



APPENDIX 1

Aquatic Baseline Report

Aquatic baseline report for the proposed Cooloo Wind Farm, Co. Galway



Prepared by Triturus Environmental Ltd. for MKO

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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 Cooloo wind farm (hereafter ‘Proposed Project’) located near Abbeyknockmoy, Co. Galway (**Figure 2.1**).

Undertaken on a catchment-wide scale, this report provides a baseline assessment of the aquatic ecology including fisheries and biological water quality, as well as protected species and habitats in the vicinity of the Proposed Project inclusive of the Proposed Grid Connection. Aquatic surveys were undertaken in July 2024 and updated those previously completed by Triturus in September 2022 (Triturus, 2023).

1.2 Development description

A full description of the Proposed Project is provided in the Environmental Impact Assessment Report (EIAR) used to support consenting applications.

2. Methodology

2.1 Selection of watercourses for assessment

All freshwater watercourses which could be affected directly or indirectly by the Proposed Project were considered as part of the current assessment. This included sites in vicinity of the site boundary and watercourses crossed by the proposed grid cable route. Thus, a total of $n=31$ sites were selected for detailed aquatic assessment (see **Table 2.1, Figure 2.1 & 2.2** below). The river courses and nomenclature of the survey sites followed Environmental Protection Agency (EPA) mapping.

Riverine survey sites were present on the Dangan Eighter Stream (EPA code: 30D35), Grange River (30G02), Ahgloragh Stream (30A26), Lecarrow Stream (30L49), Forty Acres Stream (30F16), Abbert River (30A01), Feagh East Stream (30F17) and 4 no. unnamed channels (**Table 2.1**). Furthermore, a total of 10. no. lacustrine habitats including lakes, ponds and wetlands including Horseleap Lough, were also surveyed.

The Proposed Project boundary overlapped with the Lough Corrib SAC (000297) and a number of survey sites were located within this site, which is designated for a range of aquatic qualifying interests (NPWS, 2017).

Please note this aquatic report should be read in conjunction with the final Environmental Impact Assessment Report (EIAR) prepared for the Proposed Project. 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 24th, 25th, 26th, and 27th July 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 proposed development 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 $n=31$ aquatic survey sites in the vicinity of the proposed Cooloo wind farm, Co. Galway

Site no.	Watercourse	EPA code	Location	X (ITM)	Y (ITM)
A1	Dangan Eighter Stream	30D35	Cooloo	556015	749329
A2	Unnamed stream	n/a	Cooloo	556367	749439
A3	Unnamed stream	n/a	Cooloo	555526	750169
A4	Unmapped channel	n/a	Cooloo	555973	749795
A5	Dangan Eighter Stream	30D35	Elmhill	556805	749933
A6	Unmapped channel	n/a	Cloondahamper	555139	750851
A7	Grange River	30G02	Cloondahamper	555221	751533
A8	Grange River	30G02	Grange Bridge	547969	749929
B1	Ahgloragh Stream	30A26	Omaun More	552003	750147
B2	Ahgloragh Stream	30A26	Kilmore	549737	750447
C1	Lecarrow Stream	30L49	Lecarrow	555330	747693
C2	Forty Acres Stream	30F16	Dangan Eighter	553873	747215
C3	Lecarrow Stream	30L49	Brierfield South	553872	744741
C4	Abbert River	30A01	N63 road crossing	551644	743655
D1	Unnamed stream	n/a	Cooloo	557505	748926
D2	Dangan Eighter Stream	30D35	Trasternagh North	557415	750253
D3	Grange River	30G02	Cloonascragh	556369	751183
E1	Lecarrow Stream	30L49	Lecarrow	555791	746488
E2	Forty Acres Stream	30F16	Dangan Eighter	553623	744964
E3	Feagh East Stream	30F17	Feagh West	550583	744755
E4	Grange River	30G02	Ballinderry Bridge	544475	746990
L1	Derrynacrick Lough (west)	30_413	Cooloo	556077	749688
L2	Derrynacrick Lough (east)	30_205	Elmhill	556325	749586
L3	Horseleap Lough	30_248	Lecarrow	555730	746589
P1	Unnamed pond	n/a	Cooloo	557335	748689
P2	Unnamed pond	n/a	Gorteenlahard	557946	748788
P3	Unnamed pond	n/a	Lecarrow	555414	747794
P4	Unnamed pond	n/a	Lecarrow	555963	748055
P5	Unnamed pond	n/a	Lecarrow	556065	748220
P6	Unnamed pond	n/a	Lecarrow	556121	748055
P7	Unnamed pond	n/a	Polladooey	555298	747163

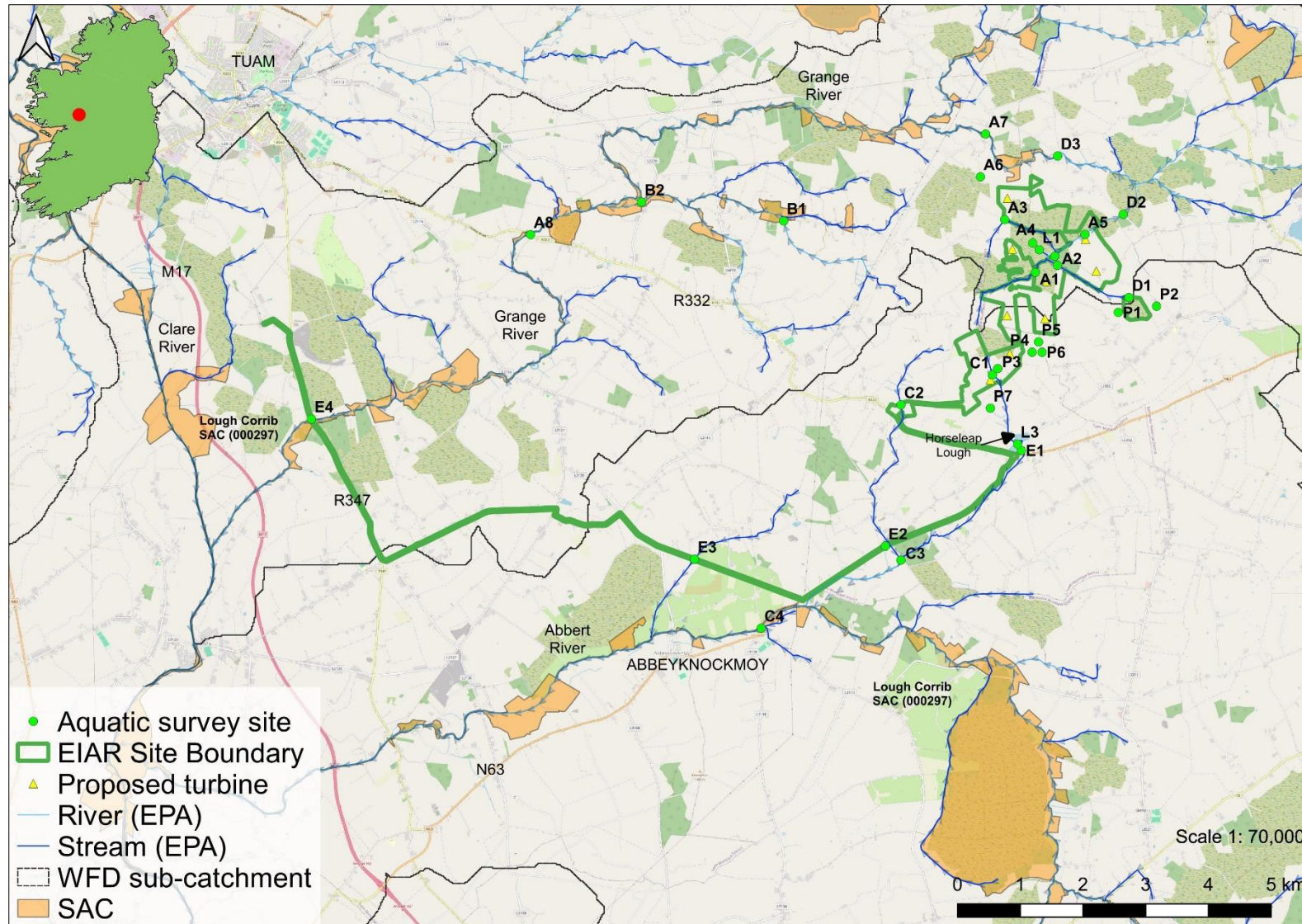


Figure 2.1 Overview of the aquatic survey sites in the vicinity of the Proposed Project

2.3 Fisheries assessment & habitat appraisal

A single anode Smith-Root LR24 backpack (12V DC input; 300V, 100W DC output) was used to electro-fish sites on riverine watercourses in the vicinity of the Proposed Project in July 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 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 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 wind farm catchment/sub-catchments in the survey area to minimise the risk of transfer invasive propagules (including crayfish plague) in an upstream direction.

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

2.5 Biological water quality (Q-sampling)

The 21 no. riverine survey sites were assessed for biological water quality through Q-sampling in July 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 status	Pollution status	Condition
Q5 or Q4-5	High status	Unpolluted	Satisfactory
Q4	Good status	Unpolluted	Satisfactory
Q3-4	Moderate status	Slightly polluted	Unsatisfactory
Q3 or Q2-3	Poor status	Moderately polluted	Unsatisfactory
Q2, Q1-2 or Q1	Bad status	Seriously polluted	Unsatisfactory

2.6 Lacustrine macro-invertebrate communities

The 10 no. lacustrine sites were sampled for macro-invertebrates via sweep netting. A standard pond net (250mm width, mesh size 500µm) was used to sweep macrophytes to capture macro-invertebrates. The net was also moved along the canal bed to collect epibenthic and epiphytic invertebrates from the substratum (as per Cheal et al., 1993). A 3-minute sampling period was employed. To ensure appropriate habitat coverage, the sampling period was also divided amongst the range of meso-habitats present at the survey sites to get a representative sample for sub-habitats.

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 *Ranunculum fluitantis* and *Callitriche-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 Site is located in a lowland karstic area approximately 11km west of Tuam, Co. Galway. The Proposed Project is within the Western River Basin District and within hydrometric area 30 (Corrib). The aquatic survey sites were located within the Clare[Galway]_SC_040 and Clare[Galway]_SC_050 river sub-catchments.

The watercourses and aquatic surveys sites in the vicinity of the Proposed Project are typically small, historically modified lowland depositing channels (FW2; Fossitt, 2000) which flow over areas of karstic Visean limestone and calcareous shale (Geological Survey of Ireland data). Land use practices in the wider survey area are dominated by peat bogs (CORINE 412) with extensive adjoining areas of pasture (312).

3.2 Fisheries

The Grange River, a major tributary of the Clare River, is a spring-fed river which rises some 5km north of Summerville Lough. Following arterial drainage works (which significantly impacted fisheries habitat; Browne & Gallagher, 1987), the Grange River was subjected to extensive fisheries rehabilitation works during the 1990s (O'Connor, 2007). The river is known to support Atlantic salmon (*Salmo salar*), brown trout (*Salmo trutta*), pike (*Esox lucius*), stone loach (*Barbatula barbatula*) and *Lampetra* sp. (Triturus 2022 data; Gordon et al., 2021; O'Briain et al., 2019; O'Connor, 2007).

The Ahgloragh River, a short tributary of the Grange River, is known to support Atlantic salmon, brown trout, stone loach and three-spined stickleback (*Gasterosteus aculeatus*) (Triturus 2022 data; Gordon et al., 2021; O'Briain et al., 2019).

The Abbert River, another major tributary of the Clare River, supports Atlantic salmon, brown trout, pike, stone loach and three-spined stickleback (Triturus 2022 data; O'Briain et al., 2019; Kelly et al., 2011) in addition to *Lampetra* sp. (O'Connor, 2007). Having previously been modified by arterial drainage, rehabilitation works have restored areas of this river and it is now considered to provide good salmonid habitat (O'Reilly, 2009). Brown trout growth in the river has been noted as 'very slow' based on the criteria of Kennedy and Fitzmaurice (1971) (Kelly et al., 2011). From a genetic perspective, both the Abbert and Grange rivers contribute significantly to the adult brown trout population of Lough Corrib (Delanty et al., 2021; Massa-Gallucci et al., 2010).

During the previous survey (September 2022), the Danagan Eighter Stream, a tributary of the Grange River, was found to support brown trout, lamprey (*Lampetra* sp.), stone loach, three-spined stickleback and non-native roach (*Rutilus rutilus*) (Triturus 2022 data).

Three-spined stickleback was the only fish species recorded from the Forty Acres Stream, with no fish recorded from 2 no. sites on the Lecarrow Stream (Triturus 2022 data).

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. M44, M45, M54 & M55) identified a low number of records for rare and or protected aquatic species within the vicinity of the Site.

A relatively high number of records (c.50) were available for Annex II white-clawed crayfish (*Austropotamobius pallipes*) in the respective grid squares. However, the majority of these were historical only (i.e. pre-1994). Most of the more contemporary records were available for the Grange River and Abbert River (**Figure 3.1**). Crayfish were recorded on the Danagan Eighter Stream (at site D2) during the previous 2022 survey (Triturus, 2023).

A low number of contemporary Annex II otter (*Lutra lutra*) records (2005-2022) were available for the respective 10km grid squares, including on the Grange River (at survey site A7) and the Forty Acres Stream (**Figure 3.1**). Only historical records were available for the Abbert River (1980; data not shown).

No NPWS records for macrophytes or aquatic bryophytes protected under the Flora (Protection) Order, 2022 were available for the respective grid squares.

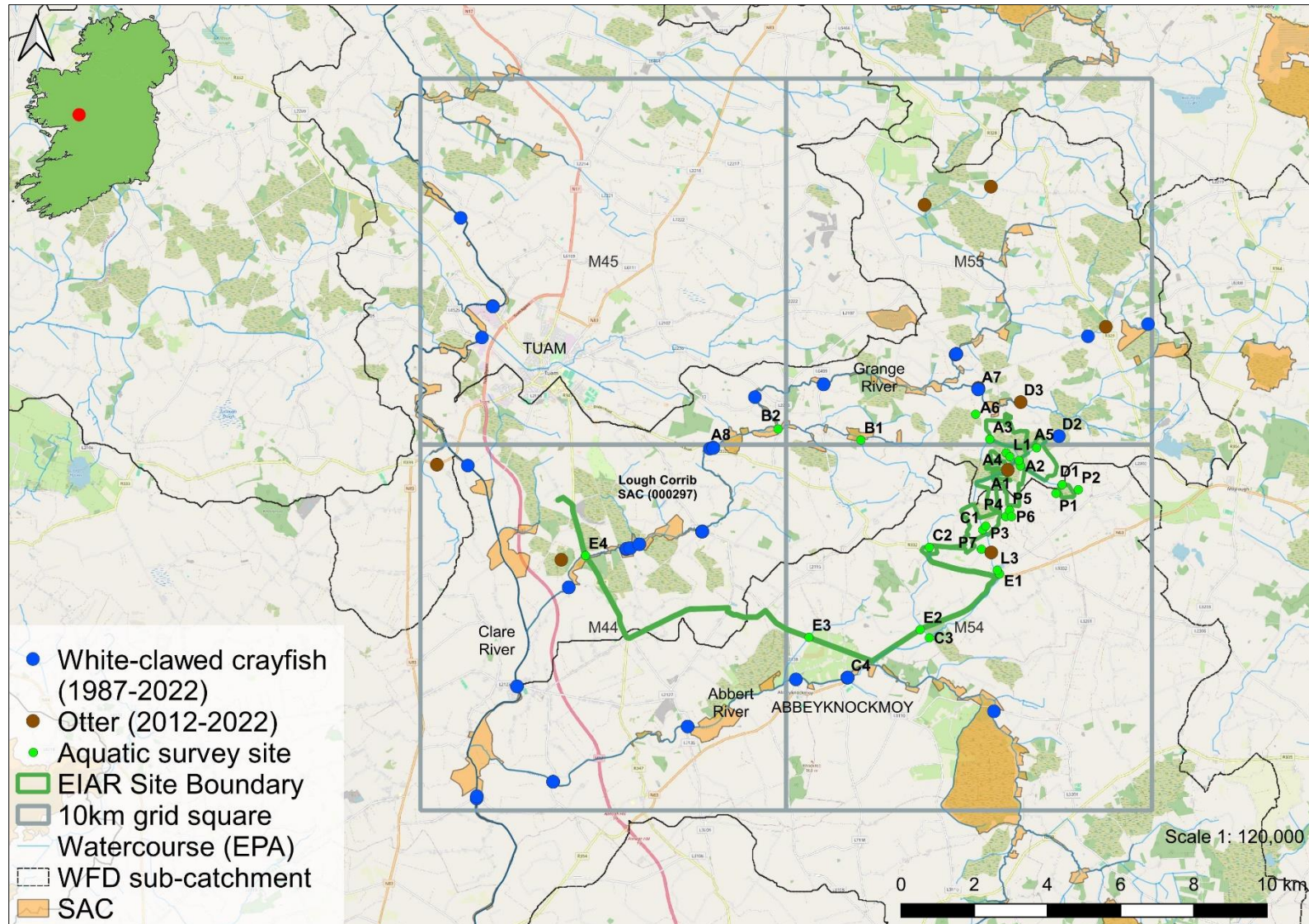


Figure 3.1 Selected protected aquatic species records in the vicinity of the Proposed Project (source: Triturus, NPWS, NCPSP, EPA & NBDC data)

4. Results of aquatic surveys

The following section summarises each of the $n=31$ 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 B**. 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 2024.

4.1 Aquatic survey site results

4.1.1 Site A1 – Dangan Eighter Stream, Cooloo

Site A1 was located on the Dangan Eighter Stream (EPA code: 30D35) at a proposed access track crossing within the Proposed Wind Farm site. The lowland depositing stream (FW2; Fossitt, 2000) had been extensively straightened and deepened historically and flowed in a trapezoidal channel with steep peaty banks of 2-2.5m. The stream suffered from low summer flows at the time of survey and was a homogenous 2m wide and 0.2-0.3m deep. The profile comprised shallow glide with only very localised pool and no riffle. The substrata were dominated by exposed peat/soft sediment with scattered mixed gravels and boulder restricted to the perched pipe culvert apron only. Given high peat staining and shading, macrophyte cover growth was sparse with only localised fool's watercress (*Helosciadium nodiflorum*), water mint (*Mentha aquatica*), branched bur-reed (*Sparganium erectum*) and water forget-me-not (*Myosotis scorpioides*). Aquatic bryophyte coverage was also low given the paucity of hard substrata although some *Leptodictyum riparium* moss was present near the culvert. The riparian areas supported dense scrub vegetation (WS1) dominated by grey willow (*Salix cinerea*), bramble (*Rubus fruticosus* agg.) and rank grasses. The site was bordered by scrub and recolonising cutover bog (PB4).

Three-spined stickleback (*Gasterosteus aculeatus*) were the only fish species recorded via electro-fishing at site A1 (**Appendix A**). With the exception of high densities of this species, the stream at this location was of poor fisheries value given low summer flows, extensive historical modifications and siltation pressures. There was very poor suitability for salmonids and no suitability for lamprey. Suitability for European eel was low and none were recorded. The site supported a low density of white-clawed crayfish (*Austropotamobius pallipes*) (4 per 25 refugia), with a low number of juveniles recorded. The steep peaty banks featured numerous crayfish burrows. A regular otter spraint, containing abundant crayfish and diving beetle remains, was recorded on a boulder at the pipe culvert (ITM 556006, 749326).

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). 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 presence of white-clawed crayfish and utilisation by otter, the aquatic ecological evaluation of site A1 was of **local importance (higher value)** (Table 4.4).



Plate 4.1 Representative image of site A1 on the Dangan Eighter Stream, July 2024

4.1.2 Site A2 – unnamed stream, Cooloo

Site A2 was located on an unnamed Danagan Eighter Stream tributary at a proposed access track crossing. The stream (FW2) had been extensively straightened and deepened along field boundaries adjacent to a coniferous plantation, resulting in a homogenous U-shaped channel with very poor hydromorphology. The channel was 2-2.5m wide with stagnant water of 0.05-0.15m deep. The substrata comprised deep anoxic silt (peat) with no hard substrata. Instream peat dams were frequent and impeded water flows. The channel was heavily vegetated with abundant bulrush (*Typha latifolia*) and branched bur-reed. Fool's watercress was localised. Encroachment from terrestrial species such as creeping bent (*Agrostis stolonifera*), meadowsweet (*Filipendula ulmaria*) and great willowherb (*Epilobium hirsutum*) was high. The historically cleared banks supported intermittent scrub (WS1) dominated by grey willow, gorse (*Ulex europaeus*) and rushes (*Juncus* sp.). The site was bordered by semi-improved pasture to the south (GA1) with a mature coniferous block along the north bank (WD4).

No fish were recorded via electro-fishing at site A2 (**Appendix A**). With the exception of stickleback species (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 **Q3 (poor status)** (**Appendix B**). 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 Dangan Eighter Stream tributary, July 2024

4.1.3 Site A3 – unnamed stream, Cooloo

Site A3 was located on an unnamed Danagan Eighter Stream tributary adjoining the Site boundary. The stream represented a peat drainage channel and had been extensively straightened and deepened as part of cutover bog drainage, resulting in a homogenous U-shaped channel with 1.5-2m high unstable peat banks and very poor hydromorphology. The stream was 2m wide and 0.05m deep at the time of survey with near imperceptible flows in glide habitat. Instream peat dams caused frequent impediments to flow. The substrata were comprised entirely of deep, soft humic sediments (peat). The channel supported frequent bottle sedge (*Carex rostrata*) and scattered stands of branched bur-reed with occasional water mint and lesser spearwort (*Ranunculus flammula*) along the littorals. Bladderwort (*Utricularia* sp.) was present but rare. Aquatic bryophytes were not recorded. The banks supported abundant heather (*Calluna vulgaris*), purple moor grass (*Molinia caerulea*) and bog myrtle (*Myrica gale*) with scattered grey willow. The site was bordered by degraded raised bog (PB1) and cutover bog (PB4).

No fish were recorded via electro-fishing at site A3 (**Appendix A**). With the exception of stickleback species (not recorded), the channel at this location was not of fisheries value given extensive modifications, shallow depths, poor flows, siltation pressures and poor fluvial 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 B)**. 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)**.



Plate 4.3 Representative image of site A3 on an unnamed Dangan Eighter Stream tributary, July 2024

4.1.4 Site A4 – unmapped channel, Cooloo

Site A4 was located on an unnamed (unmapped) channel approximately 100m upstream of Derrynacrick Lough (west). The peat drainage channel (FW4) had been extensively straightened and deepened historically with a resulting U-shaped channel and bank heights of up to 2m. The homogenous channel was 2m wide and 0.2-0.4m deep in very slow-flowing glide habitat. The substrata were comprised entirely of deep humic sediment (peat) with high peat staining at the time of survey. The site was heavily vegetated with frequent bottle sedge and locally abundant common reed (*Phragmites australis*) and bulrush. Aquatic bryophytes were not recorded. The open banks supported gorse, heather, rushes (*Juncus* sp.) and scattered downy birch (*Betula pubescens*). The site was bordered by degraded raised bog (PB1) and cutover bog (PB4).

No fish were recorded via electro-fishing at site A4 (**Appendix A**). With the exception of stickleback species (not recorded), the channel at this location was not of fisheries value given extensive modifications, shallow depths, poor flows, siltation pressures and poor fluvial 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 B)**. 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 an unnamed Derrynacrick Lough tributary, July 2024

4.1.5 Site A5 – Dangan Eighter Stream, Elmhill

Site A5 was located on the Dangan Eighter Stream (30D35) at a proposed access track crossing (an existing clearspan masonry bridge). The lowland depositing stream (FW2) had been extensively straightened and deepened historically, resulting in a homogenous trapezoidal channel with poor summer flows. The river was 2.5-3m wide and >0.5m deep with a bed comprised exclusively of deep soft sediment with a high clay fraction. The steep banks had been excavated to the clay layer in many areas. The profile was very slow-flowing deep glide and pool with no riffles. The site was heavily vegetated with local stands of yellow lily (*Nuphar lutea*) and unbranched bur-reed (*Sparganium emersum*). Common reed and bulrush were present along the margins, with water mint and fool's watercress. Common duckweed (*Lemna minor*) was present locally. Aquatic bryophytes were not recorded. The heavily scrubbed riparian areas supported abundant herbaceous vegetation with hemp agrimony (*Eupatorium cannabinum*), meadowsweet, purple loosestrife (*Lythrum salicaria*), wild angelica (*Angelica sylvestris*) and bracken (*Pteridium aquilinum*) with abundant grey willow and gorse. The site was bordered by maturing sitka spruce with downy birch borders (WD4), scrub (WS1) and blanket/cutover bog (PB3/PB4).

Electro-fishing was not undertaken at site A5 given a high average depth of the sediment and unsafe access. However, three-spined stickleback and juvenile roach (*Rutilus rutilus*) were recorded in macro-invertebrate sweep samples. The heavily modified channel was of some suitability for coarse fish species in addition to European eel but was of poor suitability for lamprey and salmonids given poor flows, poor hydromorphology and a predominance of soft substrata. The steep cay banks were of suitability for white-clawed crayfish burrowing. While none were recorded during the current survey, the species is known downstream (site D2). 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 B)**. 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 Dangan Eighter Stream, July 2024

4.1.6 Site A6 – unmapped channel, Cloondahamper

Site A6 was located on an unmapped tributary of the Grange River at a farm access crossing (pipe culvert). The drainage channel (FW4) had been extensively straightened and deepened historically as part of land drainage works, resulting in a homogenous U-shaped profile and cleared low-lying banks. The channel was 2m wide and supported stagnant pools of water up to 0.2m deep (no flows) with a deep silt (mostly peat) base. The channel was heavily vegetated with near total cover. Branched bur-reed and watercress was abundant with frequent water mint. Aquatic bryophytes were not recorded. Encroachment from terrestrial species such as lesser stitchwort (*Stellaria graminea*), creeping buttercup (*Ranunculus repens*), great willowherb, rushes (*Juncus* sp.) and grasses were high. The banks

featured scattered patches of bramble scrub and isolated hawthorn only. The site was bordered by semi-improved pasture (GA1) (to the bank top) with cutover bog to the south.

No fish were recorded via electro-fishing at site A6 (**Appendix A**). With the exception of stickleback species (not recorded), the channel at this location was not of fisheries value given extensive modifications, shallow depths, poor flows, siltation pressures and poor fluvial 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 B)**. 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 A6 was of **local importance (lower value) (Table 4.4)**.



Plate 4.6 Representative image of site A6 on an unnamed tributary of the Grange River, July 2024

4.1.7 Site A7 – Grange River, Cloondahamper

Site A7 was located on the Grange River (30G02) at a local road crossing (with rendered apron). The lowland depositing alkaline river (FW2) had been historically deepened but retained some good semi-natural features, including sinuosity, and demonstrated some good instream recovery. The river was 4-5m wide and ranged from 0.2m to 0.8m deep with trapezoidal banks of 4-5m. The profile was dominated by deeper glide with localised riffle and pool. The substrata comprised frequent small boulder, cobble and mixed gravels with localised sand and shallow (flocculent) silt accumulations. The bed was moderately silted with moderate compaction. The site was well-vegetated with abundant branched bur-reed, fool's watercress in addition to localised broad-leaved pondweed (*Potamogeton*

natans), yellow lily, water mint, unbranched bur-reed, water forget-me-not, various-leaved water starwort (*Callitriche platycarpa*) and ivy-leaved duckweed (*Lemna trisulca*). Mare's-tail (*Hippuris vulgaris*), blue water speedwell (*Veronica anagallis-aquatica*), spiked water milfoil (*Myriophyllum spicatum*) and bulrush were present but rare. Coverage of aquatic bryophytes was high with abundant *Leptodictyum riparium*. The filamentous rhodophyte *Torularia atrum* was frequent. Filamentous algae cover was also high, further indicating enrichment. The riparian areas supported scattered mature sycamore (*Acer psuedoplatanus*), ash (*Fraxinus excelsior*) and grey willow with abundant herbaceous and rank grass vegetation along the steep banks. The site was bordered by improved pasture (GA1) and dry meadow verges (GS2).

Atlantic salmon (*Salmo salar*), brown trout, pike (*Esox lucius*) and stone loach (*Barbatula barbatula*) were recorded via electro-fishing at site A7 (**Appendix A**). Despite historical drainage works, the site was a good quality salmonid nursery, supporting relatively high numbers of mixed cohort juveniles, with good flow diversity and abundant instream refugia. Good quality salmonid and lamprey spawning habitat was present in glide and pool tailings despite some compaction and siltation. Deeper glide and pool provided good quality holding opportunities for adult salmonids. Suitability for lamprey was poor given high bed compaction with localised, shallow and compacted deposits of silt. Despite some good suitability for European eel and white-clawed crayfish, none were recorded. While good foraging suitability for otter existed, no otter signs were recorded in vicinity of the site.

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

Given the location of the site within the Lough Corrib SAC (000297), the aquatic ecological evaluation of site A7 was of **international importance (Table 4.4)**.

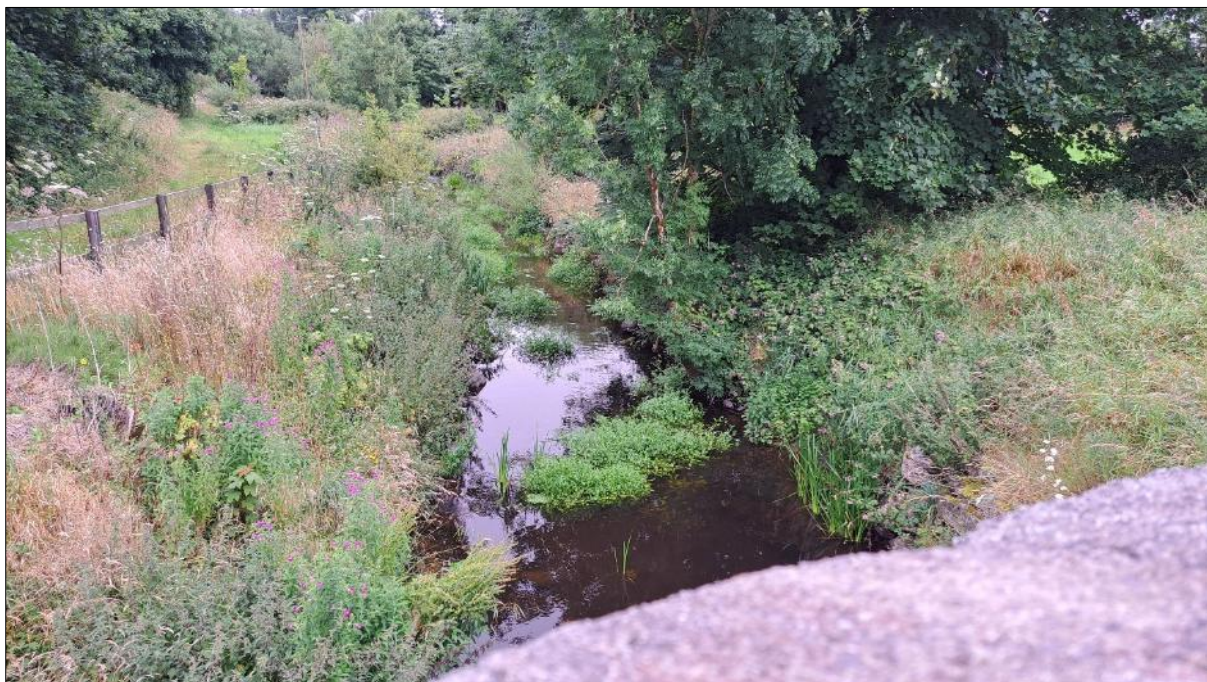


Plate 4.7 Representative image of site A7 on the Grange River, July 2024

4.1.8 Site A8 – Grange River, Grange Bridge

Site A8 was located on the Grange River (30G02) at Grange Bridge, approximately 10km downstream of site A7. The large lowland depositing alkaline river (FW2) had been extensively deepened historically at this location, with large berms (and excavated limestone rock) present on the north bank and bank heights of 4-7m. Despite modifications, the river exhibited good instream recovery with a semi-natural profile of deeper glide with localised riffle and pool. Instream enhancement measures were also evident downstream of the bridge (boulders). The high energy alkaline river was 7-8m wide and 0.3-1m deep with locally deeper pool to 1.5m. The substrata were dominated by abundant boulder and cobble with high rates of calcification and compaction. Mixed gravels were present locally with small areas of sand/silt in the lee of boulders. Siltation was low overall given high flow rates. The site was very heavily vegetated with abundant common clubrush (*Schoenoplectus lacustris*) and curled pondweed (*Potamogeton crispus*). Fool's watercress, lesser water parsnip (*Berula erecta*), water mint and watercress were frequent with rare yellow lily, water starwort (*Callitriche* sp.) and river water dropwort (*Oenanthe fluviatilis*). Aquatic bryophyte coverage was high with abundant *Rhynchostegium riparoides*, occasional *Leptodictyum riparium* and *Fissedens* sp. The liverwort *Pellia endiviifolia* was recorded as rare. Filamentous algal cover (*Cladophora* sp.) was locally high, indicating enrichment. The filamentous rhodophyte *Torularia atrum* was recorded locally. Given the presence of several indicator species (EC, 2013), the aquatic vegetation community was representative of the Annex I habitat 'Water courses of plain to montane levels, with submerged or floating vegetation of the *Ranunculion fluitantis* and *Callitriche-Batrachion* (low water level during summer) or aquatic mosses [3260]' (aka floating river vegetation). The riparian areas were open with low levels of shading and graded into calcareous grassland (GS1) that had been semi-improved for sheep grazing (GA1).

Atlantic salmon, brown trout, pike and stone loach were recorded via electro-fishing at site A8 (**Appendix A**). The site was an excellent salmonid nursery despite historical drainage works, with abundant instream refugia supporting high densities of juvenile salmonids. Good quality salmonid spawning habitat was present locally in glide and pool tailings despite compaction and siltation of substrata. The site was also of value as a holding habitat for adult salmonids with localised deep pool and glide. Whilst some soft sediment accumulations were present (e.g. near clubrush beds), they were compacted and no lamprey ammocoetes were recorded. Despite high suitability, no European eel or white-clawed crayfish were recorded. While good foraging value existed no otter signs were recorded in the vicinity of the survey area.

Biological water quality, based on Q-sampling, was calculated as **Q3-4 (moderate 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 location of the site within the Lough Corrib SAC (000297), the aquatic ecological evaluation of site A8 was of **international importance (Table 4.4)**.



Plate 4.8 Representative image of site A8 on the Grange River at Grange Bridge, July 2024

4.1.9 Site B1 – Aghloragh Stream, Omaun More

Site B1 was located on the Ahgloragh Stream (30A26) at a local road crossing. The small lowland depositing stream (FW2) had been straightened and deepened historically resulting in a deep U-shaped channel with 2-4m high banks. The stream suffered from very low summer flows at the time of survey with much of the channel bed exposed and dry. The stream was 2-3m wide with a wetted width of <1.5m. The depth was typically <0.05m with a single plunge pool of 0.5m depth immediately downstream of the perched rendered bridge apron (fish barrier at low flows). The profile comprised riffle with localised pool. The substrata were dominated by heavily compacted and calcified cobble and mixed gravels with scattered boulder. Macrophyte cover of the semi-dry channel was very high with abundant fool's watercress and water mint. Watercress was present but rare. Terrestrial encroachment was high with abundant herbaceous vegetation such as great willowherb. Aquatic bryophyte coverage was moderate with locally frequent *Rhynchostegium riparoides* and some *Leptodictyum riparium*. The riparian areas supported scattered osier (*Salix viminalis*), hawthorn and bramble but were largely open (historically cleared) and bordered areas of wet grassland (GS4).

Brown trout and three-spined stickleback were the only fish species recorded via electro-fishing at site B1 (**Appendix A**). The site was a moderate quality salmonid nursery only given historical modifications, calcification of the bed and very low summer flows. The site provided poor to moderate spawning opportunities for salmonids given heavy compaction of the bed. The site was of poor holding value for adult salmonids due to a paucity of deeper glide and pool. The site was also of poor value for lamprey given heavy compaction of the bed and an absence of areas with deeper silt accumulations. Despite some potential for European eel in localised pool, none were recorded. The substrata were considered too compacted for white-clawed crayfish and none were recorded. No otter signs were recorded in the vicinity of the site despite high foraging value.

Biological water quality, based on Q-sampling, was calculated as **Q3-4 (moderate 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, the aquatic ecological evaluation of site B1 was of **local importance (higher value) (Table 4.4)**.



Plate 4.9 Representative image of site B1 on the Aghloragh Stream, July 2024

4.1.10 Site B2 – Aghloragh Stream, Kilmore

Site B2 was located on the Aghloragh Stream (30A26) at a local road crossing approximately 2.5km downstream of site B1 and 0.6km upstream of the Grange River confluence. The lowland depositing calcareous stream (FW2) (also known locally as the Omaum River) had been locally deepened and straightened historically but retained a good flow diversity and a semi-natural profile. Instream enhancement works by Inland Fisheries Ireland and the Cairde an Chláir angling club had occurred very recently (July 2024), including gravel installations downstream of the bridge. The stream was 3m wide and 0.1-0.3m deep with low lying banks of 1-2m in height (mostly fenced off). Following instream enhancement measures, the profile was dominated by riffle and glide with occasional small pool and a bed of mixed limestone gravels. Natural gravels were also present locally. Natural and installed boulders were scattered throughout the channel improving flow heterogeneity. However, livestock poaching reduced the bed quality in the channel margins where soft sediment accumulations were noted. Filamentous algal cover was locally high indicating enrichment. Macrophyte cover was low and consisted of localised stands of fool's watercress, watercress, brooklime and branched bur-reed. Some yellow iris also grew along the littorals. The bryophytes *Leptodictyum riparium* and *Rhynchostegium riparioides* were locally abundant (on boulder) with some *Pellia endiviifolia*. The largely open banks supported scattered mature alder (*Alnus glutinosa*), blackthorn and osier. The Aghloragh Stream was bordered by improved pasture (GA1) with narrow riparian buffers.

Atlantic salmon, brown trout, pike, stone loach and three-spined stickleback were recorded via electro-fishing at site B2 (**Appendix A**). The site was of high value for salmonids supporting a high density of juvenile trout and lower numbers of salmon. The shallow site was of relatively poor value as a holding habitat for adult salmonids although some small pools and bank undercuts offered valuable habitat. Whilst lamprey spawning was present, no ammocoetes were recorded from small areas of soft sediment. Despite good suitability, no European eel or white-clawed crayfish were recorded. No other signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3-4 (moderate 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), the aquatic ecological evaluation of site B2 was of **local importance (higher value) (Table 4.4)**.



Plate 4.10 Representative image of site B2 on the Aghloragh Stream showing recently installed gravels, July 2024

4.1.11 Site C1 – Lecarrow Stream, Lecarrow

Site C1 was located on the Lecarrow Stream (30L49) at a proposed access track crossing approximately 0.6km upstream of the seasonal Horseleap Lough (site L3). The lowland depositing stream (FW2) had been extensively straightened and deepened as part of land drainage and contained localised stagnant water at the time of the survey (i.e. no flows). The heavily modified U-shaped channel was 2m wide and 0.1m deep with bank heights of 2m. The substrata comprised silt with a high clay fraction. The site was heavily choked with narrow-fruited watercress (*Nasturtium microphyllum*) and fool's watercress with marsh bedstraw (*Galium palustre*), water mint and creeping bent (*Agrostis stolonifera*). Aquatic bryophytes were not recorded. The open riparian areas supported common calcicolous species such as great willowherb, common knapweed, meadowsweet, wild angelica and

field scabious (*Knautia arvensis*) with scattered hawthorn. The site was bordered by improved grassland (GA1) and arable crops (BC1).

No fish were recorded via electro-fishing at site C1. The site was not of fisheries value given extensive historical modifications, siltation pressures and very poor flows. There was no suitability for white-clawed crayfish and the species was not recorded present. 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 B)**. However, it should be noted that this is a tentative rating given poor flows and lack of suitable riffle areas for sampling (as per 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 4.11 Representative image of site C1 on the Lecarrow Stream, July 2024 (semi-dry channel)

4.1.12 Site C2 – Forty Acres Stream, Dangan Eighter

Site C2 was located on the Forty Acres Stream (30F16) at a proposed access track crossing upstream of the R332 road. The lowland calcareous stream (FW2) had been extensively deepened and locally straightened, resulting in a steep trapezoidal channel with poor hydromorphology. The stream suffered from very low summer water levels at the time of survey, with pools of water and imperceptible flows. The stream was 2-2.5m wide and typically less than 0.1m deep. The profile comprised riffle and shallow glide with occasional shallow pools. The substrata were dominated by mixed gravels, sand and small cobble that were compacted and calcified. Boulder was scattered but rare in the vicinity of the bridge. Siltation was moderate and exacerbated by low flows although no soft sediment accumulations were present. The very shallow site was heavily vegetated with abundant

(near total cover) of fool's watercress. Water mint was frequent along the littorals. Aquatic bryophyte cover was low with some *Leptodictyum riparium*, *Pellia endiviifolia*. Colonies of the globose algae *Chaetophora* sp. were present on instream substrata. Terrestrial encroachment of scrub and herbaceous vegetation such as great willowherb was high. The steep banks supported scattered mature ash, grey willow, alder, elder (*Sambucus nigra*) and hawthorn with abundant bramble scrub (WS1). The site was bordered by improved pasture (GA1) with areas of wet grassland (GS4).

Brown trout and three-spined stickleback were the only fish species recorded via electro-fishing at site C2 (**Appendix A**). The site was of low fisheries value given very low summer flows in addition to historical modifications. However, the value would improve under higher flows and a single adult brown trout was recorded. Some good quality salmonid spawning and nursery habitat was present but low flows precluded the presence of higher fish densities at the site. Whilst the site was of some physical value as lamprey spawning habitat, soft sediment nursery areas were not present and low flows would likely preclude the species. Suitability for European eel and white-clawed crayfish was low given a paucity of instream refugia and none were recorded. No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3-4 (moderate 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, the aquatic ecological evaluation of site C2 was of **local importance (higher value) (Table 4.4)**.



Plate 4.12 Representative image of site C2 on the Forty Acres Stream, July 2024

4.1.13 Site C3 – Lecarrow Stream, Brierfield South

Site C3 was located on the Lecarrow Stream (30L49) near the Forty Acres Stream confluence, approximately 2.9km downstream of Horseleap Lough (site L3) in a known karstic area (EPA, 2012). The large lowland depositing stream (FW2), also known locally as the Derreen Stream, had been historically straightened and deepened throughout but had been enhanced in the recent past by Inland Fisheries Ireland (IFI) as part of the Derreen Stream Habitat enhancement project. The swift-flowing alkaline stream was 4-5m wide and 0.1-0.4m deep with locally deeper areas to 1m. The profile was of localised riffle, deep glide and occasional pool. The substrata were dominated by extensive areas of medium gravels (mostly installed) with finer gravel and sand in interstitial spaces. Boulder was scattered. The substrata were partially bedded and exposed to moderate rates of siltation. The site supported abundant fool's watercress with occasional water mint and water starwort (*Callitriche* sp.). Water crowfoot (*Ranunculus* sp.) was rare. The aquatic bryophyte *Rhynchostegium riparioides* was occasional on large boulder. The riparian areas supported scattered mature alder with bramble, meadowsweet and gorse in the understories. The site was bordered by scrub (WS1) and improved pasture (GA1).

Despite high physical suitability for salmonids and other fish species, only a single Atlantic salmon parr was recorded via electro-fishing at site C3 (**Appendix A**). The site was considered a moderate quality salmonid nursery, spawning and holding area. However, the stream is known to run dry periodically given the karstic nature of the surrounding landscape (EPA, 2012), thus impacting the distribution and persistence of fish populations. Whilst there was some physical suitability for lamprey spawning, no suitable nursery (soft sediment) habitat was present. Suitability for European eel was moderate although none were recorded. The site was also physically suitable for white-clawed crayfish although none were recorded. No otter signs were recorded in the vicinity of the site. A non-native mink (*Neovison vison*) was observed at the site.

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 Atlantic salmon, the aquatic ecological evaluation of site C3 was of **local importance (higher value) (Table 4.4)**.



Plate 4.13 Representative image of site C3 on the Lecarrow Stream, July 2024

4.1.14 Site C4 – Abbert River, N63 road crossing

Site C4 was located on the Abbert River (30A01) at the N63 road crossing approximately 0.8km downstream of the Lecarrow Stream confluence. The large lowland depositing river (FW2) featured a semi-natural profile with only localised modifications such as scour protection in vicinity of the road crossing. The alkaline river was 10-12m wide and varied from 0.3m to 1.2m deep. The profile was of deep glide with riffle and pool (i.e. a good flow diversity). The substrata comprised mixed boulder, cobble, gravels, sand and silt. The bed was moderately silted and moderately compacted near the bridge but was largely uncompacted downstream. The site supported frequent water crowfoot (*Ranunculus* sp.) and fool's watercress with occasional water mint and water forget-me-not. Submerged cobble and boulder supported frequent *Fontinalis antipyretica* with occasional *Leptodictyum riparium* and *Cinclidotus fontinaloides*. The north bank supported treelines of mature alder and ash with dense bramble scrub (WS1) while the south bank was more open with scattered immature ash, bramble and amenity grassland (GA2).

Atlantic salmon, brown trout and stone loach were recorded via electro-fishing at site C4 (**Appendix A**). The site was an excellent quality salmonid nursery given ample broken riffle and glide with mixed coarse substrata and macrophyte refugia. As per previous surveys (2022), the site supported the highest densities of Atlantic salmon recorded during the survey. The site was of very high spawning value for salmonids despite compaction and siltation pressures. Deep glide and pool provided high quality holding habitat for adult salmonids. The site was of poor value for lamprey given heavy compaction of the bed and more limited deposits of silt in the vicinity of the survey area (none recorded). While the site had good potential for European eel, none were recorded. No white-clawed crayfish were recorded via hand searching of ample refugia although the species is known from other areas of the Abbert River. No otter signs were recorded in the vicinity of the site despite high foraging value.

Biological water quality, based on Q-sampling, was calculated as **Q4 (good 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 location of the site within the Lough Corrib SAC (000297), the aquatic ecological evaluation of site C4 was of **international importance (Table 4.4)**.



Plate 4.14 Representative image of site C4 on the Abbert River at the N63 road crossing, July 2024

4.1.15 Site D1 – unnamed stream, Cooloo

Site D1 was located on an unnamed tributary of the Dangan Eighter Stream. The channel had been extensively straightened and deepened historically as part of land drainage works, resulting in a homogenous, trapezoidal channel with cleared banks. The 1.5m wide channel was dry at the time of survey with a damp mud base indicating occasional water flows. The presence of macrophytes such as fool’s watercress, water mint and brooklime were further indicators of the occasional presence of aquatic habitats. Aquatic bryophytes were not recorded. Encroachment of the narrow channel by terrestrial grasses and rushes was high. The largely open banks supported scattered hawthorn, gorse, grey willow and bramble scrub (WS1). The site was bordered by semi-improved pasture (GA1), scrub (WS1) and dry meadows (GS2).

Given the dry, ephemeral nature of the channel, no aquatic species or habitats of high conservation value were present, and it was not possible to collect a biological water quality sample.

Given the absence of aquatic species or habitats of higher conservation value, the aquatic ecological evaluation of site D1 was of **local importance (lower value) (Table 4.4)**.



Plate 4.15 Representative image of site D1 on an unnamed stream, July 2024 (dry, ephemeral channel)

4.1.16 Site D2 – Dangan Eighter Stream, Trasternagh North

Site D2 was located on the Dangan Eighter Stream (30D35) at a local road approximately 0.7km downstream of site A5. The small lowland depositing stream (FW2) had been straightened and deepened historically resulting in a deep U-shaped channel. However, the stream retained some good semi-natural characteristics with riffle and glide sequences including localised deeper pool. The stream was 2-2.5m wide and 0.2-0.5m deep with locally deeper areas to 0.8m. The substrata comprised mixed small boulder, cobble and gravels with beds of silt and peat downstream of the road crossing. Siltation was moderate and exacerbated by low summer flows. The site was heavily vegetated with a good diversity of macrophytes. Fool's watercress, branched bur-reed, bog pondweed (*Potamogeton polygonifolius*) and water mint were frequent with localised yellow lily, common clubrush, water forget-me-not and water starwort (*Callitriche* sp.). Water plantain (*Alisma plantago-aquatica*) and spiked water milfoil were present but rare. Aquatic bryophyte coverage was low with localised *Leptodictyum riparium* and *Pellia* sp. on more stable cobble and boulder. Cover of filamentous algae was high, indicating enrichment. The riparian zone featured scattered sitka spruce (*Picea sitchensis*), hawthorn and ash. The site was bordered by wet grassland (GS4) and conifer plantations (WD4).

Brown trout, lamprey (*Lampetra* sp.), stone loach and three-spined stickleback were recorded via electro-fishing at site D2 (**Appendix A**). The site was a good quality salmonid nursery (ample riffle and broken glide with a stoney bed near bridge) although the value was reduced as a result of historical drainage and siltation pressures. Good quality spawning habitat for salmonids and lamprey (gravels) was present locally although again impacted by siltation pressures. Localised deeper pool and glide and bank scours provided some holding opportunities for adult salmonids although the value was reduced given low summer flows. The site was of moderate value as a lamprey nursery, with localised soft sediment accumulations (mostly along the margins) supporting a low density of ammocoetes (5

per m²). Despite some suitability no European eel were recorded. Despite impacts from historical drainage, the site supported a moderate density of white-clawed crayfish ($n=5$, 30 refugia searched), with both adults and juveniles present. No other signs were recorded in vicinity of the site despite some good foraging opportunities.

Biological water quality, based on Q-sampling, was calculated as **Q4 (good 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, lamprey (*Lampetra* sp.) and white-clawed crayfish, the aquatic ecological evaluation of site D2 was of **local importance (higher value) (Table 4.4)**.



Plate 4.16 Representative image of site D2 on the Dangan Eighter Stream, July 2024

4.1.17 Site D3 – Grange River, Cloonascragh

Site D3 was located on the Grange River (30G02) at a local road. The lowland depositing river (FW2) had been extensively deepened historically (not straightened), resulting in a channelised river with low lying banks and poor hydromorphology. The river was between 3-4m wide and typically >1.5m deep. The profile comprised deep glide and pool with no riffle areas. The substrata were dominated by compacted soft sediment with a high clay fraction. Scattered boulder and cobble were present in vicinity of the apron and along areas of historical banks works. The site was very heavily vegetated with near total cover of macrophytes. Yellow lily (*Nuphar lutea*) and broad-leaved pondweed (*Potamogeton natans*) dominated with more occasional water mint, water starwort (*Callitriche* sp.), water forget-me-not, branched bur-reed and water-plantain (*Alisma plantago-aquatica*). Filamentous algal mats were widespread, indicating enrichment. The bryophytes *Fontinalis antipyretica* and *Cinclidotus fontinaloides* were rare. The banks featured very narrow fenced riparian zones which had been cleared historically resulting in almost no shading. The site was bordered by improved pasture (GA1).

Low densities of Atlantic salmon, brown trout, stone loach and three-spined stickleback were recorded via electro-fishing at site D3 (**Appendix A**). However, it should be noted that it was only possible to survey a short section under the local road crossing on the bridge apron given prohibitive depth of >1.6m. Overall the site was of low value for salmonids given poor hydromorphology but likely supported larger adult brown trout in deeper glide given these areas would also serve as holding habitat. The poor spawning habitat and limited well oxygenated organic silt created poor conditions for lamprey. Despite high suitability for European eel and white-clawed crayfish, none were recorded under the bridge (where suitable boulder refugia were present). A recent otter spraint (fish remains only) was recorded on the grassy banktop adjoining the bridge abutment (ITM 556350, 751180).

Biological water quality, based on Q-sampling, was calculated as **Q4 (good status) (Appendix B)**. However, it should be noted that this is a tentative rating given poor flows and lack of suitable riffle areas for sampling (as per Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the location of the site within the Lough Corrib SAC (000297), the aquatic ecological evaluation of site D3 was of **international importance (Table 4.4)**.



Plate 4.17 Representative image of site D3 on the Grange River, July 2024

4.1.18 Site E1 – Lecarrow Stream, Lecarrow

Site E1 was located on the Lecarrow Stream (30L49) at the outflow from Horseleap Lough adjacent to the Proposed Grid Connection. The stream (FW2) had been straightened and deepened historically, resulting in a deep trapezoidal channel 1.5-2m wide with 3-4m high banks. The stream was dry at this location at the time of survey. Being present in a karstic area, the upper reaches of the stream frequently dry out (pers. obs.). The bed supported large boulders, cobble and gravels. Macrophytes were absent although instream boulders supported the moss species *Leptodictyum riparium* and *Fontinalis antipyretica*, indicative of occasional water flows. The riparian areas supported mature

sycamore, pine, rowan (*Sorbus aucuparia*), hawthorn and grey willow with ivy, bramble and fern understories. As the channel was karstic it was not of value to fish or amphibians but could be considered a corridor for mammals moving in and out of Horseleap Turlough.

Given the dry, ephemeral nature of the channel, no aquatic or fisheries habitats were present and it was not possible to collect a biological water quality sample. Given poor fluvial connectivity with downstream habitats the site is unlikely to support fish populations.

Given the absence of aquatic species or habitats of higher conservation value, the aquatic ecological evaluation of site D1 was of **local importance (lower value)** (Table 4.4).



Plate 4.18 Representative image of site E1 on the Lecarrow Stream, July 2024

4.1.19 Site E2 – Forty Acres Stream, Dangan Eighter

Site E2 was located on the Forty Acres Stream (30F16) at the N63 road and Proposed Grid Connection crossing. The lowland stream (FW2) had been historically deepened and realigned, with bank strengthening works in vicinity of the road box culvert. The stream was 1.5-2m wide and 0.1-0.3m deep with banks of up to 3m. The profile was of very slow-flowing shallow glide. Riffle habitat was absent and pool was confined to upstream of the culvert. The substrata comprised mixed cobbles and gravels with occasional small boulder. The bed was heavily compacted and calcified with high siltation. The site supported occasional fool's watercress and branched bur-reed in superficial soft sediment deposits along the margins. The riparian areas supported scattered alder with gorse, bramble and meadowsweet in the understories. The site was bordered by heavily improved pasture (GA1) and scrub (WS1).

Brown trout was the only fish species recorded via electro-fishing at site E2 (**Appendix A**). The site was a low value salmonid nursery given the poor hydromorphology, low summer flows, compacted bed and evident siltation pressures, with only a low density of fish recorded. This limited available

spawning habitat while diminishing refugia for juvenile fish. Poor summer flows also limited the supply of oxygenated water. Bed compaction reduced suitability for European eel (none recorded). The site was unsuitable for lamprey given the compaction of substrata and presence of shallow soft sediment areas only. While some low suitability existed for white-clawed crayfish (i.e. calcareous stream habitat), historical drainage and the calcified bed created poorer conditions for the species (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 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, the aquatic ecological evaluation of site E2 was of **local importance (higher value) (Table 4.4)**.



Plate 4.19 Representative image of site E2 on the Forty Acres Stream, July 2024

4.1.20 Site E3 – Feagh East Stream, Feagh West

Site E3 was located on the Feagh East Stream (30F24), a tributary of the Abbert River, at the L6324 road and Proposed Grid Connection crossing. The lowland stream (FW2) had been extensively straightened and deepened historically, resulting in a homogenous U-shaped profile. The stream was 3-4m wide and 0.3-0.6m deep with banks of up to 2m. The profile was of very slow-flowing glide (near stagnant). The substrata were dominated by abundant silt deposits with localised areas of silted mixed gravels and cobble. Macrophyte cover was very high with abundant branched bur-reed, common duckweed (*Lemna minor*) and fool's watercress in addition to frequent water plantain. The cleared banks supported herbaceous vegetation and isolated alder only. The site was bordered by semi-improved pasture (GA1) with very narrow borders.

Three-spined stickleback were the only fish species recorded via electro-fishing at site E3 (**Appendix A**). With the exception of high numbers of this species, the site was of poor fisheries value given extensive modifications, siltation pressures, absence of clean substrata and poor flows. However, there was some low suitability for both European eel and white-clawed crayfish (abundant silt & macrophyte refugia) although neither were recorded. No otter signs were recorded in the vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status) (Appendix B)**. 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 E3 was of **local importance (lower value) (Table 4.4)**.



Plate 4.20 Representative image of site E3 on the Forty Acres Stream, July 2024

4.1.21 Site E4 – Grange River, Ballinderry Bridge

Site E4 was located on the lower reaches of the Grange River (30G02) at Ballinderry Bridge (R347), a Proposed Grid Connection crossing. The lowland depositing river (FW2) had been extensively deepened historically (but not straightened) as part of arterial drainage. The river was 10-12m wide and ranged from 0.5-3m deep with a profile of slow-flowing glide and pool (no riffle). The substrata comprised bedded boulder, cobble, localised coarse gravels and silt with some calcification. Downstream of the bridge apron the river had frequent deep pool habitat and was very heavily vegetated by macrophytes. Common clubrush and broad-leaved pondweed were abundant with frequent yellow water lily. River water dropwort, water crowfoot, water plantain, lesser water parsnip, blue water speedwell, water starwort (*Callitriche* sp.), water mint, branched bur-reed and fool's watercress were all occasional. Instream boulder supported *Fontinalis antipyretica* with occasional

Rhynchosstegium riparioides and *Leptodictyum riparium*. The aquatic vegetation community was considered representative of Annex I floating river vegetation habitat (3260). The riparian areas supported scattered grey willow, hawthorn, alder and ash with reed canary grass, great willowherb, meadowsweet, nettle (*Urtica dioica*) and hedge bindweed (*Calystegia sepium*). The site was bordered by improved pasture (GA1) with very narrow borders.

Atlantic salmon, brown trout, pike, stone loach and minnow (*Phoxinus phoxinus*) were recorded via electro-fishing at site E4 (**Appendix A**). The site was a moderate quality salmonid nursery only, with the value reduced due to historical drainage and the absence of broken riffle and swift flowing glide. However, deep glide and pool offered good holding opportunities for adult salmonids. Suitable spawning habitat for salmonids and lamprey was absent. While the channel had some depositing areas, the compacted nature the soft sediment areas with very limited flow created poor conditions for lamprey ammocoetes. There was good suitability for European eel and the species likely occurs in deeper glide and pool. The site was of highest value as a coarse fish habitat with abundant spawning areas present. Despite some low suitability, no white-clawed crayfish were recorded. No otter signs were recorded in vicinity of the site (few marking opportunities).

Biological water quality, based on Q-sampling, was calculated as **Q4 (good status) (Appendix B)**. 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 location of the site within the Lough Corrib SAC (000297), the aquatic ecological evaluation of site E4 was of **international importance (Table 4.4)**.



Plate 4.21 Representative image of site E4 on the Grange River at Ballinderry Bridge, July 2024

4.1.22 Site L1 – Derrynacrick Lough (west)

Site L1 was located at Derrynacrick Lough (west), a small broadly circular 0.7ha mesotrophic lake in the centre of the Proposed Wind Farm site. The lake was situated in a peat basin and ranged from 1m to >4m deep with a very deep and often flocculent bed of (humic) silt. The littorals were densely vegetated with abundant bulrush, bog bean (*Menyanthes trifoliata*), greater pond sedge (*Carex riparia*) and common reed. Small stands of yellow lily, white lily (*Nymphaea alba*), common clubrush and broad-leaved pondweed were frequent around the margins. The quaking bog littorals also supported marsh cinquefoil (*Comarum palustre*), purple loosestrife, marsh marigold (*Caltha palustris*), water horsetail (*Equisetum fluviatile*) and bottle sedge (*Carex rostrata*). The lake margins supported scrubby grey willow, bog myrtle (*Myrica gale*), downy birch (*Betula pubescens*) and gorse (*Ulex euopaeus*) that graded into areas of degraded raised bog (PB1) and cutover bog (PB4).

Site L1 was of moderate suitability for brown trout which were observed during the site visit. The lake also had some good suitability for European eel given suitable depths, good quality foraging habitat and connectivity to the Dangan Eighter Stream. The peatland lake had no suitability for white-clawed crayfish but did have some suitability for smooth newt albeit none were recorded via sweep netting. No otter signs were recorded in vicinity of the site despite good foraging value.

The near threatened shady whirligig beetle *Gyrinus natator* (Foster et al., 2009) was recorded via sweep sampling at site L1 (**Appendix B**). No other macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via sweep sampling.

Given the presence of sand the Red-listed *Gyrinus natator*, the aquatic ecological evaluation of site L1 was of **local importance (higher value)** (**Table 4.4**).



Plate 4.22 Representative image of site L1 at Derrynacrick Lough (west), July 2024

4.1.23 Site L2 – Derrynacrick Lough (east)

Site L2 was a small wetland and pond basin of c.0.02ha adjoining the Proposed Wind Farm, adjacent to the Dangan Eighter Stream. The site featured a small, heavily vegetated pond basin in an extensive area of reed swamp habitat (FS1) dominated by common reed. Scattered stands of common clubrush were also present with marsh bedstraw, marsh cinquefoil, wild angelica, water horsetail, meadowsweet and nettle. The small pond basin (0.5-1m deep with a silt bed) featured near total cover of broad-leaved pondweed. The site was fringed by mature grey willow. The site was bordered by mature sitka spruce plantation (WD4) and cutover bog (PB4) to the north and west.

The pond was not considered of value to fish given its very small size, heavy macrophyte cover and highly peat-stained water. The pond had low suitability for amphibians albeit none were recorded via sweep netting. There was no suitability for white-clawed crayfish and the species was not recorded during the survey. No otter signs were recorded in the vicinity of the site.

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

Given the absence of aquatic species or habitats of higher conservation value, the aquatic ecological evaluation of site L2 was of **local importance (lower value)** (Table 4.4).



Plate 4.23 Representative image of site L2 at Derrynacrick Lough (east), July 2024

4.1.24 Site L3 – Horseleap Lough

Site L3 was located at Horseleap Lough, a large wetland which seasonally extends to 4-5ha in surface area with several small ephemeral pond areas. The site once supported a permanent lake but was historically drained in the 1950s (BEC, 2015). Despite historical drainage, the wetland retained good semi-natural characteristics. The wetland had localised ponding areas but was predominantly a reed

swamp habitat (FS1) dominated by bulrush and common clubrush with more localised greater pond sedge. Water mint, water horsetail and marsh bedstraw were also present. The open ponding areas supported bristly stonewort (*Chara hispida*), pond water-crowfoot (*Ranunculus peltatus*), waterplantain and amphibious bistort (*Persicaria amphibia*). The turlough was bordered by pockets of calcareous grassland (GS1) and improved pasture (GA1).

Both three spined stickleback and ten-spined stickleback (*Pungitius pungitius*) were recorded via sweep netting at site L3. With the exception of stickleback species, Horseleap Lough was not of fisheries value given the small, shallow ephemeral nature of the ponding areas. Environmental DNA sampling during previous surveys did not detect European eel or white-clawed crayfish (Triturus, 2023). However, the site was of value for smooth newt and a moderate density of juveniles (efts) was recorded in small ponding areas (as per previous surveys). No otter signs were recorded in vicinity of the site.

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

Given the presence of a smooth newt population, the aquatic ecological evaluation of site L3 was of **local importance (higher value)** (Table 4.4).



Plate 4.24 Representative image of site L3 at Horseleap Lough, July 2024

4.1.25 Site P1 – pond, Cooloo

Site P1 was a small, ephemeral pond basin located in a field hollow adjacent to the Proposed Wind Farm site. The pond does hold water seasonally (Triturus, 2023) but was dry at the time of survey with a dry mud base. The dry basin supported occasional fool’s watercress, lesser water spearwort, redshank (*Persicaria maculosa*) and agricultural grasses. The site was bordered by heavily improved pasture (GA1) with no buffer zones.

Given the dry, ephemeral nature of the pond, no aquatic or fisheries habitats were present and it was not possible to collect a macro-invertebrate sample.

Given the absence of aquatic species or habitats of higher conservation value, the aquatic ecological evaluation of site P1 was of **local importance (lower value) (Table 4.4)**.



Plate 4.25 Representative image of pond site P1, July 2024 (dry, ephemeral pond)

4.1.26 Site P2 – pond, Gorteenlahard

Site P2 was a very small shallow pond containing c.20m² of open water. The pond was very shallow, averaging 0.05m deep at the time of survey with shallow sloping margins and a deep silt bed. Given high turbidity caused by algal blooms (eutrophication) and cattle poaching, macrophytes were limited to marginal stands of fool's watercress with water starwort (*Callitriche* sp.). The site had a low diversity of littoral vegetation given that it was bordered by grazed, heavily improved pasture (GA1) with no buffer zone.

The very shallow pond was not of value to fish and had poor suitability for smooth newt given an absence of macrophytes and very shallow water. The site may be utilised by common frog as a breeding habitat but no amphibians were recorded via sweep netting. No otter signs were recorded in the vicinity of the site.

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

Given the absence of aquatic species or habitats of higher conservation value, the aquatic ecological evaluation of site P2 was of **local importance (lower value) (Table 4.4)**.



Plate 4.26 Representative image of pond site P2, July 2024

4.1.27 Site P3 – pond, Lecarrow

Site P3 was a small, shallow historical pond basin located in a field hollow in an area of reclaimed land. The pond was dry at the time of survey (July 2024) and was considered to rarely hold water given the encroachment from common agricultural weeds and terrestrial grasses.

The ephemeral pond was not of value to fish and had poor suitability for smooth newt given its ephemeral nature. However, the site may be utilised by breeding common frog during wetter periods. No otter signs were recorded in the vicinity of the site.

Due to the dry nature of the site, it was not possible to collect a macro-invertebrate sweep sample.

Given the absence of aquatic species or habitats of higher conservation value, the aquatic ecological evaluation of site P3 was of **local importance (lower value)** (Table 4.4).



Plate 4.27 Representative image of pond site P3, July 2024 (dry, ephemeral pond)

4.1.28 Site P4 – pond, Lecarrow

Site P4 was a small circular pond basin adjacent to the Proposed Wind Farm site containing c.200m² of open water at the time of survey. The pond was 0.1-0.2m deep and a homogenous bed composed exclusively of deep silt. The site was highly turbid with a cyanobacterial bloom evident (i.e. hyper-eutrophic). Macrophytes were limited to a narrow fringe of emergent branched bur-reed with spike rush (*Eleocharis palustris*) and creeping bent grass. Filamentous algae were abundant on the silt bed, further indicating enrichment. The site had a low diversity of littoral vegetation given that it was bordered by grazed heavily improved pasture (GA1) with no buffer zone.

The very shallow pond was not of value to fish and had poor suitability for smooth newt given an absence of macrophytes and highly eutrophic conditions. However, the site may be utilised by common frog (none recorded via sweep netting). No otter signs were recorded in the vicinity of the site.

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

Given the absence of aquatic species or habitats of higher conservation value, the aquatic ecological evaluation of site P4 was of **local importance (lower value)** (Table 4.4).



Plate 4.28 Representative image of pond site P4, July 2024

4.1.29 Site P5 – pond, Lecarrow

Site P5 was a seasonal pond and wetland area located in reclaimed agricultural land adjacent to the Proposed Wind Farm site. Excavations and berms were evident near the historical pond basin. The small circular shaped hollow c. 150m² in area was dry at the time of survey with an absence of aquatic vegetation. The dry basin supported vegetation common in wetter patches of agricultural land including rushes (*Juncus* spp.) buttercups (*Ranunculus* spp.), broad-leaved dock (*Rumex obtusifolius*) and thistles (*Cirsium* spp.). The site was bordered by heavily improved pasture (GA1).

The ephemeral pond was not of value to fish or smooth newt given an absence of persisting aquatic habitats. However, the site may be utilised by breeding common frog during wetter periods. No otter signs were recorded in the vicinity of the site.

Due to the dry nature of the site, it was not possible to collect a macro-invertebrate sweep sample.

Given the absence of aquatic species or habitats of higher conservation value, the aquatic ecological evaluation of site P5 was of **local importance (lower value)** (Table 4.4).



Plate 4.29 Representative image of pond site P5, July 2024 (dry, ephemeral pond)

4.1.30 Site P6 – pond, Lecarrow

Site P6 was a small, shallow historical pond basin located in a field hollow adjacent to the Proposed Wind Farm site. In contrast to previous surveys (2022), the pond was dry at the time of survey. The dry mud base supported amphibious bistort and spike rush and likely held water seasonally. The site was bordered by improved pasture (GA1) with hawthorn-dominated hedgerows (WL1).

The ephemeral pond was not of value to fish and had poor suitability for smooth newt given an absence of persisting aquatic habitats. However, the site may be utilised by breeding common frog during wetter periods. No otter signs were recorded in the vicinity of the site.

Given the dry nature of the site, it was not possible to collect a macro-invertebrate sweep sample.

Due to the absence of aquatic species or habitats of higher conservation value, the aquatic ecological evaluation of site P6 was of **local importance (lower value)** (Table 4.4).



Plate 4.30 Representative image of pond site P6, July 2024 (dry, ephemeral pond)

4.1.31 Site P7 – pond, Polladooey

Site P7 was a very small, shrinking pond basin of c.5m² in a field hollow adjacent to the Lecarrow Stream and the Proposed Wind Farm site. The pond was <0.1m deep with high turbidity caused by both a cyanobacterial bloom and livestock poaching. The bed was composed entirely of deep silt. Macrophytes were absent with some creeping bent encroachment. Cover of filamentous algae on the bed was high. The pond was bordered by a dry calcareous meadow habitat (GS2) with low cattle grazing pressure.

The very shallow pond was not of value to fish and had poor suitability for smooth newt given an absence of macrophytes, very shallow water and likely ephemeral nature. However, the site may be utilised by common frog as a breeding habitat. No amphibians were recorded via sweep netting. No otter signs were recorded in the vicinity of the site.

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

Given the absence of aquatic species or habitats of higher conservation value, the aquatic ecological evaluation of site P7 was of **local importance (lower value)** (Table 4.4).



Plate 4.31 Representative image of pond site P7, July 2024

4.2 White-clawed crayfish survey

White-clawed crayfish were recorded from sites A1 and D2 on the Dangan Eighter Stream at low densities (following the density criteria of Peay, 2003). Despite widespread suitability in the survey area, no crayfish were recorded elsewhere via hand-searching/sweep netting of instream refugia inspection of otter spraint sites.



Plate 4.32 Crayfish burrows in muddy banks at site A1 on the Dangan Eighter Stream, July 2024



Plate 4.33 White-clawed crayfish remains in otter spraint at site A1 on the Dangan Eighter Stream, July 2024



Plate 4.34 White-clawed crayfish hatchling recorded at site D2 on the Dangan Eighter Stream, July 2024

4.3 Biological water quality (macro-invertebrates)

The near threatened shady whirligig beetle *Gyrinus natator* was recorded via sweep sampling at site L1 (**Appendix B**).

With the exception of white-clawed crayfish (site D2, see above), no other rare or protected macro-invertebrate species (according to national red lists) were recorded in the biological water quality samples taken from a total of 19 no. wetted riverine sites in July 2024 (**Appendix B**).

A total of 3 no. sites on the Abbert River (site C4), Dangan Eighter Stream (D2) and Grange River (E4) achieved **Q4 (good status)** water quality and thus met the target good status ($\geq Q4$) requirements of the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 and the Water Framework Directive (2000/60/EC) (**Figure 4.1**). This was given the presence of at least one group A taxa in fair numbers (5% of total abundance), either the mayfly *Ecdyonurus dispar* or the *Ephemera danica* (**Appendix B**).

A total of 5 no. sites on the Grange River (A7, A8), Aghloragh Stream (B1, B2) and Forty Acres Stream (C2) achieved **Q3-4 (moderate status)** water quality (**Figure 4.1**). Despite the presence of the EPA group A mayfly species *Ecdyonurus dispar* and or *Ephemera danica*, or the stonefly *Protonemura meyeri*, these were only recorded in low numbers (<5% of total sample) and thus did not meet the qualifying criteria for good status as set out by Toner et al. (2005).

A total of 11 no. sites (i.e. A1, A2, A3, A4, A5, A5, C1, C3, D3, E2 & E3) 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*), non-biting midge larvae (non-*Chironomus* sp.) and hoglouse (*Asellus aquaticus*) (**Appendix B**).

The ratings for several sites (i.e. sites A2, A3, A4, A5, A6, C1, D3 & E4) were tentative given poor summer flows and an absence of riffle areas for sampling (as per Toner et al., 2005).

Sites D1 on an unnamed Dangan Eighter Stream tributary and E1 the Lecarrow Stream were dry at the time of survey and thus it was not possible to collect a biological water quality sample at these locations.

Table 4.1 Comparison of 2022 and 2024 biological water quality (Q-ratings) at riverine sites in vicinity of the Proposed Project

Site no.	Watercourse	EPA code	September 2022		August 2024	
			Q-rating	WFD status	Q-rating	WFD status
A1	Dangan Eighter Stream	30D35	n/a	n/a	Q3	Poor
A2	Unnamed stream	n/a	n/a	n/a	Q3*	Poor
A3	Unnamed stream	n/a	Q2-3*	Poor	Q3*	Poor
A4	Unmapped channel	n/a	Q2*	Bad	Q2-3*	Poor
A5	Dangan Eighter Stream	30D35	n/a	n/a	Q2-3*	Poor
A6	Unmapped channel	n/a	Q2*	Bad	Q2-3*	Poor
A7	Grange River	30G02	Q3-4	Moderate	Q3-4	Moderate
A8	Grange River	30G02	Q3-4	Moderate	Q3-4	Moderate
B1	Ahgloragh Stream	30A26	Q3-4	Moderate	Q3-4	Moderate
B2	Ahgloragh Stream	30A26	Q4	Good	Q3-4	Moderate
C1	Lecarrow Stream	30L49	n/a	n/a	Q2-3*	Poor
C2	Forty Acres Stream	30F16	Q3*	Poor	Q3-4	Moderate
C3	Lecarrow Stream	30L49	Q3	Poor	Q3	Poor
C4	Abbert River	30A01	Q3-4	Moderate	Q4	Good
D1	Unnamed stream	n/a	n/a	n/a	n/a - dry	n/a
D2	Dangan Eighter Stream	30D35	Q4	Good	Q4	Good
D3	Grange River	30G02	n/a	n/a	Q3*	Poor
E1	Lecarrow Stream	30L49	n/a	n/a	n/a - dry	n/a
E2	Forty Acres Stream	30F16	n/a	n/a	Q3	Poor
E3	Feagh East Stream	30F17	n/a	n/a	Q3	Poor
E4	Grange River	30G02	n/a	n/a	Q4*	Good

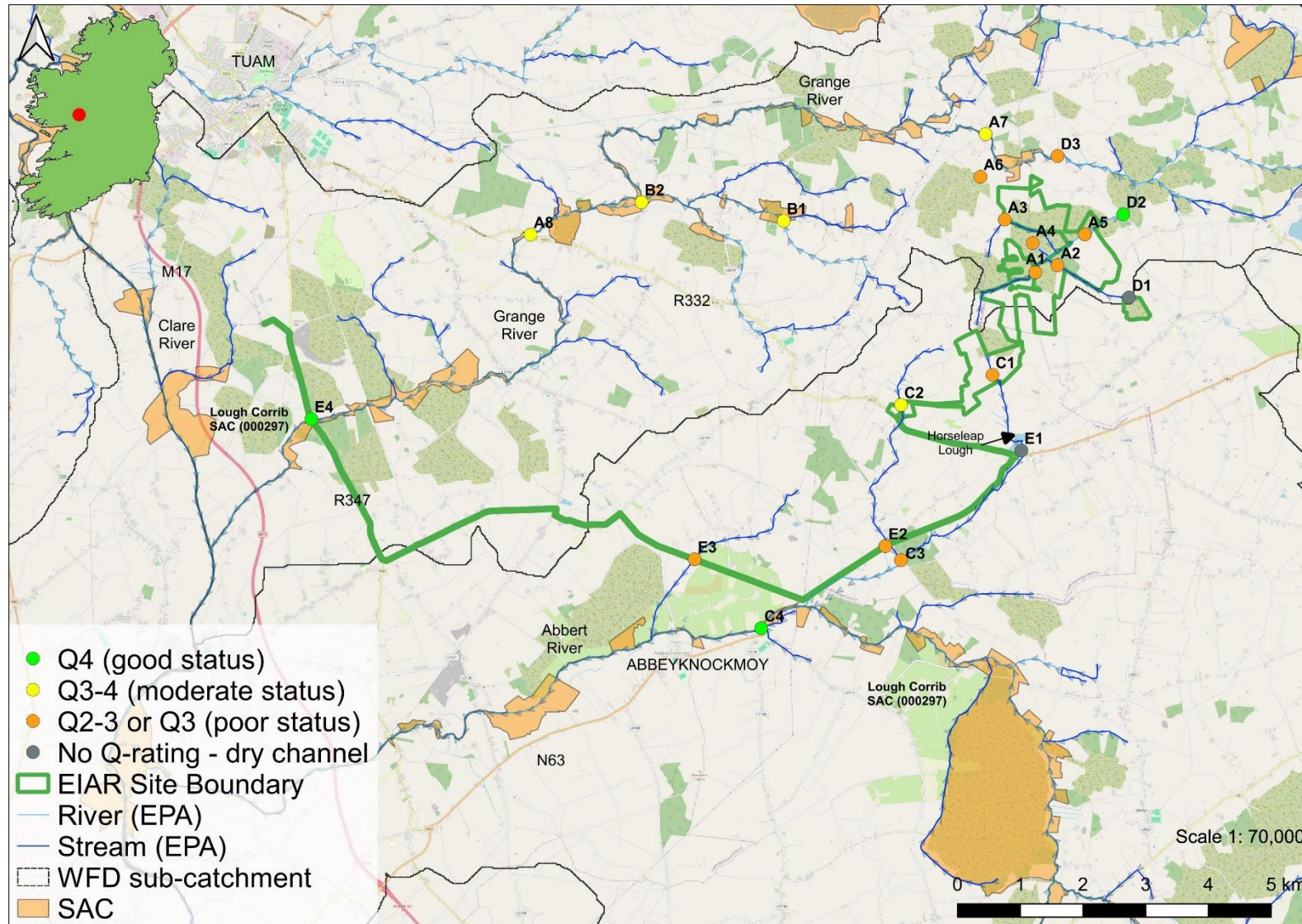


Figure 4.1 Overview of the biological water quality status in the vicinity of the Proposed Project, July 2024

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

Site	Watercourse	Atlantic salmon	Brown trout	<i>Lampetra</i> sp.	Other species
A1	Dangan Eighter Stream	Not recorded	Not recorded	Not recorded	Three-spined stickleback
A2	Unnamed stream	Not recorded	Not recorded	Not recorded	No fish recorded
A3	Unnamed stream	Not recorded	Not recorded	Not recorded	No fish recorded
A4	Unmapped channel	Not recorded	Not recorded	Not recorded	No fish recorded
A5	Dangan Eighter Stream	Not recorded	Not recorded	Not recorded	n/a – too deep for electro-fishing
A6	Unmapped channel	Not recorded	Not recorded	Not recorded	No fish recorded
A7	Grange River	High	Medium	Not recorded	Pike, stone loach
A8	Grange River	High	High	Not recorded	Pike, stone loach, three-spined stickleback
B1	Ahgloragh Stream	Not recorded	Low	Not recorded	Three-spined stickleback
B2	Ahgloragh Stream	Medium	High	Not recorded	Pike, stone loach, three-spined stickleback
C1	Lecarrow Stream	Not recorded	Not recorded	Not recorded	No fish recorded
C2	Forty Acres Stream	Not recorded	Low	Not recorded	Three-spined stickleback
C3	Lecarrow Stream	Low	Not recorded	Not recorded	
C4	Abbert River	High	Medium	Not recorded	Stone loach
D1	Unnamed stream	Not recorded	Not recorded	Not recorded	No fish recorded (dry channel)
D2	Dangan Eighter Stream	Not recorded	Medium	Low	Stone loach, three-spined stickleback
D3	Grange River	Low	Low	Not recorded	Stone loach, three-spined stickleback
E1	Lecarrow Stream	Not recorded	Not recorded	Not recorded	No fish recorded (dry channel)
E2	Forty Acres Stream	Not recorded	Low	Not recorded	
E3	Feagh East Stream	Not recorded	Not recorded	Not recorded	Three-spined stickleback
E4	Grange River	Medium	Low	Not recorded	Pike, minnow
L1	Derrynacrick Lough (west)	Not recorded	Not recorded	Not recorded	Fisheries appraisal only (brown trout observed)
L2	Derrynacrick Lough (east)	Not recorded	Not recorded	Not recorded	Fisheries appraisal only
L3	Horseleap Lough	Not recorded	Not recorded	Not recorded	Fisheries appraisal only (three-spined & ten-spined stickleback recorded via sweep netting)
P1	Unnamed pond	Not recorded	Not recorded	Not recorded	Fisheries appraisal only
P2	Unnamed pond	Not recorded	Not recorded	Not recorded	Fisheries appraisal only
P3	Unnamed pond	Not recorded	Not recorded	Not recorded	Fisheries appraisal only
P4	Unnamed pond	Not recorded	Not recorded	Not recorded	Fisheries appraisal only

Site	Watercourse	Atlantic salmon	Brown trout	<i>Lampetra</i> sp.	Other species
P5	Unnamed pond	N/A	N/A	N/A	Fisheries appraisal only
P6	Unnamed pond	N/A	N/A	N/A	Fisheries appraisal only
P7	Unnamed pond	N/A	N/A	N/A	Fisheries appraisal only

Table 4.3 Summary of aquatic species and habitats of higher conservation value recorded in the vicinity of the Proposed Project, July 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	Dangan Eighter Stream	Low density recorded	Regular spraint site	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	Unnamed stream	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
A4	Unmapped channel	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
A5	Dangan Eighter Stream	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
A6	Unmapped channel	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
A7	Grange River	None recorded	No signs recorded	Not present	None recorded	None recorded	Atlantic salmon
A8	Grange River	None recorded	No signs recorded	Floating river vegetation (3260)	None recorded	None recorded	Atlantic salmon
B1	Ahgloragh Stream	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
B2	Ahgloragh Stream	None recorded	No signs recorded	Not present	None recorded	None recorded	Atlantic salmon
C1	Lecarrow Stream	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
C2	Forty Acres Stream	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
C3	Lecarrow Stream	None recorded	No signs recorded	Not present	None recorded	None recorded	Atlantic salmon
C4	Abbert River	None recorded	No signs recorded	Not present	None recorded	None recorded	Atlantic salmon
D1	Unnamed stream	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
D2	Dangan Eighter Stream	Low density recorded	No signs recorded	Not present	None recorded	None recorded	Lamprey (<i>Lampetra</i> sp.)
D3	Grange River	None recorded	Spraint site	Not present	None recorded	None recorded	Atlantic salmon
E1	Lecarrow Stream	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded

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
E2	Forty Acres Stream	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
E3	Feagh East Stream	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
E4	Grange River	None recorded	No signs recorded	Floating river vegetation (3260)	None recorded	None recorded	Atlantic salmon
L1	Derrynacrick Lough (west)	None recorded	No signs recorded	Not present	None recorded	Shady whirligig beetle (<i>Gyrinus natator</i>)	None recorded
L2	Derrynacrick Lough (east)	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
L3	Horseleap Lough	None recorded	No signs recorded	Not present	None recorded	None recorded	Smooth newt
P1	Unnamed pond	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
P2	Unnamed pond	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
P3	Unnamed pond	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
P4	Unnamed pond	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
P5	Unnamed pond	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
P6	Unnamed pond	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded
P7	Unnamed pond	None recorded	No signs recorded	Not present	None recorded	None recorded	None recorded

Conservation value: White-clawed crayfish (*Austropotamobius pallipes*), 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'). White-clawed crayfish are listed as 'Endangered' according to the IUCN Red List (Füreder et al., 2010). Atlantic salmon are also protected under the Wild Salmon and Sea Trout Tagging Scheme (Amendment) Regulations. Smooth newt (*Lissotriton vulgaris*) are protected under the Irish Wildlife Acts 1976-2023. The shady whirligig beetle (*Gyrinus natator*) is listed as near threatened in Ireland (Foster et al., 2009).

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	Dangan Eighter Stream	30D35	Local importance (higher value)	White-clawed crayfish & otter recorded
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	Unnamed stream	n/a	Local importance (lower value)	No aquatic species or habitats of high conservation value; Q3 (poor status) water quality (tentative rating)
A4	Unmapped channel	n/a	Local importance (lower value)	No aquatic species or habitats of high conservation value; Q2-3 (poor status) water quality (tentative rating)
A5	Dangan Eighter Stream	30D35	Local importance (lower value)	No aquatic species or habitats of high conservation value; Q2-3 (poor status) water quality (tentative rating)
A6	Unmapped channel	n/a	Local importance (lower value)	No aquatic species or habitats of high conservation value; Q2-3 (poor status) water quality (tentative rating)
A7	Grange River	30G02	International importance	Located within the Lough Corrib SAC (000297)
A8	Grange River	30G02	International importance	Located within the Lough Corrib SAC (000297)
B1	Ahgloragh Stream	30A26	Local importance (higher value)	Salmonids recorded
B2	Ahgloragh Stream	30A26	Local importance (higher value)	Salmonids (including Atlantic salmon) recorded
C1	Lecarrow Stream	30L49	Local importance (lower value)	No aquatic species or habitats of high conservation value; Q2-3 (poor status) water quality (tentative rating)
C2	Forty Acres Stream	30F16	Local importance (higher value)	Salmonids recorded
C3	Lecarrow Stream	30L49	Local importance (higher value)	Atlantic salmon recorded
C4	Abbert River	30A01	International importance	Located within the Lough Corrib SAC (000297)
D1	Unnamed stream	n/a	Local importance (lower value)	No aquatic species or habitats of high conservation value; dry, ephemeral channel
D2	Dangan Eighter Stream	30D35	Local importance (higher value)	Salmonids, lamprey (<i>Lampetra</i> sp.) & white-clawed crayfish recorded
D3	Grange River	30G02	International importance	Located within the Lough Corrib SAC (000297)
E1	Lecarrow Stream	30L49	Local importance (lower value)	No aquatic species or habitats of high conservation value; dry, ephemeral channel

Site no.	Watercourse	EPA code	Evaluation of importance	Rationale summary
E2	Forty Acres Stream	30F16	Local importance (higher value)	Salmonids recorded
E3	Feagh East Stream	30F17	Local importance (lower value)	No aquatic species or habitats of high conservation value; Q3 (poor status) water quality (tentative rating)
E4	Grange River	30G02	International importance	Located within the Lough Corrib SAC (000297)
L1	Derrynacrick Lough (west)	30_413	Local importance (higher value)	Salmonids and Red-listed <i>Gyrinus natator</i> recorded
L2	Derrynacrick Lough (east)	30_205	Local importance (lower value)	No aquatic species or habitats of high conservation value
L3	Horseleap Lough	30_248	Local importance (higher value)	Smooth newt recorded
P1	Unnamed pond	n/a	Local importance (lower value)	No aquatic species or habitats of high conservation value; dry, ephemeral pond
P2	Unnamed pond	n/a	Local importance (lower value)	No aquatic species or habitats of high conservation value
P3	Unnamed pond	n/a	Local importance (lower value)	No aquatic species or habitats of high conservation value; dry, ephemeral pond
P4	Unnamed pond	n/a	Local importance (lower value)	No aquatic species or habitats of high conservation value
P5	Unnamed pond	n/a	Local importance (lower value)	No aquatic species or habitats of high conservation value; dry, ephemeral pond
P6	Unnamed pond	n/a	Local importance (lower value)	No aquatic species or habitats of high conservation value; dry, ephemeral pond
P7	Unnamed pond	n/a	Local importance (lower value)	No aquatic species or habitats of high conservation value

Conservation value: White-clawed crayfish (*Austropotamobius pallipes*), 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'). White-clawed crayfish are listed as 'Endangered' according to the IUCN Red List (Füeder et al., 2010). 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. Smooth newt (*Lissotriton vulgaris*) are protected under the Irish Wildlife Acts 1976-2023. The shady whirligig beetle (*Gyrinus natator*) is listed as near threatened in Ireland (Foster et al., 2009).

5. Discussion

The watercourses in the vicinity of the Proposed Project were typically lowland depositing river channels which had been heavily modified as part of arterial drainage and land reclamation works. Whilst some good instream recovery had occurred locally (e.g. Grange River, Abbert River), hydromorphological and siltation pressures were evident throughout the survey area.

However, a number of high conservation species and habitats were recorded during the surveys of riverine sites including Annex II Atlantic salmon, lamprey (*Lampetra* sp.), white-clawed crayfish and otter. A total of 7 no. riverine sites (i.e. A1, B1, B2, C2, C3, D2, E2, L1 & L3) were of **local importance (higher value)**. All three sites on the Grange River (A7, A8 & D3) and site C4 on the Abert River were of **international importance** given their location with the Lough Corrib SAC (000297), a site with numerous aquatic qualifying interests including Atlantic salmon, brook lamprey (*Lampetra planeri*), white-clawed crayfish, otter and floating river vegetation (3260) (NPWS, 2017). All four of these sites supported Atlantic salmon during the current survey.

The Annex I habitat 'Water courses of plain to montane levels, with submerged or floating vegetation of the *Ranunculus fluitantis* and *Callitriche-Batrachion* (low water level during summer) or aquatic mosses [3260]' (aka floating river vegetation) was present on the Grange River at site A8 (Grange Bridge) and E4 (Ballinderry Bridge), where several indicator species (EC, 2013) were present including broad-leaved pondweed, curled pondweed and aquatic bryophytes including *Fontinalis antipyretica*.

Broadly speaking, the highest value riverine watercourses in terms of aquatic ecology were the Grange River, Abbert River and, to a lesser degree, the Ahgloragh Stream and Dangan Eighter Stream.

The ponds within vicinity of the Proposed Project (i.e. P1-P7) were small, heavily impacted by agriculture and of low aquatic value, with many being ephemeral (seasonal). All of these sites were of **local importance (lower value)**.

The lake habitats namely Derrynacrick Lough West and Horseleap Lake were higher quality lacustrine habitats. For example, Derrynacrick Lough West supported brown trout populations and a red-listed near threatened shady whirligig beetle *Gyrinus natator*. Despite historical drainage at Horseleap Lake that damaged the ecohydrology of the site, it supported a good diversity of macrophytes in addition to a smooth newt population. Both of these lake habitats were of **local importance (higher value)** given they supported species of high conservation value.

5.1 Fisheries

A typical diversity of fish species for the Corrib catchment was recorded during the electro-fishing survey, with Atlantic salmon, brown trout, lamprey (*Lampetra* sp.), stone loach, pike, minnow and three-spined stickleback captured (**Table 4.2**). A similar fish assemblage was recorded at comparable sites in the previous 2022 surveys, albeit no Red-listed European eel were present in the current survey (**Appendix A**).

Salmonid populations were widespread, with brown trout being recorded from a total of 10 no. sites on the Grange River (A7, A8, D3, E4), Ahgloragh River (B1, B2), Lecarrow Stream (C2), Abbert River (C4), Danagan Eighter Stream (D2) and the Forty Acres Stream (E2) (**Table 4.2**). Brown trout are also known from Derrynacrick Lough (site L1). Annex II Atlantic salmon were recorded from all survey sites

on the Grange River (A7, A8, D3, E4) as well as sites on the Aghloragh River (B2), Lecarrow Stream (C3) and Abbert River (C4). As per previous surveys, lamprey ammocoetes (*Lampetra* sp.) were only recorded from the Dangan Eighter Stream where low densities were present at site D2. The quality of lamprey habitat was generally poor across the survey area (**Appendix A**). Red-listed European eel were not recorded in the current survey and are known to occupy a restricted distribution in the survey area (**Appendix A**). Siltation and hydromorphological 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**).

5.2 Otter

Despite widespread suitability, only a low number of otter signs (all spraint sites) were recorded during the survey. A regular spraint site was present at site A1 on the Dangan Eighter Stream (with crayfish remains) with a spraint also identified at site D3 on the Grange River (fish remains). No otter breeding (holt) or couch (resting) areas were identified in the vicinity of the survey sites in July 2024 or during the previous September 2022 surveys.

This paucity of otter signs aligned with previous surveys and was considered to mainly reflect the influence of low summer flows, karstic geologies and historical instream modifications on the health and distribution of fish populations, the key prey resource of otter (Krawczyk et al., 2016; Ruiz-Olmo & Jiménez, 2009). Otters are food-limited, and prey availability is a crucial factor in determining mortality, breeding success and the status of local populations (Sittenthaler et al., 2019; Ruiz-Olmo et al., 2002). Furthermore, otter sign marking is routinely associated with prominent features such as large instream boulders, and tree root systems (Almeida et al., 2012). Historical drainage significantly reduces instream habitat heterogeneity (O'Grady, 2017) and the availability or marking areas (outposts), which therefore results in the deposition and detection of fewer otter signs such as spraints, irrespective of watercourse utilisation (e.g. for foraging).

The impacts of the occurrence of invasive mink (*Neovison vison*) (**Plate 5.1**) on otter populations in the survey area is unknown given that the nuances of inter-specific competition between these two species are not yet fully understood, with both impacts to otter but more often otter dominance hypothesised (Harrington et al., 2020; García et al., 2020; Melero et al., 2012; Harrington et al., 2009; McDonald et al., 2007; Bonesi et al., 2004).



Plate 5.1 Invasive mink recorded at site C3 on the Lecarrow Stream, July 2024

5.3 White-clawed crayfish

In keeping with previous (2022) surveys, white-clawed crayfish were only recorded from the Dangan Eighter Stream, a tributary of the Grange River. Low densities (according to Peay, 2003) were present at sites A1 and D2, including both juveniles and adults (6-30mm carapace length). Crayfish were also present at site D2 during the previous survey.

Despite multiple historical records (most recent record is 2015; NPWS data; **Figure 3.1**) and good habitat suitability, no white-clawed crayfish were recorded from the Grange River at sites A7 or A8 or D3. Crayfish surveys undertaken at 3 no. sites on the Grange River in June-July 2017 also failed to detect any crayfish (Gammell et al., 2021). Whilst recent eDNA sampling in 2022 (Triturus, 2023) detected crayfish presence at Grange Bride (site A8), this only implies their presence at or upstream of the sampling point and thus the origin of this genetic signature may be an unidentified grange River tributary. Irrespectively, there has been an evident decline in the Grange crayfish population in recent times. This would imply impacts from crayfish plague (*Aphanomyces astaci*) which has been detected via eDNA sampling from the Grange River (Triturus, 2023) and the downstream-connecting Clare River in recent years (since 2018; White et al., 2019). Crayfish plague, which can cause up to 100% mortality in white-clawed crayfish populations (Edgerton et al., 2004), is listed as one of the world's 100 worst invasive species (GISD, 2022; Lowe et al., 2000) and is becoming highly prevalent across Ireland.

Although none were recorded in the current survey (despite good suitability), crayfish are known from the Abbert River as recently as the 2018-2019 period (White et al., 2019), with high densities recorded at Abbey Bridge in July-October 2017 (McFarlane et al., 2019) (**Figure 3.1**). Low densities of white-clawed crayfish are also still present in the upper Abbert catchment (Ballynaboorka River/Mill Stream, grid square M53) (Gammell et al., 2021). White-clawed crayfish often demonstrate a patchy

distribution and low local abundances in a given river system (Sint et al., 2022) and the absence from site C4¹ in the current survey cannot be considered reflective of the watercourse as a whole.

5.4 Biological water quality & pressures

The near threatened shady whirligig beetle *Gyrinus natator* was recorded via sweep sampling at site L1 (**Appendix B**). This species is typical of cutover bog and other shaded bog pools (Foster et al., 2009; Nelson, 2000).

With the exception of white-clawed crayfish (at site D2), no other rare or protected macro-invertebrate species (according to national red lists) were recorded in the biological water quality samples taken from a total of 19 no. wetted riverine sites in July 2024 (**Appendix B**), i.e. none of greater than Least Concern.

A total of 3 no. sites on the Abbert River (site C4), Dangan Eighter Stream (D2) and Grange River (E4) achieved **Q4 (good status)** water quality. However, all other sampling sites failed to meet the target good status ($\geq Q4$) 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, 2023), biological water quality results were broadly similar to 2022 (**Table 4.1**), i.e. less than good status. Low summer flows and hydromorphological modifications often resulted in tentative Q-ratings² for the survey sites, as per the guidelines of Toner et al. (2005).

In general, the biological water quality of the survey area was unsatisfactory and of **poor status (Q2-3 or Q3)** with significant siltation, eutrophication and hydromorphological impacts evidently contributing to a reduction in water quality. Abstraction and hydromorphology are among the primary threats to water quality within the survey area (EPA data) and this was observed during the current and previous site surveys.

¹ eDNA sampling detected white-clawed crayfish at site C4 in the previous survey (Triturus, 2023)

² The ratings for sites A2, A3, A4, A5, A6, C1, D3 & E4 were tentative given poor summer flows and an absence of riffle areas for sampling

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7. Appendix A – Fisheries assessment report

Please see accompanying fisheries assessment report

Fisheries assessment for the proposed Cooloo Wind Farm, Co. Galway



Prepared by Triturus Environmental Ltd. for MKO

January 2025

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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 Cooloo Wind Farm (hereafter 'Proposed Project'), located near Abbeyknockmoy, Co. Galway.

The survey was undertaken to establish baseline fisheries data used in the preparation of the EIAR for the Proposed Project. In order to gain an accurate overview of the existing and potential fisheries value of the watercourses within the vicinity of the Proposed Project, inclusive of the Proposed Grid Connection, a catchment-wide electro-fishing survey across $n=21$ riverine sites was undertaken (**Table 2.1; Figure 2.1**). A fisheries appraisal of 3 no. lake sites and 7 no. ponds was also undertaken. Electro-fishing helped to identify the importance of the watercourses as nurseries and habitats for salmonids, lamprey (*Lampetra* sp.) and European eel (*Anguilla anguilla*). Other species of lower conservation value were also recorded. The presence and or absence of fish populations and or associated supporting habitat would help inform impact assessment and any subsequent mitigation for the development.

Triturus Environmental Ltd. made an application under Section 14 of the Fisheries (Consolidation) Act, 1959 as substituted by Section 4 of the Fisheries (Amendment) Act, 1962, to undertake a catchment-wide electro-fishing survey in the vicinity of the proposed Cooloo wind farm. The surveys were undertaken in July 2024.

1.2 Fisheries (desktop review)

The Grange River, a major tributary of the Clare River, is a spring-fed river which rises some 5km north of Summerville Lough. Following arterial drainage works (which significantly impacted fisheries habitat; Browne & Gallagher, 1987), the Grange River was subjected to extensive fisheries rehabilitation works during the 1990s (O'Connor, 2007). The river is known to support Atlantic salmon (*Salmo salar*), brown trout (*Salmo trutta*), pike (*Esox lucius*), stone loach (*Barbatula barbatula*) and *Lampetra* sp. (Triturus 2022 data; Gordon et al., 2021; O'Briain et al., 2019a; O'Connor, 2007).

The Ahgloragh River, a short tributary of the Grange River, is known to support Atlantic salmon, brown trout, stone loach and three-spined stickleback (*Gasterosteus aculeatus*) (Triturus 2022 data; Gordon et al., 2021; O'Briain et al., 2019a).

The Abbert River, another major tributary of the Clare River, supports Atlantic salmon, brown trout, pike, stone loach and three-spined stickleback (Triturus 2022 data; O'Briain et al., 2019; Kelly et al., 2011) in addition to *Lampetra* sp. (O'Connor, 2007). Having previously been modified by arterial drainage, rehabilitation works have restored areas of this river and it is now considered to provide good salmonid habitat (O'Reilly, 2009). Brown trout growth in the river has been noted as 'very slow' based on the criteria of Kennedy and Fitzmaurice (1971) (Kelly et al., 2011). From a genetic perspective, both the Abbert and Grange rivers contribute significantly to the adult brown trout population of Lough Corrib (Delanty et al., 2021; Massa-Gallucci et al., 2010).

During the previous survey (September 2022), the Danagan Eighter Stream, a tributary of the Grange River, was found to support brown trout, lamprey (*Lampetra* sp.), stone loach, three-spined stickleback and non-native roach (*Rutilus rutilus*) (Triturus 2022 data).

Three-spined stickleback was the only fish species recorded from the Forty Acres Stream, with no fish recorded from 2 no. sites on the Lecarrow Stream (Triturus 2022 data).

There was no fisheries data available for the other survey watercourses prior to this survey.

2. Methodology

2.1 Fish stock 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 proposed Cooloo wind farm on the 24th, 25th, 26th, and 27th July 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 21 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 high conductivity waters of the sites a voltage of 200-240v, frequency of 35-40Hz and pulse duration of 3.5-4ms was utilised to draw fish to the anode without causing physical damage.

2.1.2 Lamprey

Electro-fishing for lamprey ammocoetes was conducted using targeted quadrat-based electro-fishing (as per Harvey & Cowx, 2003) in objectively suitable areas of sand/silt, where encountered. As lamprey take longer to emerge from silts and require a more persistent approach, they were targeted at a lower frequency (30Hz) burst DC pulse setting which also allowed detection of European eel in sediment, if present. Settings for lamprey followed those recommended and used by Harvey & Cowx (2003), APEM (2004) and Niven & McAuley (2013). Using this approach, the anode was placed under

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

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

2.2 Fisheries habitat

A fisheries habitat appraisal of all 15 no. 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 $n=31$ electro-fishing & fisheries appraisal survey sites in the vicinity of the Proposed Project

Site no.	Watercourse	EPA code	Location	X (ITM)	Y (ITM)
Electro-fishing site					
A1	Dangan Eighter Stream	30D35	Cooloo	556015	749329
A2	Unnamed stream	n/a	Cooloo	556367	749439
A3	Unnamed stream	n/a	Cooloo	555526	750169
A4	Unmapped channel	n/a	Cooloo	555973	749795
A5	Dangan Eighter Stream	30D35	Elmhill	556805	749933
A6	Unmapped channel	n/a	Cloondahamper	555139	750851
A7	Grange River	30G02	Cloondahamper	555221	751533
A8	Grange River	30G02	Grange Bridge	547969	749929
B1	Ahgloragh Stream	30A26	Omaun More	552003	750147
B2	Ahgloragh Stream	30A26	Kilmore	549737	750447
C1	Lecarrow Stream	30L49	Lecarrow	555330	747693
C2	Forty Acres Stream	30F16	Dangan Eighter	553873	747215
C3	Lecarrow Stream	30L49	Brierfield South	553872	744741
C4	Abbert River	30A01	N63 road crossing	551644	743655
D1	Unnamed stream	n/a	Cooloo	557505	748926
D2	Dangan Eighter Stream	30D35	Trasternagh North	557415	750253
D3	Grange River	30G02	Cloonascragh	556369	751183
E1	Lecarrow Stream	30L49	Lecarrow	555791	746488
E2	Forty Acres Stream	30F16	Dangan Eighter	553623	744964
E3	Feagh East Stream	30F17	Feagh West	550583	744755
E4	Grange River	30G02	Ballinderry Bridge	544475	746990
Fisheries appraisal site					
L1	Derrynacrick Lough (west)	30_413	Cooloo	556077	749688
L2	Derrynacrick Lough (east)	30_205	Elmhill	556325	749586
L3	Horseleap Lough	30_248	Lecarrow	555730	746589
P1	Unnamed pond	n/a	Cooloo	557335	748689
P2	Unnamed pond	n/a	Gorteenlahard	557946	748788
P3	Unnamed pond	n/a	Lecarrow	555414	747794
P4	Unnamed pond	n/a	Lecarrow	555963	748055
P5	Unnamed pond	n/a	Lecarrow	556065	748220
P6	Unnamed pond	n/a	Lecarrow	556121	748055
P7	Unnamed pond	n/a	Polladooey	555298	747163

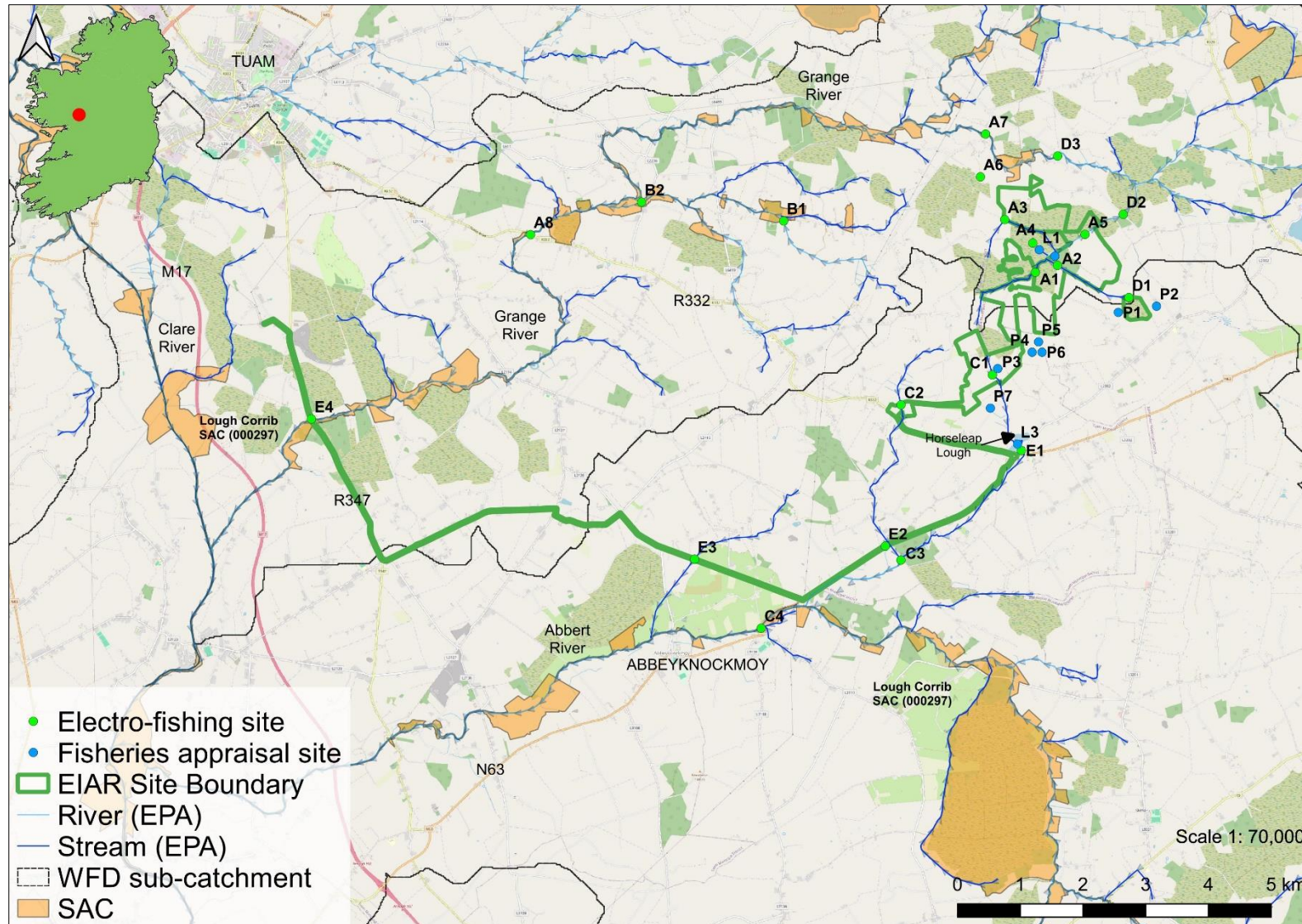


Figure 2.1 Overview of the $n=31$ electro-fishing & fisheries appraisal survey site locations for the Proposed Project

3. Results

A catchment-wide fisheries survey of 21 no. riverine and 10 no. lacustrine sites in the vicinity of the Proposed Project was conducted on the 24th, 25th, 26th, and 27th July 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 Aquatic survey site results

3.1.1 Site A1 – Dangan Eighter Stream, Cooloo

Three-spined stickleback (*Gasterosteus aculeatus*) ($n=26$) were the only fish species recorded via electro-fishing at site A1 on the Dangan Eighter Stream (EPA code: 30D35) at a proposed access track crossing within the Proposed Wind Farm site (**Figure 3.1**).

With the exception of high densities of this species, the stream at this location was of poor fisheries value given low summer flows, extensive historical modifications and siltation pressures. There was very poor suitability for salmonids and no suitability for lamprey. Suitability for European eel was low and none were recorded.

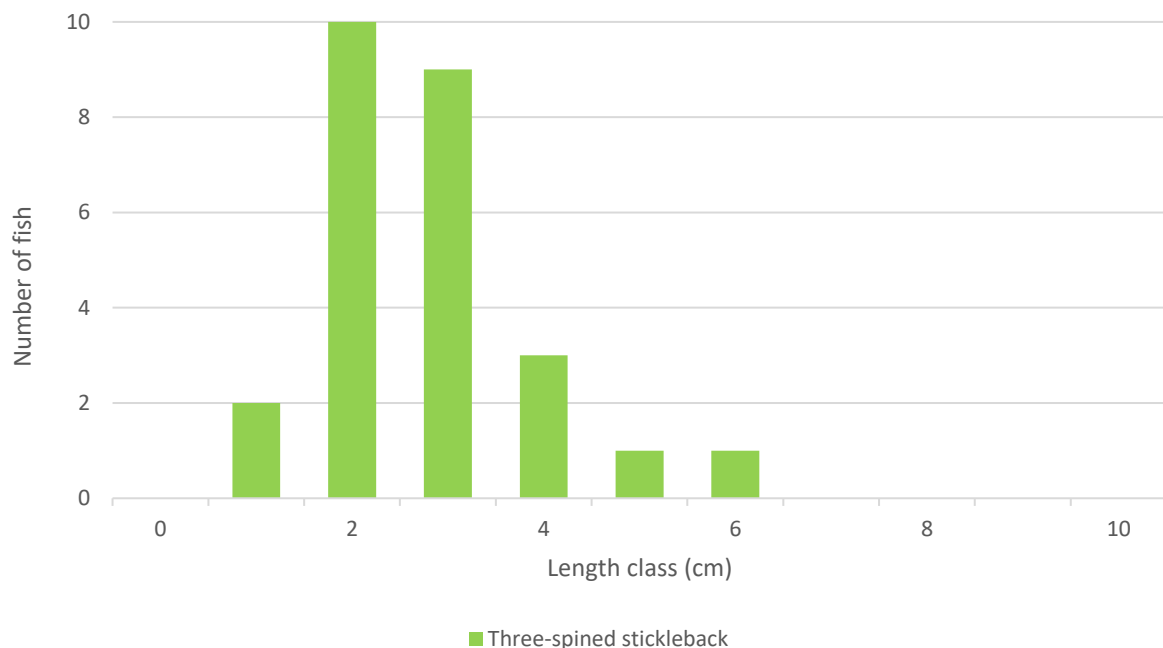


Figure 3.1 Length frequency distribution recorded via electro-fishing at site A1, July 2024



Plate 3.1 Three-spined stickleback recorded at site A1 on the Dangan Eighter Stream, July 2024

3.1.2 Site A2 – unnamed stream, Cooloo

No fish were recorded via electro-fishing at site A2 on an unnamed Danagan Eighter Stream tributary at a proposed access track crossing. With the exception of stickleback species (not recorded), the channel at this location was not of fisheries value given extensive modifications, shallow depths, poor flows and siltation pressures.



Plate 3.2 Representative image of site A2 on an unnamed Dangan Eighter Stream tributary, July 2024

3.1.3 Site A3 – unnamed stream, Cooloo

No fish were recorded via electro-fishing at site A3 on an unnamed Danagan Eighter Stream tributary adjoining the Site boundary. With the exception of stickleback species (not recorded), the channel at this location was not of fisheries value given extensive modifications, shallow depths, poor flows, siltation pressures and poor fluvial connectivity with downstream habitats.



Plate 3.3 Representative image of site A3 on an unnamed Dangan Eighter Stream tributary, July 2024

3.1.4 Site A4 – unmapped channel, Cooloo

No fish were recorded via electro-fishing at site A4 on an unnamed (unmapped) channel approximately 100m upstream of Derrynacrick Lough (west). With the exception of stickleback species (not recorded), the channel at this location was not of fisheries value given extensive modifications, shallow depths, poor flows, siltation pressures and poor fluvial connectivity with downstream habitats.



Plate 3.4 Representative image of site A4 on an unnamed Derrynacrick Lough tributary, July 2024

3.1.5 Site A5 – Dangan Eighter Stream, Elmhill

Electro-fishing was not undertaken at site A5 on the Dangan Eighter Stream (30D35) at a proposed access track crossing given a high average depth of the sediment and unsafe access. However, three-spined stickleback and juvenile roach (*Rutilus rutilus*) were recorded in macro-invertebrate sweep samples. The heavily modified channel was of some suitability for coarse fish species in addition to European eel but was of poor suitability for lamprey and salmonids given poor flows, poor hydromorphology and a predominance of soft substrata.



Plate 3.5 Representative image of site A5 on the Dangan Eighter Stream, July 2024

3.1.6 Site A6 – unmapped channel, Cloondahamper

No fish were recorded via electro-fishing at site A6 on an unmapped tributary of the Grange River at a farm access crossing. With the exception of stickleback species (not recorded), the channel at this location was not of fisheries value given extensive modifications, shallow depths, poor flows, siltation pressures and poor fluvial connectivity with downstream habitats.



Plate 3.6 Representative image of site A6 on an unnamed tributary of the Grange River, July 2024

3.1.7 Site A7 – Grange River, Cloondahamper

Atlantic salmon (*Salmo salar*) ($n=47$), brown trout ($n=26$), pike (*Esox lucius*) ($n=2$) and stone loach (*Barbatula barbatula*) ($n=9$) were recorded via electro-fishing at site A7 on the Grange River (30G02) at a local road crossing (**Figure 3.2**).

Despite historical drainage works, the site was a good quality salmonid nursery, supporting relatively high numbers of mixed cohort juveniles, with good flow diversity and abundant instream refugia. Good quality salmonid and lamprey spawning habitat was present in glide and pool tailings despite some compaction and siltation. Deeper glide and pool provided good quality holding opportunities for adult salmonids. Suitability for lamprey was limited given high bed compaction and none were recorded. Despite some good suitability for European eel, the species was not recorded during the survey.

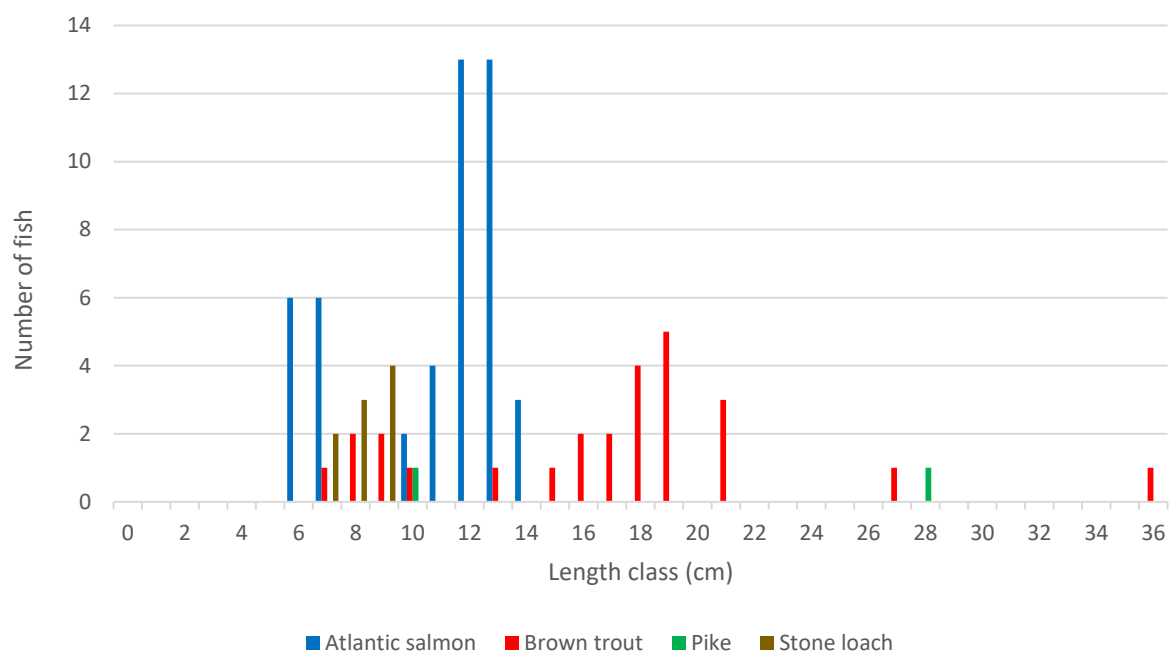


Figure 3.2 Length frequency distribution recorded via electro-fishing at site A7, July 2024



Plate 3.7 Atlantic salmon (top), brown trout & stone loach recorded at site A7 on the Grange River, July 2024

3.1.8 Site A8 – Grange River, Grange Bridge

Atlantic salmon ($n=53$), brown trout ($n=42$), pike ($n=1$) and stone loach ($n=1$) were recorded via electro-fishing at site A8 on the Grange River (30G02) at Grange Bridge (**Figure 3.3**).

The site was an excellent salmonid nursery despite historical drainage works, with abundant instream refugia supporting high densities of juvenile salmonids. Good quality salmonid spawning habitat was present locally in glide and pool tailings despite compaction and siltation of substrata. The site was also of value as a holding habitat for adult salmonids with localised deep pool and glide. Whilst some sub-optimal soft sediment accumulations were present (e.g. near clubrush beds), no lamprey ammocoetes were recorded. Despite high suitability, no European eel were recorded.

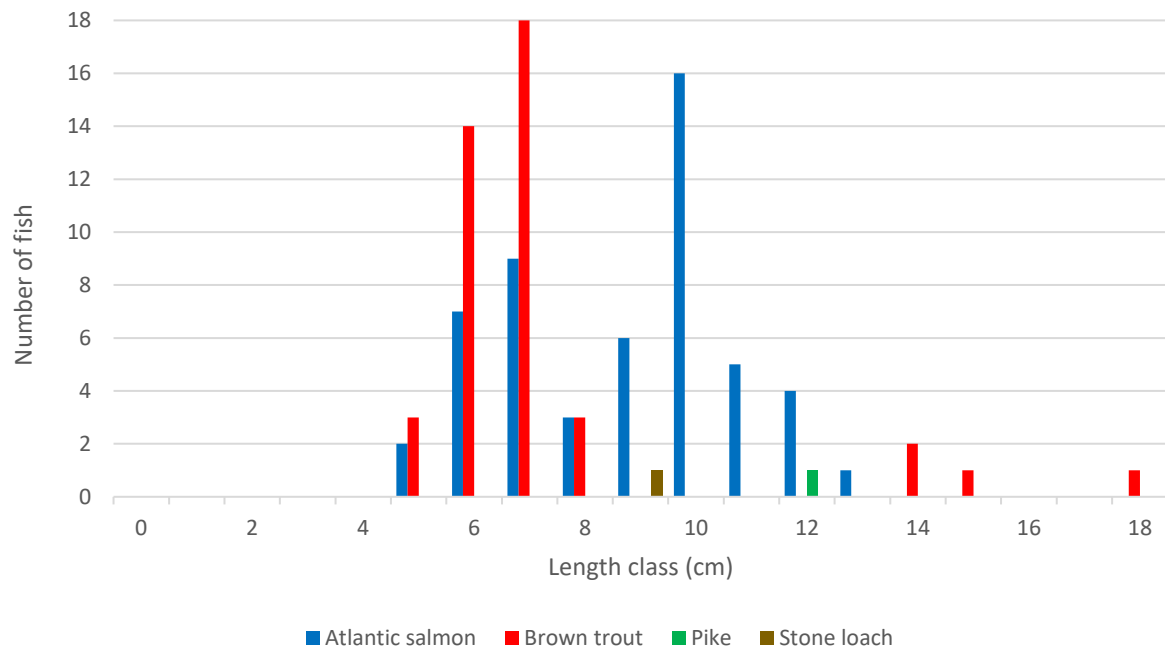


Figure 3.3 Length frequency distribution recorded via electro-fishing at site A8, July 2024



Plate 3.8 Mixed cohort brown trout recorded at site A8 on the Grange River at Grange Bridge, July 2024

3.1.9 Site B1 – Aghloragh Stream, Omaun More

Brown trout ($n=7$) and three-spined stickleback ($n=1$) were the only fish species recorded via electro-fishing at site B1 on the Aghloragh Stream (30A26) at a local road crossing (**Figure 3.4**).

The site was a moderate quality salmonid nursery only given historical modifications, calcification of the bed and very low summer flows. The site provided poor to moderate spawning opportunities for salmonids given heavy compaction of the bed. The site was of poor holding value for adult salmonids due to a paucity of deeper glide and pool. The site was also of poor value for lamprey given heavy compaction of the bed and an absence of areas with deeper silt accumulations. Despite some potential for European eel in localised pool, none were recorded.

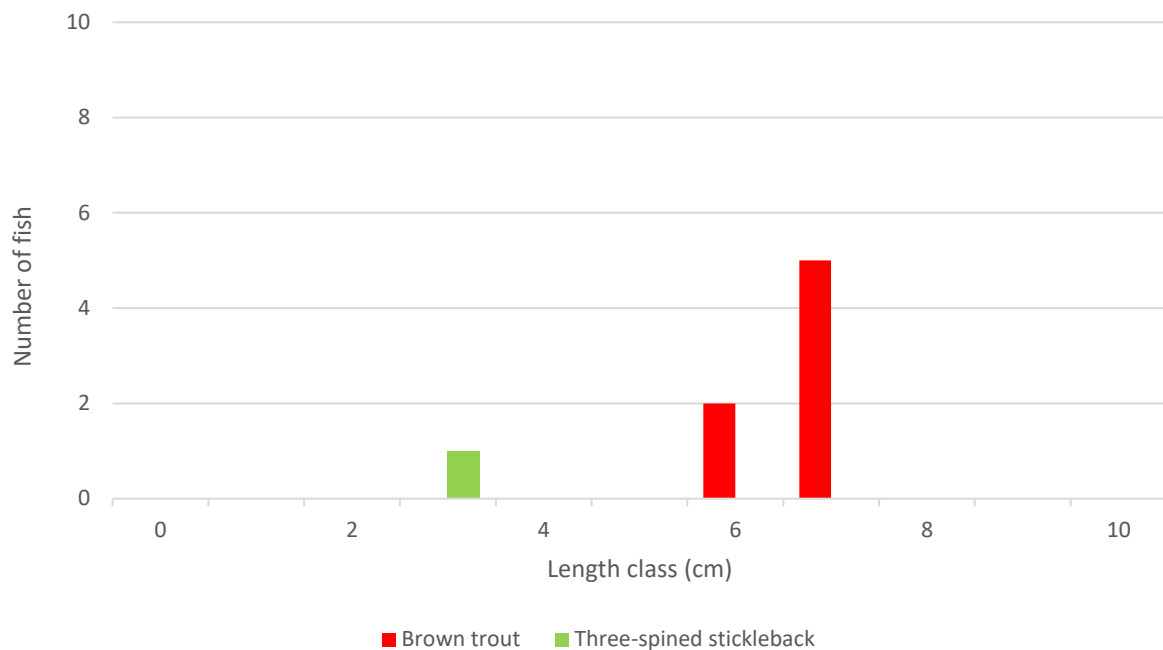


Figure 3.4 Length frequency distribution recorded via electro-fishing at site B1, July 2024



Plate 3.9 Juvenile brown trout recorded at site B1 on the Aghloragh Stream, July 2024

3.1.10 Site B2 – Aghloragh Stream, Kilmore

Atlantic salmon ($n=29$), brown trout ($n=55$), pike ($n=3$), stone loach ($n=11$) and three-spined stickleback ($n=3$) were recorded via electro-fishing at site B2 on the Aghloragh Stream (30A26) at a local road crossing (**Figure 3.5**).

The site was of high value for salmonids supporting a high density of juvenile trout and lower numbers of salmon. Recently installed mixed gravels¹ will, in time, provide highly valuable salmonid spawning habitat. The shallow site was of relatively poor value as a holding habitat for adult salmonids although some small pools and bank scours/undercuts offered valuable habitat. Whilst lamprey spawning was present, no ammocoetes were recorded from small areas of soft sediment. Despite good suitability, no European eel were recorded.

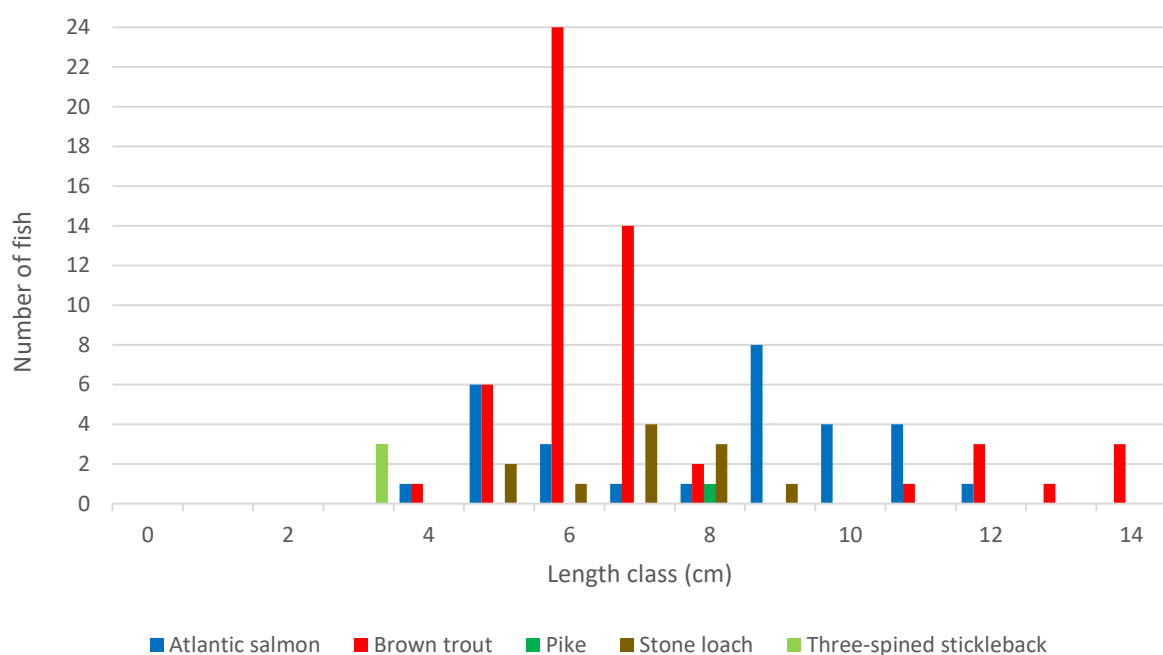


Figure 3.5 Length frequency distribution recorded via electro-fishing at site B2, July 2024

¹ Instream enhancement works by Inland Fisheries Ireland and the Cairde an Chláir angling club had occurred very recently (July 2024), including gravel installations downstream of the bridge



Plate 3.10 Juvenile pike & Atlantic salmon recorded at site B2 on the Aghloragh Stream, July 2024

3.1.11 Site C1 – Lecarrow Stream, Lecarrow

No fish were recorded via electro-fishing at site C1 on the Lecarrow Stream (30L49) at a proposed access track. The site was not of fisheries value given extensive historical modifications, siltation pressures and poor flows in the upper reaches.



Plate 3.11 Representative image of site C1 on the Lecarrow Stream, July 2024 (semi-dry, ephemeral channel)

3.1.12 Site C2 – Forty Acres Stream, Dangan Eighter

Brown trout (n=1) and three-spined stickleback (n=28) were the only fish species recorded via electro-fishing at site C2 on the Forty Acres Stream (30F16) at a proposed access track crossing upstream of the R332 road (**Figure 3.6**).

The site was of low fisheries value given very low summer flows in addition to historical modifications. However, the value would improve under higher flows and a single adult brown trout was recorded. Some good quality salmonid spawning and nursery habitat was present but low flows precluded the presence of higher fish densities at the site. Whilst the site was of some physical value as lamprey spawning habitat, soft sediment nursery areas were not present and low flows would likely preclude the species. Suitability for European eel was low given a paucity of instream refugia and none were recorded.

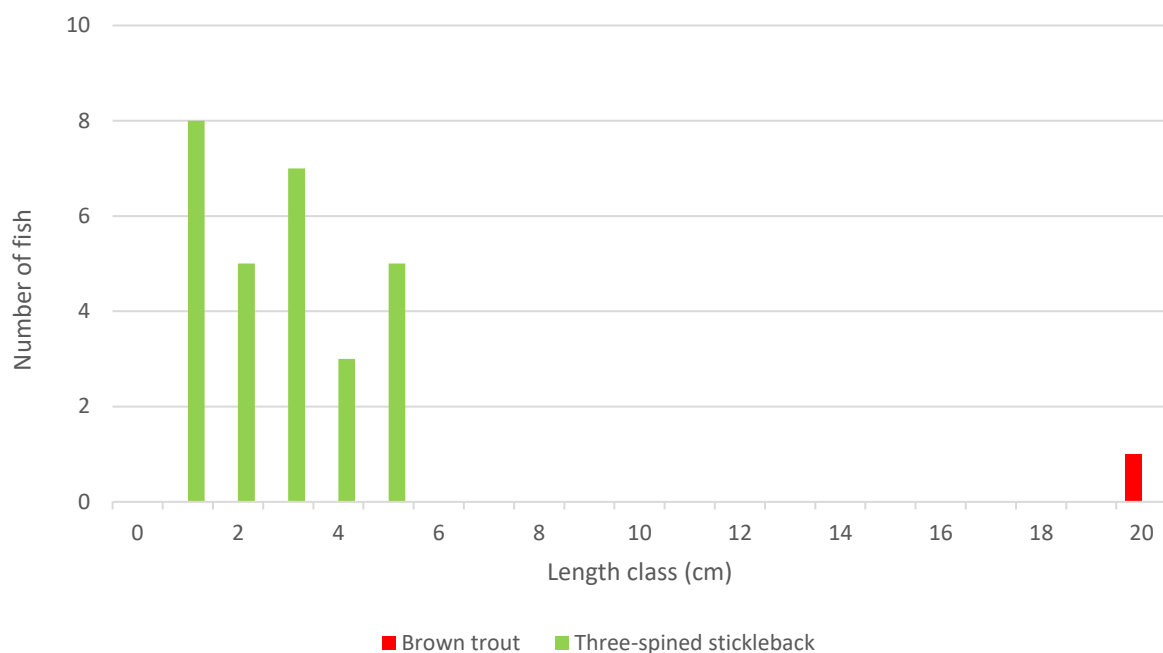


Figure 3.6 Length frequency distribution recorded via electro-fishing at site C2, July 2024



Plate 3.12 Male (left) and female three-spined stickleback recorded at site C2 on the Forty Acres Stream, July 2024

3.1.13 Site C3 – Lecarrow Stream, Brierfield South

Despite high physical suitability for salmonids and other fish species, only a single Atlantic salmon parr was recorded via electro-fishing at site C3 on the Lecarrow Stream (30L49) near the Forty Acres Stream confluence (**Figure 3.7**).

The site, located in a karstic area, was considered a moderate quality salmonid nursery, spawning and holding area. However, the stream is known to run dry periodically given the karstic nature of the surrounding landscape (EPA data), thus impacting the distribution and persistence of fish populations. Whilst there was some physical suitability for lamprey spawning, no suitable nursery (soft sediment) habitat was present. Suitability for European eel was moderate although none were recorded.

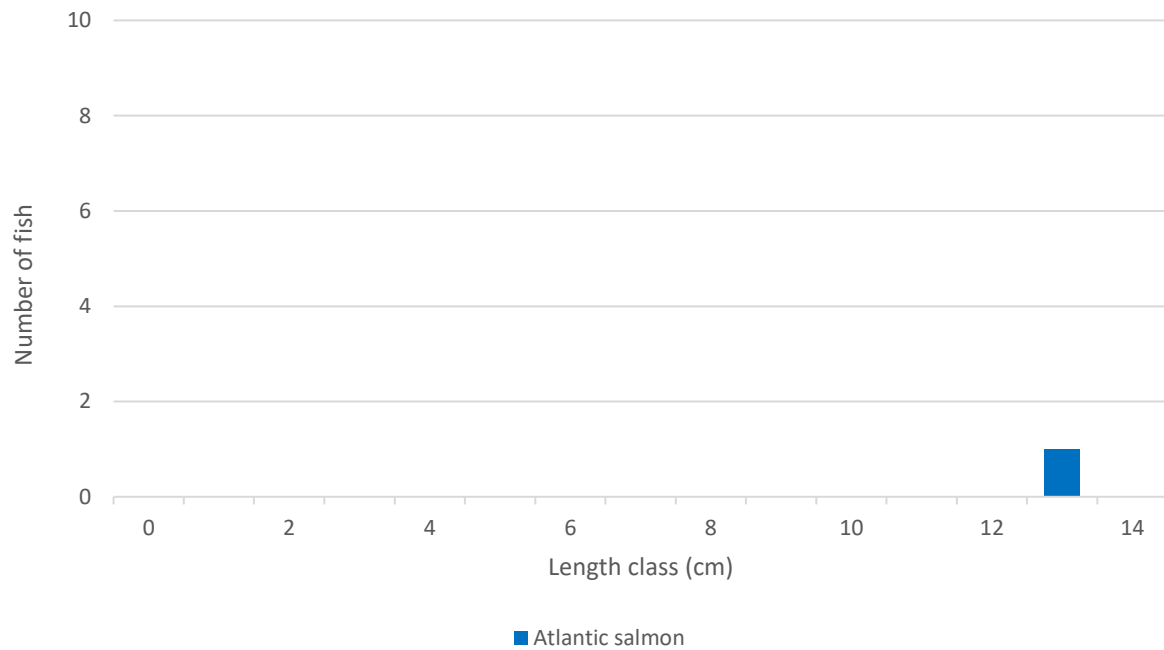


Figure 3.7 Length frequency distribution recorded via electro-fishing at site B2, July 2024



Plate 3.13 Representative image of site C3 on the Lecarrow Stream, July 2024

3.1.14 Site C4 – Abbert River, N63 road crossing

Atlantic salmon ($n=63$), brown trout ($n=26$) and stone loach ($n=3$) were recorded via electro-fishing at site C4 on the Abbert River (30A01) at the N63 road crossing (**Figure 3.8**).

The site was an excellent quality salmonid nursery given ample broken riffle and glide with mixed coarse substrata and macrophyte refugia. As per previous surveys (2022), the site supported the

highest densities of Atlantic salmon recorded during the survey and the site was of very high spawning value for salmonids, despite compaction and siltation pressures. Deep glide and pool provided high quality holding habitat for adult salmonids. The site was of poor value for lamprey given heavy compaction of the bed and more limited deposits of silt in the vicinity of the survey area. While the site had good potential for European eel, none were recorded.

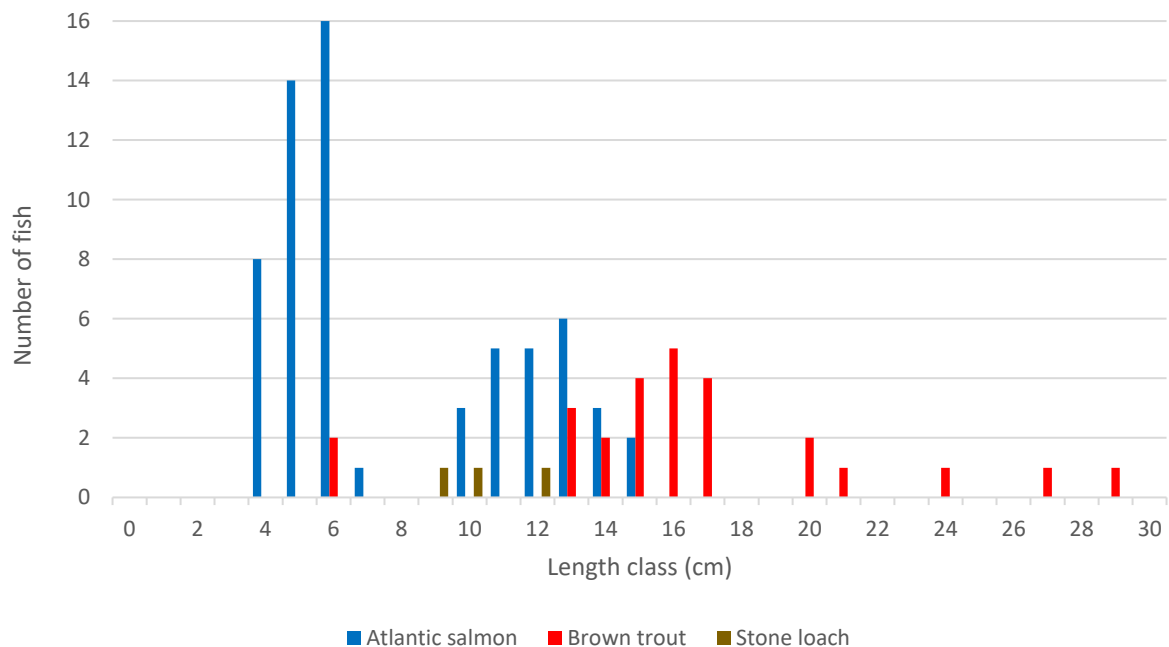


Figure 3.8 Length frequency distribution recorded via electro-fishing at site C4, July 2024



Plate 3.14 Representative image of site C4 on the Abbert River at the N63 road crossing, July 2024 (very high quality salmonid spawning & nursery habitat)

3.1.15 Site D1 – unnamed stream, Cooloo

Site D1 was located on an unnamed tributary of the Dangan Eighter Stream. The 1.5m wide channel was dry at the time of survey and therefore of no fisheries value.



Plate 3.15 Representative image of site D1 on an unnamed stream, July 2024 (dry, ephemeral channel)

3.1.16 Site D2 – Dangan Eighter Stream, Trasternagh North

Brown trout ($n=37$), lamprey (*Lampetra* sp.) ($n=10$), stone loach ($n=13$) and three-spined stickleback ($n=7$) were recorded via electro-fishing at site D2 on the Dangan Eighter Stream (30D35) at a local road (**Appendix A**).

The site was a good quality salmonid nursery (ample riffle and broken glide with a stoney bed near bridge) although the value was reduced as a result of historical drainage and siltation pressures. Good quality spawning habitat for salmonids and lamprey (gravels) was present locally although again impacted by siltation pressures. Localised deeper pool and glide and bank scours provided some holding opportunities for adult salmonids although the value was reduced given low summer flows. The site was of moderate value as a lamprey nursery, with localised soft sediment accumulations (mostly along the margins) supporting a low density of ammocoetes (5 per m²). Despite some suitability no European eel were recorded.

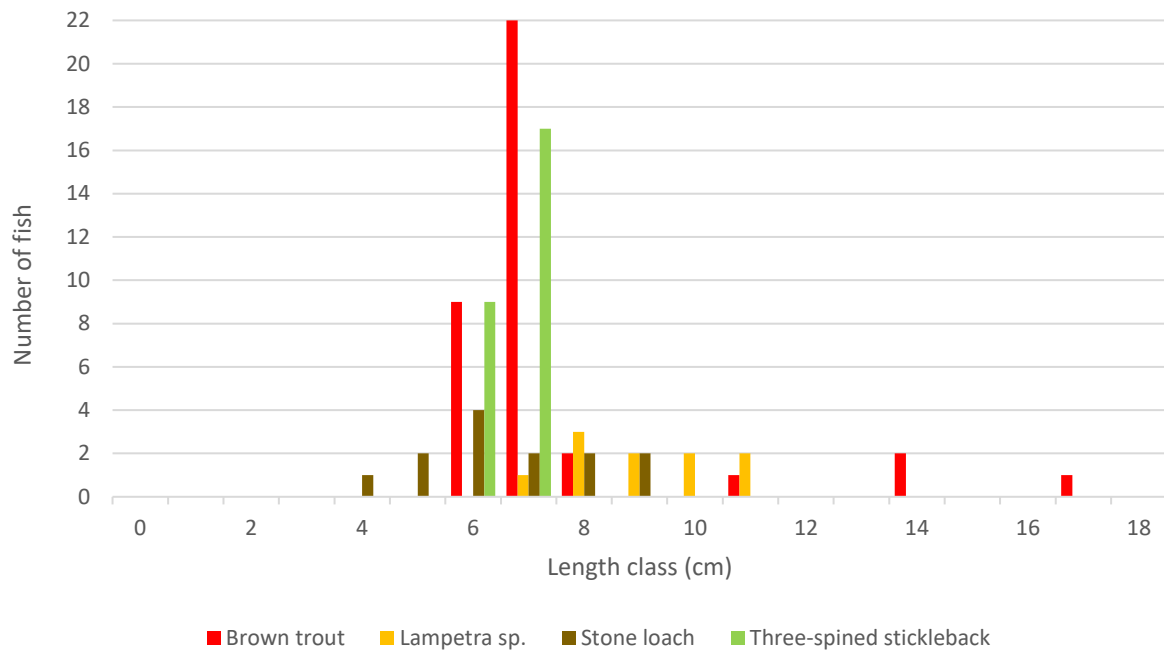


Figure 3.9 Length frequency distribution recorded via electro-fishing at site D2, July 2024



Plate 3.16 Brown trout, stone loach & *Lampetra* sp. ammocoete recorded at site D2 on the Dangan Eighter Stream, July 2024

3.1.17 Site D3 – Grange River, Cloonascragh

Atlantic salmon ($n=1$), brown trout ($n=1$), stone loach ($n=5$) and three-spined stickleback ($n=4$) were recorded via electro-fishing at site D3 on the Grange River (30G02) at a local road. (**Figure 3.10**). However, it should be noted that it was only possible to survey a short section (bridge apron) given prohibitive depths of $>1.6\text{m}$.

The site was of low value for salmonids overall although likely supported adult brown trout in deeper glide. These areas would also serve as holding habitat for migratory salmonids, seasonally. Given poor hydromorphology and low flows, there was poor suitability for lamprey ammocoetes. Furthermore there was an absence of lamprey spawning habitat and the species was not recorded. Despite high suitability for European eel none were recorded.

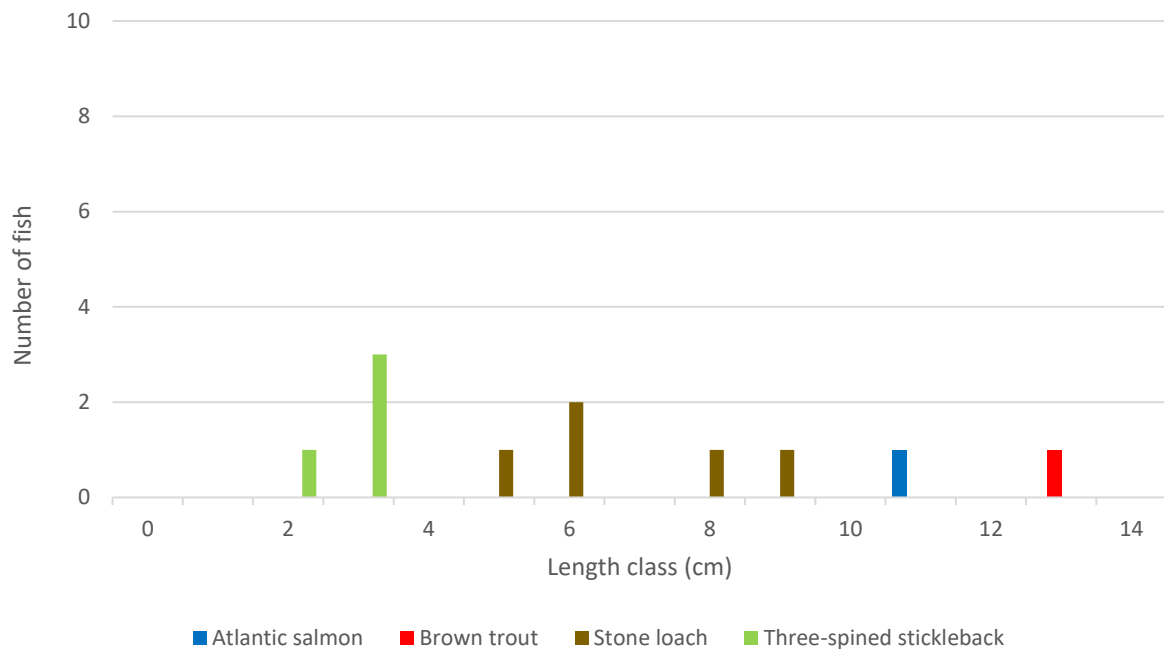


Figure 3.10 Length frequency distribution recorded via electro-fishing at site D3, July 2024



Plate 3.17 Atlantic salmon (top), stone loach & brown trout recorded at site D3 on the Grange River, July 2024

3.1.18 Site E1 – Lecarrow Stream, Lecarrow

Site E1 was located on the Lecarrow Stream (30L49) at the outflow from Horseleap Lough adjacent to the Proposed Grid Connection. The stream was dry at this location at the time of survey and thus of no fisheries value. Furthermore, given poor fluvial connectivity with downstream habitats the site is unlikely to support fish populations even due winter spates.



Plate 3.18 Representative image of site E1 on the Lecarrow Stream, July 2024 (dry channel)

3.1.19 Site E2 – Forty Acres Stream, Dangan Eighter

Brown trout ($n=4$) was the only fish species recorded via electro-fishing at site E2 on the Forty Acres Stream (30F16) at the N63 road and Proposed Grid Connection crossing (**Figure 3.11**).

The site was a low value salmonid nursery given the poor hydromorphology, low summer flows, compacted bed and evident siltation pressures, with only a low density of fish recorded. This limited available spawning habitat while diminishing refugia for juvenile fish. Poor summer flows also limited the supply of oxygenated water. Bed compaction reduced suitability for European eel (none recorded). The site was unsuitable for lamprey given the compaction of substrata and presence of shallow soft sediment areas only.

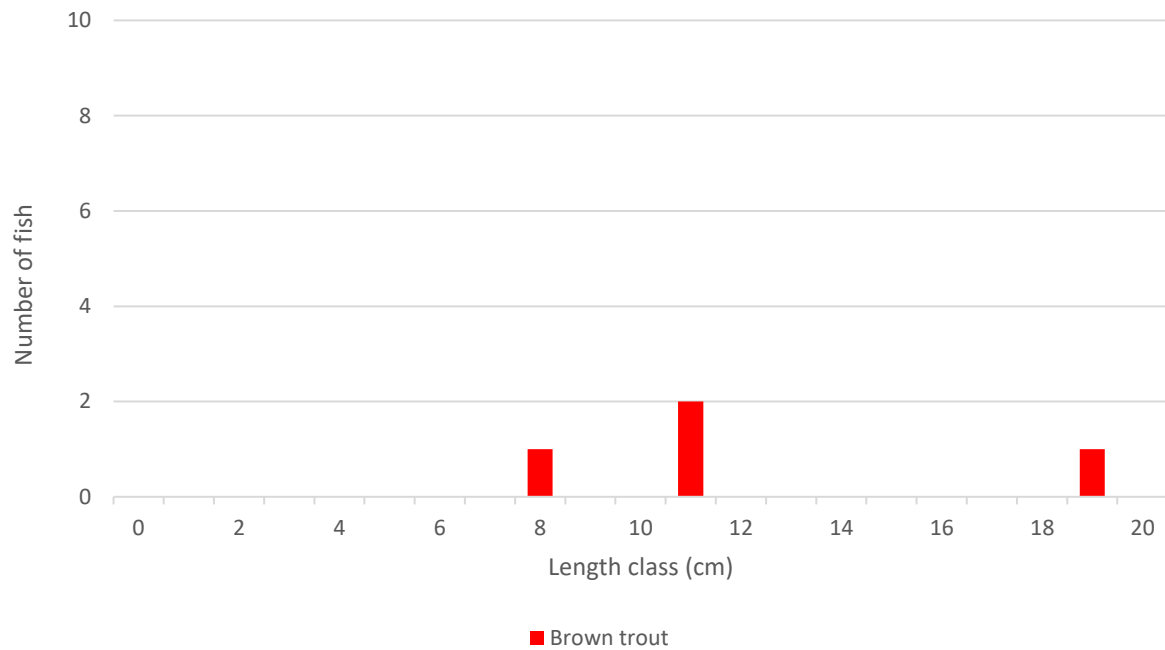


Figure 3.11 Length frequency distribution recorded via electro-fishing at site E2, July 2024



Plate 3.19 Representative image of site E2 on the Forty Acres Stream, July 2024

3.1.20 Site E3 – Feagh East Stream, Feagh West

Three-spined stickleback ($n=41$) were the only fish species recorded via electro-fishing at site E3 on the Feagh East Stream (30F24), a tributary of the Abbert River, at the L6324 road and Proposed Grid Connection crossing (**Figure 3.12**).

With the exception of high numbers of stickleback, the site was of poor fisheries value given extensive modifications, siltation pressures, absence of clean substrata and poor flows. However, there was some low suitability for European eel (abundant silt & macrophyte refugia) although none were recorded.

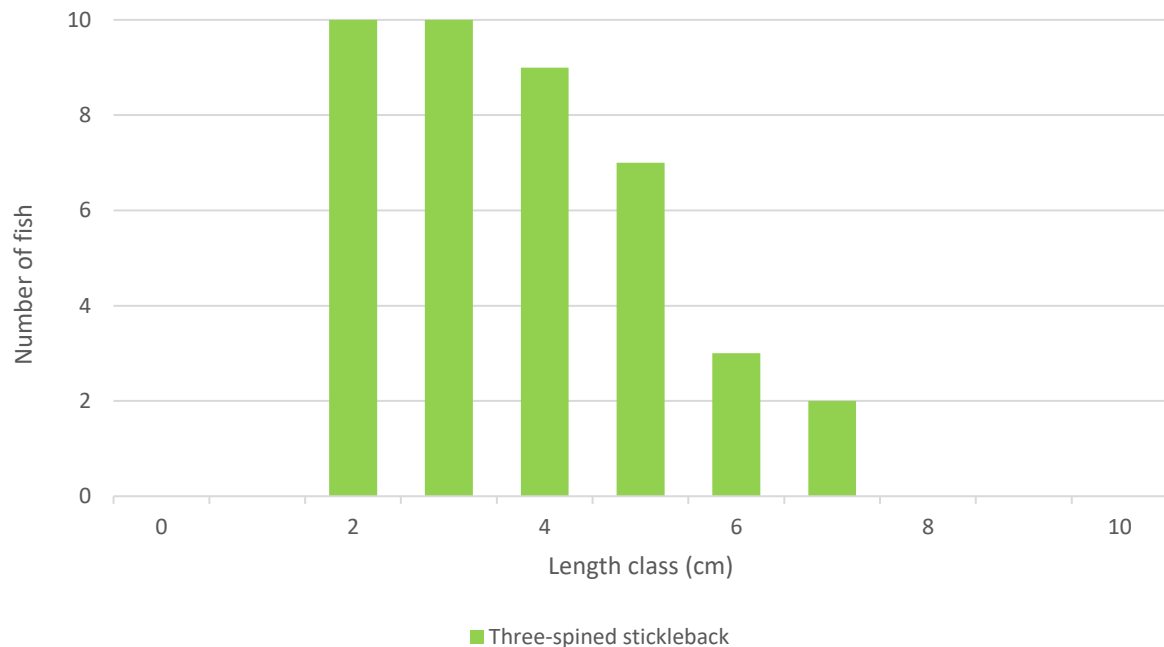


Figure 3.12 Length frequency distribution recorded via electro-fishing at site E3, July 2024



Plate 3.20 Representative image of site E3 on the Forty Acres Stream, July 2024

3.1.21 Site E4 – Grange River, Ballinderry Bridge

Atlantic salmon ($n=12$), brown trout ($n=3$), pike ($n=4$), stone loach ($n=7$) and minnow (*Phoxinus phoxinus*) ($n=15$) were recorded via electro-fishing at site E4 on the lower reaches of the Grange River (30G02) at Ballinderry Bridge (R347), a Proposed Grid Connection crossing (**Figure 3.13**).

The site was a moderate quality salmonid nursery only, with the value reduced due to historical drainage and the absence of broken riffle and swift flowing glide. However, deep glide and pool offered good holding opportunities for adult salmonids. Suitable spawning habitat for salmonids and lamprey was absent. While the channel had some depositing areas, the compacted nature the soft sediment areas with very limited flow created poor conditions for lamprey ammocoetes and none were recorded. There was good suitability for European eel and the species likely occurs in deeper glide and pool. The site was of highest value as a coarse fish habitat with abundant spawning areas present.

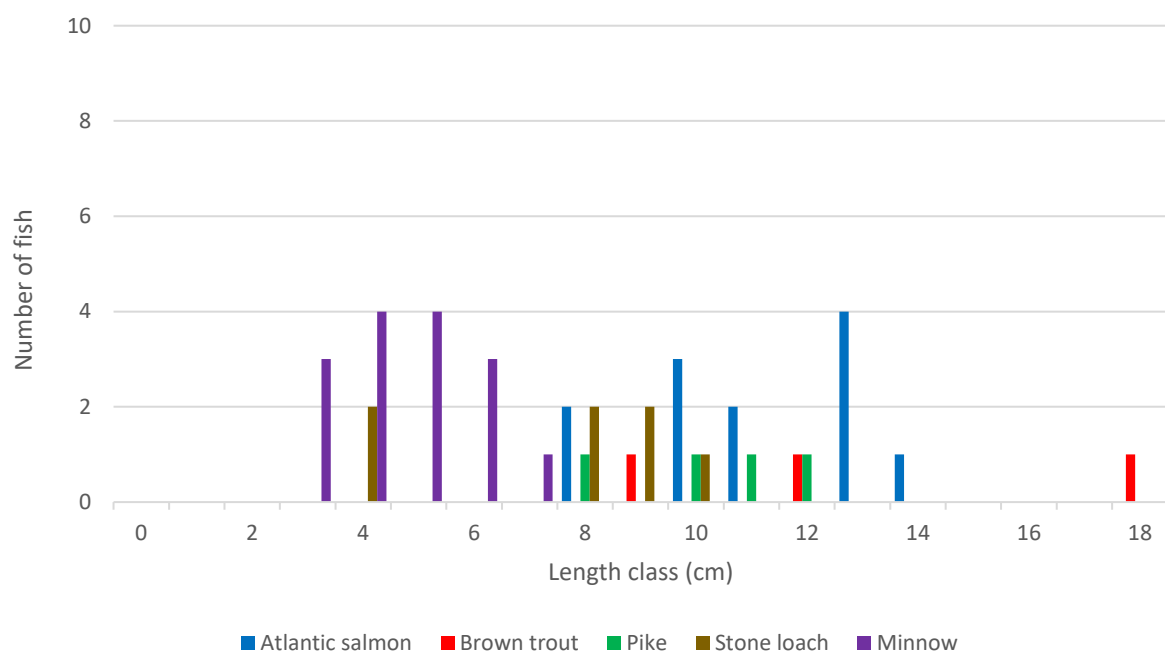


Figure 3.12 Length frequency distribution recorded via electro-fishing at site E4, July 2024



Plate 3.21 Representative image of site E4 on the Grange River at Ballinderry Bridge, July 2024

3.1.22 Site L1 – Derrynacrick Lough (west)

Site L1 was located at Derrynacrick Lough (west), a small broadly circular 0.7ha mesotrophic lake in the centre of the Proposed Wind Farm site. Site L1 was of moderate suitability for brown trout which were observed during the site visit. The lake also had some good suitability for European eel given suitable depths, good quality foraging habitat and connectivity to the Dangan Eighter Stream.



Plate 3.22 Representative image of site L1 at Derrynacrick Lough (west), July 2024

3.1.23 Site L2 – Derrynacrick Lough (east)

Site L2 was a small wetland and pond basin of c.0.02ha adjoining the Proposed Wind Farm site, adjacent to the Dangan Eighter Stream. The pond was not considered of value to fish given its very small size, heavy macrophyte cover and highly peat-stained water.



Plate 3.23 Representative image of site L2 at Derrynacrick Lough (east), July 2024

3.1.24 Site L3 – Horseleap Lough

Site L3 was located at Horseleap Lough, a large wetland which seasonally extends to 4-5ha in surface area with several small ephemeral pond areas. Both three spined stickleback and ten-spined stickleback (*Pungitius pungitius*) were recorded via sweep netting at site L3. With the exception of stickleback species, Horseleap Lough was not of fisheries value given the small, shallow ephemeral nature of the ponding areas. Environmental DNA sampling during previous surveys did not detect European eel, which was considered the only viable fish species of high conservation value that could survive in the localised areas of shallow ponding water (Triturus, 2023).



Plate 3.24 Representative image of site L3 at Horseleap Lough, July 2024

3.1.25 Site P1 – pond, Cooloo

Site P1 was a small, ephemeral pond basin located in a field hollow adjacent to the Proposed Wind Farm site. The pond does hold water seasonally (Triturus, 2023) but was dry at the time of survey with a dry mud base and thus not of fisheries value.



Plate 3.25 Representative image of pond site P1, July 2024 (dry, ephemeral pond)

3.1.26 Site P2 – pond, Gorteenlahard

Site P2 was a very small shallow pond containing c.20m² of open water. The very shallow pond (<0.05m) was not of value to fish given the very shallow water, limited macrophyte cover and lack of connectivity to riverine habitat.



Plate 3.26 Representative image of pond site P2, July 2024

3.1.27 Site P3 – pond, Lecarrow

Site P3 was a small, shallow historical pond basin located in a field hollow in an area of reclaimed land. As per previous surveys, the pond was dry at the time of survey (July 2024) and evidently rarely held water given the encroachment from common agricultural weeds and terrestrial grasses. The ephemeral pond was therefore not of value to fish.



Plate 3.27 Representative image of pond site P3, July 2024 (dry, ephemeral pond)

3.1.28 Site P4 – pond, Lecarrow

Site P4 was a small circular pond basin adjacent to the Proposed Wind Farm site containing c.200m² of open water at the time of survey. The very shallow pond (0.1-0.2m) was not of value to fish given its very shallow depths and highly eutrophic conditions.



Plate 3.28 Representative image of pond site P4, July 2024

3.1.29 Site P5 – pond, Lecarrow

Site P5 was a seasonal pond and wetland area located in reclaimed agricultural land adjacent to the Proposed Wind Farm site. The small circular shaped hollow c. 150m² in area was dry at the time of survey and therefore not of value to fish.



Plate 3.29 Representative image of pond site P5, July 2024 (dry, ephemeral pond)

3.1.30 Site P6 – pond, Lecarrow

Site P6 was a small, shallow historical pond basin located in a field hollow adjacent to the Proposed Wind Farm site. In contrast to previous surveys when it contained water (2022), the pond was dry at the time of survey and was therefore not of value to fish.



Plate 3.30 Representative image of pond site P6, July 2024 (dry, ephemeral pond)

3.1.31 Site P7 – pond, Polladooey

Site P7 was a very small, shrinking pond basin of c.5m² in a field hollow adjacent to the Lecarrow Stream and the Proposed Wind Farm site. The pond was <0.1m deep with high turbidity caused by both a cyanobacterial bloom and livestock poaching. The very shallow pond was not of value to fish given its very shallow water and likely ephemeral nature.



Plate 3.31 Representative image of pond site P7, July 2024

Table 3.1 Fish species densities per m² recorded at sites in the vicinity of the Proposed Project via electro-fishing in July 2024 (values in **bold** represent the highest densities recorded for each species, respectively)

Site	Watercourse	CPUE (elapsed time)	Approximately area fished (m ²)	Atlantic salmon	Brown trout	<i>Lampetra</i> sp.	Three-spined stickleback	Pike	Minnow	Stone loach
A1	Dangan Eighter Stream	10	160	0.000	0.000	0.000	0.163	0.000	0.000	0.000
A2	Unnamed stream	5	60	0.000	0.000	0.000	0.000	0.000	0.000	0.000
A3	Unnamed stream	10	200	0.000	0.000	0.000	0.000	0.000	0.000	0.000
A4	Unmapped channel	10	180	0.000	0.000	0.000	0.000	0.000	0.000	0.000
A5	Dangan Eighter Stream	n/a	Too deep for electro-fishing	n/a	n/a	n/a	n/a	n/a	n/a	n/a
A6	Unmapped channel	5	100	0.000	0.000	0.000	0.000	0.000	0.000	0.000
A7	Grange River	10	260	0.181	0.100	0.000	0.000	0.008	0.000	0.035
A8	Grange River	10	315	0.168	0.133	0.000	0.010	0.003	0.000	0.003
B1	Ahgloragh Stream	5	60	0.000	0.117	0.000	0.017	0.000	0.000	0.000
B2	Ahgloragh Stream	10	150	0.193	0.367	0.000	0.020	0.020	0.000	0.073
C1	Lecarrow Stream	5	30	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C2	Forty Acres Stream	10	175	0.000	0.006	0.000	0.160	0.000	0.000	0.000
C3	Lecarrow Stream	10	300	0.003	0.000	0.000	0.000	0.000	0.000	0.000
C4	Abbert River	10	280	0.225	0.093	0.000	0.000	0.000	0.000	0.011
D1	Unnamed stream	n/a	Dry channel	n/a	n/a	n/a	n/a	n/a	n/a	n/a
D2	Dangan Eighter Stream	10	175	0.000	0.211	5 per m²	0.040	0.000	0.000	0.074
D3	Grange River	5	50	0.020	0.020	0.000	0.080	0.000	0.000	0.100

Site	Watercourse	CPUE (elapsed time)	Approximately area fished (m ²)	Atlantic salmon	Brown trout	<i>Lampetra</i> sp.	Three-spined stickleback	Pike	Minnow	Stone loach
E1	Lecarrow Stream	n/a	Dry channel	n/a	n/a	n/a	n/a	n/a	n/a	n/a
E2	Forty Acres Stream	10	150	0.000	0.027	0.000	0.000	0.000	0.000	0.000
E3	Feagh East Stream	10	180	0.000	0.000	0.000	0.228	0.000	0.000	0.000
E4	Grange River	10	250	0.048	0.012	0.000	0.000	0.016	0.060	0.028
L1	Derrynacrick Lough (west)	n/a	Fisheries appraisal only	n/a	n/a	n/a	n/a	n/a	n/a	n/a
L2	Derrynacrick Lough (east)	n/a	Fisheries appraisal only	n/a	n/a	n/a	n/a	n/a	n/a	n/a
L3	Horseleap Lough	n/a	Fisheries appraisal only	n/a	n/a	n/a	n/a	n/a	n/a	n/a
P1	Unnamed pond	n/a	Fisheries appraisal only	n/a	n/a	n/a	n/a	n/a	n/a	n/a
P2	Unnamed pond	n/a	Fisheries appraisal only	n/a	n/a	n/a	n/a	n/a	n/a	n/a
P3	Unnamed pond	n/a	Fisheries appraisal only	n/a	n/a	n/a	n/a	n/a	n/a	n/a
P4	Unnamed pond	n/a	Fisheries appraisal only	n/a	n/a	n/a	n/a	n/a	n/a	n/a
P5	Unnamed pond	n/a	Fisheries appraisal only	n/a	n/a	n/a	n/a	n/a	n/a	n/a
P6	Unnamed pond	n/a	Fisheries appraisal only	n/a	n/a	n/a	n/a	n/a	n/a	n/a
P7	Unnamed pond	n/a	Fisheries appraisal only	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table 3.2 Relative abundance of fish species of higher conservation value recorded via **electro-fishing** in the vicinity of the Proposed Project, July 2024

Site	Watercourse	Atlantic salmon	Brown trout	<i>Lampetra</i> sp.	Other species
A1	Dangan Eighter Stream	Not recorded	Not recorded	Not recorded	Three-spined stickleback
A2	Unnamed stream	Not recorded	Not recorded	Not recorded	No fish recorded
A3	Unnamed stream	Not recorded	Not recorded	Not recorded	No fish recorded
A4	Unmapped channel	Not recorded	Not recorded	Not recorded	No fish recorded
A5	Dangan Eighter Stream	Not recorded	Not recorded	Not recorded	n/a – too deep for electro-fishing
A6	Unmapped channel	Not recorded	Not recorded	Not recorded	No fish recorded
A7	Grange River	High	Medium	Not recorded	Pike, stone loach
A8	Grange River	High	High	Not recorded	Pike, stone loach, three-spined stickleback
B1	Ahgloragh Stream	Not recorded	Low	Not recorded	Three-spined stickleback
B2	Ahgloragh Stream	Medium	High	Not recorded	Pike, stone loach, three-spined stickleback
C1	Lecarrow Stream	Not recorded	Not recorded	Not recorded	No fish recorded
C2	Forty Acres Stream	Not recorded	Low	Not recorded	Three-spined stickleback
C3	Lecarrow Stream	Low	Not recorded	Not recorded	
C4	Abbert River	High	Medium	Not recorded	Stone loach
D1	Unnamed stream	Not recorded	Not recorded	Not recorded	No fish recorded (dry channel)
D2	Dangan Eighter Stream	Not recorded	Medium	Low	Stone loach, three-spined stickleback
D3	Grange River	Low	Low	Not recorded	Stone loach, three-spined stickleback
E1	Lecarrow Stream	Not recorded	Not recorded	Not recorded	No fish recorded (dry channel)
E2	Forty Acres Stream	Not recorded	Low	Not recorded	
E3	Feagh East Stream	Not recorded	Not recorded	Not recorded	Three-spined stickleback
E4	Grange River	Medium	Low	Not recorded	Pike, minnow
L1	Derrynacrick Lough (west)	Not recorded	Not recorded	Not recorded	Fisheries appraisal only (brown trout observed)
L2	Derrynacrick Lough (east)	Not recorded	Not recorded	Not recorded	Fisheries appraisal only
L3	Horseleap Lough	Not recorded	Not recorded	Not recorded	Fisheries appraisal only (three-spined & ten-spined stickleback recorded via sweep netting)
P1	Unnamed pond	Not recorded	Not recorded	Not recorded	Fisheries appraisal only
P2	Unnamed pond	Not recorded	Not recorded	Not recorded	Fisheries appraisal only
P3	Unnamed pond	Not recorded	Not recorded	Not recorded	Fisheries appraisal only
P4	Unnamed pond	Not recorded	Not recorded	Not recorded	Fisheries appraisal only

Site	Watercourse	Atlantic salmon	Brown trout	<i>Lampetra</i> sp.	Other species
P5	Unnamed pond	Not recorded	Not recorded	Not recorded	Fisheries appraisal only
P6	Unnamed pond	Not recorded	Not recorded	Not recorded	Fisheries appraisal only
P7	Unnamed pond	Not recorded	Not recorded	Not recorded	Fisheries appraisal only

Conservation value: Atlantic salmon (*Salmo salar*), brook lamprey (*Lampetra 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]. 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 in 2022 and 2024 at sites in vicinity of the Proposed Project

Site no. (2024)	Watercourse	EPA code	Fish species recorded	
			September 2022	July 2024
A1	Dangan Eighter Stream	30D35	Not surveyed	Three-spined stickleback
A2	Unnamed stream	n/a	Not surveyed	No fish recorded
A3	Unnamed stream	n/a	No fish recorded	No fish recorded
A4	Unmapped channel	n/a	No fish recorded	No fish recorded
A5	Dangan Eighter Stream	30D35	Not surveyed	n/a – too deep for electro-fishing
A6	Unmapped channel	n/a	Three-spined stickleback	No fish recorded
A7	Grange River	30G02	Atlantic salmon, brown trout, pike, stone loach	Atlantic salmon, brown trout, pike, stone loach
A8	Grange River	30G02	Atlantic salmon, brown trout, pike, stone loach	Atlantic salmon, brown trout, pike, stone loach, three-spined stickleback
B1	Ahgloragh Stream	30A26	Brown trout, three-spined stickleback	Brown trout, three-spined stickleback
B2	Ahgloragh Stream	30A26	Atlantic salmon, brown trout, pike, stone loach	Atlantic salmon, brown trout, pike, stone loach, three-spined stickleback
C1	Lecarrow Stream	30L49	Not surveyed	No fish recorded
C2	Forty Acres Stream	30F16	Not surveyed	Brown trout, three-spined stickleback
C3	Lecarrow Stream	30L49	No fish recorded	Atlantic salmon
C4	Abbert River	30A01	Atlantic salmon, brown trout, stone loach, European eel	Atlantic salmon, brown trout, stone loach
D1	Unnamed stream	n/a	Not surveyed	No fish recorded (dry channel)
D2	Dangan Eighter Stream	30D35	Brown trout, <i>Lampetra</i> sp., stone loach, three-spined stickleback, roach	Brown trout, <i>Lampetra</i> sp., stone loach, three-spined stickleback
D3	Grange River	30G02	Not surveyed	Atlantic salmon, brown trout, stone loach, three-spined stickleback
E1	Lecarrow Stream	30L49	Not surveyed	No fish recorded (dry channel)
E2	Forty Acres Stream	30F16	Not surveyed	Brown trout
E3	Feagh East Stream	30F17	Not surveyed	Three-spined stickleback

Site no. (2024)	Watercourse	EPA code	Fish species recorded	
			September 2022	July 2024
E4	Grange River	30G02	Not surveyed	Atlantic salmon, brown trout, pike, minnow
L1	Derrynacrick Lough (west)	30_413	Fisheries appraisal only (brown trout observed)	Fisheries appraisal only (brown trout observed)
L2	Derrynacrick Lough (east)	30_205	Fisheries appraisal only	Fisheries appraisal only
L3	Horseleap Lough	30_248	Fisheries appraisal only	Fisheries appraisal only (three-spined & ten-spined stickleback recorded via sweep netting)
P1	Unnamed pond	n/a	Fisheries appraisal only	No fisheries habitat – dry pond
P2	Unnamed pond	n/a	Fisheries appraisal only	Fisheries appraisal only
P3	Unnamed pond	n/a	No fisheries habitat – dry pond	No fisheries habitat – dry pond
P4	Unnamed pond	n/a	Fisheries appraisal only	Fisheries appraisal only
P5	Unnamed pond	n/a	No fisheries habitat – dry pond	No fisheries habitat – dry pond
P6	Unnamed pond	n/a	Fisheries appraisal only	No fisheries habitat – dry pond
P7	Unnamed pond	n/a	Not surveyed	Fisheries appraisal only

4. Discussion

The surveyed watercourses in the vicinity of the Proposed Project were typically small lowland channels that had been historically straightened and deepened. Hydromorphological modifications coupled with low summer flows and ongoing siltation and eutrophication pressures had significantly reduced the quality of fisheries habitat in the majority of surveyed watercourses. Historical straightening and deepening of watercourses damages habitat and hydromorphological heterogeneity, removes instream structure and refugia, encourages sediment deposition and invariably results in an irreparable reduction in fisheries potential, particularly for salmonids (O’Briain et al., 2019b; O’Grady et al., 2017, O’Grady, 2006) but also European eel and lamprey species (King et al., 2015). Furthermore, bank clearance works which typically accompany arterial drainage (as observed in this survey) reduce riparian cover along watercourses and increase thermal stress to fish, especially less thermally-plastic salmonids (O’Briain et al., 2020, 2017).

A typical diversity of fish species for the Corrib catchment was recorded during the electro-fishing survey, with Atlantic salmon, brown trout, lamprey (*Lampetra* sp.), stone loach, pike, minnow and three-spined stickleback captured (**Table 3.1, 3.2**). A similar fish assemblage was recorded at comparable sites in the previous 2022 surveys (**Table 3.3**), albeit no Red-listed European eel were present in the current survey (previously recorded at site C4 on the Abbert River). The ponds within vicinity of the Proposed Wind Farm site (sites P1-P7) were small, heavily impacted by agriculture and of low aquatic value, with many being ephemeral (seasonal) and thus not of value to fish.

Salmonid populations were widespread, with brown trout being recorded from a total of 10 no. sites on the Grange River (A7, A8, D3, E4), Aghloragh River (B1, B2), Lecarrow Stream (C2), Abbert River (C4), Danagan Eighter Stream (D2) and the Forty Acres Stream (E2) (**Table 3.2**). Brown trout are also known from Derrynacrick Lough (site L1) and were observed during the site visit (as per 2022). Annex II Atlantic salmon were recorded from all survey sites on the Grange River (A7, A8, D3, E4) as well as sites on the Aghloragh River (B2), Lecarrow Stream (C3) and Abbert River (C4). Where present, salmon were typically recorded in good numbers², with site C4 on the Abbert River providing high quality nursery and spawning habitat and supporting the highest density of salmon parr captured in the current and previous surveys (**Table 3.1**). Despite evident stressors (chiefly hydromorphology), the Ahgloragh Stream (a Grange River tributary) was of high value for salmonids and supported the highest density of brown trout in the survey area. Instream enhancement works by Inland Fisheries Ireland and the Cairde an Chláir angling club had occurred very recently (July 2024) on the Aghloragh River (known locally as the Omaum River) and will likely bolster salmonid production in the catchment. As would be expected for channels exposed to drainage and siltation pressures, the larger watercourses in the survey area, namely the Grange River, Abbert River and, to a lesser extent, the Ahgloragh Stream, provided the highest quality salmonid habitat in vicinity of the Proposed Project. The Abbert and Grange rivers are known to be the most important salmonid spawning and nursery habitats in the Clare River catchment (Gordon et al., 2021; O’Briain et al., 2019a) and contribute significantly to the adult brown trout population of Lough Corrib (Delanty et al., 2021; Massa-Gallucci et al., 2010).

² except at site C3 on the Lecarrow Stream where a single Atlantic salmon parr was recorded

As per previous surveys, lamprey ammocoetes (*Lampetra* sp.) were only recorded from the Dangan Eighter Stream (at site D2). Ammocoetes were present in low densities (5 per m², respectively) (**Table 3.1**), a pattern also observed during previous surveys of the wider Corrib catchment (O'Connor, 2007; Byrne et al., 2000). This reflected the paucity of suitable nursery (soft sediment) habitat within the survey area, in addition to sub-optimal spawning habitat. 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 was limited and of poor quality due to historical modifications and siltation pressures, in addition to natural calcification (e.g. Ahgloragh Stream, Grange River). Furthermore, lamprey ammocoetes require the deposition of fine, organic-rich sediment ≥5cm in depth in which to burrow and mature (Aronsoo & Virkkala, 2014; Goodwin et al., 2008; Gardiner, 2003). The peat-dominated and or flocculent soft sediments typically found in the survey area do not provide optimal burial/burrowing habitat for ammocoetes.

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 suitability at numerous survey sites, European eel were not recorded in the current survey (**Table 3.1, 3.2**) although they were present at site C4 on the Abbert River during the 2022 survey (Triturus, 2023). These results are in keeping with other surveys in the Clare catchment which have also recorded eel in low densities (Gordon et al., 2021; O'Briain et al., 2019). The lack of eel largely reflected the poor hydromorphology and reduced instream habitat heterogeneity resulting from (often extensive) historical modifications, providing a low frequency of suitable refugia (e.g. boulders, pools) required by the species (Laffaille et al., 2003). 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 – Macro-invertebrates (biological water quality)

Table 8.1 Macro-invertebrate Q-sampling results for sites A1-A8 & B1-B2, July 2024

Group	Family	Species	A1	A2	A3	A4	A5	A6	A7	A8	B1	B2	EPA group
Ephemeroptera	Ephemeridae	<i>Ephemera danica</i>								2			A
Ephemeroptera	Heptageniidae	<i>Ecdyonurus dispar</i>							8		2	1	A
Plecoptera	Nemouridae	<i>Protonemura meyeri</i>										3	A
Ephemeroptera	Baetidae	<i>Alainites muticus</i>							8	19	1	12	B
Ephemeroptera	Leptophlebiidae	<i>Paraleptophlebia cincta</i>							1				B
Plecoptera	Leuctridae	<i>Leuctra fusca</i>							4			2	B
Trichoptera	Cased caddis pupa	sp. indet.					1	2	1	1			B
Trichoptera	Glossosomatidae	<i>Agapetus fuscipes</i>									6	31	B
Trichoptera	Goeridae	<i>Silo pallipes</i>										1	B
Trichoptera	Lepidostomatidae	<i>Lepidostoma hirtum</i>							8				B
Trichoptera	Limnephilidae	<i>Halesus radiatus</i>	5	2									B
Trichoptera	Limnephilidae	<i>Limnephilus lunatus</i>					4						B
Trichoptera	Limnephilidae	<i>Potamophylax cingulatus</i>								6	5		B
Trichoptera	Phryganeidae	<i>Agrypnia obsoleta</i>				1	7						B
Trichoptera	Sericostomatidae	<i>Sericostoma personatum</i>	5							5			B
Odonata	Coenagrionidae	sp. indet.		5	6	4		3			1		B
Ephemeroptera	Baetidae	<i>Baetis rhodani</i>							42	29	1	21	C
Ephemeroptera	Ephemerellidae	<i>Serratella ignita</i>							51	62	3	26	C
Trichoptera	Hydropsychidae	<i>Hydropsyche instabilis</i>							4			10	C
Trichoptera	Hydropsychidae	<i>Hydropsyche siltalai</i>							10	10	1	5	C
Trichoptera	Polycentropodidae	<i>Polycentropus kingi</i>								4			C
Trichoptera	Polycentropodidae	<i>Plectrocnemia conspersa</i>										1	C
Trichoptera	Rhyacophilidae	<i>Rhyacophila dorsalis</i>									1		C
Crustacea	Gammaridae	<i>Gammarus duebeni</i>	11	5			22		42	21	17		C
Coleoptera	Dytiscidae	<i>Ilybius fuliginosus</i>					2						C

Group	Family	Species	A1	A2	A3	A4	A5	A6	A7	A8	B1	B2	EPA group
Coleoptera	Dytiscidae	<i>Nebrioporus depressus</i>							5	3			C
Coleoptera	Dytiscidae	<i>Hydroporus palustris</i>			1			1					C
Coleoptera	Dytiscidae	<i>Hydroporus tessellatus</i>										15	C
Coleoptera	Dytiscidae	<i>Dytiscus marginalis</i>						2			2		C
Coleoptera	Elmidae	<i>Brychius elevatus</i>	1						12	3		6	C
Coleoptera	Elmidae	<i>Elmis aenea</i>	3							7	1	5	C
Coleoptera	Gyrinidae	<i>Gyrinus natator</i>	7										C
Coleoptera	Hydrophilidae	<i>Helophorus brevipalpis</i>	1	1	6								C
Diptera	Chironomidae	Non- <i>Chironomus</i> spp.	1	2	7	4	17	4		4	2	3	C
Diptera	Culicidae	sp. indet.			2					1			C
Diptera	Pediciidae	<i>Dicranota</i> sp.						2					C
Diptera	Simuliidae	sp. indet.							12	53			C
Diptera	Tipuliidae	sp. indet.						3					C
Hemiptera	Corixidae	<i>Corixidae nymph</i>				4	1						C
Hemiptera	Gerridae	<i>Gerris</i> sp.	5		6					2			C
Hemiptera	Veliidae	<i>Velia caprai</i>	1		2	1					2		C
Gastropoda	Ancylidae	<i>Ancylus fluviatilis</i>								3			C
Gastropoda	Bithyniidae	<i>Bithynia tentaculata</i>	5										C
Gastropoda	Physidae	<i>Physa fontinalis</i>								1	3		C
Gastropoda	Planorbidae	<i>Bathyomphalus contortus</i>		2									C
Gastropoda	Planorbidae	<i>Planorbis planorbis</i>						4				1	C
Gastropoda	Tateidae	<i>Potamopyrgus antipodarum</i>	83						5	5	13	53	C
Platyhelminthes	Planariidae	sp. indet.						3					C
Arachnida	Hydrachnidae	sp. indet.			4		7		4		4		C
Crustacea	Asellidae	<i>Asellus aquaticus</i>		7		24	49	6	2	1			D
Gastropoda	Lymnaeidae	<i>Ampullacaena balthica</i>		2		6				1		7	D
Gastropoda	Lymnaeidae	<i>Lymnaea stagnalis</i>					1						D

Group	Family	Species	A1	A2	A3	A4	A5	A6	A7	A8	B1	B2	EPA group
Mollusca	Sphaeriidae	sp. indet.	14	6	8			4					D
Megaloptera	Sialidae	<i>Sialis lutaria</i>					1						D
Diptera	Chironomidae	<i>Chironomus</i> spp.	8	11	2		9		1	1	5		E
Annelidae	Oligochaeta	sp. indet.						11					n/a
Abundance			150	43	44	44	121	34	220	244	70	203	
Q-rating			Q3	Q3*	Q3*	Q2-3*	Q2-3*	Q2-3*	Q3-4	Q3-4	Q3-4	Q3-4	
WFD status			Poor	Poor	Poor	Poor	Poor	Poor	Mod	Mod	Mod	Mod	

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

Table 8.2 Macro-invertebrate Q-sampling results for sites C1-C4, D1-D3 & E3-E4, July 2024

Group	Family	Species	C1	C2	C3	C4	D2	D3	E2	E3	E4	EPA group
Ephemeroptera	Ephemeridae	<i>Ephemera danica</i>									5	A
Ephemeroptera	Heptageniidae	<i>Ecdyonurus dispar</i>		2		4	8					A
Ephemeroptera	Baetidae	<i>Alainites muticus</i>				4						B
Ephemeroptera	Leptophlebiidae	<i>Paraleptophlebia cincta</i>					1					B
Plecoptera	Leuctridae	<i>Leuctra fusca</i>				7	1					B
Trichoptera	Cased caddis pupa	sp. indet.		1								B
Trichoptera	Glossosomatidae	<i>Glossosoma boltoni</i>				1						B
Trichoptera	Glossosomatidae	<i>Agapetus fuscipes</i>		52	1					1		B
Trichoptera	Goeridae	<i>Silo pallipes</i>		1		1						B
Trichoptera	Lepidostomatidae	<i>Lepidostoma hirtum</i>									5	B
Trichoptera	Limnephilidae	<i>Limnephilus lunatus</i>								6		B
Trichoptera	Limnephilidae	<i>Potamophylax cingulatus</i>							2			B
Trichoptera	Limnephilidae	<i>Drusus annulatus</i>			5					1		B
Trichoptera	Limnephilidae	<i>Micropterna</i> sp.			2							B
Trichoptera	Sericostomatidae	<i>Sericostoma personatum</i>		6						2		B
Odonata	Calopterygidae	<i>Calopteryx splendens</i>						4				B
Ephemeroptera	Baetidae	<i>Baetis rhodani</i>		32		9	4	1		2		C
Ephemeroptera	Ephemerellidae	<i>Serratella ignita</i>		25	8	12	19	17		2	7	C
Trichoptera	Hydropsychidae	<i>Hydropsyche instabilis</i>				1	7				1	C
Trichoptera	Polycentropodidae	<i>Polycentropus kingi</i>							1		1	C
Trichoptera	Rhyacophilidae	<i>Rhyacophila dorsalis</i>		7			4					C
Crustacea	Gammaridae	<i>Gammarus duebeni</i>	11	66	9	11	3		7	18	3	C
Crustacea	Astacidae	<i>Austropotamobius pallipes</i>					2					C
Coleoptera	Dytiscidae	<i>Nebrioporus depressus</i>									6	C
Coleoptera	Dytiscidae	<i>Hydroporus tessellatus</i>		2								C

Group	Family	Species	C1	C2	C3	C4	D2	D3	E2	E3	E4	EPA group
Coleoptera	Elmidae	<i>Brychius elevatus</i>				3	6		10	2	2	C
Coleoptera	Elmidae	<i>Elmis aenea</i>		14	2	3	13		1	18		C
Coleoptera	Elmidae	<i>Limnius volckmari</i>				3				2		C
Coleoptera	Hydrophilidae	<i>Helophorus brevipalpis</i>		2								C
Diptera	Chironomidae	Non- <i>Chironomus</i> spp.	2	2		6		5			11	C
Diptera	Culicidae	sp. indet.					1	1				C
Diptera	Pediciidae	<i>Dicranota</i> sp.		1	2		6			2		C
Diptera	Simuliidae	sp. indet.	1			2	6					C
Diptera	Tipuliidae	sp. indet.	2				2					C
Hemiptera	Corixidae	<i>Corixidae nymph</i>	5					1				C
Hemiptera	Veliidae	<i>Velia caprai</i>		5								C
Hemiptera	Veliidae	Veliidae nymph					1					C
Gastropoda	Ancylidae	<i>Ancylus fluviatilis</i>				1						C
Gastropoda	Bithyniidae	<i>Bithynia tentaculata</i>									3	C
Gastropoda	Physidae	<i>Physa fontinalis</i>						9				C
Gastropoda	Valvatidae	<i>Valvata piscinalis</i>				2						C
Gastropoda	Planorbidae	<i>Bathyomphalus contortus</i>						2		1		C
Gastropoda	Planorbidae	<i>Planorbis planorbis</i>						2				C
Gastropoda	Tateidae	<i>Potamopyrgus antipodarum</i>				4	82	15		5		C
Platyhelminthes	Planariidae	sp. indet.	1	2								C
Arachnida	Hydrachnidae	sp. indet.	6							3		C
Crustacea	Asellidae	<i>Asellus aquaticus</i>	9	16				21		1	18	D
Gastropoda	Lymnaeidae	<i>Ampullacaena balthica</i>				1		1				D
Gastropoda	Lymnaeidae	<i>Lymnaea stagnalis</i>						1				D
Hirudinidae	Glossiphoniidae	sp. indet.		1	1					1		D
Diptera	Chironomidae	<i>Chironomus</i> spp.	1		5	3	3	3		3	4	E
Annelidae	Oligochaeta	sp. indet.	2			1						n/a

Group	Family	Species	C1	C2	C3	C4	D2	D3	E2	E3	E4	EPA group
Abundance			38	237	35	78	169	83	21	70	66	
Q-rating			Q2-3*	Q3-4	Q3	Q4	Q4	Q3*	Q3	Q3	Q4*	
WFD status			Poor	Mod	Poor	Good	Good	Poor	Poor	Poor	Good	

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

Table 8.3 Macro-invertebrate sweep sampling results for lacustrine sites*, July 2024

Group	Family	Species	L1	L2	L3	P2	P4	P7
Ephemeroptera	Baetidae	<i>Alainites muticus</i>						
Ephemeroptera	Baetidae	<i>Baetis rhodani</i>						
Ephemeroptera	Baetidae	<i>Cloeon simile</i>	32				3	
Ephemeroptera	Ephemerellidae	<i>Serratella ignita</i>						
Ephemeroptera	Heptageniidae	<i>Ecdyonurus dispar</i>						
Plecoptera	Leuctridae	<i>Leuctra fusca</i>						
Trichoptera	Glossosomatidae	<i>Glossosoma boltoni</i>						
Trichoptera	Goeridae	<i>Silo pallipes</i>						
Trichoptera	Hydropsychidae	<i>Hydropsyche instabilis</i>						
Trichoptera	Leptoceridae	<i>Trienodes bicolor</i>	5					
Trichoptera	Limnephilidae	<i>Limnephilus lunatus</i>	10	1				
Trichoptera	Phryganeidae	<i>Agrypnia obsoleta</i>	2					
Trichoptera	Polycentropodidae	<i>Plectrocnemia conspersa</i>	1					
Odonata	Coenagrionidae	sp. indet.	12	8		4		
Odonata	Aeshnidae	<i>Aeshna</i> sp.	8	3				
Mollusca	Bithyniidae	<i>Bithynia tentaculata</i>	2					
Mollusca	Lymnaeidae	<i>Ampullacena baltica</i>						
Mollusca	Lymnaeidae	<i>Lymnaea stagnalis</i>		3	2			
Mollusca	Physidae	<i>Physa fontinalis</i>	1					
Mollusca	Planorbidae	<i>Ancylus fluviatilis</i>						
Mollusca	Planorbidae	<i>Bathyomphalus contortus</i>			1			
Mollusca	Tateidae	<i>Potamopyrgus antipodarum</i>						4
Mollusca	Valvatidae	<i>Valvata piscinalis</i>						
Mollusca	Sphaeriidae	sp. indet.	6	7				1
Crustacea	Gammaridae	<i>Gammarus duebeni</i>						
Crustacea	Asellidae	<i>Asellus aquaticus</i>	25	42				
Coleoptera	Dytiscidae	Dytiscidae larva	1	3			1	
Coleoptera	Dytiscidae	<i>Hydroporus palustris</i>			1			
Coleoptera	Dytiscidae	<i>Hygrotus inaequalis</i>			1			
Coleoptera	Dytiscidae	<i>Ilybius ater</i>	4	2				
Coleoptera	Dytiscidae	<i>Porhydrus lineatus</i>	2					
Coleoptera	Dytiscidae	<i>Rhantus exoletus</i>			1			
Coleoptera	Dytiscidae	<i>Rhantus frontalis</i>			2			
Coleoptera	Elmidae	<i>Brychius elevatus</i>						
Coleoptera	Elmidae	<i>Elmis aenea</i>						
Coleoptera	Elmidae	<i>Limnius volckmari</i>						
Coleoptera	Gyrinidae	<i>Gyrinus natator</i>	2					
Coleoptera	Halipliidae	<i>Haliphus ruficollis</i> group		1	6	1	4	1
Coleoptera	Hydrophilidae	<i>Helophorus brevipalpis</i>	2		1	2		
Coleoptera	Hydrophilidae	<i>Hydrobius fuscipes</i>			1			

Group	Family	Species	L1	L2	L3	P2	P4	P7
Diptera	Chironomidae	Non- <i>Chironomus</i> spp.	8	3	1	5	6	3
Diptera	Chironomidae	<i>Chironomus</i> spp.	18	10	11	24	58	31
Diptera	Simuliidae	sp. indet.						
Hemiptera	Corixidae	<i>Corixa praeusta</i>		5		2	68	4
Hemiptera	Corixidae	<i>Corixa punctata</i>			5			
Hemiptera	Corixidae	Corixidae nymph		5			6	
Hemiptera	Corixidae	<i>Hesperocorixa linnaei</i>		1	2	1		
Hemiptera	Corixidae	<i>Sigara</i> sp.				1	3	
Hemiptera	Nepidae	<i>Nepa cinerea</i>		1				
Hirudinidae	Glossiphoniidae	sp. indet.			1	2	1	
Megaloptera	Sialidae	<i>Sialis lutaria</i>	2					
Annelidae	Oligochaeta	sp. indet.				6	6	2
Arachnida	Hydrachnidae	sp. indet.	11	4		7	12	
Abundance			154	99	36	55	168	46
Taxon richness			20	16	14	11	11	7

* sites P1, P3, P5 & P6 were dry at the time of survey (ephemeral ponds)



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