Biological Water Quality Assessment of a Section the River Allow September 2024 (Q-values and SSRS)

Prepared for

North Cork Creameries

by

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1. INTRODUCTION

The purpose of the present report, prepared by Pascal Sweeney of Sweeney Consultancy, is a biological assessment of water quality in a section of the River Allow at Kanturk, Co. Cork, based on a survey of macroinvertebrate communities. This assessment was commissioned by North Cork Creameries.

Freshwater macroinvertebrates are visible to the human eye and can be found in the benthic environments in both rivers (river bed) and lakes (lake bed). Macroinvertebrates live in the water for all or part of their lives and therefore, their survival is directly related to the quality of the water in which they live. A change in the physical or chemical environment may change the composition and abundance of macroinvertebrate communities. Because macroinvertebrates are long-lived and of known sensitivity to pollution they can provide an assessment of water quality based on a single sample in a manner not possible with a small number of chemical samples. Several biological indices have been developed worldwide, based on the composition of river benthic macroinvertebrate communities. In the Republic of Ireland, the main two such indices are Q-values and Small Stream Risk Scores (SSRS). The Q-value method is a biological water quality assessment system, developed by the Environmental Protection Agency (EPA) and used in the River Biological Monitoring Programme, with sites throughout the country assessed on a three-year cycle. Macroinvertebrate communities are ascribed values from Q1 (grossly polluted) to Q5 (very high quality), with intermediate values (e.g. Q3-4) also used. The Small Streams Risk Score (SSRS) is different to the Q-value system in that it is not a system for assigning a quality status to a river body, but rather it is a biological risk assessment system, developed by the EPA, for identifying first and second order streams that are possibly or definitely ‘at risk’ of failing to achieve the ‘good’ water quality status goals of the Water Framework Directive (WFD).

2. METHODOLOGY

2.1 BIOLOGICAL WATER QUALITY

2.1.1 Q-values

At three sites (see satellite image, Appendix 1), biological water quality was assessed, following the Standard Operating Procedures of the EPA (2021) on 12/09/2024. At each site, notes on the physical habitat were recorded. A two-to-three-minute macroinvertebrate kick sample was collected from faster flowing riffle habitat. A further one-minute hand search was carried out to locate macroinvertebrates that remained attached to the underside of the cobbles. The entire sample was placed in a white tray on the riverbank. All macroinvertebrates were identified to at least genus/family level and the relative percentage abundance was recorded for each taxon. A Q-value was assigned based on the relative abundance of the pollution sensitive and tolerant taxa present in the sample. River typology and seasonality were considered when assigning the Q-value status.

Location details of the macroinvertebrate sampling sites assessed are presented in Table 1. Photographs of the sampling sites are presented in Appendix 2. Other relevant descriptive information for the macroinvertebrate sampling sites is presented in Appendix 3.

2.1.2 Small Streams Risk Scores

The same macroinvertebrate sample was used for determining the SSRS as was used for the Q-value determination. The score was calculated, based on the numbers of taxa and their abundances in each of the following five invertebrate groupings.

Group 1: Ephemeroptera (excluding *Baetis rhodani*);

Group 2: Plecoptera;

Group 3: Trichoptera;

Group 4: G.O.L.D. (Gastropoda, Oligochaeta, Leeches, Diptera);

Group 5: Asellus.

Based on the score, the site was determined to be “at risk”, “intermediate” or “probably not at risk” of achieving the WFD “good status” goals.

Table 1: Macroinvertebrate Sampling Sites.

No.	X Co-ordinate (ING)	Y Co-ordinate (ING)	Survey Location
1	138280	103040	River Allow. Downstream of the confluence of the River Dalua confluence, immediately upstream and downstream of the rock weir at MS1.
2	138511	102266	Downstream of MS2, upstream of Kanturk Urban WWTP outfall.
3	138389	102002	Downstream of Kanturk Urban WWTP outfall

3. RESULTS

3.1 Biological Water Quality

3.1.1 Q-values

The macroinvertebrate community recorded at each of the three sites sampled, giving relative abundance for each taxon, identified to the taxonomic level required for the EPA Q-scheme methodology, is presented in Appendix 4.

The Q-value ascribed to each site, together with current ecological status, classified in accordance with the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 (S.I. 77 of 2019) is shown in Table 2.

Table 2: Q-value results.

Site	Q-value	Ecological Condition
1	Q4	Good
2	Q4	Good
3	Q3-4	Moderate

At Sites 1 and 2, sufficient numbers of Group A pollution sensitive species are present to indicate Good ecological water quality (Q4). At Site 3, while three Group A taxa are present, numbers are low. This invertebrate community does not quite qualify for Q4, so Q 3-4 is assigned, indicating Moderate ecological water quality.

3.1.2 Small Streams Risk Scores

Calculations for SSR Scores are presented in Appendix 5. The SSRS calculated for each site, together with current risk category, is shown in Table 3. SSRS Risk categories are:

SSRS > 7.25: Probably not at risk

SSRS 6.5 – 7.25: Indeterminate – Stream might be at risk

SSRS < 6.5: Stream at risk

Table 3: SSRS results.

Site	SSRS	Risk Category
1	8.8	Probably not at risk
2	9.6	Probably not at risk
3	8.8	Probably not at risk

By the SSRS methodology, scores calculated for all three sites fall into the "Probably not at risk" category.

4. CONCLUSIONS & DISCUSSION

By the Q-scheme method the biological water quality of Sites 1 and 2 are assessed as Q4 (Good). Downstream of the Kanturk WWTP outfall, the Q-value drops slightly to Q3-4, indicating Moderate ecological conditions here.

By the Small Stream Risk Score method, when applied to the fauna found at the three sites, the scores fall into the "Probably not at risk" category.

No biological water quality impact from discharges of North Cork Creameries is detectable by either of the two assessment methods applied.

A slight deterioration in biological water quality can be detected in the faunal composition downstream of the Kanturk WWTP outfall.

APPENDIX 1

MACROINVERTEBRATE SAMPLING SITES

APPENDIX 2
PHOTOGRAPHS

Photo 1: Sampling Site 1

Photo 2: Sampling Site 2

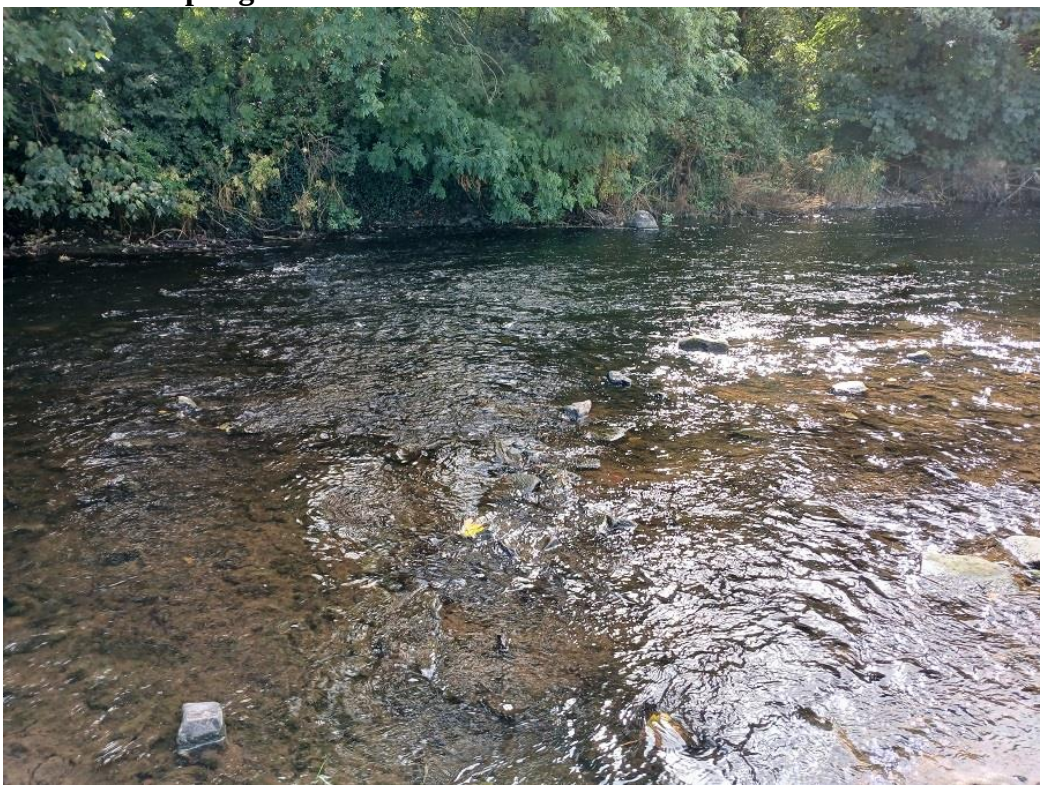

Photo 3: Sampling Site 3

APPENDIX 3
MACROINVERTEBRATE SAMPLING SITE DETAILS

Watercourse	River Allow
Site Code	1
Exact Sample Location	ING 138280 103040 Immediately upstream and downstream of rock weir at MS1.
Photograph	1
Wet Width (m)	40
Sampling depth (m)	0.1 – 0.4
Flow Type	Riffle 100%
Velocity	Moderate
Substratum	Cobble 55% Large Gravel 30% Small Gravel 5% Sand 5% Silt 5%
Instream Vegetation	*Fontinalis antipyretica.* 5% *Ranunculus sp.* 15%
Shade	None

Watercourse	River Allow
Site Code	2
Exact Sample Location	ING 138511 102266 Downstream of MS2, upstream of Kanturk Urban WWTP outfall.
Photograph	2
Wet Width (m)	30
Sampling depth (m)	0.2
Flow Type	Riffle 100%
Velocity	Moderate
Substratum	Cobble 60% Large Gravel 20% Small Gravel 10% Sand 5% Silt 5%
Instream Vegetation	*Ranunculus sp.* 15% *Fontinalis antipyretica.* 10% *Oenanthe crocata* <5%
Shade	Partial

Watercourse	River Allow
Site Code	3
Exact Sample Location	ING 138389 102002 Downstream of Kanturk Urban WWTP outfall. Just upstream of a surface water discharge entering on left bank.
Photograph	3
Wet Width (m)	20
Sampling depth (m)	0.2
Flow Type	Riffle 30% Fast Glide 70%
Velocity	Fast
Substratum	Cobble 30% Large Gravel 40% Small Gravel 20% Sand 5% Silt 5%
Instream Vegetation	*Ranunculus sp.* 25%
Shade	Partial

APPENDIX 4
Q-VALUE ASSESSMENT RESULTS

Relative abundance expressed as D: Dominant; N: Numerous; C: Common; F: Few; SS: Single Specimen

SITE TAXON	1	2	3
Group A (Pollution Sensitive)			
Ecdyonurus sp.	C	C	F
Heptagenia sp.		F	F
Perla sp.	SS		
Nemouridae	SS		SS
Group B (Less Pollution Sensitive)			
Leuctra sp.	F	F	
Leptoceridae	SS	SS	
Group C (Relatively Pollution Tolerant)			
Lumbriculidae			SS
Ancylus fluviatilis		F	F
Potamopyrgus antipodarum	F	F	C
Hydrachnidae			
Gammarus sp.	N	N	C
Caenis sp.			
Baetis rhodani	C	C	C
Hydropsychidae		N	N
Polycentropodidae	F	F	F
Rhyacophila sp.	F	F	
Dicranota sp.			
Simuliidae	F	F	F
Tipulidae	SS		
Chironomidae	F	F	F
Ceratopogonidae		SS	
Elmis aenea		F	F
Limnius volckmari		SS	F
Gyrinidae			SS
Group D (Very Pollution Tolerant)			
Erpobdella sp.	SS	SS	SS
Glossiphonia sp.	F		F
Group E (Most Pollution Tolerant) – None Recorded			
Tubificinae			F
Q-value	**Q4**	**Q4**	**Q3-4**

APPENDIX 5

SMALL STREAM RISK SCORE CALCULATIONS

Macroinvertebrate Composition

Invertebrate Groups	**Relative Abundance**	**Ab**
Group 1: Ephemeroptera (*ex. Baetis rhodani*)	1-5 specimens	1
Group 2: Plecoptera	6-20 specimens	2
Group 3: Trichoptera	21-50 specimens	3
Group 4: G.O.L.D (Gastropoda, Oligochaeta, Leeches and Diptera	51-100 specimens	4
Group 5: Asellus	>100 specimens	5

Ephemeroptera	**Ab**	**Plecoptera**	**Ab**
Ecdyonurus	3	*Leuctra*	1
Rhithrogena		*Isoperla*	
Heptagenia		*Protonemura*	1
Serratella		*Amphinemura*	
Caenis		*Perla*	1
Paraleptophlebia		*Dinocras*	
Ephemera danica		*Chloroperla*	
		Brachyptera risi	
Total no. of Taxa: 1	Total Rel. Ab.: 3	Total no. of Taxa: 3	Total Rel. Ab.: 3

Trichoptera	**Ab**	**G.OL.D**	**Ab**		**Ab**		**Ab**
Hydropsychidae	2	*Radix balthica*				**Asellus**	
Polycentropus	1	*Lymnea stagnalis*		Tubificinae		Absent	✓
Philopotamidae		Planorbidae		Hirudinea	1	Few (1-20)	
Rhyacophila	1	*Ancylus*	1	Lumbriculidae		Common (>20)	
Limnephilidae		*Physa*		*Chironomus*			
Leptoceridae	1	*Valvata*		Other Chironomidae	2		
Sericostomatidae	1	*Bithynia*		Simuliidae	2		
Goeridae		*Theodoxus*		*Dicranota*			
Glossosomatidae		*Potamopyrgus*	2	*Tipula*	1		
		Eiseniella tetreda		Ceratopogonidae			
				Dixidae			
Total no. of Taxa: 5	Total Rel. Ab.: 6			Total no. of Taxa: 6	Total Rel. Ab.: 9	Absent	

Group	**No. of Taxa**	**Relative Abundance**	**Score**
1	1	3	6
2	3	3	8
3	5	6	4
4	6	9	0
5		A	4
		Total Index Score	**22**
		Average Index Score	**4.4**
		SSR Score	**8.8**

Site 2

Macroinvertebrate Composition									
Invertebrate Groups Group 1: Ephemeroptera (*ex. Baetis rhodani*) Group 2: Plecoptera Group 3: Trichoptera Group 4: G.O.L.D (Gastropoda, Oligochaeta, Leeches and Diptera Group 5: Asellus							**Relative Abundance**	**Ab**
							1-5 specimens	1
							6-20 specimens	2
							21-50 specimens	3
							51-100 specimens	4
							>100 specimens	5
Ephemeroptera			**Ab**	**Plecoptera**				**Ab**
Ecdyonurus			3	*Leuctra*				1
Rhithrogena				*Isoperla*				
Heptagenia			2	*Protonemura*				
Serratella				*Amphinemura*				
Caenis				*Perla*				
Paraleptophlebia				*Dinocras*				
Ephemera danica				*Chloroperla*				
Baetis muticus				*Brachyptera risi*				
Total no. of Taxa	2	Total Rel. Ab.	5	Total no. of Taxa	0	Total Rel. Ab.		
Trichoptera			**Ab**	**G.OL.D**			**Ab**	
Hydropsychidae			4	*Radix balthica*				
Polycentropus			1	*Lymnea stagnalis*				
Philopotamidae				Planorbidae				
Rhyacophila			1	*Ancylus*			1	
Limnephilidae				*Physa*				
Leptoceridae			1	*Valvata*				
Sericostomatidae				*Bithynia*				
Goeridae				*Theodoxus*				
Glossosomatidae				*Potamopyrgus*			1	
				Pisidium				
				Eiseniella tetreda				
Total no. of Taxa	4	Total Rel. Ab.	7					

								Ab
				Lumbriculidae				**Asellus**
				Tubificinae				Absent ✓
				Erpobdella sp.				Few (1-20)
				Glossiphonia				Common (>20)
				Chironomus				
				Other Chironomidae			1	
				Simuliidae			2	
				Dicranota				
				Tipula				
				Ceratopogonidae			1	
				Dixidae				
Total no. of Taxa	5	Total Rel. Ab.	6	Absent				

Group	**No. of Taxa**	**Relative Abundance**	**Score**
1	3	8	8
2	1	1	4
3	4	7	4
4	5	6	4
5		A	4
		Total Index Score	**24**
		Average Index Score	**4.8**
		SSR Score	**9.6**

Site 3

Macroinvertebrate Composition												
Invertebrate Groups Group 1: Ephemeroptera (*ex. Baetis rhodani*) Group 2: Plecoptera Group 3: Trichoptera Group 4: G.O.L.D (Gastropoda, Oligochaeta, Leeches and Diptera Group 5: Asellus								**Relative Abundance** 1-5 specimens 6-20 specimens 21-50 specimens 51-100 specimens >100 specimens	**Ab** 1 2 3 4 5			
Ephemeroptera			**Ab**	**Plecoptera**			**Ab**					
Ecdyonurus *Rhithrogena* *Heptagenia* *Serratella* *Caenis* *Paraleptophlebia* *Ephemera danica* *Baetis muticus*			2 1	*Leuctra* *Isoperla* *Protonemura* *Amphinemura* *Perla* *Dinocras* *Chloroperla* *Brachyptera risi*			1 1					
Total no. of Taxa	2	Total Rel. Ab.	3	Total no. of Taxa	2	Total Rel. Ab.	2					
Trichoptera			**Ab**	**G.OL.D**			**Ab**				**Ab**	
Hydropsychidae Polycentropus Philopotamidae *Rhyacophila* Limnephilidae Leptoceridae Sericostomatidae Goeridae Glossosomatidae			4 1 1	*Radix balthica* *Lymnea stagnalis* Planorbidae *Ancylus* *Physa* *Valvata* *Bithynia* *Theodoxus* *Potamopyrgus* *Pisidium* *Eiseniella tetreda*			 1 3	Tubificinae Lumbriculidae *Glossiphonia* *Chironomus* Other Chironomidae Simuliidae *Dicranota* *Tipula* Ceratopogonidae Dixidae	1 1 2 2 1	**Asellus** Absent Few (1-20) Common (>20) Absent	 ✓	
Total no. of Taxa	3	Total Rel. Ab.	6					Total no. of Taxa	7	Total Rel. Ab.	11	

Group	**No. of Taxa**	**Relative Abundance**	**Score**
1	2	3	8
2	2	2	6
3	3	6	4
4	7	11	0
5		A	4
		Total Index Score	**22**
		Average Index Score	**4.4**
		SSR Score	**8.8**

APPENDIX 10
REFERENCES

EPA (2021). Standard Operating Procedure for River Biological Monitoring Field Sampling Surveys (Version 1.10). EPA internal publication.