AECOM

Shannon Technology and Energy Park (STEP) Power Plant

Appendix A7B.4: Aquatic Survey

Shannon LNG Limited

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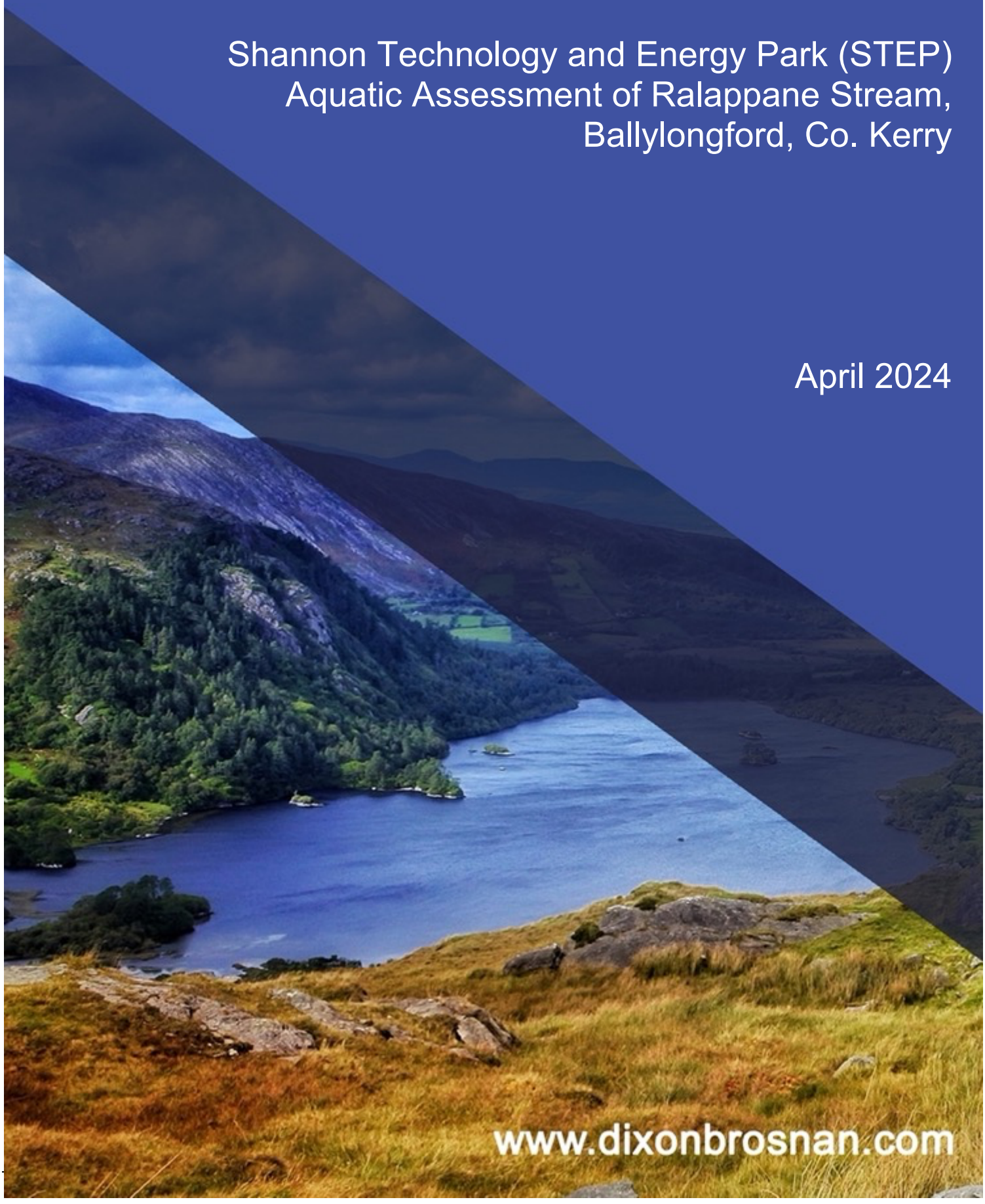
DixonBrosnan
environmental consultants

Shannon Technology and Energy Park (STEP)
Aquatic Assessment of Ralappane Stream, Ballylongford, Co. Kerry

April 2024



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1. Introduction

1.1 Survey Background

DixonBrosnan were commissioned to carry out an aquatic survey of the Ralappane Stream in 2021 as part of the ecological assessment for the Shannon Energy Park. The survey, which consisted of chemical and biological analyses at three sampling stations was carried out to assess current water quality and to determine the ecological value of the stream.

urus Environmental Ltd. were commissioned by DixonBrosnan to conduct baseline aquatic surveys to inform EIAR preparation for the proposed Shannon LNG Pipeline project in 2022. This included an assessment aquatic ecology including fisheries and biological water quality, as well as protected aquatic species and habitats in the vicinity of the proposed project, located between Tarbert, Co. Kerry and Foynes, Co. Limerick. The results of monitoring of the Ralappane Stream are included below.

It is noted that the Aquatic Services Unit (ASU) carried out sampling along the Ralappane Stream in 2006.

1.2 Proposed Development

The Proposed Development consists of a Power Plant together with associated infrastructure on an approximately 41ha area in the northeast of the overall 243ha landbank. The Proposed Development site consists of grassland on the southern shores of the Shannon Estuary and is surrounded by a mixture of agricultural land, rural housing, public roads and the Shannon Estuary.

The information in this report has been used to help determine the impacts on bird populations and also inform the conclusions of the Environmental Impact Assessment Report (EIAR) for the Proposed Development. Details of the study area are included in **Appendix 1**.

This report presents the results of breeding bird surveys conducted during the 2023 breeding season. The objective of the survey was to identify breeding bird activity within the planning boundary.

This report has been written in accordance with the Chartered Institute of Ecological and Environmental Management (CIEEM) *Guidelines for Ecological Report Writing* (CIEEM 2017).

The aim of this report is to provide a description of the bird survey methods used; to provide the results of breeding bird surveys; and to provide an interpretation of the results.

Figure 1. Overview of proposed development site | Source AECOM

1.3 Location

The Proposed Development will be located on the Shannon Estuary, approximately 4.5 km from Tarbert and 3.5 km from Ballylongford, Co. Kerry. **T**arbert Power Station is located approximately 5 km to the north-east of the Site. Moneypoint Power Station located on the northern shore of the Shannon Estuary, approximately 3 km to the north of the Site.

There are a small number of residential properties located within 500 m of the Site. Residential properties are also located along the existing L1010 road (Coast Road) immediately south of the Site, with additional residential properties, again to the south of the Site, to the east and west along the L1010 road.

The area of the Site to be developed is characterised by predominantly improved grassland in an agricultural setting. The field boundaries predominantly consist of hedgerows with small drainage ditches. The Site is in pasture, comprising primarily improved grassland with some wet grassland adjacent to the Shannon Estuary,

2. Location and description of watercourse

The Ralappane Stream is a small watercourse which discharges to the Shannon Estuary close to the western boundary of the proposed development. It supports a permanent flow of water but is of insufficient size to be included in the EPA biological monitoring programme and has a status of “unassigned” under the Water Framework Directive. The stream arises approximately 3.5km south-east of the proposed development site and passes through a landscape dominated by intensive agriculture with blocks of planted woodland, before

discharging to the estuary. Although there are sections with a natural riffle-glide flow pattern sections of the stream have straightened and deepened leading to sluggish flows and a soft substrate.

3. DixonBrosnan 2021 Survey

3.1 Sampling Locations

Three sampling stations were selected within the applicant's land ownership boundary as shown below on **Figure 1.**

Figure 2. Aquatic Sampling locations.

3.2 Survey methodology

The field survey was undertaken on the 22nd of April 2021. Water chemistry samples were taken at each location and transported to ELS Cork for analysis. Biological sampling was carried out at each station using the kick-sampling technique as described by the Clabby *et al.* (2001) The kick-sampling technique involved using a 'D' shaped hand net (mesh size 0.5 mm; 350 mm diameter) which was submerged in the river with its mouth directed upstream. Where available, riffle habitat is utilised. The substrate immediately upstream of the net was kicked for two minutes to dislodge invertebrates. Stone washing was also undertaken to ensure a representative sample of the fauna present at each site is collected. Samples were transferred to plastic bags and preserved using 70% alcohol. Samples were subsequently sieved and sorted using a white sorting tray. Identification was undertaken in the laboratory using a high-powered binocular microscope and using standard identification keys.

To establish the water quality of the two samples the EPA protocol for calculating Q values was utilised (Toner *et al*. 2005). This biotic index is used by the EPA and allows river quality to be compared under standardised guidelines. This method divides macro-invertebrates into five groups, depending on their sensitivity to pollution as presented in **Table 1**.

Table 1. Macroinvertebrate sensitivity classes.

Group	Sensitivity
A	Sensitive
B	Less Sensitive
C	Tolerant
D	Very tolerant
E	Most tolerant

Having determined the relative proportions of the various organisms in a sample, water quality can be inferred by a comparison of this data with that which might be expected from unpolluted habitats of the type under investigation. The Q-value determined using the fauna collected at each station therefore provides an indication of the quality of the water at that station. The relationship between Q values and water quality is set out in **Table 2** below. The relationship between the Q-rating system and the Water Framework Directive classification as defined by the Surface Water Regulations (S.I. 77 of 2019) is shown in **Table 3**.

Table 2. Q-value and water quality.

Q-value	Water quality	Status
5	Good	Satisfactory
4	Fair	Satisfactory
3	Doubtful	Unsatisfactory
2	Poor	Unsatisfactory
1	Bad	Unsatisfactory

Table 3. Correlation between the WFD classification and Q values

Ecological status WFD	Q Values
High	Q5, Q4-5
Good	Q4
Moderate	Q3-4
Poor	Q3, Q2-3
Bad	Q2, Q1

3.3 Characteristics of sampling stations

General descriptions of each sampling location are provided below in **Table 4**.

Table 4. Characteristics of sampling locations

Site	Stream name	Stream characteristics	Instream vegetation	Riparian vegetation	Flow type	Flow width m	Channel depth cm
SW1	Ralappane	20% gravel, 80% mud Deep glide with mud substrate. Shade 80%	Common Starwort	Willow, Bramble	Glide	1m	20
SW2	Ralappane	60% cobbles, 40% gravel Riffle adjoining intensive pasture with cattle. Upstream of cattle drinking point. Siltation evident. Stickleback noted.	Water Parsnip, Fools Watercress. Common Starwort	Willow, Bramble, Gorse	Riffle	1m	15
SW3	Ralappane	40% cobbles, 60% gravel; Silt levels high. Riffle adjoining wet grassland. Siltation evident. European Eel noted.	Water Parsnip, Fools Watercress.	Willow, Horsetail, Bramble, Yellow Flag, Remote Sedge	Riffle	1m	10

3.4 Results- Water Chemistry

Water samples were obtained from each survey location and analysed for a range of standard water quality parameters. Results from water chemistry samples are detailed below in **Table 5.**

Table 5. Water chemistry

PARAMETER	S1	S2	S3
pH	6.9	7.4	7.4
BOD (mg/l)	1	1	<1.0
Suspended solids (mg/l)	<5	<5	<5
Nie as N (mg/l)	0.005	<0.005	<0.005
Nitrate (N) (mg/l)	0.15	0.15	2.1
Ammonia as N (mg/l)	0.016	0.005	0.012
Total Nitrogen (mg/l)	5.2	5.9	8.5
Orthophosphate (Ortho/MRP) as P (mg/l)	0.009	0.005	0.014
Total phosphorus -mg/l P	0.03	0.03	0.04
Conductivity µs/cm	296	295	294

The water chemistry results are generally indicative of satisfactory water quality. In particular Orthophosphate levels, which is often a limiting factor in freshwater were relatively low. The Surface Water Regulations (S.I. 77 of 2019) specify requirements for key physio-chemical parameters at 95% and mean flows with respect to high or good status for rivers as detailed below in **Table 6**. Although samples were taken on a one-off basis, results obtained in respect of BOD, Orthophosphate and Total Ammonia would be indicative of High Status.

Table 6. Limits for high and good status at mean and 95% flows

	Mean flow		95%ile flow	
Parameter	**High status**	**Good status**	**High status**	**Good status**
BOD (mg O2/l)	≤1.3	≤1.5	≤2.2	≤2.6
Total Ammonia (mg N/l)	≤0.040	≤0.065	≤0.090	≤0.140
Ortho-phosphate (mg P/l)	≤0.025	≤0.035	≤0.045	≤0.075

3.5 Results- Biological survey

Macro-invertebrates found at each site were identified down to the lowest taxon required for the determination of Q value, using the rating systems described above. The results of the biological survey are presented in **Table 7**.

Table 7. Macroinvertebrate identification and Q values

Taxa	SW1	SW2	SW3
Group A			
None recorded			
GROUP B			
Glossosomatidae		1	3
Limnephilidae	4		3
Seracostoma personatum	2	5	12
GROUP C			
Baetis rhodani			2
Rhyacophila dorsalis	1		
Hydropsyche siltalai		1	2
Elmis aenea		11	9
Limnius volkmari	3	2	1
Gammarus duebeni	2	7	8
Potamopyrgus jenkinsi	9	6	15
Ancylus fluviatilis		1	
Simuliidae		2	2
Chironomidae			1
GROUP D			
Lymnaeidae			1
Glossiphonia			2
Planorbiidae		1	
Group E			
Chironomous sp.			3
OTHER			
Oligochaeta	4	6	1
Q values	Q3	Q3	Q3

4. Triturus 2022 Survey

4.1 Aquatic Survey Methodology

Aquatic surveys of the watercourses within the vicinity of the proposed pipeline project were conducted on Tuesday 20th to Thursday 22nd September 2022. Survey effort focused on both instream and riparian habitats. Surveys at each of these sites included a fisheries assessment (electro-fishing and or fisheries habitat appraisal), white-clawed crayfish (*Austropotamobius pallipes*) survey, macrophyte and aquatic bryophyte survey and (where suitable) biological water quality sampling (Q-sampling) (**Figure 2**). This holistic approach informed the overall aquatic ecological evaluation of each site in context of the proposed project and ensured that any habitats and species of high conservation value would be detected to best inform mitigation for the pipeline project.

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 etc.) including associated evidence of historical drainage
- Substrate type, listing substrate fractions in order of dominance (i.e. bedrock, boulder, cobble, gravel, sand, silt etc.)
- Flow type 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

4.2 Fish stock assessment (electro-fishing)

A single anode Smith-Root LR24 backpack (12V DC input; 300V, 100W DC output) was used to electro-fish the Ralappane Stream (as location shown in **Figure 2**), 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.

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 can be surveyed. Electro-fishing methodology followed accepted European standards (CEN, 2003) and adhered to best practice (e.g., CFB, 2008).

A broad appraisal of the upstream and downstream habitat at each site was also undertaken to evaluate the wider contribution to salmonid and lamprey spawning and general fisheries habitat. 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.).

4.3 Biological Monitoring

The Ralappane Stream was assessed for biological water quality through Q-sampling in September 2022 (**Figure 2.1).** The sample was 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. Samples were converted to Q-ratings as per Toner et al. (2005) and assigned to WFD status classes. 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).

4.3 Results

Triturus Environmental Ltd carried out aquatic surveys of the Ralappane Stream in 2022. The details of the survey are shown in **Table 8.**

No fish were recorded via electro-fishing during the 2022 survey. The site was not of fisheries value given the very shallow nature (likely ephemeral at the sampling location) and evident siltation pressures. There was no suitability for White-clawed crayfish. It is noted that during the 2022 survey, the stream suffered from low summer flows, with an imperceptible flow during the time of survey.

Table 8: Fisheries Assessment - Survey Locations

				Fish density (per m^2)			
Location X Y(ITM)	**Watercourse**	**CPUE (elapsed time)**	**Approx. area fished (m^2)**	**Atlantic salmon**	**Brown trout**	**European eel**	**Stone loach**
502865 648084	Ralappane Stream	5	60	0.000	0.000	0.000	0.000

The low fisheries value of this stream is likely linked to the short length of the stream, low flows, lack of available spawning substrate or due to debris and marginal vegetation blocking migration routes through the stream. There is no evidence to indicate that the stream has significant spawning habitat or is generally of high value for fish.

Small numbers of fish use the stream, and no Annex II species were recorded. Aquatic Invertebrates

The 2022 aquatic survey location along the Ralappane Stream (EPA code: 24R30) was located approximately 1.6 km upstream of the Shannon Estuary confluence. Here the stream is heavily modified and had been historically straightened and deepened. The stream suffered from low summer flows at the time of the 2022 survey, with an imperceptible flow. The stream averaged 2 m wide and 0.05-0.1 m deep in a deep U-shaped channel with bank heights of 2-2.5m. The substrata comprised scattered gravels and cobble with abundant deep silt accumulations. Cover of macrophytes was high with abundant fool's watercress (*Apium*

nodiflorum) and very localised water starwort (*Callitriche* sp.). Aquatic bryophytes were not recorded. The riparian areas were open on the south bank with no trees while the north bank supported dense Grey willow (*Salix cinerea*), Hawthorn, Blackthorn and Ivy, with Bramble and ferns on an earthen bank in the understory. The site was bordered by heavily improved pasture (GA1).

Biological water quality was calculated as Q4 (good status). 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). Biological water quality (Q-sample) results are also summarised for each riverine sampling site and in **Table 9**. No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling. Biological monitoring at 3 locations carried out by DixionBrosnan along the Ralappane Stream in 2021 classified all sites at Q3 (poor status). The Q4 rating is in-line with biological monitoring carried out by the ASU in 2011.

Given the absence of aquatic species or habitats of higher conservation value, the aquatic ecological evaluation of the Ralappane Stream was of local importance (lower value).

Table 9. Q-sample results (biological water quality)

Group	Family	Species	C1	EPA class
Ephemeroptera	Heptageniidae	*Ecdyonurus dispar*		**A**
Ephemeroptera	Heptageniidae	*Rhithrogena semicolorata*		**A**
Plecoptera	Nemouridae	*Nemurella pictetii*	37	**A**
Ephemeroptera	Baetidae	*Alainites muticus*		**B**
Plecoptera	Leuctridae	*Leuctra hippopus*		**B**
Trichoptera	Cased Caddis Pupa	sp. indet.		**B**
Trichoptera	Limnephilidae	*Potamophylax cingulatus*		**B**
Trichoptera	Sericostomatidae	*Sericostoma personatum*		**B**
Ephemeroptera	Baetidae	*Baetis rhodani*		**C**
Trichoptera	Hydropsychidae	*Hydropsyche siltalai*		**C**
Trichoptera	Philopotamidae	*Philopotamus montanus*		**C**
Trichoptera	Philopotamidae	*Wormaldia occipitalis*		**C**
Trichoptera	Polycentropodidae	*Plectrocnemia conspersa*		**C**
Trichoptera	Polycentropodidae	*Polycentropus flavomaculatus*		**C**
Trichoptera	Polycentropodidae	*Polycentropus kingi*		**C**
Trichoptera	Rhyacophilidae	*Rhyacophila dorsalis*		**C**
Coleoptera	Dytiscidae	*Hydroporus tessellatus*		**C**
Coleoptera	Dytiscidae	*Stictotarsus duodecimpustulatus*	1	**C**
Coleoptera	Elmidae	*Elmis aenea*		**C**
Coleoptera	Elmidae	*Limnius volckmari*		**C**
Coleoptera	Hydraenidae	*Hydraena gracilis*		**C**
Coleoptera	Scirtidae	*Scirtidae larva*		**C**
Diptera	Ceratopogonidae	sp. indet.		**C**

Diptera	Chironomidae	non-*Chironomus* spp.	6	**C**
Diptera	Culicidae	sp. indet.		**C**
Diptera	Limoniidae	*Antocha* sp.		**C**
Diptera	Limoniidae/Pediciidae	sp. indet.		**C**
Diptera	Pediciidae	*Dicranota* sp.		**C**
Diptera	Ptychopteridae	sp. indet.		**C**
Diptera	Simuliidae	sp. indet.	1	**C**
Diptera	Tipuliidae	sp. indet.		**C**
Hemiptera	Veliidae	*Velia caprai*		**C**
Hemiptera	Veliidae	Veliidae nymph		**C**
Crustacea	Gammaridae	*Gammarus duebeni*	5	**C**
Gastropoda	Tateidae	*Potamopyrgus antipodarum*	3	**C**
Gastropoda	Planorbidae	*Ancylus fluviatilis*		**C**
Arachnida	Hydrachnidiae	sp. indet.		**C**
Gastropoda	Lymnaeidae	*Ampullacaena balthica*	7	**D**
Gastropoda	Sphaeriidae	sp. indet.		**D**
Hirudinidae	Glossiphoniidae	sp. indet.	1	**D**
Diptera	Chironomidae	*Chironomus* spp.	3	**E**
Annelidae	Oligochaeta	sp. indet.		n/a
Abundance	**64**			
	Q4*			
WFD status	Good			

5. ASU 2011

During the ASU survey of the Ralappane Stream in 2011, small numbers of fish were caught during the electrofishing survey and only three species were detected. Two species (Stone Loach *Nemacheilus barbatus* and European Eel *Anguilla anguilla*) were found in low numbers with higher numbers of Stickleback *Gasterosteus aculaeatus* recorded. European Eel is listed by the International Union for Conservation of Nature (IUCN) as a critically endangered species, with numbers in catastrophic decline. No salmonids were recorded.

The ASU survey noted the following on the Ralappane Stream:

> The freshwater stream has a fairly typical mix of taxa but is low in mayflies (Ephemeroptera) and revealed no stoneflies (Plecoptera), which may point to a marginal degree of water quality impairment. However, an overall Q-value of Q4 (unpolluted) was assigned to the stream. A value of Q3-4 (slightly polluted) might also have been assigned, especially to Site 3, where there were relatively more oligochaetes and leeches, although the effect is marginal. The presence of large numbers of the caddis species Philopomatidae in the stream is probably indicative of a more headwater nature to this small channel.

6. Discussion & Conclusions

During the DixonBrosnan 2021 biological monitoring, Site 2 and 3 were considered suitable for kick sampling surveys, however site 1 is considered sub-optimal due to sluggish flows and a soft substrate. All three sites were assigned Q values of 3 with the most sensitive species (Group A) absent from all three sites. No sites achieved the target of good status (Q4) water quality, as specified under the Water Framework Directive (2000/60/EC).

Site 1 and 2 adjoin intensive grassland with cattle drinking points evident within this section of the watercourse. Site 3 adjoins wet grassland which is less intensively managed and diversity was generally higher at site 3.

The results from 2021 chemical analysis of water samples were not indicative of significant water quality impairment; however, it is noted that cattle drinking points have the potential to cause significant localised nutrient enrichment in small streams where dilution is limited. European Eel and Stickleback were noted within the watercourse which is considered highly unlikely, given its limited size, to support salmonids. No salmonids were recorded during the fish stock assessment in 2006.

The Tritarius survey in 2022 assigned a tentaive Q4 value given poor flows and lack of suitable riffle areas for sampling in terms of their aquatic ecology. The stream did not support fish at the time of survey.

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