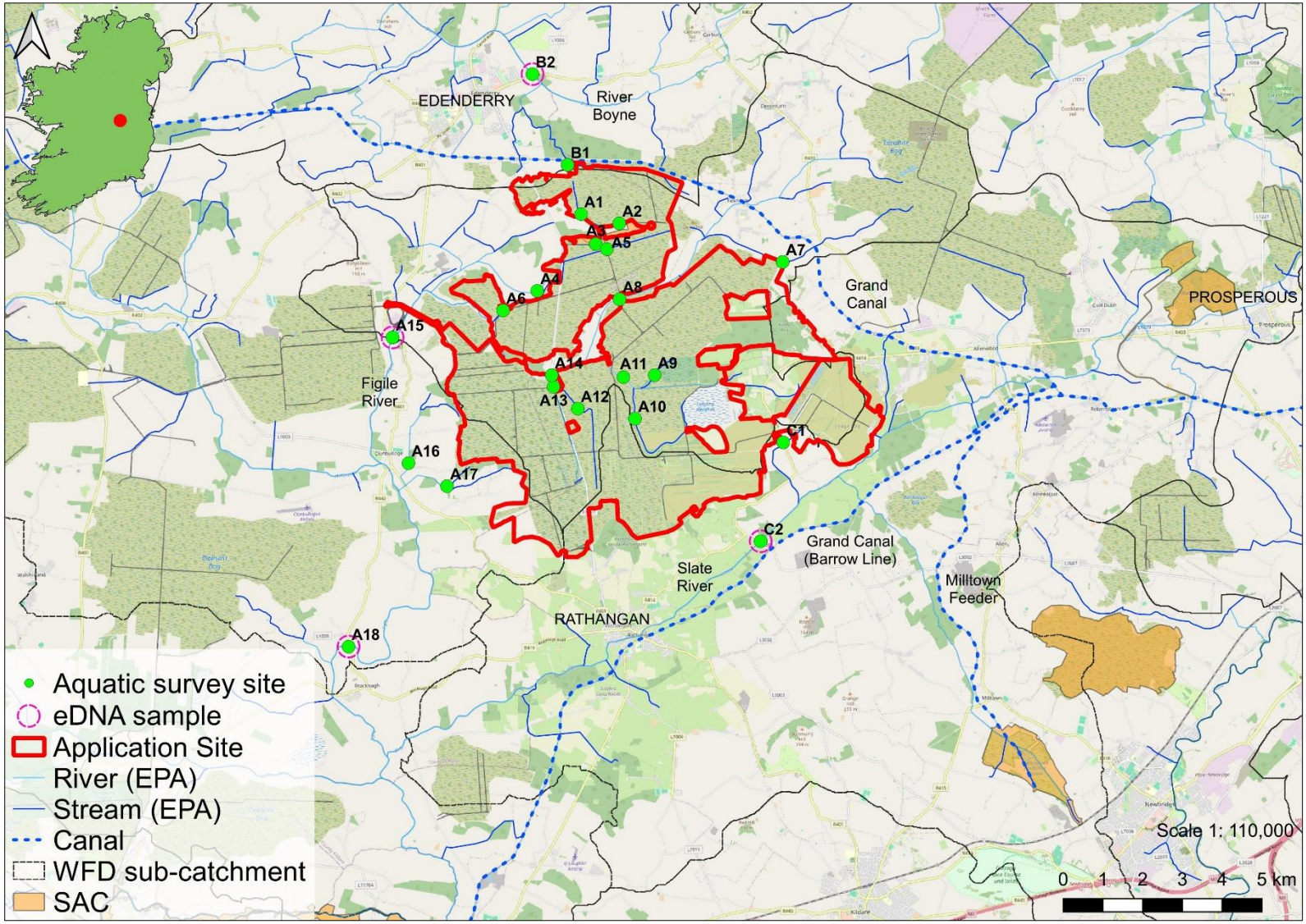

Figure 2.1 Overview of the aquatic survey sites in the vicinity of the Application Site, Co. Kildare and Co. Offaly.

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 development in August 2024 (**Table 2.1, Figure 2.1; Appendix A**), following notification to Inland Fisheries Ireland, under the conditions of a Department of the Environment, Climate and Communications (DECC) licence. The survey was undertaken in accordance with best practice (CFB, 2008; CEN, 2003) and Section 14 licencing requirements.

Furthermore, a fisheries habitat appraisal of all aquatic survey sites (**Table 2.1**) was undertaken to establish their importance for salmonid, lamprey, European eel and other fish species. The baseline assessment also considered the quality of spawning, nursery and holding habitat for salmonids and lamprey 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 July-August 2024 under a National Parks and Wildlife (NPWS) open national licence (no. C20/2024), 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 Application Site 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 analysis

To further validate site surveys and to detect potentially cryptically low populations of protected and or rare aquatic species within the study area, composite water samples were collected from the Figile River (sites A15 & A18), River Boyne (B2) and Slate River (C2) in August 2024 (**Figure 2.1; Table 2.2**). These were analysed for freshwater pearl mussel (*Margaritifera margaritifera*), white-clawed crayfish (*Austropotamobius pallipes*) and crayfish plague (*Aphanomyces astaci*) environmental DNA (eDNA). The sites were 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 29 no. riverine survey sites were assessed for biological water quality through Q-sampling in August 2024 (**Table 2.1**). 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 class	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 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 the Annex I habitats, e.g., 'Water courses of plain to montane levels, with submerged or floating vegetation of the *Ranunculion fluitantis* and *Callitricho-Batrachion* (low water level during summer) or aquatic mosses [3260]' (more commonly referred to as 'floating river vegetation').

2.8 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.).

2.9 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).

2.10 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.

3. Desktop review

3.1 Survey area description

The Application Site is located in an area of peatland near Clonbulloge, Co. Kildare and Co. Offaly (**Figure 2.1**). The Application Site is situated within the Shannon River Basin District and within the Boyne_SC_010, Figile_SC_010, Figile_SC_020 and Slate_SC_010 river sub-catchments in hydrometric areas 7 (Boyne) and 14 (Barrow).

The watercourses in the vicinity of the Application Site are typically small, historically modified lowland depositing channels (FW2; Fossitt, 2000) and drainage ditches (FW4). Land use practices within the vicinity of the Application Site were predominantly peat bogs (CORINE 412), with the wider survey area featuring land principally occupied by agriculture, with significant areas of natural vegetation (243) and pastures (231). Predominantly, the watercourses flowed over areas of Carboniferous limestone & calcareous shale and dark-grey argillaceous, cherty limestone and shale (Geological Survey of Ireland data).

Fisheries

The River Boyne rises in Co. Kildare and flows for over 110km in a north easterly direction through counties Offaly, Meath and Louth before entering the Irish Sea at Drogheda. The Boyne is a designated salmonid watercourse under the European Communities (Quality of Salmonid Waters) Regulations, 1988 (S.I. No. 293/1988) and is a renowned wild brown trout, Atlantic salmon and (in its lower reaches) sea trout fishery (O'Reilly, 2009). As well as salmonids, the river is known to support *Lampetra* sp., European eel (*Anguilla anguilla*), stone loach (*Barbatula barbatula*), minnow (*Phoxinus phoxinus*) and three-spined stickleback (*Gasterosteus aculeatus*) (Kelly et al., 2011a, 2011b). A number of other cyprinid species are also known from the river, including roach (*Rutilus rutilus*) and bream (*Abramis brama*), primarily in the middle to lower reaches (pers. obs.).

The Slate River is one of the larger Barrow sub-catchments and covers an area of approximately 214km^2. As part of the upper Barrow system, the Slate is known to support a range of fish species including brown trout, Atlantic salmon, *Lampetra* sp., minnow, three-spined stickleback, roach, perch (*Perca fluviatilis*), stone loach, European eel and invasive dace (*Leuciscus leuciscus*) (Gordon et al., 2021; Delanty et al., 2017; Triturus 2021 data). Whilst the Slate is a noted recreational trout fishery (O'Reilly, 2009), the Slate sub-catchment has been identified as one of the least productive for salmonids in the wider Barrow catchment, primarily due to historical drainage and water quality pressures (Delanty et al., 2017).

The Figile is the largest of the Barrow sub-catchments and drains an area of approximately 320km^2. After its confluence with the Cushina and Slate Rivers, it becomes the Black River before it enters the River Barrow at Monasterevin. The Figile is known to support brown trout, European eel, lamprey (*Lampetra* sp.), minnow, stone loach, roach, roach x bream hybrids (*Rutilus rutilus* x *Abramis brama*), dace, perch, pike, three-spined stickleback and nine-spined stickleback (*Pungitius pungitius*) (Gordon et al., 2021; Delanty et al., 2017). The Figile River has been identified as one of the least productive for salmonids in the wider Barrow catchment, primarily due to historical drainage and water quality pressures which have impacted the availability of spawning and nursery areas (Delanty et al., 2017).

Brown trout and European eel are known from the Cloncant Stream, with brown trout also present in the Lullybeg Stream (Triturus 2021 data). No fish were recorded from sites on the Ballygarrett River or Drumsru Stream during previous surveys undertaken in vicinity of the Application Site (Triturus, 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 development (i.e. N61, N62, N63, N72, N73 & N82) identified a low number of records for rare and or protected aquatic species within the vicinity of the Application Site.

Numerous records for white-clawed crayfish (*Austropotamobius pallipes*) records were available within the survey area (**Figure 3.1**). On the Figile River, >20 records were available, with a lower number of records also available for the Slate River at Ford Bridge and Agar Bridge. Available records ranged from 1986 to 2020. A low number of historical records were also available for the upper reaches of the River Boyne in the vicinity of Edenderry (1975 and 1985, respectively). No white-clawed crayfish were recorded during the previous 2021 surveys undertaken in vicinity of the Application Site (Triturus, 2021).

Otter (*lutra lutra*) records were widespread throughout the relevant grid squares, with a high number of records available for the Figile River and small tributaries, including those within the Application Site boundary (e.g., Lullybeg Stream, Cloncant Stream). A lower number of records were also available for Slate River, River Boyne and Grand Canal within the vicinity of the Application Site (NPWS, Triturus & NBDC data; **Figure 3.1**). Previous surveys by Triturus undertaken in vicinity of the Application Site in 2021 also recorded otter signs on the River Boyne (current site B2), Codd River, Lullybeg Stream (A14), Figile River (A15), Clonbulloge River and the Slate River (C2).

Several records were available from the Grand Canal east of the 19th lock for the nationally rare macrophyte species opposite leaved-pondweed (*Groenlandia densa*), listed on the Flora (Protection) Order, 2022. These records were from the 1992-1993 period (data not shown). No NPWS records for other macrophytes or aquatic bryophytes protected under the Flora (Protection) Order, 2022 were available for the respective grid squares.

Common frog (*Rana temporaria*) were widespread throughout the 10km grid squares, including within the Application Site boundary. Smooth newt (*Lissotriton vulgaris*) records were available for the Lullymore wetlands, within and adjoining the site boundary, and also Ballynafagh Bog north of the proposed GCR (2011-2019 data; **Figure 3.1**).

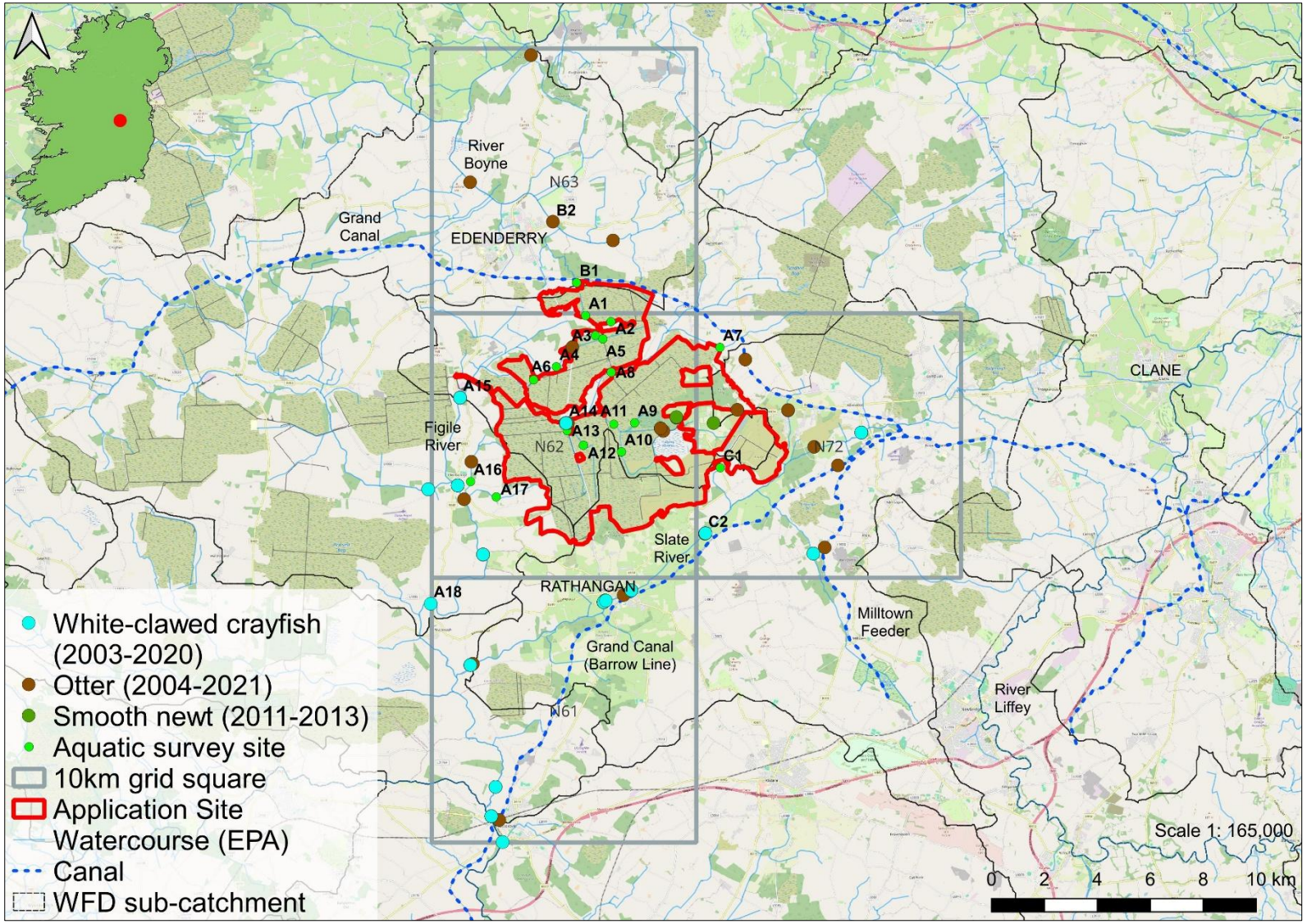

Figure 3.1 Selected protected aquatic species records in the vicinity of the Application Site (source: Triturus, NPWS, NCPSP, EPA & NBDC data)

4. Results of aquatic surveys

The following section summarises each of the *n*=22 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) results are also summarised for each riverine sampling site and in **Appendix C**. A summary of the fish species recorded at each survey site is provided in **Table 4.2**. A summary of the aquatic species and habitats of high conservation concern recorded during the surveys is provided in **Table 4.3**. An evaluation of the aquatic ecological importance of each survey site based on these aquatic surveys is provided and summarised in **Table 4.4**. Habitat codes are according to Fossitt (2000). Scientific names are provided at first mention only. Sites were surveyed in July and August 2024.

4.1 Aquatic survey site results

4.1.1 Site A1 – unnamed stream, Derries

Site A1 was located on an unnamed tributary of the Codd River (no EPA code) adjoining the Application Site boundary. The lowland stream (FW2: Fossitt, 2000) had been historically straightened and deepened resulting in a homogenous deep U-shaped channel with poor hydromorphology and 3m high banks. The channel was 2m wide and 1-1.5m deep with no perceptible flows at the time of survey (i.e. stagnant pool). The bed was dominated by deep peat and silt accumulations with no hard substrata. The site featured dense macrophyte growth with frequent common water starwort (*Callitriche stagnalis*), fool's watercress (*Helosciadium nodiflorum*) and branched bur-reed (*Sparganium erectum*). Common water plantain (*Alisma plantago-aquatica*) and small pondweed (*Potamogeton berchtoldii*) were occasional. The heavily modified channel was bordered by dense scrubbed-over embankments supporting grey willow (*Salix cinerea*), bramble (*Rubus fruticosus* agg.), bracken (*Pteridium aquilinum*), meadowsweet (*Filipendula ulmaria*), hedge bindweed (*Calystegia sepium*), marsh valerian (*Valeriana dioi*ca), marsh woundwort (*Stachys palustris*) and rosebay willowherb (*Chamaenerion angustifolium*). The site was bordered by scrub (WS1) and extensive areas of cutover bog (PB4).

Three-spined stickleback (*Gasterosteus aculeatus*) was the only fish species via electro-fishing at site A1 (**Appendix A**). The heavily silted channel was of low fisheries value and was unsuitable for salmonids or lamprey species given the lack of flow, absence of coarse substrata and significant siltation. The site had some value as a European eel nursery given deep water, abundant macrophyte refugia and prey resources albeit the species was not recorded. The site offered 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 poor flows and 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 4.4).**

Plate 4.1 Representative image of site A1 on an unnamed Codd River tributary, July 2024

4.1.2 Site A2 – unnamed stream, Derries

Site A2 was located on an unnamed tributary of the Codd River (no EPA code) adjoining the Application Site boundary. The lowland stream (FW2) had been historically straightened and deepened resulting in a homogenous deep U-shaped channel with poor hydromorphology and 3-4m high banks. The channel was 2.5-4m wide and 0.5-1.2m deep with low summer flows at the time of survey. The profile comprised slow-flowing glide with localised riffle and pool at culverts. The substrata were dominated by deep compacted peat with some scattered boulders. Macrophyte growth was sparse with occasional stands of bulrush (*Typha latifolia*), reed sweet-grass (*Glyceria maxima*) and small pondweed. Common duckweed (*Lemna minor*) was frequent. No aquatic bryophytes were recorded. The heavily modified channel was bordered by dense, scrubbed-over embankments supporting a mixture of lowland blanket bog and scrub species. These included immature grey willow, downy birch (*Betula pubescens*), deer grass (*Trichophorum germanicum*), cross-leaved heath (*Erica tetralix*), meadowsweet and bramble. The site was bordered by extensive areas of cutover bog (PB4) with coniferous afforestation (WD4) on the south bank.

Three-spined stickleback was the only fish species recorded via electro-fishing at site A2 (**Appendix A**). With the exception of low densities of this species, the heavily silted channel was of low fisheries value and was unsuitable for salmonids or lamprey species given the lack of flow, paucity of coarse substrata and significant siltation. The site had some value as a European eel nursery given deep water, abundant macrophyte refugia and prey resources albeit the species was not recorded. The site offered 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 poor flows and 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 A2 was of **local importance (lower value) (Table 4.4).**

Plate 4.2 Representative image of site A2 on an unnamed Codd River tributary, July 2024

4.1.3 Site A3 – Codd River, Derries

Site A3 was located on the upper reaches of the Codd River (EPA code: 14C44) within the Application Site boundary. The lowland river (FW2) had been extensively straightened and deepened historically, resulting in a deep, homogenous V-shaped channel with poor hydromorphology and peat banks of 6-8m in height. The channel was 1-1.5m wide and 0.1-0.3m deep with no perceptible flows at the time of survey (i.e. stagnant pool). The substrata were dominated by deep compacted peat. Macrophyte growth was sparse with occasional water mint (*Mentha aquatica*), branched bur-reed, watercress (*Nasturtium officinale*), fool's watercress instream. Encroachment of terrestrial herbaceous vegetation was often high with abundant great willowherb (*Epilobium hirsutum*). The scrubbed-over peat embankments supported immature grey willow, downy birch, deer grass, cross-leaved heath, heather (*Calluna vulgaris*), meadowsweet, bramble and ferns (*Dryopteris* sp.). The site was bordered by scrub (WS1) and extensive areas of cutover bog (PB4).

No fish were recorded via electro-fishing at site A3 (**Appendix A**). The channel at this location was not of fisheries value given extensive modifications, poor flows and siltation pressures. 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 poor flows and 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 A3 was of **local importance (lower value) (Table 4.4).** Whilst the site lies contiguous with The Long Derries, Edenderry SAC (000925), a site of **international importance**, this is designated for terrestrial habitats only (NPWS, 2021a).

Plate 4.3 Representative image of site A3 on the upper reaches of the Codd River, July 2024

4.1.4 Site A4 – Codd River, Codd

Site A4 was located on the upper reaches of the Codd River (14C44) at a farm access crossing, approximately 3.4km downstream of site A3. The lowland river (FW2) had been extensively straightened and deepened historically through pasture, resulting in a homogenous U-shaped channel with poor hydromorphology and banks of 1-1.5m in height. The channel was 1.5-2m wide and 0.2-0.5m deep with no perceptible flows at the time of survey (i.e. stagnant pool). The bed was comprised entirely of deep soft sediment (silt). Macrophyte cover as high with frequent watercress, fool's watercress, water mint and common duckweed. Much of the channel was grassed over by creeping bent (*Agrostis stolonifera*) with pockets of open water being more isolated. The heavily modified channel had narrow riparian zones supporting hawthorn (*Crataegus monogyna*), blackthorn (*Prunus spinosa*), bramble, gorse (*Ulex europaeus*), alder (*Alnus glutinosa*) and grey willow. The site was bordered by improved pasture (GA1) with cutover bog (PB4) upstream.

No fish were recorded via electro-fishing at site A4 (**Appendix A**). The channel at this location was not of fisheries value given extensive modifications, poor flows and siltation pressures. 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 poor flows and 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 A4 was of **local importance (lower value) (Table 4.4).**

Plate 4.4 Representative image of site A4 on the upper reaches of the Codd River, July 2024

4.1.5 Site A5 – Cloncant Stream, Derries

Site A5 was located on the uppermost reaches of the Cloncant Stream (14C41) at a bog access track crossing (pipe culvert). The small lowland stream (FW2) had been extensively straightened and deepened historically through peatland, resulting in a deep, homogenous V-shaped channel with poor hydromorphology and peat banks of 6m in height. The channel was 1.5-2m wide and 0.3m deep with no perceptible flows at the time of survey (i.e. stagnant pool). The substrata were dominated by deep compacted peat. Macrophytes were limited to occasional stands of water mint and branched bur-reed with high levels of terrestrial encroachment by herbaceous species such as wild angelica (*Angelica sylvestris*) and marsh valerian (*Valeriana dioica*). The riparian areas featured an open gravelly bank with heavy scrub cover on the opposite bank dominated by bracken. The site was bordered by scrub (WS1) and extensive areas of cutover bog (PB4).

Three-spined stickleback was the only fish species recorded via electro-fishing at site A5 (**Appendix A**). With the exception of low densities of this species, the heavily modified channel was not of fisheries value given the lack of flow, absence of coarse substrata and significant siltation. The site offered 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 poor flows and 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 A5 was of **local importance (lower value) (Table 4.4).**

Plate 4.5 Representative image of site A5 on the Cloncant Stream, August 2024

4.1.6 Site A6 – Cloncant Stream, Cushaling

Site A6 was located on the Cloncant Stream (14C41) at a bog access track crossing approximately 3.5km downstream of site A5. The lowland stream (FW2) had been extensively straightened and deepened historically, resulting in a deep, trapezoidal channel with poor hydromorphology and peat banks of 5-6m in height. The channel was 2-3m wide and 0.1-0.3m deep with a profile of slow-flowing glide and riffle. The substrata were dominated by compacted peat although cobbles and coarse gravels were present locally. Macrophyte cover was moderate with occasional branched bur-reed, unbranched bur-reed (*Sparganium emersum*), water plantain and common water starwort. No aquatic bryophytes were recorded. Cover of filamentous algae was high (c.70%) indicating significant enrichment. The riparian areas featured dense scrub dominated by bracken, gorse, bramble and grey willow with herbaceous species. The site was bordered by cutover bog (PB4) and scrub (WS1) with improved pasture (GA1) upstream.

Three-spined stickleback was the only fish species recorded via electro-fishing at site A6 (**Appendix A**). With the exception of low densities of this species, the heavily silted channel was of low fisheries value and was unsuitable for salmonids or lamprey species given poor flows, poor hydromorphology, paucity of coarse substrata and significant siltation. The site had some low value as a European eel

nursery given abundant refugia and suitable prey resources albeit the species was not recorded. The site was of poor suitability for white-clawed crayfish and none were recorded. No otter signs were recorded in vicinity of the site (as per 2021 surveys).

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 absence of aquatic species or habitats of higher conservation value, the aquatic ecological evaluation of site A6 was of **local importance (lower value) (Table 4.4).**

Plate 4.6 Representative image of site A6 on the Cloncant Stream, August 2024

4.1.7 Site A7 – Abbeylough Stream, Kilpatrick

Site A7 was located on the Abbeylough Stream (14A01) at a local road crossing. The lowland stream (FW2) had been historically straightened and locally deepened resulting in channel with poor hydromorphology. The channel was 2m wide and 0.3-0.6m deep with no perceptible flows at the time of survey (i.e. stagnant pool). The substrata comprised deep silt with only scattered cobble and superficial mixed gravels upstream of the crossing where livestock poaching (erosion) had occurred. Open areas supported patches of fool's watercress and common duckweed with high riparian shading typically precluding macrophyte growth. No aquatic bryophytes were recorded. Cover of filamentous algae was high, indicating significant enrichment. Whist open (cleared) upstream of the crossing, the banks were heavily scrubbed with dense blackthorn, hawthorn, bramble and scattered mature ash (*Fraxinus excelsior*). The site was bordered by heavily improved pasture (GA1) with scrub (WS1) and cutover bog (PB4) to the south.

Three-spined stickleback was the only fish species recorded via electro-fishing at site A7 (**Appendix A**). With the exception of low densities of this species, the heavily modified channel was of poor

fisheries value given the lack of flow, absence of coarse substrata and significant siltation. Despite some low suitability for European eel given deeper water and instream refugia (undercut banks, macrophytes), none were recorded. The site was of low suitability for white-clawed crayfish and none were recorded. No otter signs were recorded in vicinity of the site (as per 2021 surveys).

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 poor flows and 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 A7 was of **local importance (lower value) (Table 4.4).**

Plate 4.7 Representative image of site A7 on the Abbeylough Stream, August 2024

4.1.8 Site A8 – Figile River, Ticknevin

Site A8 was located on the Figile River (14F01) at a bog access track crossing. The lowland river (FW2) had been historically straightened and deepened to drain adjoining peatland. However, some instream recovery had occurred. The channel was 4-5m wide and 0.1-0.6m deep with 3m high banks. The profile was of shallow slow-flowing glide with riffles confined to bridge aprons and culverts. The substrata were dominated by very soft peat with localised cobble, boulder and gravels under the bridges. The faster flowing riffle and glide under the bridges supported unbedded gravels with lighter siltation. The site supported occasional branched bur-reed and fool's watercress instream. Instream boulder supported abundant *Leptodictyum riparium*, an aquatic bryophyte indicator of enrichment. Filamentous algae cover was high (c.80%), indicating significant enrichment. The peatland channel had a mature riparian zone that supported mature grey willow, reed canary grass (*Phalaris arundinacea*),

meadowsweet and great willowherb. The site was bordered by cutover bog (PB4) with patches of scrub (WS1).

Brown trout (*Salmo trutta*) and three-spined stickleback were the only fish species recorded via electro-fishing at site A8 (**Appendix A**). The site was of some low value as a salmonid nursery and spawning habitat, supporting a low density of juvenile trout, although the quality was reduced considerably by siltation and enrichment pressures. Spawning areas were limited to broken riffle and glide underneath bridges where mixed gravels free of algae were present. The site offered moderate quality European eel habitat (i.e. refugia under coarse substrata with ample prey resources) albeit no eel were recorded. Soft sediment areas were typically humic in nature and unsuitable for lamprey ammocoetes. Despite some moderate suitability for white-clawed crayfish, none were recorded. 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**). 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 A8 was of **local importance (higher value) (Table 4.5).**

Plate 4.8 Representative image of site A8 on the Figile River, August 2024

4.1.9 Site A9 – unnamed stream, Lullybeg

Site A9 was located on an unnamed Lullymore East River tributary within the Application Site boundary. The stream had been historically straightened and deepened resulting in a U-shaped channel with poor hydromorphology and 3-4m high banks. The channel was 1.5-2m wide and 0.05-0.1m deep with a profile of very slow-flowing glide and pool (no riffles). The stream suffered from low summer flows at the time of survey. The substrata were dominated by soft, flocculent peat with very

localised cobble and gravels. Given heavy riparian shading, macrophytes were limited to occasional branched bur-reed and water mint in open areas. The mature riparian zones supported mature grey willow, blackthorn and downy birch with a dense scrub understory. The site was bordered by scrub (WS1) and extensive areas of cutover bog (PB4).

No fish were recorded via electro-fishing at site A9 (**Appendix A**). The channel at this location was not of fisheries value given extensive modifications, poor flows, 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 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 poor flows and 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 A9 was of **local importance (lower value) (Table 4.4).**

Plate 4.9 Representative image of site A9 on an unnamed Lullymore East River tributary, August 2024

4.1.10 Site A10 – Lullybeg Stream, Lullybeg

Site A10 was located on the Lullybeg Stream (14L13), a tributary of the Lullymore East River, within the Application Site boundary. The lowland stream (FW2) had been historically straightened and locally deepened resulting in channel with poor hydromorphology and steep banks of 4-6m in height. The homogenous channel was 3m wide and 0.5-1m deep with high peat staining and no perceptible flows at the time of survey (i.e. stagnant pool). The bed was composed entirely of deep silt/peat. Macrophyte cover was high with abundant branched bur-reed in addition to common duckweed and ivy-leaved duckweed (*Lemna trisulca*). No aquatic bryophytes were recorded. The mature riparian

zones supported grey willow and sycamore (*Acer psuedoplatanus*) with a dense scrub understory dominated by bramble, bracken meadowsweet and marsh woundwort. site was bordered by scrub (WS1) and extensive areas of cutover bog (PB4).

Three-spined stickleback was the only fish species recorded via electro-fishing at site A10 (**Appendix A**). With the exception of low densities of this species, the heavily silted channel was of low fisheries value and was unsuitable for salmonids or lamprey species given poor flows, poor hydromorphology, paucity of coarse substrata and significant siltation. The site had some low value as a European eel nursery given abundant refugia and suitable prey resources albeit the species was not recorded. The site was unsuitable 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 poor flows and 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 A10 was of **local importance (lower value) (Table 4.4).**

Plate 4.10 Representative image of site A10 on the Lullybeg Stream, August 2024

4.1.11 Site A11 – Lullymore East River, Lullybeg

Site A11 was located on the Lullymore East River (14L11) at a bog access track crossing (box culvert) within the Application Site boundary. The lowland river (FW2) had been extensively straightened and deepened historically, resulting in a deep, homogenous U-shaped channel with poor hydromorphology and peat banks of 4-6m in height. The channel was 3-4m wide and 1-2m deep with very low summer flows at the time of survey (i.e. near stagnant). The profile composed deep pool and near stagnant glide with only isolated riffle associated with the culvert. The substrata were dominated

by very soft peat with localised cobble and gravels near the culvert. The site supported frequent arrowhead (*Sagittaria sagittifolia*) with occasional branched bur-reed, water plantain and water starwort (*Callitriche* sp.) (mostly upstream of the culvert). Aquatic bryophytes were not recorded. The riparian zones supported mature grey willow, downy birch, sycamore and ash with a dense scrub understory of bramble, bracken and reed canary grass. The site was bordered by scrub (WS1) and extensive areas of cutover bog (PB4).

Brown trout, European eel (*Anguilla anguilla*) and three-spined stickleback were recorded via electro-fishing at site A11 (**Appendix A**). The site was a poor quality salmonid habitat supporting a very low density of adult trout. Suitable spawning habitat was absent with the quality of nursery habitat impacted by poor flows, siltation and hydromorphological pressures. There was some low value as a salmonid holding habitat given the predominance of deep glide and pool. These areas also offered some value for European eel which were also present in low densities. Abundant soft sediment accumulations were unsuitable for lamprey given their humic nature. The site was of poor suitability for white-clawed crayfish and none were recorded. No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3 (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 and European eel, the aquatic ecological evaluation of site A11 was of **local importance (higher value) (Table 4.4).**

Plate 4.11 Representative image of site A11 on the Lullymore East River, August 2024

4.1.12 Site A12 – Lullybeg Stream[1], Cushaling

Site A12 was located on the Lullybeg Stream (14L33), a tributary of the Figile River, at a bog access track crossing. The lowland stream (FW2) had been extensively straightened and deepened historically, resulting in a deep U-shaped channel with poor hydromorphology. The peat-stained channel was 3-5m wide and 1.5-2m deep with a profile of very slow-flowing glide and pool (no riffle). The substrata comprised very soft peat with no hard substrata. The peat channel supported limited macrophyte growth apart from localised branched bur-reed and yellow lily (*Nuphar lutea*). The narrow riparian zones supported mature grey willow, bracken, bramble, bindweed (*Calystegia sepium*) and nettle (*Urtica dioica*). The site was bordered by scrub (WS1) and extensive areas of cutover bog (PB4).

Electro-fishing was not undertaken at site A12 due to prohibitive sediment and water depths (**Appendix A**). The site was of poor fisheries value given extensive modifications, poor flows and siltation pressures. However, there was some low suitability for coarse fish species (e.g. roach, dace, pike) and European eel given connectivity with the Figile River. The site was of low suitability for white-clawed crayfish and none were recorded. 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 poor flows and 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 A12 was of **local importance (lower value) (Table 4.4).**

Plate 4.12 Representative image of site A12 on the Lullybeg Stream, August 2024

[1] A separate watercourse to the homonymous Lullybeg Stream (EPA code: 14L13) located c.1km east

4.1.13 Site A13 – Clonbrown River, Cushaling

Site A13 was located on the Clonbrown River (14C32), a tributary of the Figile River. The lowland river (FW2) had been heavily modified throughout resulting in impoundment and conversion to peat attenuation ponds in its lower reaches with very poor fluvial connectivity to downstream habitats. The section at the survey site featured a historical pumping station and a channel/pond habitat with steep 5-6m high banks. The site was 1.5-3m deep with a bed comprised entirely of deep soft peat and silt. The site supported abundant spiked water milfoil (*Myriophyllum spicatum*) with occasional bulrush and water mint. Reed sweet-grass (*Glyceria maxima*) was also frequent with branched bur-reed being rare. Aquatic bryophytes were not recorded. Filamentous algal mats were abundant, indicating significant enrichment. The riparian areas supported abundant scrub including grey willow, downy birch, bracken and gorse with scattered heather, deer grass and the native shrub alder buckthorn (*Frangula alnus*). The site was bordered by scrub (WS1) and extensive areas of cutover bog (PB4).

Electro-fishing was not undertaken at site A13 due to prohibitive sediment and water depths (**Appendix A**). The ponding area had limited fisheries value apart from as a coarse fish habitat. Species such as roach, pike and perch may occur in the pond in addition to European eel although poor fluvial connectivity via culverts may restrict fish passage. The ponding area had some good suitability for smooth newt given high macrophyte cover but none were recorded during sweep netting. The site was of low suitability for white-clawed crayfish and none were recorded. No otter signs were recorded in vicinity of the site.

Site A13 was unsuitable for Q-sampling given the pond-like conditions. No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via sweep sampling.

Given the absence of aquatic species or habitats of higher conservation value, the aquatic ecological evaluation of site A13 was of **local importance (lower value)** (**Table 4.4**).

Plate 4.13 Representative image of site A13 on the impounded Clonbrown River, August 2024

4.1.14 Site A14 – Figile River, Cushaling Bridge

Site A14 was located on the Figile River[2] (14F01) at Cushaling Bridge. The lowland river (FW2) had been historically straightened and deepened but retained some semi-natural characteristics, with broken riffle-glide sequences among deeper vegetated areas. The U-shaped channel was 8-10m wide and 0.1-0.4m deep, with 3m high banks. The profile was dominated by riffle and glide with more localised deeper pool habitat downstream of the bridge. Upstream the channel was dominated by slow-flowing deep glide. The substrata comprised frequent boulder and cobble with abundant coarse and medium gravels. These had moderate to high siltation with high infiltration of silt and partial bedding. The site was heavily vegetated with abundant curled pondweed (*Potamogeton crispus*) and frequent unbranched bur-reed. Water plantain was present locally. The aquatic moss species *Leptodictyum riparium*, a species indicative of enrichment pressures, was frequent on cobble and boulder. Filamentous algal cover was high (c.60% cover of the bed), indicating significant enrichment. The riparian areas were heavily scrubbed with bramble, reed canary grass, great willowherb and meadowsweet with scattered grey willow. A large mature sitka spruce (*Picea sitchensis*) plantation (WD4) was present downstream of the bridge on the south bank with improved pasture (GA1) to the north.

Brown trout, pike (*Esox lucius*), perch (*Perca fluviatilis*), stone loach (*Barbatula barbatula*), minnow (*Phoxinus phoxinus*) and roach (*Rutilus rutilus*) were recorded via electro-fishing at site A14 (**Appendix A).** The site was a poor-quality salmonid habitat given significant enrichment pressures in addition to siltation that compromised the quality of spawning and nursery habitat. Some holding habitat for adult salmonids was present in deeper glide upstream of the road bridge but these areas primarily supported coarse fish. Areas of silt and peat were heavily compacted and not suitable for lamprey ammocoete burial (none recorded). The site had some suitability as a nursery for European eel given coarse bed substrata and macrophyte cover but none were recorded. Despite some low suitability for white-clawed crayfish, none were recorded. A regular otter spraint site was recorded underneath the bridge (ITM 665011, 725886) (as per 2021 surveys).

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). 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 Red-listed European eel, in addition to utilisation by otter, the aquatic ecological evaluation of site A14 was of **local importance (higher value) (Table 4.4).**

[2] also known as the Black River at this location

Plate 4.14 Representative image of site A14 on the Figile River at Cushaling Bridge, August 2024

4.1.15 Site A15 – Figile River, Kilcumber Bridge

Site A15 was located on the Figile River (14F01) at Kilcumber Bridge (R401) near Edenderry Power Station, approximately 6km downstream of site A14. The lowland river (FW2) had been historically straightened and locally deepened but retained some semi-natural characteristics, with broken riffle-glide sequences adjoining deeper vegetated areas. The U-shaped channel was 10-12m wide and 0.3-1m deep, with 4-8m high banks. The profile was dominated by deep glide with more localised deeper pool and riffle. The substrata were dominated by boulder and cobble with patches of coarse gravels. These were heavily silted. The site was heavily vegetated with abundant yellow lily and curled pondweed. Arrowhead and branched bur-reed were present locally in addition to common water starwort. The aquatic moss Leptodictyum *riparium* was frequent on cobble and boulder. Filamentous algal cover was very high (c.80% cover of the bed), indicating highly significant enrichment. The riparian areas were heavily scrubbed with bramble, reed canary grass, great willowherb and meadowsweet in addition to scattered grey willow. The site was bordered by improved pasture (GA1) with the power station (BL3) present on the west bank upstream of the bridge.

Pike, roach, stone loach and dace (*Leuciscus leuciscus*) were recorded via electro-fishing at site A15 (**Appendix A**). The site was of low value for salmonids given significant siltation, enrichment and hydromorphological pressures, with none recorded during the survey (previously recorded at this site, however; Triturus, 2021). Whilst some good quality holding habitat for adults was present, the enrichment at the site created conditions inimical for salmonids. Suitability was high for coarse fish species, however. Areas of soft sediment suitable as lamprey nurseries were preset locally but these were sub-optimal and did not support ammocoetes. Despite some suitability for European eel and white-clawed crayfish, neither were recorded. Furthermore, environmental DNA sampling at the site did not detect white-clawed crayfish (**Table 4.1**). An otter spraint site was recorded on a boulder under the bridge (ITM 661001, 726836), with otter prints recorded at this site previously in 2021.

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

Given the utilisation by otter, the aquatic ecological evaluation of site A15 was of **local importance (higher value) (Table 4.4).**

Plate 4.15 Representative image of site A15 on the Figile River at Kilcumber Bridge, August 2024

4.1.16 Site A16 – Clonbulloge River, Clonmel

Site A16 was located on the Clonbulloge River (15C53) at a local road crossing. The small lowland stream (FW2) had been extensively straightened and deepened historically, resulting in a trapezoidal channel with poor hydromorphology and banks of 2-2.5m in height. The channel was 1.5m wide and 0.05-0.1m deep and suffered from low summer flows at the time of survey. The profile was of very shallow and slow-flowing glide. The substrata comprised heavily bedded and silted cobble and gravels with areas of sand and shallow, flocculent silt. Given high riparian shading, submerged macrophytes and aquatic bryophytes were absent, with some localised water horsetail (*Equisetum fluviatile*) along channel margins. The banks supported dense scrub vegetation of grey willow, ash and hawthorn with abundant bramble. The site was bordered by improved pasture (GA1) with narrow riparian buffers.

No fish were recorded via electro-fishing at site A16 (**Appendix A**). The channel at this location was not of fisheries value given extensive modifications, shallow depths, poor flows and siltation pressures. 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 poor flows and 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 A16 was of **local importance (lower value) (Table 4.4).**

Plate 4.16 Representative image of site A16 on the Clonbulloge River, August 2024

4.1.17 Site A17 – Ballygarrett River, Clonmel

Site A17 was located on the Ballygarrett River (14B30), a tributary of the Figile River, at the confluence with the Clonmel Stream (14C56). The lowland river (FW2) had been extensively straightened and deepened historically, resulting in a deep U-shaped channel with poor hydromorphology. The river suffered from low summer flows and featured high turbidity (likely from livestock poaching) at the time of survey. The river was 3-4m wide and 0.1-0.2m deep with a profile of very slow-flowing glide and pool. Riffle was highly localised. The substrata were dominated by deep silt with occasional boulder, cobble and mixed gravels. The substrata were heavily bedded and the majority of the channel suffered from gross siltation (beds of silt up to 0.2m deep). Given high riparian shading and turbidity, macrophytes and aquatic bryophytes were absent. Filamentous algal cover was high, indicating significant enrichment. The river was lined by narrow, dense riparian treelines of ash, hawthorn, alder, grey willow and hazel (*Corylus avellana*) along filed boundaries. The site was bordered by improved pasture (GA1).

No fish were recorded via electro-fishing at site A17 (**Appendix A**). With the exception of potential for three-spined stickleback (not recorded), the channel at this location was not of fisheries value given extensive modifications, shallow depths, poor flows and siltation pressures. 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 **Q2 (bad status)** (**Appendix C**). However, it should be noted that this was a tentative rating given poor flows and 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 A17 was of **local importance (lower value) (Table 4.4).**

Plate 4.17 Representative image of site A17 on the Ballygarrett River, August 2024

4.1.18 Site A18 – Figile River, Millgrove Bridge

Site A18 was located on the lower reaches of the Figile River (14F01) at Millgrove Bridge (R442). The lowland river (FW2) had a semi-natural, sinuous profile with broken riffle-glide sequences adjoining deeper pool. The channel was 10-14m wide and 0.2-1m deep with 1-2m high banks. The substrata were dominated by boulder and cobble with patches of coarse gravels. These were moderately bedded and heavily silted. Macrophyte growth was dense, with frequent heterophyllous common clubrush (*Schoenoplectus lacustris*). Spiked-water milfoil, branched-bur-reed and curled pondweed were present locally. Instream boulders supported frequent *Rhynchostegium riparioides* with occasional *Fontinalis antipyretica* and *Leptodictyum riparium*. Filamentous algal cover was very high (c.80% surface cover of the bed), indicating highly significant enrichment. The riparian areas supported scattered mature sycamore, grey willow, ash and lime (*Tilia* sp.) with reed canary grass, great willowherb and meadowsweet in the understories. The site was bordered by improved pasture (GA1) with narrow buffers.

Atlantic salmon (*Salmo salar*), brown trout, pike, dace, gudgeon (*Gobio gobio*), stone loach and minnow were recorded via electro-fishing at site A18 (**Appendix A**). The fish community was one tolerant of eutrophication. However, a low number of Atlantic salmon parr were recorded, with the site providing poor quality nursery and spawning habitat for salmonids. Some good quality holding

habitat for adult salmonids was present, but the enrichment and siltation pressures created conditions inimical for healthy salmonid populations. There was only limited suitability for lamprey given the absence of finer, clean spawning gravels. No lamprey ammocoete burial habitat was recorded downstream of the bridge but ammocetes are present elsewhere on the watercourse (Gordon et al., 2021; Delanty et al., 2017). The site had some suitability as a nursery for European eel (i.e. refugia and good food resources) but none were recorded. Suitability for white-clawed crayfish was low due to very high levels of enrichment and sedimentation with none recorded. 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**). 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 A18 was of **local importance (higher value) (Table 4.4).**

Plate 4.18 Representative image of site A18 on the Figile River at Millgrove Bridge, August 2024

4.1.19 Site B1 – Clonkeen Stream, Cloncanon

Site B1 was located on the Clonkeen Stream (07C36) at the northern extent of the Application Site boundary, just upstream of the Grand Canal aqueduct. The stream had been extensively straightened and deepened historically, resulting in a deep U-shaped channel with very poor hydromorphology and 2m high banks. The channel was 3m wide and 0.2m deep with no perceptible flows at the time of survey (i.e. stagnant ponding of water). The substrata were dominated by peat and silt. Macrophyte growth was sparse with occasional patches of common water starwort, small pondweed and spiked water milfoil. Scattered stands of branched-bur reed were also present. No aquatic bryophytes were recorded. The channel was heavily shaded by mature treelines of grey willow, hawthorn and occasional ash. The site was bordered by scrub (WS1) and improved pasture (GA1).

Three-spined stickleback were the only fish species recorded via electro-fishing at site B1 (**Appendix A).** However, European eel were recorded at this site previously (Triturus, 2021) and the close proximity of the Grand Canal (to the north) likely acts as a source area for a small eel population. With the exception of low densities of these species, the heavily silted channel was of very poor fisheries value and not capable of supporting salmonids or lamprey species given the lack of flow and heavily silted (peat) conditions. The site offered 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 **Q2 (bad status)** (**Appendix C**). However, it should be noted that this was a tentative rating given poor flows and 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 known utilisation by Red-listed European eel, the aquatic ecological evaluation of site B1 was of **local importance (higher value) (Table 4.4).**

Plate 4.19 Representative image of site B1 on the Clonkeen Stream, August 2024

4.1.20 Site B2 – River Boyne, Kishawanny Bridge

Site B2 was located on the upper reaches of the River Boyne (07B04) at Kishawanny Bridge. The lowland river (FW2) had been extensively straightened and deepened historically as art of arterial drainage works, resulting in a U-shaped channel with 2-6m high banks and poor hydromorphology. The river was 6-8m and 0.3-1m deep. The profile was dominated by deeper glide-pool sequences with shallower riffle areas confined to the bridge apron. The substrata comprised large, bedded boulder and cobble with more localised coarse and medium gravels (all heavily silted). Large areas of deeper organic-rich silt were also present in pools and in depositing littorals, including under the bridge. The bed had moderate cover of filamentous algae (20% cover). Macrophyte cover was high with frequent common duckweed, heterophyllous arrowhead, common clubrush and branched-bur-reed. Lesser

water parsnip (*Berula erecta*) was rare. Aquatic bryophytes were limited to occasional *Leptodictyum riparium* on small boulders. The riparian areas supported abundant reed canary grass and nettle with scattered mature sycamore and hawthorn. Th site was bordered by improved pasture (GA1) with narrow buffers.

Brown trout, lamprey (*Lampetra* sp.) and European eel were recorded via electro-fishing at site B2 (**Appendix A**). The site was a poor-quality salmonid nursery and spawning habitat given limited clean coarse substrata and a paucity of broken oxygenated water. There was moderate suitability for European eel, with a single example recorded. Lamprey ammocoetes were present at moderate to high densities in organic-rich marginal silt beds, which were widespread. There was poor suitability for white-clawed crayfish given the aforementioned siltation issues and none were recorded. As per previous 2021 surveys, otter prints and a latrine was recorded in marginal mud underneath the bridge (ITM 664513, 733467) but these did not contain crayfish remains. An invasive mink (*Neovison vison*) was observed during the survey.

Biological water quality, based on Q-sampling, was calculated as **Q2-3 (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, lamprey (*Lampetra* sp.) and Red-listed European eel, in addition to utilisation by otter, the aquatic ecological evaluation of site B2 was of **local importance (higher value) (Table 4.4).**

Plate 4.20 Representative image of site C2 on the River Boyne at Kishawanny Bridge, August 2024

4.1.21 Site C1 – Drumsru Stream, Barnaran

Site C1 was located on the Drumsru Stream (25B06), a Slate River tributary, adjoining the Application Site boundary. The small lowland stream (FW2) had been historically straightened and deepened,

resulting in a homogenous U-shaped channel with poor hydromorphology and banks of up to 4m in height. The stream was 1.5-2m wide and 0.1m deep with no perceptible flows at the time of survey (i.e. stagnant). The bed was composed entirely of deep, soft sediment accumulations. Macrophytes were limited to occasional watercress and common duckweed. No aquatic bryophytes were recorded. The mature riparian zones supported dense scrub including bramble, bracken, hedge bindweed and rosebay willowherb with scattered grey willow, alder and downy birch. The site was bordered by scrub (WS1) and improved pasture (GA1) with extensive areas of cutover bog (PB4) upstream.

No fish were recorded via electro-fishing at site C1 (**Appendix A**), in keeping with previous surveys of the site (Triturus, 2021). The channel at this location was not of fisheries value given extensive modifications, poor flows, 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 site.

Biological water quality, based on Q-sampling, was calculated as **Q2-3 (poor status)** (**Appendix C**). However, it should be noted that this was a tentative rating given poor flows and 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 C1 was of **local importance (lower value) (Table 4.4).**

Plate 4.21 Representative image of site C1 on the Drumsru Stream, August 2024

4.1.22 Site C2 – Slate River, Agar Bridge

Site C2 was located on the Slate River (14S01) at Agar Bridge (L7004 road). The lowland river (FW2) had been extensively straightened and deepened historically both upstream and downstream of the bridge, resulting in a characteristic trapezoidal channel with poor hydromorphology and 4-5m high banks. The river was 8-10m wide and 0.3-1.6m deep with a profile of deep glide and pool. Shallow

riffle was present at the bridge apron. The substrata were dominated by large boulder and cobble with localised coarse and medium gravels. These were heavily silted. Accumulations of deep silt were also present in pools and along depositing littorals. Given a high average depth, macrophytes were typically restricted to marginal areas with heterophyllous clubrush and occasional spiked-water milfoil and fool's watercress. Aquatic bryophytes were limited to occasional *Fontinalis antipyretica* in isolated riffle areas. Filamentous algal cover was very high (c.70%), indicating significant enrichment. The riparian areas supported abundant reed canary grass with a dense hedgerow of hawthorn and scattered elder along the north bank. The site was bordered by heavily improved pasture (GA1).

Atlantic salmon, brown trout, minnow, stone loach and dace were recorded via electro-fishing at site C2 (**Appendix A**). The site was a poor-quality salmonid nursery and spawning habitat due to historical modifications and siltation/eutrophication pressures. However, deep glide and pool provided some suitability as holding areas for adult salmonids. These areas also offered diurnal refugia for European eel which were not recorded in the current survey. The site was of higher value as a coarse fish habitat. Despite an abundance of soft sediment accumulation these were mostly humic in nature and, coupled with poor flows, did not provide optimal conditions for lamprey ammocoetes. Suitability for white-clawed crayfish was low and none were recorded. An otter spraint site was recorded in the vicinity of the bridge (ITM 670258, 721697) (as per 2021 surveys).

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). 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 utilisation by otter, the aquatic ecological evaluation of site C2 was of **local importance (higher value) (Table 4.4).**

Plate 4.22 Representative image of site C2 on the Slate River at Agar Bridge, August 2024

4.2 White-clawed crayfish survey

No white-clawed crayfish were recorded via hand-searching or sweep netting of instream refugia and no crayfish remains were identified in otter spraint sites recorded during the survey. Furthermore, white-clawed crayfish eDNA was not detected in samples collected from the Figile River (sites A15 & A18), River Boyne (B2) or Slate River (C2) (section 4.3 below).

4.3 eDNA analysis

No white-clawed crayfish, crayfish plague or freshwater pearl mussel eDNA was detected in composite water samples collected from the Figile River (sites A15 & A18), River Boyne (B2) or Slate River (C2) (0 positive qPCR replicates out of 12, respectively) (**Table 4.1; Appendix C**). These results were considered as evidence of the species' absence at and or upstream of the sampling locations.

Table 4.1 eDNA results in the vicinity of the Application Site, Co. Kildare and Co. Offaly (positive qPCR replicates out of 12 in parentheses)

Site	Watercourse	Freshwater pearl mussel	White-clawed crayfish	Crayfish plague
A15	Figile River	Negative (0/12)	Negative (0/12)	Negative (0/12)
A18	Figile River	Negative (0/12)	Negative (0/12)	Negative (0/12)
B2	River Boyne	Negative (0/12)	Negative (0/12)	Negative (0/12)
C2	Slate River	Negative (0/12)	Negative (0/12)	Negative (0/12)

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 22 no. riverine sites in July-August 2024 (**Appendix C**).

None of the survey sites achieved greater than **Q3-4 (moderate status)** and thus all 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**).

Site A6 on the Cloncant Stream achieved **Q3-4 (moderate status)** water quality (**Figure 4.1**). Despite the presence of the EPA group A mayfly species *Ecdyonurus* sp., this was 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).

A total of 18 no. sites (i.e. A1, A2, A3, A4, A5, A7, A8, A9, A10, A11, A12, A14, A15, A16, A18, B2, C1, C2) achieved **Q2-3 or Q3 (poor status)** based on an absence of group A species, low numbers of group B species and a dominance of group C and D species, particularly freshwater shrimp (*Gammarus duebeni*) and hoglouse (*Asellus aquaticus*) (**Appendix C**).

Sites A17 on the Ballygarrett River and B1 on the Clonkeen Stream achieved **Q2 (bad status)** given the dominance of highly pollution tolerant group D and E species such as *Asellus aquaticus* and Chironomus spp. (**Appendix C**). However, the ratings for both sites were tentative given poor summer flows and an absence of riffle areas for sampling (as per Toner et al., 2005). The Q-rating for a further 12 no. sites were also tentative for these reasons (**Appendix C**).

Site A13 on the Clonbrown River was unsuitable for Q-sampling (too deep, no flows) and a macro-invertebrate sweep sample was collected instead.

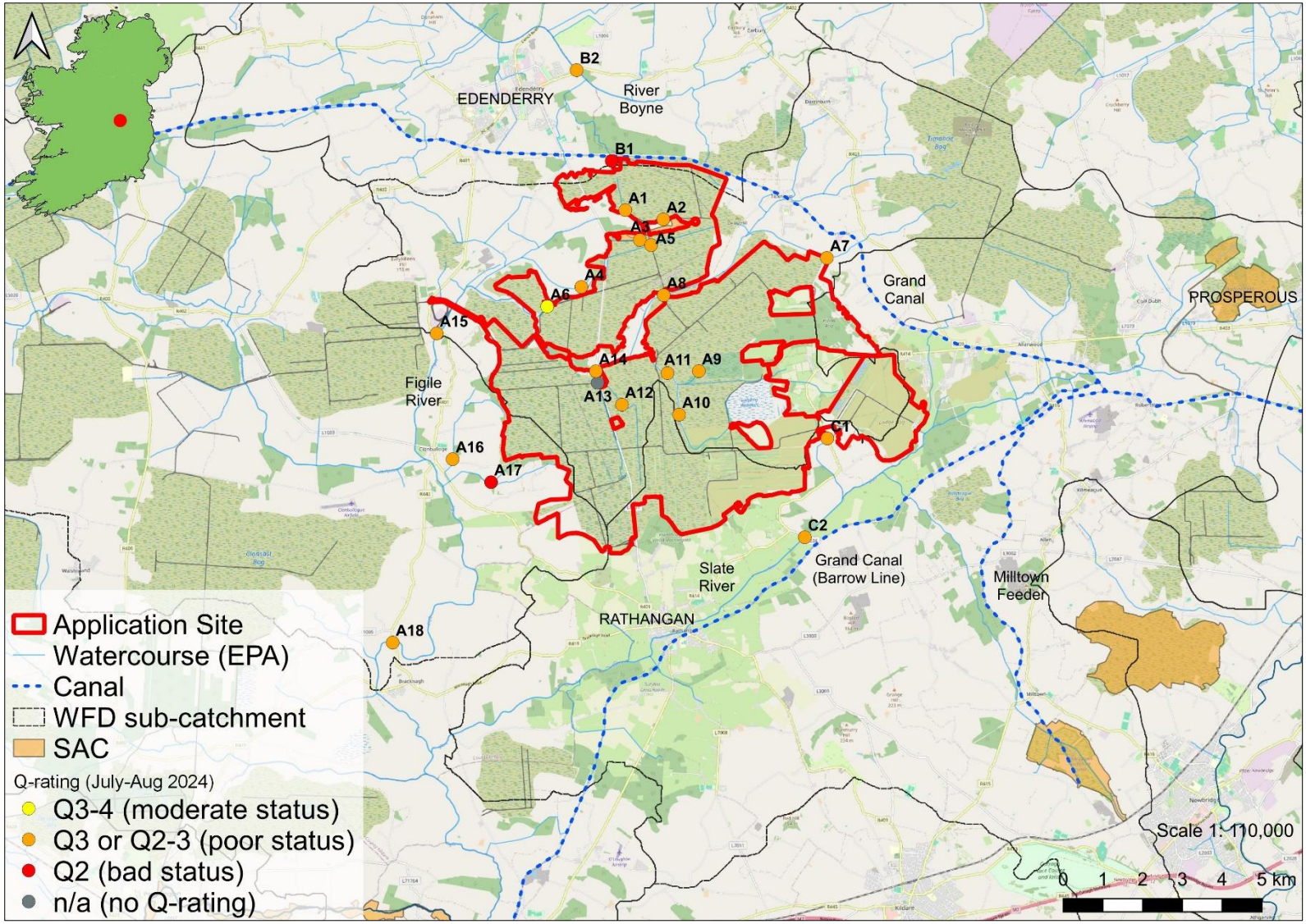

Figure 4.1 Overview of the biological water quality status in the vicinity of the Application Site, July-August 2024

Table 4.2 Relative abundance of fish species of higher conservation value recorded via **electro-fishing** in the vicinity of the Application Site, July-August 2024

Site	Watercourse	Atlantic salmon	Brown trout	*Lampetra* sp.	European eel	Other species
A1	Unnamed stream	Not recorded	Not recorded	Not recorded	Not recorded	Three-spined stickleback
A2	Unnamed stream	Not recorded	Not recorded	Not recorded	Not recorded	Three-spined stickleback
A3	Codd River	Not recorded	Not recorded	Not recorded	Not recorded	No fish recorded
A4	Codd River	Not recorded	Not recorded	Not recorded	Not recorded	No fish recorded
A5	Cloncant Stream	Not recorded	Not recorded	Not recorded	Not recorded	Three-spined stickleback
A6	Cloncant Stream	Not recorded	Not recorded	Not recorded	Not recorded	Three-spined stickleback
A7	Abbeylough Stream	Not recorded	Not recorded	Not recorded	Not recorded	Three-spined stickleback
A8	Figile River	Not recorded	Low	Not recorded	Not recorded	Three-spined stickleback
A9	Unnamed stream	Not recorded	Not recorded	Not recorded	Not recorded	No fish recorded
A10	Lullybeg Stream	Not recorded	Not recorded	Not recorded	Not recorded	Three-spined stickleback
A11	Lullymore East River	Not recorded	Low	Not recorded	Low	Three-spined stickleback
A12	Lullybeg Stream	n/a	n/a	n/a	n/a	Too deep for electro-fishing
A13	Clonbrown River	n/a	n/a	n/a	n/a	Too deep for electro-fishing
A14	Figile River	Not recorded	Low	Not recorded	Not recorded	Minnow, perch, pike, roach, stone loach
A15	Figile River	Not recorded	Not recorded	Not recorded	Not recorded	Dace, pike, roach, stone loach
A16	Clonbulloge River	Not recorded	Not recorded	Not recorded	Not recorded	No fish recorded
A17	Ballygarrett River	Not recorded	Not recorded	Not recorded	Not recorded	No fish recorded
A18	Figile River	Low	Low	Not recorded	Not recorded	Minnow, dace, gudgeon, pike, stone loach
B1	Clonkeen Stream	Not recorded	Not recorded	Not recorded	Not recorded	Three-spined stickleback
B2	River Boyne	Not recorded	Low	High	Low	No fish recorded
C1	Drumsru Stream	Not recorded	Not recorded	Not recorded	Not recorded	No fish recorded
C2	Slate River	Low	Low	Not recorded	Not recorded	Stone loach, dace, minnow

Table 4.3 Summary of aquatic species and habitats of higher conservation value recorded in the vicinity of the Application Site, July-August 2024

Site	Watercourse	White-clawed crayfish	Otter signs[3]	Annex I aquatic habitats	Rare or protected macrophytes/ aquatic bryophytes	Rare or protected macro-invertebrates	Other species/habitats of high conservation value
A1	Unnamed stream	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
A2	Unnamed stream	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
A3	Codd River	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
A4	Codd River	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
A5	Cloncant Stream	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
A6	Cloncant Stream	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
A7	Abbeylough Stream	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
A8	Figile River	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
A9	Unnamed stream	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
A10	Lullybeg Stream	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
A11	Lullymore East River	None recorded	No signs recorded	Not present	None recorded	None recorded	**European eel**
A12	Lullybeg Stream	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
A13	Clonbrown River	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
A14	Figile River	None recorded	**Regular spraint site**	Not present	None recorded	None recorded	**European eel**
A15	Figile River	None recorded	**Spraint site**	Not present	None recorded	None recorded	None recorded
A16	Clonbulloge River	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
A17	Ballygarrett River	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
A18	Figile River	None recorded	No signs recorded	Not present	None recorded	None recorded	**Atlantic salmon**

Site	Watercourse	White-clawed crayfish	Otter signs[3]	Annex I aquatic habitats	Rare or protected macrophytes/ aquatic bryophytes	Rare or protected macro-invertebrates	Other species/habitats of high conservation value
B1	Clonkeen Stream	None recorded	No signs recorded	Not present	None recorded	None recorded	**European eel (known from site; Triturus, 2021)**
B2	River Boyne	None recorded	**Latrine & prints**	Not present	None recorded	None recorded	***Lampetra* sp., European eel**
C1	Drumsru Stream	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
C2	Slate River	None recorded	**Spraint site**	Not present	None recorded	None recorded	**Atlantic salmon**

Conservation value: Eurasian otter (*Lutra lutra*), Atlantic salmon (*Salmo salar*) & lamprey (*Lampetra* spp.) are listed under Annex II and Annex V of the Directive on the Conservation of Natural Habitats of Wild Fauna and Flora (92/43/EEC) ('EU Habitats Directive'). 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).

[3] Otter signs within 150m of the survey site

Table 4.4 Aquatic ecological evaluation summary of the survey sites according to NRA (2009) criteria

Site no.	Watercourse	EPA code	Evaluation of importance	Rationale summary
A1	Unnamed stream	n/a	Local importance (lower value)	No aquatic species or habitats of high conservation value; Q3 (poor status) water quality (tentative rating)
A2	Unnamed stream	n/a	Local importance (lower value)	No aquatic species or habitats of high conservation value; Q3 (poor status) water quality (tentative rating)
A3	Codd River	14C44	Local importance (lower value)	No aquatic species or habitats of high conservation value; Q3 (poor status) water quality (tentative rating)
A4	Codd River	14C44	Local importance (lower value)	No aquatic species or habitats of high conservation value; Q3 (poor status) water quality (tentative rating)
A5	Cloncant Stream	14C41	Local importance (lower value)	No aquatic species or habitats of high conservation value; Q3 (poor status) water quality (tentative rating)
A6	Cloncant Stream	14C41	Local importance (lower value)	No aquatic species or habitats of high conservation value; Q3-4 (moderate status) water quality
A7	Abbeylough Stream	14A01	Local importance (lower value)	No aquatic species or habitats of high conservation value; Q3 (poor status) water quality (tentative rating)
A8	Figile River	14F01	**Local importance (higher value)**	Salmonids recorded
A9	Unnamed stream	n/a	Local importance (lower value)	No aquatic species or habitats of high conservation value; Q3 (poor status) water quality (tentative rating)
A10	Lullybeg Stream	14L13	Local importance (lower value)	No aquatic species or habitats of high conservation value; Q3 (poor status) water quality (tentative rating)
A11	Lullymore East River	14L11	**Local importance (higher value)**	Salmonids and Red-listed European eel recorded
A12	Lullybeg Stream	14L33	Local importance (lower value)	No aquatic species or habitats of high conservation value; Q3 (poor status) water quality (tentative rating)
A13	Clonbrown River	14C32	Local importance (lower value)	No aquatic species or habitats of high conservation value
A14	Figile River	14F01	**Local importance (higher value)**	Salmonids, Red-listed European eel & otter recorded
A15	Figile River	14F01	**Local importance (higher value)**	Otter recorded
A16	Clonbulloge River	14C53	Local importance (lower value)	No aquatic species or habitats of high conservation value; Q3 (poor status) water quality (tentative rating)
A17	Ballygarrett River	14B30	Local importance (lower value)	No aquatic species or habitats of high conservation value; Q2 (bad status) water quality (tentative rating)
A18	Figile River	14F01	**Local importance (higher value)**	Salmonids (including Atlantic salmon) recorded

Site no.	Watercourse	EPA code	Evaluation of importance	Rationale summary
B1	Clonkeen Stream	07C36	**Local importance (higher value)**	Red-listed European eel known from site (Triturus, 2021)
B2	River Boyne	07B04	**Local importance (higher value)**	Salmonids, lamprey (*Lampetra* sp.), Red-listed European eel & otter recorded
C1	Drumsru Stream	14D19	Local importance (lower value)	No aquatic species or habitats of high conservation value; Q2-3 (poor status) water quality (tentative rating)
C2	Slate River	14S01	**Local importance (higher value)**	Salmonids (including Atlantic salmon) & otter recorded

Conservation value: Eurasian otter (*Lutra lutra*), Atlantic salmon (*Salmo salar*) & lamprey (*Lampetra* spp.) are listed under Annex II of the Directive on the Conservation of Natural Habitats of Wild Fauna and Flora (92/43/EEC) ('EU Habitats Directive') and are protected under the Irish Wildlife Acts 1976-2023. 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). Atlantic salmon are also protected under the Wild Salmon and Sea Trout Tagging Scheme (Amendment) Regulations. Apart from the Inland Fisheries Acts 1959 to 2017, non-anadromous brown trout and coarse fish species have no legal protection in Ireland.

5. Discussion

The surveyed watercourses in the vicinity of the Application Site were typically small lowland channels draining areas of peatland that experienced low summer flows. Historical drainage pressures (straightening, deepening) and peat escapement (siltation) had significantly reduced the quality of aquatic habitats and biological water quality on the majority of surveyed watercourses. Sites were often evaluated as **local importance (lower value) (Table 4.4)**. However, in keeping with previous 2021 surveys of the area, several species of high conservation value were recorded including Annex II Atlantic salmon, lamprey (*Lampetra* sp.) and otter as well as Red-listed European eel. This resulted in the aquatic evaluation of 8 no. sites on the Figile River (A8, A14, A15, A18), Lullymore East River (A11), Clonkeen Stream (B1), River Boyne (B2) and Slate River (C2) as **local importance (higher value) (Table 4.4).**

Freshwater pearl mussel and white-clawed crayfish were not recorded during the surveys, in keeping with findings of the previous 2021 surveys in vicinity of the Application Site. No rare or protected macro-invertebrates, macrophytes or aquatic bryophytes, nor examples of Annex I aquatic habitats were recorded. Broadly speaking, the highest value watercourses in the survey area in terms of aquatic ecology were the larger River Boyne, Figile River and Slate River.

5.1 Fisheries

A typical diversity of fish species for the upper Barrow and Boyne catchments was recorded during the electro-fishing survey, with Atlantic salmon, brown trout, lamprey (*Lampetra* sp.), European eel, stone loach, minnow, gudgeon, pike, perch and three-spined stickleback captured, alongside invasive roach and dace[3] (**Table 4.2**). A similar fish assemblage was recorded at comparable sites in the previous 2021 surveys in vicinity of the Application Site (**Appendix A**).

Salmonid populations were restricted in their distribution, with low densities of brown trout being recorded from a total of 6 no. sites on the Figile River (A8, A14, A18), Lullymore East River (A11), River Boyne (B2) and the Slate River (C2) (**Table 4.2**). Annex II Atlantic salmon were only recorded from sites A18 on the Figile River (Millgrove Bridge) and C2 on the Slate River (Agar Bridge). As per previous surveys, lamprey ammocoetes (*Lampetra* sp.) were only recorded from a single site on the River Boyne at Kishawanny Bridge (B2), where low densities were present. The quality of lamprey habitat was generally poor across the survey area given widespread hydromorphological and siltation pressures (**Appendix A**). Red-listed European eel were also restricted in their distribution, being recorded from sites A11 on the Clonkeen Stream (a Figile tributary) and B2 on the River Boyne. Siltation and eutrophication pressures were significant throughout much of the survey area and were evidently contributing to a reduction in the quality of fisheries habitat, particularly for salmonids and lamprey (**Appendix A**).

[3] Although established in Ireland, both roach and dace are invasive cyprinid species listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011-2021 (S.I. 477/2011) and subject to Regulations 49 and 50 throughout the State

5.2 Otter

Otter signs (comprising spraints, latrines and or prints) were recorded from a total of 4 no. sites on the Figile River (site A14, A15), River Boyne (B2) and Slate River (C2). Otters are known to be widespread in the vicinity of the Application Site (**Figure 3.1**), including during the previous surveys (Triturus, 2021), with a preference for larger lowland channels such as the Boyne, Figile and Slate rivers which support superior prey resources (Hong et al., 2020; Sittenthaler et al., 2019; Scorpio et al., 2016; Reid et al., 2013; Remonti et al., 2009). No breeding (holt) or couch (resting) areas were identified in the vicinity of the survey sites in July-August 2024.

5.3 White-clawed crayfish

Despite local habitat suitability and numerous available records within the study area, including on the Figile and Slate rivers (1986-2020; **Figure 3.1**), no white-clawed crayfish were recorded during the current survey. Environmental DNA sampling of the Figile, Boyne and Slate rivers also failed to detect the species in the survey area (**Table 4.1; Appendix B**). No crayfish were recorded during the previous 2021 surveys (Triturus, 2021). The limited distribution would appear to be reflective of not only peat harvesting and historical drainage pressures but also of the spread of crayfish plague. The Boyne catchment suffered crayfish plague outbreaks in the late 1980s (Demers et al., 2005) and in more recent years, crayfish plague has been confirmed on the Slate River in the vicinity of Rathangan (NPWS, 2019). However, white-clawed crayfish were detected via eDNA sampling on the Figile River as recently as 2020 (near Bracknagh) as part of the National Crayfish Plague Surveillance Programme (NCPSP), although most crayfish records within the wider survey area are from 2015 or before (NPWS, EPA & Triturus data).

5.4 Biological water quality & pressures

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 22 no. riverine sites in July-August 2024 (**Appendix C**), i.e. none of greater than Least Concern.

None of the survey sites achieved greater than **Q3-4 (moderate status)** and thus all 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**). Whilst not all of the current survey sites were directly comparable to previous surveys (Triturus, 2021), biological water quality results were broadly similar in the wider survey area (i.e. less than good status). Low summer flows and hydromorphological modifications often resulted in tentative Q-ratings for the survey sites, as per the guidelines of Toner et al. (2005). In general, the biological water quality of the survey area was of **poor status (Q2-3 or Q3)** with significant siltation, eutrophication and hydromorphological impacts evidently contributing to a reduction in aquatic habitat quality. Arterial drainage (hydromorphological) and peat harvesting have been identified as the major pressures impacting water quality in the upper Barrow and Boyne catchments (EPA data) and this was observed during the current and previous surveys.

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7. Appendix A – Fisheries assessment report

Please see accompanying fisheries assessment report

Fisheries Report: Ballydermot, Co. Kildare and Co. Offaly

Prepared by Triturus Environmental Ltd. for MKO

July 2026

Please cite as:

Triturus (2026). Fisheries Report: Ballydermot, Co. Kildare and Co. Offaly. Report prepared by Triturus Environmental Ltd. for MKO. July 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 Ballydermot Wind Farm development located within the Application Site at Ballydermot, located near Clonbulloge, Co. Offaly.

Fisheries surveys were undertaken in July and August 2024 and would update those previously completed by Triturus in the vicinity of the Application Site in July 2021 (Triturus, 2021). Please note that whilst the surveys were conducted to inform the Environmental Impact Assessment Report (EIAR) for the proposed wind farm application, the fisheries baseline conditions observed are applicable/relevant to the site boundary for the Substitute Consent Application. As such, this report has been used to establish the fisheries baseline within Chapter 6 of the Remedial Environmental Impact Assessment Report (rEIAR), used to support the substitute consent application for Peat Extraction and Ancillary Activities at Ballydermot, Co. Kildare and Co. Offaly.

In order to gain an accurate overview of the existing and potential fisheries value of the watercourses within the vicinity of the Application Site, a catchment-wide electro-fishing survey across *n*=22 riverine sites was undertaken (**Table 2.1; Figure 2.1**). 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.

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 Application Site. The surveys were undertaken in July and August 2024.

1.2 Fisheries (desktop review)

The River Boyne rises in Co. Kildare and flows for over 110km in a north easterly direction through counties Offaly, Meath and Louth before entering the Irish Sea at Drogheda. The Boyne is a designated salmonid watercourse under the European Communities (Quality of Salmonid Waters) Regulations, 1988 (S.I. No. 293/1988) and is a renowned wild brown trout, Atlantic salmon and (in its lower reaches) sea trout fishery (O'Reilly, 2009). As well as salmonids, the river is known to support *Lampetra* sp., European eel (*Anguilla anguilla*), stone loach (*Barbatula barbatula*), minnow (*Phoxinus phoxinus*) and three-spined stickleback (*Gasterosteus aculeatus*) (Kelly et al., 2011a, 2011b). A number of other cyprinid species are also known from the river, including roach (*Rutilus rutilus*) and bream (*Abramis brama*), primarily in the middle to lower reaches (pers. obs.).

The Slate River is one of the larger Barrow sub-catchments and covers an area of approximately 214km^2. As part of the upper Barrow system, the Slate is known to support a range of fish species including brown trout, Atlantic salmon, *Lampetra* sp., minnow, three-spined stickleback, roach, perch (*Perca fluviatilis*), stone loach, European eel and invasive dace (*Leuciscus leuciscus*) (Gordon et al., 2021; Delanty et al., 2017; Triturus 2021 data). Whilst the Slate is a noted recreational trout fishery (O'Reilly, 2009), the Slate sub-catchment has been identified as one of the least productive for

salmonids in the wider Barrow catchment, primarily due to historical drainage and water quality pressures (Delanty et al., 2017).

The Figile is the largest of the Barrow sub-catchments and drains an area of approximately 320km^2. After its confluence with the Cushina and Slate Rivers, it becomes the Black River before it enters the River Barrow at Monasterevin. The Figile is known to support brown trout, European eel, lamprey (*Lampetra* sp.), minnow, stone loach, roach, roach x bream hybrids (*Rutilus rutilus* x *Abramis brama*), dace, perch, pike, three-spined stickleback and nine-spined stickleback (*Pungitius pungitius*) (Gordon et al., 2021; Delanty et al., 2017). Invasive dace has been known in the River Barrow catchment since the early 1990s (Caffrey et al., 2007). The Figile River has been identified as one of the least productive for salmonids in the wider Barrow catchment, primarily due to historical drainage and water quality pressures which have impacted the availability of spawning and nursery areas (Delanty et al., 2017).

Brown trout and European eel are known from the Cloncant Stream, with brown trout also present in the Lullybeg Stream (Triturus 2021 data). No fish were recorded from sites on the Ballygarrett River or Drumsru Stream during previous surveys for the development (Triturus, 2021).

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 sites on watercourses in the vicinity of the Application Site on the 31st July and 1st, 2nd and 3rd August 2024 following notification to Inland Fisheries Ireland and under the conditions of a Department of the Environment, Climate and Communications (DECC) licence. The electro-fishing survey was undertaken across 22 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., 2018). 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 moderate conductivity waters of the sites a voltage of 220-275v, 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 all sites was undertaken to establish the importance of the supporting habitats as nursery, spawning and or holding habitats. The appraisal surveys focused on evaluating the spawning, nursery and or holding habitat for salmonids and lamprey species but also considered 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 profiles, 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 *n*=22 electro-fishing & fisheries appraisal survey sites in the vicinity of the Application Site, Co. Kildare and Co. Offaly

Site no.	Watercourse	EPA code	Location	X (ITM)	Y (ITM)
A1	Unnamed stream	n/a	Derries	665752	729939
A2	Unnamed stream	n/a	Derries	666710	729706
A3	Codd River	14C44	Derries	666119	729187
A4	Codd River	14C44	Codd	664647	728006
A5	Cloncant Stream	14C41	Derries	666402	729057
A6	Cloncant Stream	14C41	Cushaling	663787	727511
A7	Abbeylough Stream	14A01	Kilpatrick	670827	728735
A8	Figile River	14F01	Ticknevin	666719	727796
A9	Unnamed stream	n/a	Lullybeg	667604	725885
A10	Lullybeg Stream	14L13	Lullybeg	667108	724788
A11	Lullymore East River	14L11	Lullybeg	666815	725833
A12	Lullybeg Stream	14L33	Cushaling	665668	725039
A13	Clonbrown River	14C32	Cushaling	665055	725590
A14	Figile River	14F01	Cushaling Bridge	665011	725882
A15	Figile River	14F01	Kilcumber Bridge	661004	726833
A16	Clonbulloge River	14C53	Clonmel	661405	723666
A17	Ballygarrett River	14B30	Clonmel	662374	723087
A18	Figile River	14F01	Millgrove Bridge	659896	719047
B1	Clonkeen Stream	07C36	Cloncanon	665410	731179
B2	River Boyne	07B04	Kishawanny Bridge	664528	733464
C1	Drumsru Stream	14D19	Barnaran	670840	724189
C2	Slate River	14S01	Agar Bridge	670272	721700

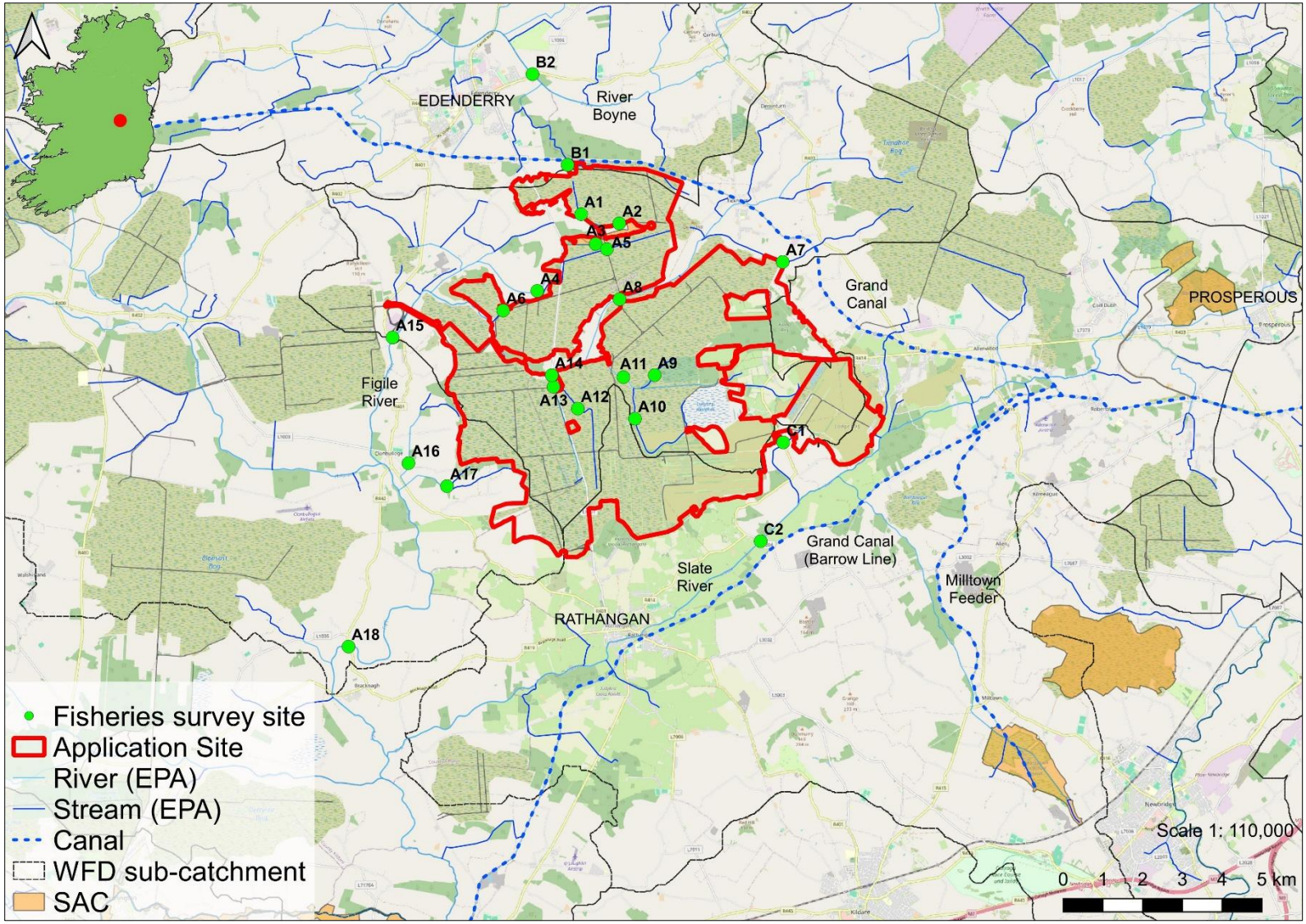

Figure 2.1 Overview of the *n*=22 electro-fishing & fisheries appraisal survey site locations for the Application Site, Co. Kildare and Co. Offaly (2024)

3. Results

A catchment-wide fisheries survey of 22 no. riverine sites in the vicinity of the Application Site was conducted on the 31st July and 1st, 2nd and 3rd August 2024 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 – unnamed stream, Derries

Three-spined stickleback (*Gasterosteus aculeatus*) (*n*=4) was the only fish species via electro-fishing at site A1 on an unnamed tributary of the Codd River (**Figure 3.1**).

The heavily silted channel was of low fisheries value and was unsuitable for salmonids or lamprey species given the lack of flow, absence of coarse substrata and significant siltation. The site had some value as a European eel nursery given deep water, abundant macrophyte refugia and prey resources albeit the species was not recorded.

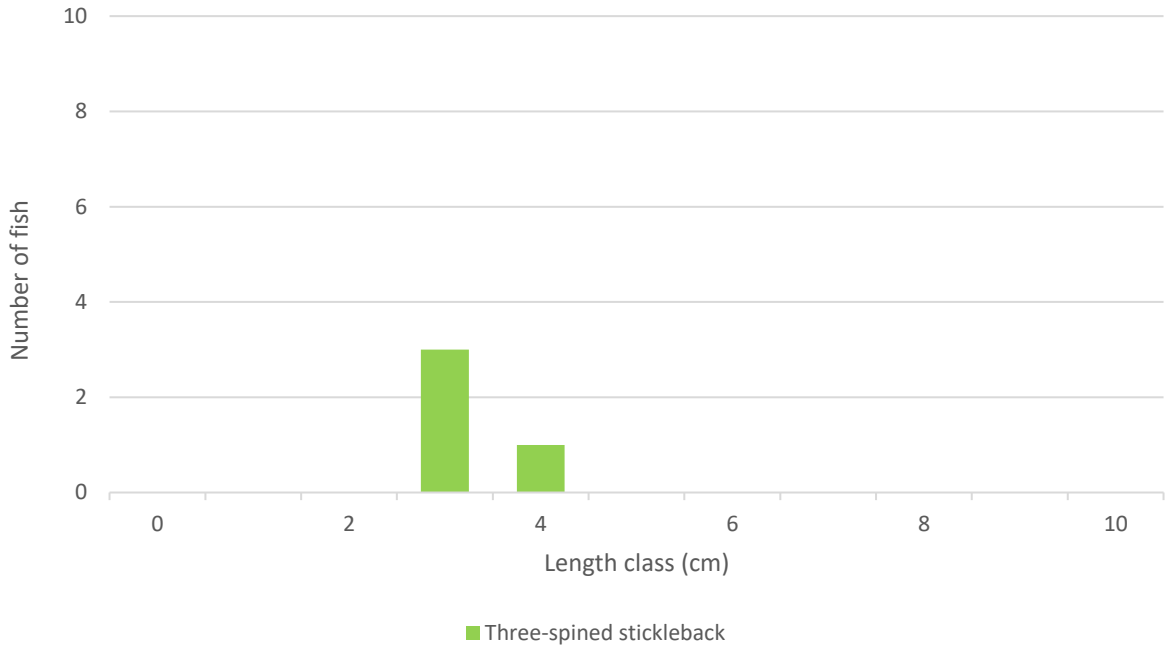

Figure 3.1 Length frequency distribution recorded via electro-fishing at site A1, July 2024

Plate 3.1 Male three-spined stickleback recorded at site A1 on an unnamed Codd River tributary, July 2024

3.1.2 Site A2 – unnamed stream, Derries

Three-spined stickleback (*n*=6) was the only fish species recorded via electro-fishing at site A2 on an unnamed tributary of the Codd River (**Figure 3.2**).

With the exception of low densities of this species, the heavily silted channel was of low fisheries value and was unsuitable for salmonids or lamprey species given the lack of flow, paucity of coarse substrata and significant siltation. The site had some value as a European eel nursery given deep water, abundant macrophyte refugia and prey resources albeit the species was not recorded.

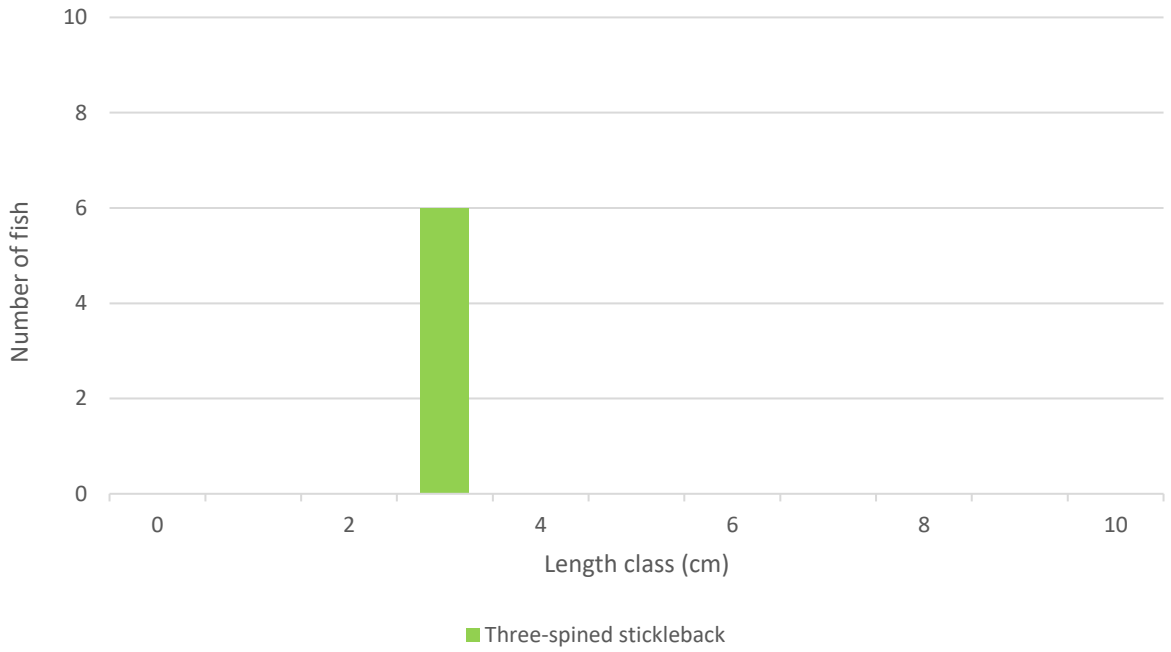

Figure 3.2 Length frequency distribution recorded via electro-fishing at site A2, July 2024

Plate 3.2 Representative image of site A2 on an unnamed Codd River tributary, July 2024

3.1.3 Site A3 – Codd River, Derries

No fish were recorded via electro-fishing at site A3 on the upper reaches of the Codd River (EPA code: 14C44). The channel at this location was not of fisheries value given extensive modifications, poor flows and siltation pressures.

Plate 3.3 Representative image of site A3 on the upper reaches of the Codd River, July 2024

3.1.4 Site A4 – Codd River, Codd

No fish were recorded via electro-fishing at site A4 on the upper reaches of the Codd River (14C44). The channel at this location was not of fisheries value given extensive modifications, poor flows and siltation pressures.

Plate 3.4 Representative image of site A4 on the upper reaches of the Codd River, July 2024

3.1.5 Site A5 – Cloncant Stream, Derries

Three-spined stickleback (*n*=10) was the only fish species recorded via electro-fishing at site A5 on the uppermost reaches of the Cloncant Stream (14C41) (**Figure 3.3**).

With the exception of low densities of this species, the heavily modified channel was not of fisheries value given the lack of flow, absence of coarse substrata and significant siltation.

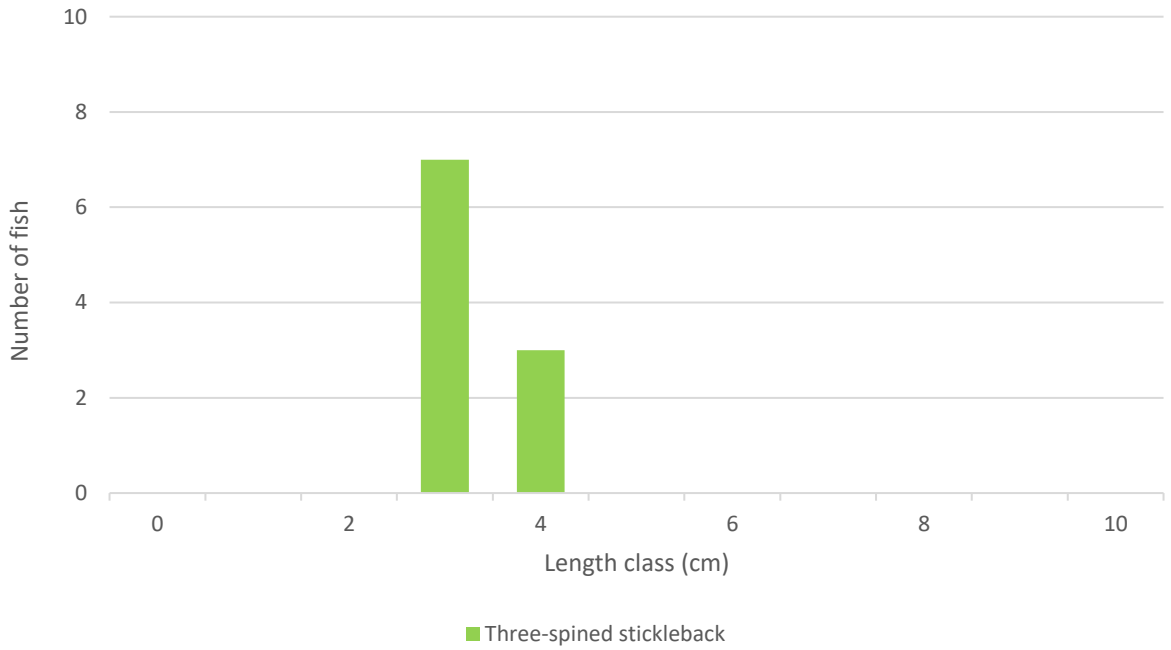

Figure 3.3 Length frequency distribution recorded via electro-fishing at site A5, July 2024

Plate 3.5 Representative image of site A5 on the Cloncant Stream, August 2024

3.1.6 Site A6 – Cloncant Stream, Cushaling

Three-spined stickleback (*n*=12) was the only fish species recorded via electro-fishing at site A6 on the Cloncant Stream (14C41) (**Figure 3.4**).

With the exception of low densities of this species, the heavily silted channel was of low fisheries value and was unsuitable for salmonids or lamprey species given poor flows, poor hydromorphology, paucity of coarse substrata and significant siltation. The site had some low value as a European eel nursery given abundant refugia and suitable prey resources albeit the species was not recorded.

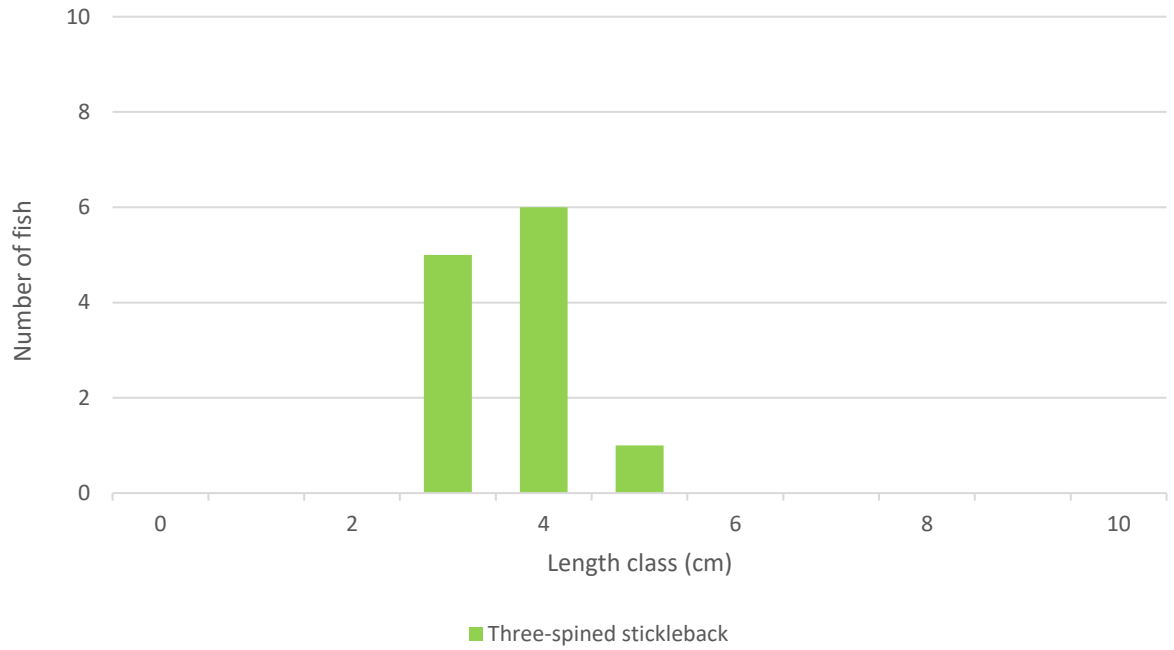

Figure 3.4 Length frequency distribution recorded via electro-fishing at site A6, July 2024

Plate 3.6 Representative image of site A6 on the Cloncant Stream, August 2024

3.1.7 Site A7 – Abbeylough Stream, Kilpatrick

Three-spined stickleback (*n*=8) was the only fish species recorded via electro-fishing at site A7 on the Abbeylough Stream (14A01) at a local road crossing (**Figure 3.5**).

With the exception of low densities of this species, the heavily modified channel was of poor fisheries value given the lack of flow, absence of coarse substrata and significant siltation. Despite some low suitability for European eel given deeper water and instream refugia (undercut banks, macrophytes), none were recorded.

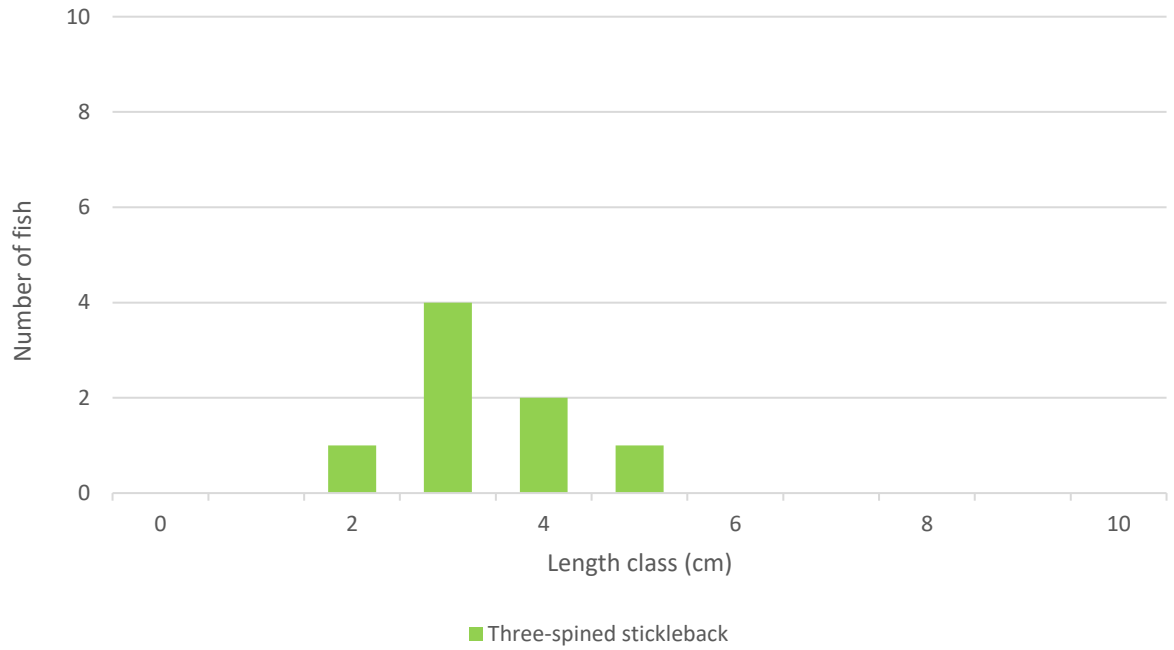

Figure 3.5 Length frequency distribution recorded via electro-fishing at site A7, July 2024

Plate 3.7 Representative image of site A7 on the Abbeylough Stream, August 2024

3.1.8 Site A8 – Figile River, Ticknevin

Brown trout (*Salmo trutta*) (*n*=3) and three-spined stickleback (*n*=3) were the only fish species recorded via electro-fishing at site A8 on the Figile River (14F01) at a bog access track crossing (**Figure 3.6**).

The site was of some low value as a salmonid nursery and spawning habitat, supporting a low density of juvenile trout, although the quality was reduced considerably by siltation and enrichment pressures. Spawning areas were limited to broken riffle and glide underneath bridges where mixed gravels free of algae were present. The site offered moderate quality European eel habitat (i.e. refugia under coarse substrata with ample prey resources) albeit no eel were recorded. Soft sediment areas were typically humic in nature and unsuitable for lamprey ammocoetes.

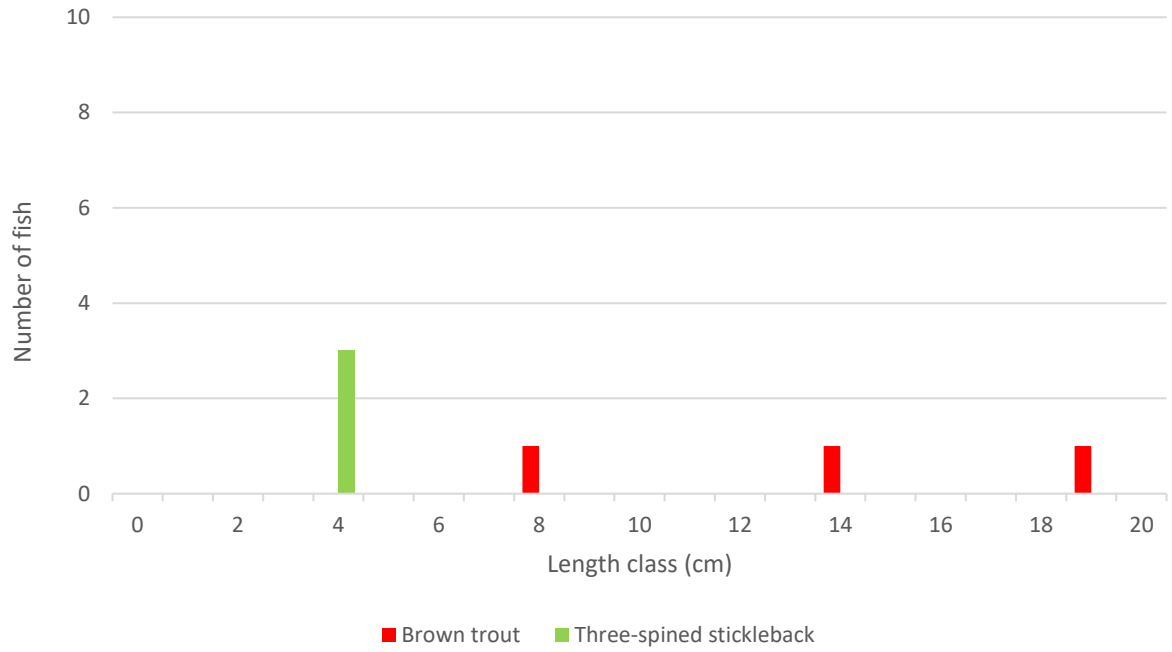

Figure 3.6 Length frequency distribution recorded via electro-fishing at site A8, July 2024

Plate 3.8 Juvenile brown trout recorded at site A8 on the Figile River, August 2024

3.1.9 Site A9 – unnamed stream, Lullybeg

No fish were recorded via electro-fishing at site A9 on an unnamed Lullymore East River tributary. The channel at this location was not of fisheries value given extensive modifications, poor flows, siltation pressures and poor connectivity with downstream habitats.

Plate 3.9 Representative image of site A9 on an unnamed Lullymore East River tributary, August 2024

3.1.10 Site A10 – Lullybeg Stream, Lullybeg

Three-spined stickleback (*n*=9) was the only fish species recorded via electro-fishing at site A10 (**Figure 3.7**).

With the exception of low densities of this species, the heavily silted channel was of low fisheries value and was unsuitable for salmonids or lamprey species given poor flows, poor hydromorphology, paucity of coarse substrata and significant siltation. The site had some low value as a European eel nursery given abundant refugia and suitable prey resources albeit the species was not recorded.

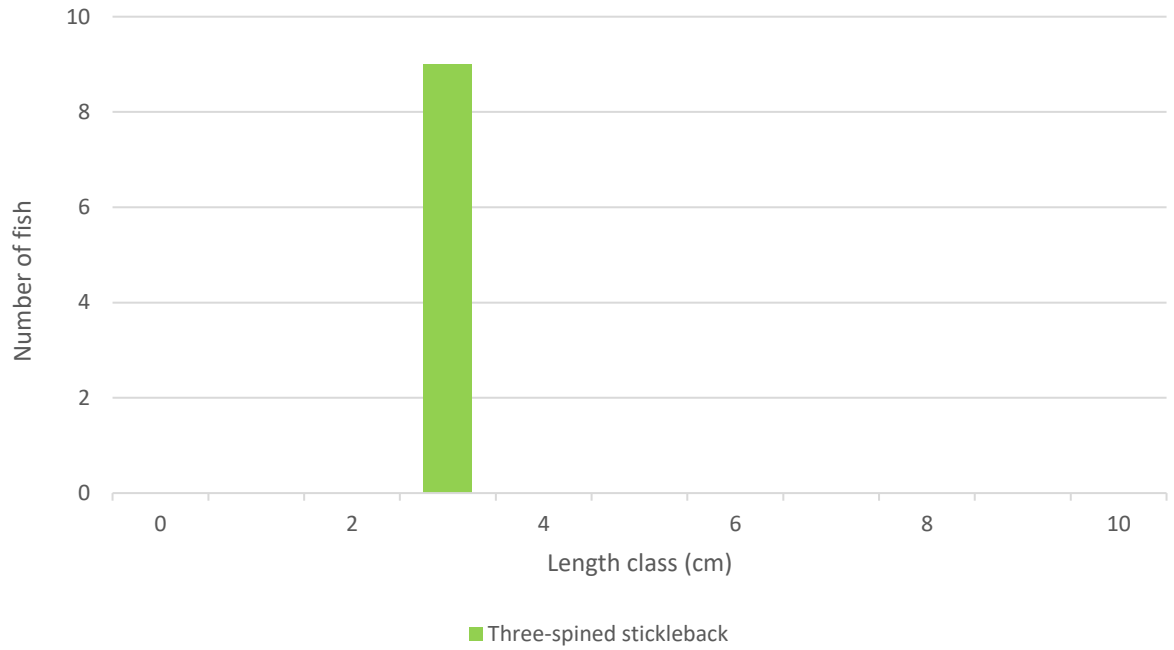

Figure 3.7 Length frequency distribution recorded via electro-fishing at site A10, July 2024

Plate 3.10 Representative image of site A10 on the Lullybeg Stream, August 2024

3.1.11 Site A11 – Lullymore East River, Lullybeg

Brown trout (*n*=1), European eel (*Anguilla anguilla*) (*n*=1) and three-spined stickleback (*n*=4) were recorded via electro-fishing at site A11 on the Lullymore East River (14L11) at a bog access track crossing (**Figure 3.8**).

The site was a poor quality salmonid habitat supporting a very low density of adult trout. Suitable spawning habitat was absent with the quality of nursery habitat impacted by poor flows, siltation and hydromorphological pressures. There was some low value as a salmonid holding habitat given the predominance of deep glide and pool. These areas also offered some value for European eel which were also present in low densities. Abundant soft sediment accumulations were unsuitable for lamprey.

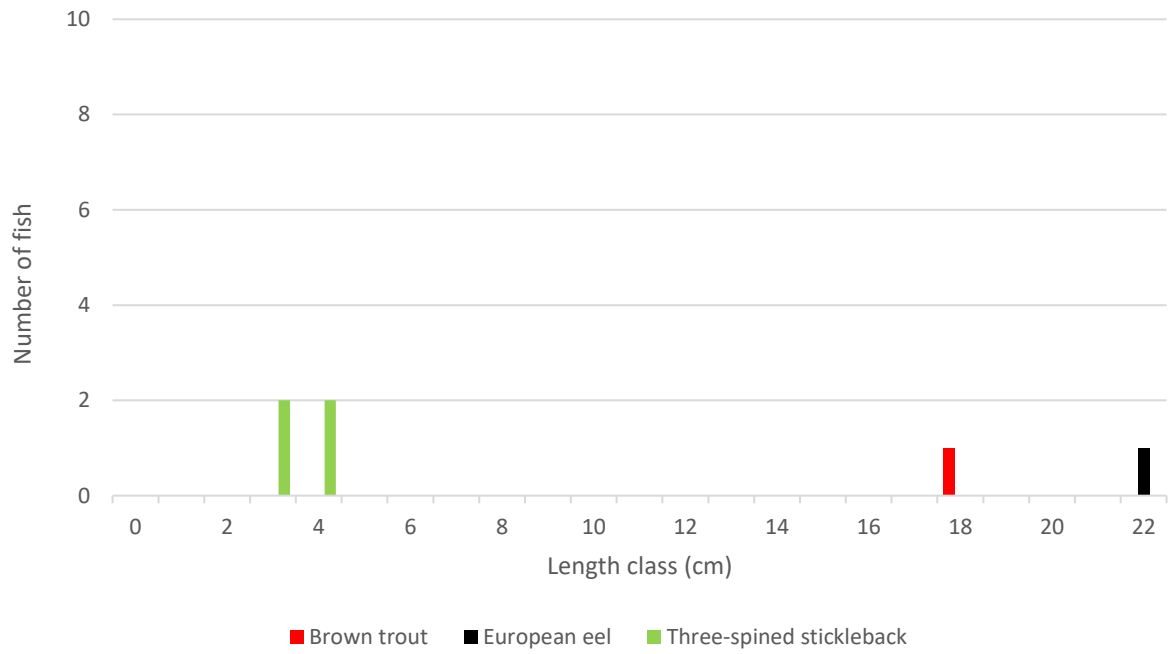

Figure 3.8 Length frequency distribution recorded via electro-fishing at site A11, July 2024

Plate 3.11 Juvenile European eel recorded at site A11 on the Lullymore East River, August 2024

3.1.12 Site A12 – Lullybeg Stream[1], Cushaling

Electro-fishing was not undertaken at site A12 due to prohibitive sediment and water depths on the Lullybeg Stream (14L33), a tributary of the Figile River. The site was of poor fisheries value given extensive modifications, poor flows and siltation pressures. However, there was some low suitability for coarse fish species (e.g. roach, dace, pike) and European eel given connectivity with the Figile River.

[1] A separate watercourse to the homonymous Lullybeg Stream (EPA code: 14L13) located c.1km east

Plate 3.12 Representative image of site A12 on the Lullybeg Stream, August 2024

3.1.13 Site A13 – Clonbrown River, Cushaling

Electro-fishing was not undertaken at site A13 due to prohibitive sediment and water depths on the Clonbrown River (14C32), a heavily modified tributary of the Figile River flowing through peat attenuation ponds. The ponding area had limited fisheries value apart from as a coarse fish habitat. Species such as roach, pike and perch may occur in the pond in addition to European eel although poor fluvial connectivity via culverts may restrict fish passage.

Plate 3.13 Representative image of site A13 on the impounded Clonbrown River, August 2024

3.1.14 Site A14 – Figile River, Cushaling Bridge

Brown trout (*n*=6), pike (*Esox lucius*) (*n*=5), perch (*Perca fluviatilis*) (*n*=1), stone loach (*Barbatula barbatula*) (*n*=9), minnow (*Phoxinus phoxinus*) (*n*=4) and roach (*Rutilus rutilus*) (*n*=1) were recorded via electro-fishing at site A14 on the Figile River[2] (14F01) at Cushaling Bridge (**Figure 3.9**).

The site was a poor quality salmonid habitat given significant enrichment pressures in addition to siltation that compromised the quality of spawning and nursery habitat. Some holding habitat for adult salmonids was present in deeper glide upstream of the road bridge but these areas primarily supported coarse fish. Areas of silt and peat were heavily compacted and not suitable for lamprey ammocoete burial (none recorded). The site had some suitability as a nursery for European eel given coarse bed substrata and macrophyte cover but none were recorded.

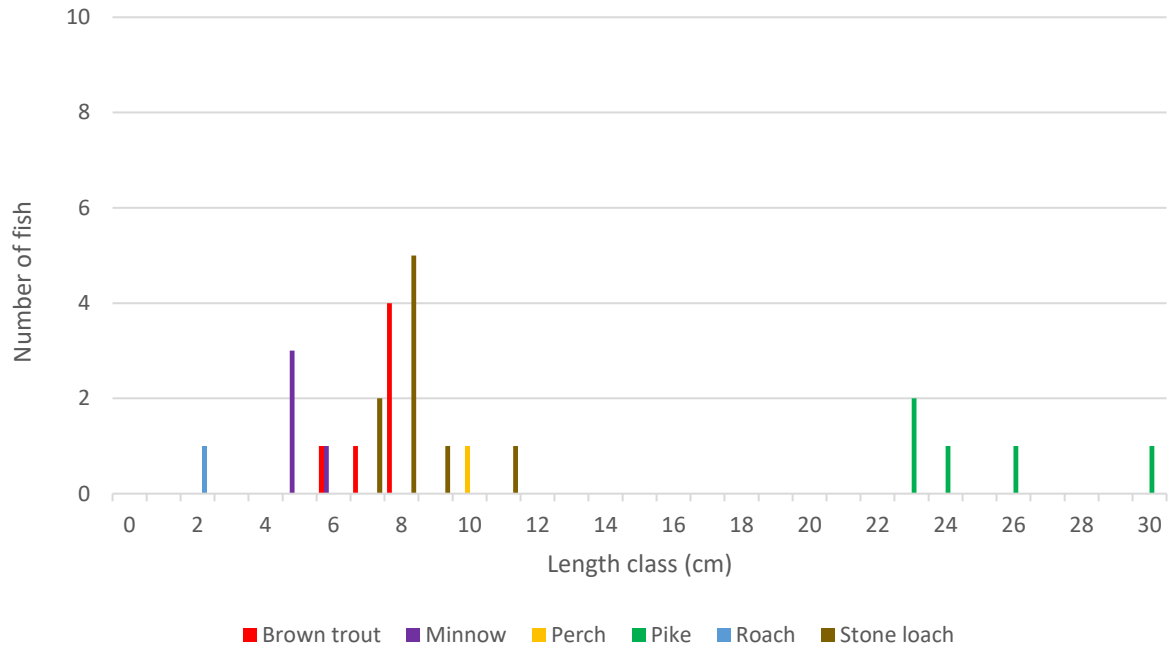

Figure 3.9 Length frequency distribution recorded via electro-fishing at site A14, July 2024

[2] also known as the Black River at this location

Plate 3.14 Juvenile pike recorded at site A14 on the Figile River at Cushaling Bridge, August 2024

3.1.15 Site A15 – Figile River, Kilcumber Bridge

Pike (*n*=3), roach (*n*=5), stone loach (*n*=7) and dace (*Leuciscus leuciscus*) (*n*=6) were recorded via electro-fishing at site A15 on the Figile River (14F01) at Kilcumber Bridge (R401) (**Figure 3.10**).

The site was of low value for salmonids given significant siltation, enrichment and hydromorphological pressures, with none recorded during the survey (previously recorded at this site, however; Triturus, 2021). Whilst some good quality holding habitat for adults was present, the enrichment at the site created conditions inimical for salmonids. Suitability was high for coarse fish species, however. Areas of soft sediment suitable as lamprey nurseries were preset locally but these were sub-optimal and did not support ammocoetes. Despite some suitability for European eel, none were recorded.

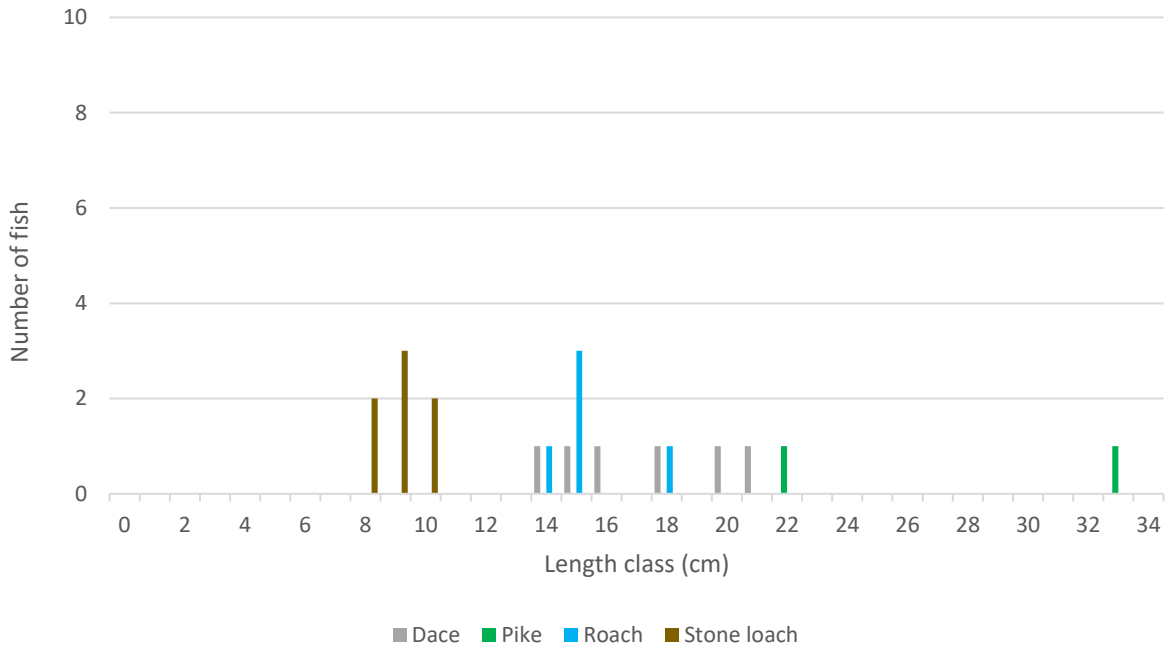

Figure 3.10 Length frequency distribution recorded via electro-fishing at site A15, July 2024

Plate 3.15 Dace and pike recorded at site A15 on the Figile River at Kilcumber Bridge, August 2024

3.1.16 Site A16 – Clonbulloge River, Clonmel

No fish were recorded via electro-fishing at site A16 on the Clonbulloge River (15C53) at a local road crossing. The channel at this location was not of fisheries value given extensive modifications, shallow depths, poor flows and siltation pressures.

Plate 3.16 Representative image of site A16 on the Clonbulloge River, August 2024

3.1.17 Site A17 – Ballygarrett River, Clonmel

No fish were recorded via electro-fishing at site A17 on the Ballygarrett River (14B30), a tributary of the Figile River, at the confluence with the Clonmel Stream (14C56). With the exception of potential for three-spined stickleback (not recorded), the channel at this location was not of fisheries value given extensive modifications, shallow depths, poor flows and siltation pressures.

Plate 3.17 Representative image of site A17 on the Ballygarrett River, August 2024

3.1.18 Site A18 – Figile River, Millgrove Bridge

Atlantic salmon (*Salmo salar*) (*n*=7), brown trout (*n*=1), pike (*n*=7), dace (*n*=7), gudgeon (*Gobio gobio*) (*n*=7), stone loach (*n*=7) and minnow (*n*=7) were recorded via electro-fishing at site A18 on the lower reaches of the Figile River (14F01) at Millgrove Bridge (R442) (**Figure 3.11**).

The fish community was one tolerant of eutrophication. However, a low number of adult trout and Atlantic salmon parr were recorded, with the site providing poor quality nursery and spawning habitat for salmonids. Some good quality holding habitat for adult salmonids was present, but the enrichment and siltation pressures created conditions inimical for healthy salmonid populations. There was only limited suitability for lamprey given the absence of finer, clean spawning gravels. No lamprey ammocoete burial habitat was recorded downstream of the bridge but ammocetes are present elsewhere on the watercourse (Gordon et al., 2021; Delanty et al., 2017). The site had some suitability as a nursery for European eel (i.e. refugia and good food resources) but none were recorded.

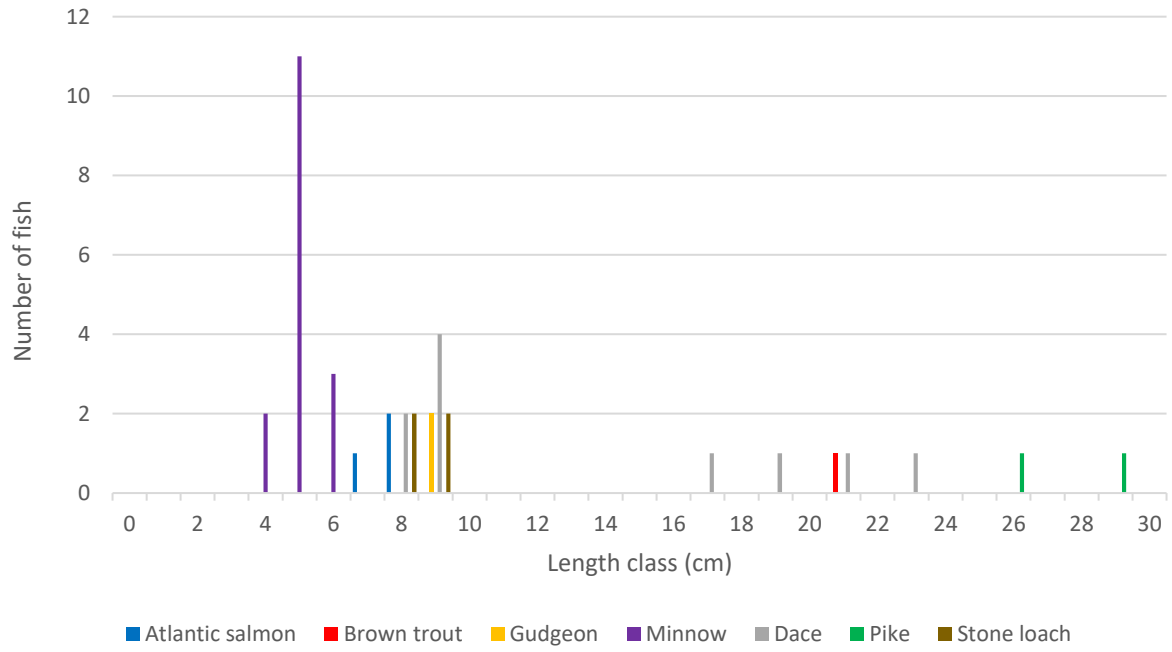

Figure 3.11 Length frequency distribution recorded via electro-fishing at site A18, July 2024

Plate 3.18 Well-conditioned brown trout, gudgeon & dace recorded at site A18 on the Figile River at Millgrove Bridge, August 2024

3.1.19 Site B1 – Clonkeen Stream, Cloncanon

Three-spined stickleback (*n*=11) were the only fish species recorded via electro-fishing at site B1 on the Clonkeen Stream (07C36) (**Figure 3.12**).

However, European eel were recorded at this site previously (Triturus, 2021) and the close proximity of the Grand Canal (to the north) likely acts as a source area for a small eel population. With the exception of low densities of these species, the heavily silted channel was of very poor fisheries value and not capable of supporting salmonids or lamprey species given the lack of flow and heavily silted (peat) conditions.

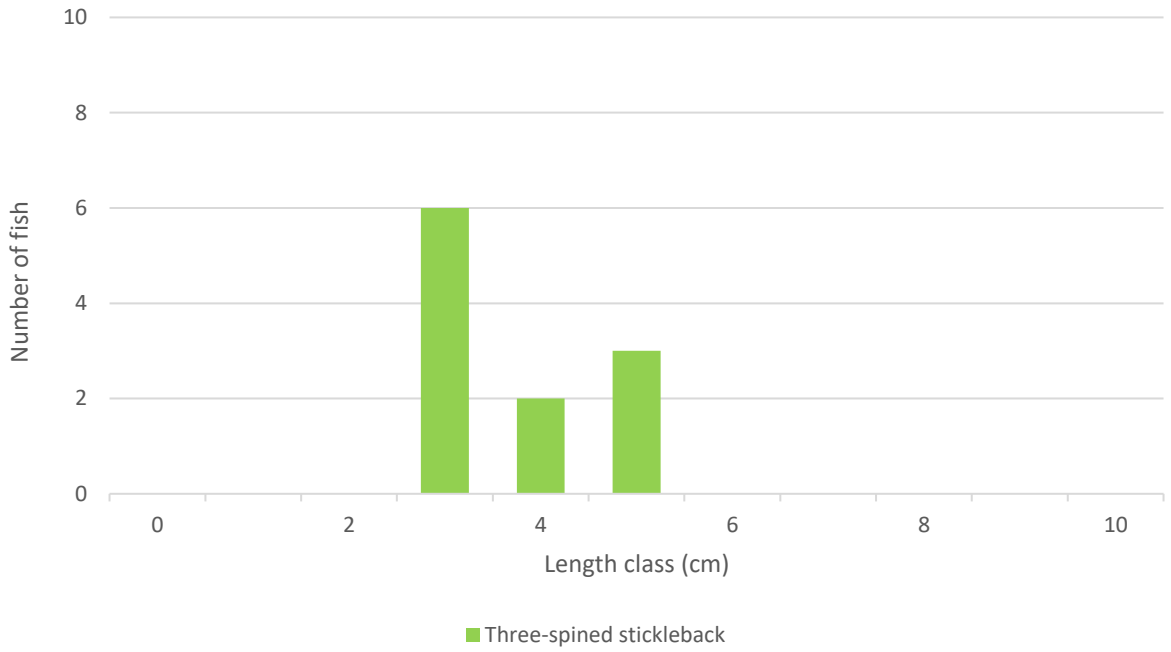

Figure 3.12 Length frequency distribution recorded via electro-fishing at site B1, July 2024

Plate 3.19 Representative image of site B1 on the Clonkeen Stream, August 2024

3.1.20 Site B2 – River Boyne, Kishawanny Bridge

Brown trout (*n*=2), lamprey (*Lampetra* sp.) (*n*=21) and European eel (*n*=1) were recorded via electro-fishing at site B2 on the upper reaches of the River Boyne (07B04) at Kishawanny Bridge (**Figure 3.13**).

The site was a poor quality salmonid nursery and spawning habitat given limited clean coarse substrata and a paucity of broken oxygenated water. There was moderate suitability for European eel, with a single example recorded. Lamprey ammocoetes were present at moderate to high densities (7 per m^2)

in organic-rich marginal silt beds, which were widespread.

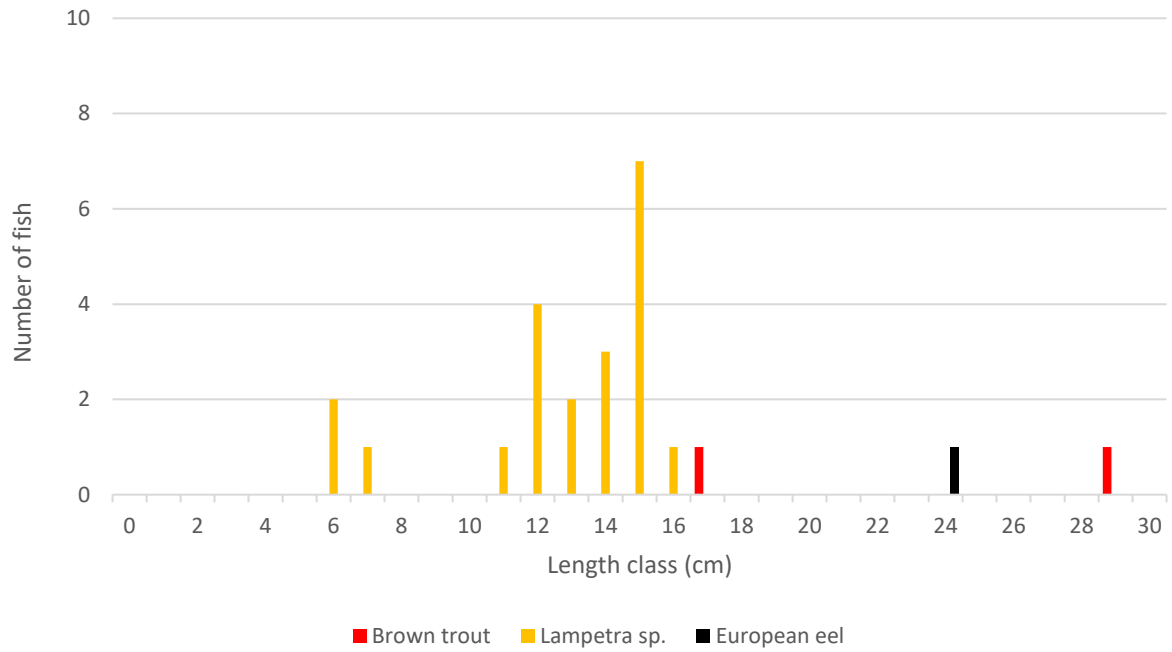

Figure 3.13 Length frequency distribution recorded via electro-fishing at site B2, July 2024

Plate 3.20 *Lampetra* sp. ammocoetes recorded at site B2 on the River Boyne at Kishawanny Bridge, August 2024

3.1.21 Site C1 – Drumsru Stream, Barnaran

No fish were recorded via electro-fishing at site C1 on the Drumsru Stream (25B06), a Slate River tributary, in keeping with previous surveys of the site (Triturus, 2021). The channel at this location was

not of fisheries value given extensive modifications, poor flows, siltation pressures and poor connectivity with downstream habitats.

Plate 3.21 Representative image of site C1 on the Drumsru Stream, August 2024

3.1.22 Site C2 – Slate River, Agar Bridge

Atlantic salmon (*n*=1), brown trout (*n*=5), minnow (*n*=3), stone loach (*n*=5) and dace (*n*=3) were recorded via electro-fishing at site C2 on the Slate River (14S01) at Agar Bridge (L7004 road) (**Figure 3.14**).

The site was a poor quality salmonid nursery and spawning habitat due to historical modifications and siltation/eutrophication pressures. However, deep glide and pool provided some suitability as holding areas for adult salmonids. These areas also offered diurnal refugia for European eel which were not recorded in the current survey. The site was of higher value as a coarse fish habitat. Despite an abundance of soft sediment accumulation these were mostly humic in nature and, coupled with poor flows, did not provide optimal conditions for lamprey ammocoetes.

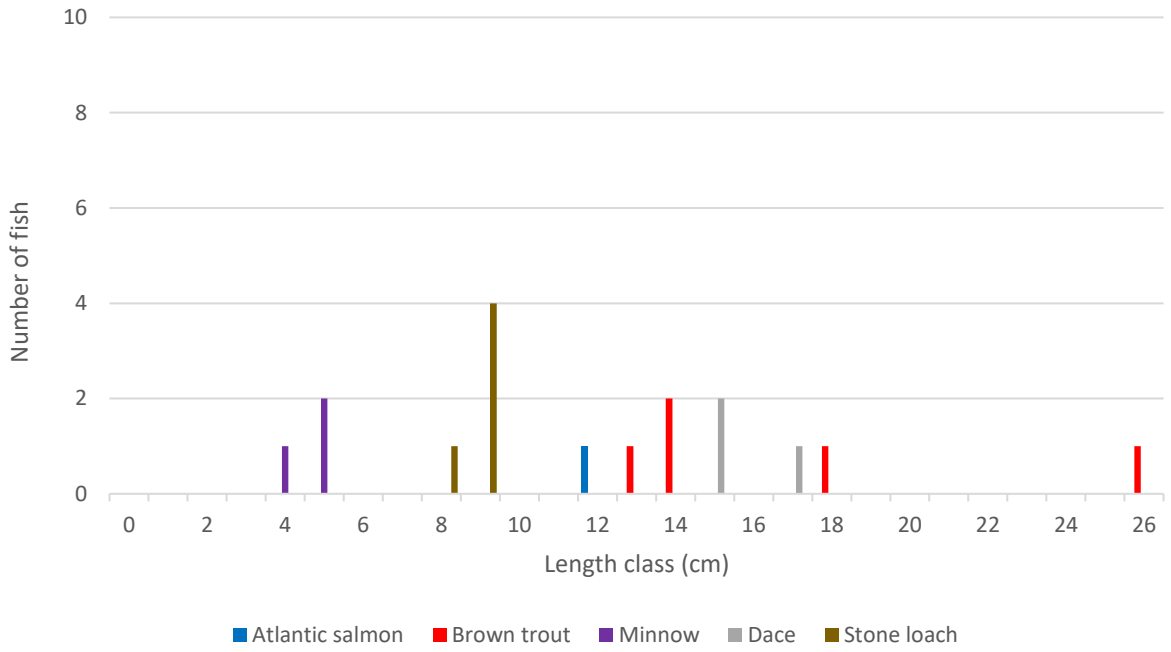

Figure 3.14 Length frequency distribution recorded via electro-fishing at site C2, July 2024

Plate 3.22 Brown trout (top) and Atlantic salmon (bottom) recorded at site C2 on the Slate River at Agar Bridge, August 2024

Table 3.1 Fish species densities per m^2 recorded at sites in the vicinity of the Application Site via electro-fishing in July-August 2024 (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	Dace	Perch	Pike	Roach	Stone loach	Gudgeon
A1	Unnamed stream	5	100	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000
A2	Unnamed stream	5	85	0.000	0.000	0.000	0.000	0.071	0.000	0.000	0.000	0.000	0.000	0.000	0.000
A3	Codd River	5	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
A4	Codd River	5	75	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
A5	Cloncant Stream	5	100	0.000	0.000	0.000	0.000	**0.200**	0.000	0.000	0.000	0.000	0.000	0.000	0.000
A6	Cloncant Stream	5	120	0.000	0.000	0.000	0.000	0.100	0.000	0.000	0.000	0.000	0.000	0.000	0.000
A7	Abbeylough Stream	10	150	0.000	0.000	0.000	0.000	0.053	0.000	0.000	0.000	0.000	0.000	0.000	0.000
A8	Figile River	10	180	0.000	0.017	0.000	0.000	0.017	0.000	0.000	0.000	0.000	0.000	0.000	0.000
A9	Unnamed stream	10	200	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
A10	Lullybeg Stream	10	150	0.000	0.000	0.000	0.000	0.060	0.000	0.000	0.000	0.000	0.000	0.000	0.000
A11	Lullymore East River	10	160	0.000	0.006	0.000	**0.006**	0.025	0.000	0.000	0.000	0.000	0.000	0.000	0.000
A12	Lullybeg Stream	n/a	Too deep for electro-fishing	n/a	n/a	n/a	n/a	n/a	0.000	0.000	n/a	n/a	n/a	n/a	n/a
A13	Clonbrown River	n/a	Too deep for electro-fishing	n/a	n/a	n/a	n/a	n/a	0.000	0.000	n/a	n/a	n/a	n/a	n/a
A14	Figile River	10	350	0.000	0.017	0.000	0.000	0.000	0.011	0.000	**0.003**	**0.014**	0.003	**0.026**	0.000
A15	Figile River	10	300	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.000	0.010	**0.017**	0.023	0.000

Site	Watercourse	CPUE (elapsed time)	Approx. area fished (m^2)	Atlantic salmon	Brown trout	*Lampetra* sp.	European eel	Three-spined stickleback	Minnow	Dace	Perch	Pike	Roach	Stone loach	Gudgeon
A16	Clonbulloge River	5	150	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
A17	Ballygarrett River	10	200	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
A18	Figile River	10	350	**0.009**	0.003	0.000	0.000	0.000	**0.046**	**0.029**	0.000	0.006	0.000	0.011	**0.006**
B1	Clonkeen Stream	5	125	0.000	0.000	0.000	0.000	0.088	0.000	0.000	0.000	0.000	0.000	0.000	0.000
B2	River Boyne	10	250	0.000	0.008	**7 per m^2**	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C1	Drumsru Stream	5	40	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C2	Slate River	10	300	0.003	0.017	0.000	0.000	0.000	0.010	0.013	0.000	0.000	0.000	0.017	0.000

Table 3.2 Relative abundance of fish species of higher conservation value recorded via **electro-fishing** in the vicinity of the Application Site, August 2024

Site	Watercourse	Atlantic salmon	Brown trout	*Lampetra* sp.	European eel	Other species
A1	Unnamed stream	Not recorded	Not recorded	Not recorded	Not recorded	Three-spined stickleback
A2	Unnamed stream	Not recorded	Not recorded	Not recorded	Not recorded	Three-spined stickleback
A3	Codd River	Not recorded	Not recorded	Not recorded	Not recorded	No fish recorded
A4	Codd River	Not recorded	Not recorded	Not recorded	Not recorded	No fish recorded
A5	Cloncant Stream	Not recorded	Not recorded	Not recorded	Not recorded	Three-spined stickleback
A6	Cloncant Stream	Not recorded	Not recorded	Not recorded	Not recorded	Three-spined stickleback
A7	Abbeylough Stream	Not recorded	Not recorded	Not recorded	Not recorded	Three-spined stickleback
A8	Figile River	Not recorded	Low	Not recorded	Not recorded	Three-spined stickleback
A9	Unnamed stream	Not recorded	Not recorded	Not recorded	Not recorded	No fish recorded
A10	Lullybeg Stream	Not recorded	Not recorded	Not recorded	Not recorded	Three-spined stickleback
A11	Lullymore East River	Not recorded	Low	Not recorded	Low	Three-spined stickleback
A12	Lullybeg Stream	n/a	n/a	n/a	n/a	Too deep for electro-fishing
A13	Clonbrown River	n/a	n/a	n/a	n/a	Too deep for electro-fishing
A14	Figile River	Not recorded	Low	Not recorded	Not recorded	Minnow, perch, pike, roach, stone loach
A15	Figile River	Not recorded	Not recorded	Not recorded	Not recorded	Dace, pike, roach, stone loach
A16	Clonbulloge River	Not recorded	Not recorded	Not recorded	Not recorded	No fish recorded
A17	Ballygarrett River	Not recorded	Not recorded	Not recorded	Not recorded	No fish recorded
A18	Figile River	Low	Low	Not recorded	Not recorded	Minnow, dace, gudgeon, pike, stone loach
B1	Clonkeen Stream	Not recorded	Not recorded	Not recorded	Not recorded	Three-spined stickleback
B2	River Boyne	Not recorded	Low	High	Low	
C1	Drumsru Stream	Not recorded	Not recorded	Not recorded	Not recorded	No fish recorded
C2	Slate River	Low	Low	Not recorded	Not recorded	Stone loach, dace, minnow

Conservation value: Atlantic salmon (*Salmo salar*), brook lamprey (L*ampetra planeri*) and river lamprey (*Lampetra fluviatilis*) are listed under Annex II of the Habitats Directive [92/42/EEC]. Atlantic salmon and river lamprey are also listed under Annex V of the Habitats Directive [92/42/EEC]. 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.

Table 3.3 Comparison of fish recorded via electro-fishing at sites in vicinity of the Application Site in 2021 and 2024

Site no.	Watercourse	EPA code	Fish species recorded	
			July 2021	July-August 2024
A1	Unnamed stream	n/a	Not surveyed	Three-spined stickleback
A2	Unnamed stream	n/a	Not surveyed	Three-spined stickleback
A3	Codd River	14C44	Not surveyed	No fish recorded
A4	Codd River	14C44	Not surveyed	No fish recorded
A5	Cloncant Stream	14C41	Not surveyed	Three-spined stickleback
A6	Cloncant Stream	14C41	Brown trout, minnow	Three-spined stickleback
A7	Abbeylough Stream	14A01	Three-spined stickleback	Three-spined stickleback
A8	Figile River	14F01	Not surveyed	Brown trout, three-spined stickleback
A9	Unnamed stream	n/a	Not surveyed	No fish recorded
A10	Lullybeg Stream	14L13	Not surveyed	Three-spined stickleback
A11	Lullymore East River	14L11	Not surveyed	Brown trout, European eel, three-spined stickleback
A12	Lullybeg Stream	14L33	Not surveyed	n/a – too deep for electro-fishing
A13	Clonbrown River	14C32	Not surveyed	n/a – too deep for electro-fishing
A14	Figile River	14F01	Not surveyed	Brown trout, minnow, perch, pike, roach, stone loach
A15	Figile River	14F01	Dace, perch	Dace, pike, roach, stone loach
A16	Clonbulloge River	14C53	Not surveyed	No fish recorded
A17	Ballygarrett River	14B30	No fish recorded	No fish recorded
A18	Figile River	14F01	Not surveyed	Atlantic salmon, brown trout, minnow, dace, gudgeon, pike, stone loach
B1	Clonkeen Stream	07C36	European eel, three-spined stickleback	Three-spined stickleback
B2	River Boyne	07B04	Brown trout, lamprey (*Lampetra* sp.), stone loach, roach	Brown trout, lamprey (*Lampetra* sp.), European eel
C1	Drumsru Stream	14D19	No fish recorded	No fish recorded
C2	Slate River	14S01	Atlantic salmon, brown trout, stone loach, dace, minnow	Atlantic salmon, brown trout, stone loach, dace, minnow

4. Discussion

The surveyed watercourses in the vicinity of the Application Site were typically small, heavily modified lowland channels draining areas of peatland that experienced low summer flows. Historical drainage pressures (straightening, deepening) and peat escapement (siltation) has significantly reduced the quality of fisheries habitats on the majority of surveyed watercourses. Historical straightening and deepening of watercourses damages habitat and hydromorphological heterogeneity, encourages sediment deposition and invariably results in an irreparable reduction in fisheries potential, particularly for salmonids and lamprey (O'Grady et al., 2017, O'Grady, 2006). Nevertheless, several fish species of high conservation value were recorded in the survey area. A typical diversity of fish species for the upper Barrow and Boyne catchments was recorded via electro-fishing, with Atlantic salmon, brown trout, lamprey (*Lampetra* sp.), European eel, stone loach, minnow, gudgeon, pike, perch and three-spined stickleback captured, alongside invasive roach and dace[3] (**Table 3.1, 3.2**). A similar fish assemblage was recorded at comparable sites in the previous 2021 surveys (**Table 3.3**).

In alignment with previous surveys of the area, salmonid populations were restricted in their distribution, with low densities of brown trout being recorded from a total of 6 no. sites on the Figile River (A8, A14, A18), Lullymore East River (A11), River Boyne (B2) and the Slate River (C2) (**Table 3.1, 3.2**). Annex II Atlantic salmon were only recorded from sites A18 on the Figile River (Millgrove Bridge) and C2 on the Slate River (Agar Bridge). Again, these were present in low numbers. Siltation and eutrophication pressures were significant throughout much of the survey area and were evidently contributing to a reduction in the quality of fisheries habitat. Although supporting the most significant salmonid populations in the survey area, both the Figile and Slate rivers have been identified among the least productive for salmonids in the wider Barrow catchment, primarily due to historical drainage and water quality pressures which have impacted the availability of spawning and nursery areas (Delanty et al., 2017).

Lamprey ammocoetes (*Lampetra* sp.) were recorded from a single site, namely site B2 on the River Boyne at Kishawanny Bridge, where a moderate density of 7 per m^2 were recorded in organic-rich, marginal silt beds. This was also the only site found to support ammocoetes in the previous 2021 survey (Triturus, 2021). The quality of lamprey habitat was generally poor across the survey area. Owing to their relatively small morphologies, *Lampetra* species such as brook lamprey require clean, fine gravels in which to dig their redds (Dawson et al., 2015; Rooney et al., 2013; Lasne et al., 2010) although areas may also include fractions of sand, larger gravels, and cobble (Nika & Virbickas, 2010). Spawning habitat in the vicinity of the Application Site was sparse and of poor quality due to significant (peat) siltation pressures (as outlined above). Furthermore, lamprey ammocoetes require the deposition of fine, organic-rich sediment ≥5cm in depth in which to burrow and mature (Aronsuu & Virkkala, 2014; Goodwin et al., 2008; Gardiner, 2003). Peat-dominated substrata (i.e., humic deposits), such as those typically found in the vicinity of the development, do not provide suitable burial/burrowing habitat complexity or structure for ammocoetes given their invariably fine and flocculent nature (pers. obs.).

[3] Although established in Ireland, both roach and dace are invasive cyprinid species listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011-2021 (S.I. 477/2011) and subject to Regulations 49 and 50 throughout the State

European eel are Red-listed in Ireland (King et al., 2011) and are classed as 'critically endangered' on a global scale (Pike et al., 2020). Despite some suitability across much of the survey area, European eel were only recorded in very low densities from sites A11 on the Clonkeen Stream (a Figile tributary) and B2 on the River Boyne (**Table 3.1, 3.2**). A very restricted eel distribution was also observed during the previous 2021 surveys. Better quality eel habitat was confined to the larger watercourses with higher flow rates and superior habitat heterogeneity/recovery, as well as the Grand Canal. As per salmonids, European eel habitat is also degraded by arterial drainage by virtue of a reduction or removal of instream refugia required by the species (Laffaille et al., 2003) and more optimal areas of channel (e.g. boulder zones) were highly localised in vicinity of the Application Site. As eel occurrence decreases significantly with increasing distance from the sea (Degerman et al., 2019), the paucity of eel observed can be further explained by the large distances between the survey area and marine habitats (Matondo et al., 2021; Chadwick et al., 2007).

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8. Appendix B – eDNA lab report

Triturus

Folio No:	3265-2024
Purchase Order:	eDNA Ballydermot 24
Contact:	Triturus Environmental Ltd
Issue Date:	13.08.2024
Received Date:	06.08.2024

eDNA Report

Technical Report

SureScreen Scientifics

Triturus

Folio No:	3265-2024
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Contact:	Triturus Environmental Ltd
Issue Date:	13.08.2024
Received Date:	06.08.2024

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
FK1869	A15		Crayfish plague	Pass	Negative	0
			Freshwater pearl mussel	Pass	Negative	0
			White-clawed crayfish	Pass	Negative	0
FK2417	C2		Crayfish plague	Pass	Negative	0
			Freshwater pearl mussel	Pass	Negative	0
			White-clawed crayfish	Pass	Negative	0
FK1868	B2		Crayfish plague	Pass	Negative	0
			Freshwater pearl mussel	Pass	Negative	0
			White-clawed	Pass	Negative	0

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		crayfish			
FKI870	A18	Crayfish plague	Pass	Negative	0
		Freshwater pearl mussel	Pass	Negative	0
		White-clawed crayfish	Pass	Negative	0

Matters affecting result: none

Reported by:Lauryn Jewkes

Approved by: Vanessa Hind

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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 – Macro-invertebrates (biological water quality)

Table 9.1 Macro-invertebrate Q-sampling results for sites A1-A18, August 2024

Group	Family	Species	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A14	A15	A16	A17	A18	EPA group
Ephemeroptera	Heptageniidae	*Ecdyonurus* sp.						1												**A**
Ephemeroptera	Baetidae	*Alainites muticus*																	1	**B**
Trichoptera	Cased caddis pupa	sp. indet.			2										1					**B**
Trichoptera	Glossosomatidae	*Agapetus fuscipes*						1												**B**
Trichoptera	Leptoceridae	*Athripsodes aterrimus*								1										**B**
Trichoptera	Limnephilidae	*Halesus radiatus*						3												**B**
Trichoptera	Limnephilidae	*Limnephilus auricularia*					3													**B**
Trichoptera	Limnephilidae	*Limnephilus lunatus*					1		3											**B**
Trichoptera	Limnephilidae	*Micropterna* sp.									2									**B**
Trichoptera	Sericostomatidae	*Sericostoma personatum*									2									**B**
Hemiptera	Aphelocheiridae	*Aphelocheirus aestivalis*													6	2			11	**B**
Odonata	Aeshnidae	*Anax imperator*												1						**B**
Odonata	Calopterygidae	*Calopteryx splendens*									1									**B**
Odonata	Coenagrionidae	sp. indet.	1	4					2				2							**B**
Ephemeroptera	Baetidae	*Baetis rhodani*											2		5	1	18		5	**C**
Ephemeroptera	Caenidae	sp. indet.							2							1				**C**
Ephemeroptera	Ephemerellidae	*Serratella ignita*					1	2		10					9	1			40	**C**
Trichoptera	Hydropsychidae	*Hydropsyche instabilis*				1		3		44					22	9	1		79	**C**
Trichoptera	Hydropsychidae	*Hydropsyche siltalai*											1							**C**
Trichoptera	Polycentropodidae	*Polycentropus kingi*						4					3			5				**C**
Coleoptera	Dytiscidae	*Acilius sulcatus*		1																**C**
Coleoptera	Dytiscidae	Dytiscidae larva							1				2							**C**
Coleoptera	Dytiscidae	*Dytiscus semisulcatus*			1															**C**
Coleoptera	Dytiscidae	*Graptodytes pictus*		1																**C**
Coleoptera	Dytiscidae	*Hydroporus tessellatus*				2														**C**

Group	Family	Species	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A14	A15	A16	A17	A18	EPA group
Coleoptera	Dytiscidae	*Hyphydrus ovatus*		1					1											C
Coleoptera	Dytiscidae	*Ilybius ater*				1														C
Coleoptera	Dytiscidae	*Ilybius fuliginosus*					1					1	1				1	1		C
Coleoptera	Dytiscidae	*Nebrioporus sp.*											1						1	C
Coleoptera	Elmidae	*Elmis aenea*						8		5					5	1			4	C
Coleoptera	Elmidae	*Limnius volckmari*						3		6						1				C
Coleoptera	Elmidae	*Oulimnius* sp.														1				C
Coleoptera	Gyrinidae	*Gyrinus substriatus*							3			1	3							C
Coleoptera	Haliplidae	*Brychius elevatus*											3							C
Coleoptera	Hydrophilidae	*Anacaena globulus*				4	1													C
Coleoptera	Hydrophilidae	*Helophorus brevipalpis*			1	2														C
Crustacea	Gammaridae	*Gammarus duebeni*	1		3		4	1	14	10	9	1	5		12	14	22	5	18	C
Diptera	Chironomidae	Non-*Chironomus* spp.				9		1	2		1				2	2		5	4	C
Diptera	Culicidae	sp. indet.				1						1								C
Diptera	Limoniidae	*Antocha* sp.													1	1				C
Diptera	Pediciidae	*Dicranota* sp.							1	4	1									C
Diptera	Simuliidae	sp. indet.						1		29					2	2			2	C
Diptera	Tipuliidae	sp. indet.							3	1			1							C
Gastropoda	Acroloxidae	*Acroloxus lacustris*					2													C
Gastropoda	Bithnyiidae	*Bithynia tentaculata*	5																	C
Gastropoda	Lymnaeidae	*Lymnaea stagnalis*					1						4						3	C
Gastropoda	Planorbidae	*Bathyomphalus contortus*				1														C
Gastropoda	Planorbidae	*Gyraulus albus*					3		1											C
Gastropoda	Planorbidae	*Planorbarius corneus*					1													C
Gastropoda	Planorbidae	*Planorbis planorbis*	1	7	1		1					5	3		1				4	C
Gastropoda	Tateidae	*Potamopyrgus antipodarum*							5				1						3	C

Group	Family	Species	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A14	A15	A16	A17	A18	EPA group
Hemiptera	Corixidae	Corixidae nymph	2						1				1			1				C
Hemiptera	Corixidae	*Hesperocorixa linnaei*	1						3										1	C
Hemiptera	Gerridae	Gerridae nymph		1	2		1	1				1	1		1					C
Hemiptera	Gerridae	*Gerris* sp.		3					2			1	2							C
Hemiptera	Hydrometridae	*Hydrometra stagnorum*										1								C
Hemiptera	Notonectidae	Notonectidae nymph		2								1								C
Hemiptera	Veliidae	*Velia caprai*				2	2		3		2	3					4	2		C
Arachnida	Hydrachnidiae	sp. indet.							6								1			C
Hirudinidae	Piscicolidae	*Piscicola* sp.									1									C
Crustacea	Asellidae	*Asellus aquaticus*	1	8		5	1	2	4	2	6	14	17	8	10	2	28	31	12	D
Crustacea	Crangonyctidae	*Crangonyx* sp.												2						D
Gastropoda	Lymnaeidae	*Ampullacaena balthica*					1													D
Hirudinidae	Glossiphoniidae	sp. indet.		1		1							1							D
Megaloptera	Sialidae	*Sialis lutaria*											1	1				1		D
Mollusca	Sphaeriidae	sp. indet.	1	2					8							4		3	2	D
Diptera	Chironomidae	*Chironomus* spp.	3			2			3				5	9	1	2	5	3		E
Annelidae	Oligochaeta	sp. indet.							5	1								4		n/a
Abundance			**16**	**31**	**10**	**31**	**24**	**31**	**73**	**113**	**25**	**30**	**60**	**21**	**78**	**50**	**80**	**55**	**190**	
Q-rating			Q3*	Q3*	Q3*	Q3*	Q3*	Q3-4	Q3*	Q3	Q3*	Q2-3*	Q3	Q2-3*	Q3	Q3	Q3*	Q2*	Q3	
WFD status			Poor	Poor	Poor	Poor	Poor	Mod	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Bad	Poor	

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

Table 9.2 Macro-invertebrate Q-sampling results for sites B1-B2 & C1-C2, August 2024

Group	Family	Species	B1	B2	C1	C2	EPA group
Ephemeroptera	Baetidae	*Alainites muticus*				2	**B**
Trichoptera	Leptoceridae	*Athripsodes aterrimus*				1	**B**
Trichoptera	Phryganeidae	*Agrypnia obsoleta*					**B**
Trichoptera	Sericostomatidae	*Sericostoma personatum*					**B**
Ephemeroptera	Baetidae	*Baetis rhodani*					**C**
Ephemeroptera	Ephemerellidae	*Serratella ignita*				28	**C**
Trichoptera	Hydropsychidae	*Hydropsyche instabilis*				3	**C**
Trichoptera	Hydropsychidae	*Hydropsyche siltalai*				1	**C**
Trichoptera	Polycentropodidae	*Plectrocnemia conspersa*					**C**
Trichoptera	Polycentropodidae	*Polycentropus kingi*				1	**C**
Coleoptera	Dytiscidae	*Nebrioporus* sp.		1			**C**
Coleoptera	Elmidae	*Elmis aenea*		2		3	**C**
Coleoptera	Halipliidae	*Brychius elevatus*		7			**C**
Coleoptera	Halipliidae	*Haliplus ruficollis* group			2		**C**
Coleoptera	Hydrophilidae	*Helophorus brevipalpis*	1				**C**
Coleoptera	Hydrophilidae	*Helophorus minutus*	1				**C**
Coleoptera	Hydrophilidae	*Hydrobius fuscipes*	1				**C**
Crustacea	Gammaridae	*Gammarus duebeni*	3	9	7	13	**C**
Diptera	Chironomidae	Non-*Chironomus* spp.					**C**
Diptera	Limoniidae	*Antocha* sp.			1		**C**
Diptera	Pediciidae	*Dicranota* sp.			1		**C**
Gastropoda	Bithnyiidae	*Bithynia tentaculata*		2			**C**
Gastropoda	Planorbidae	*Ancylus fluviatilis*					**C**
Gastropoda	Planorbidae	*Bathyomphalus contortus*				1	**C**

Group	Family	Species	B1	B2	C1	C2	EPA group
Gastropoda	Planorbidae	*Planorbis planorbis*	1				**C**
Gastropoda	Tateidae	*Potamopyrgus antipodarum*			2	5	**C**
Hemiptera	Corixidae	*Hesperocorixa linnaei*			4		**C**
Hemiptera	Gerridae	Gerridae nymph	1		1		**C**
Hemiptera	Gerridae	*Gerris* sp.	1	1	1		**C**
Hemiptera	Hydrometridae	*Hydrometra stagnorum*					**C**
Arachnida	Hydrachnidiae	sp. indet.		3	1		**C**
Crustacea	Asellidae	*Asellus aquaticus*	19	12	24	13	**D**
Crustacea	Crangonyctidae	*Crangonyx* sp.		2			**D**
Gastropoda	Lymnaeidae	*Ampullacaena balthica*			5		**D**
Hirudinidae	Glossiphoniidae	sp. indet.		2			**D**
Mollusca	Sphaeriidae	sp. indet.		3	7		**D**
Diptera	Chironomidae	*Chironomus* spp.		1	1	1	**E**
Annelidae	Oligochaeta	sp. indet.			4		**n/a**
Abundance			**28**	**45**	**61**	**72**	
Q-rating			Q2*	Q2-3	Q2-3*	Q3	
WFD status			Bad	Poor	Poor	Poor	

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

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