Local Authority Waters Programme

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Carricknabraher

Priority Area for Action

Owennaforeesha_010

Domestic Waste Water Discharge/Misconnection Referral

Document Control Sheet

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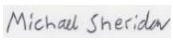
11/10/2023	F01	Final	Michael Sheridan Catchment Scientist		Cormac McConigley Western Region Catchment Manager	

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1 Background

Carricknabraher Priority Area for Action (PAA) is located in the north of Co. Roscommon and comprises the Breedoge sub-catchment (Breedoge_SC_010) of the 26B Upper Shannon (Boyle) Catchment, south of the town of Boyle and west of Elphin. The area covered by the PAA is predominantly rural, with the villages of Frenchpark, Bellanagare and Ballinameen being the main urban centres within the PAA.

The Owennaforeesha River is the main river channel in the Owennaforeesha_010 river waterbody (RWB). Rising in the townland of Tully in the south of the sub-basin, the Owennaforeesha River flows in a north-westerly direction as far as the village of Bellanagare where it transitions to the Breedoge_010 RWB (**Figure 1**). The Owennaforeesha_010 is currently at Moderate Ecological Status (2016-2021) and is *At Risk* of failing to achieve its good status objective under the Water Framework Directive (WFD). Bellanagare Bridge is the EPA operational monitoring station for the Owennaforeesha_010 and is located immediately downstream of the N5 road bridge in the village of Bellanagare (EPA station code: RS26O040100), and is approximately 100m upstream of where the Bellanagare and Environs Certificate of Authorisation waste water treatment plant (WWTP) discharges effluent to the Owennaforeesha River in the Breedoge_010 RWB (Error! Reference source not found.).

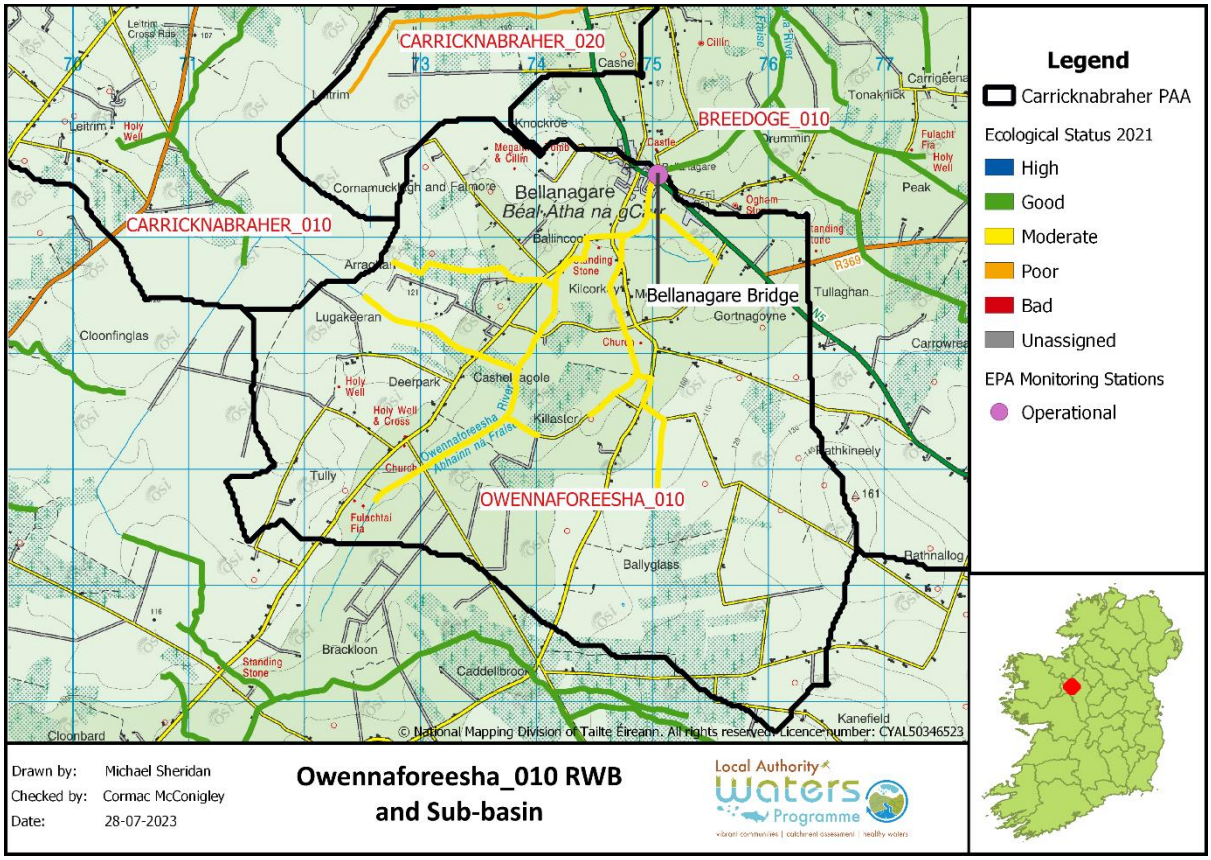


Figure 1: Owennaforeesha_010 RWB and sub-basin

The condition of this waterbody has remained relatively stable since the early 1980's, with EPA Q values fluctuating between Q3-4 (Moderate) and Q4 (Good) (see Appendix A). In 2020, Q3-4 was recorded indicating deterioration had occurred since 2017 when Q4 was achieved. In both 2017 and 2020, however, the EPA biologist noted evidence of nutrient enrichment at this site due to extensive algal cover, indicating that nutrient and/or organic pollution is a persistent issue for this waterbody. In 2020, the EPA biologist also noted that invertebrate communities were dominated by pollution

tolerant indicator taxa and that increased siltation was also impacting the reach upstream of the monitoring station.

Hydrochemistry data is limited for this waterbody, with only two sampling events per year at the EPA operational monitoring station at Bellanagare Bridge due to this being the upstream ambient monitoring point for the Bellanagare WWTP. The data available does however indicate potential issues (see graphs in Appendix A). Annual average ammonia concentrations exceeded the Good Status Environmental Quality Standard (EQS) of 0.065 mg/l in 2016 and 2020, including an exceedance of the 95%ile of 0.14 mg/l in September 2020. Annual average biological oxygen demand (BOD) exceeded the EQS of 1.5 mg/l in 2014, 2015, 2016 and 2020. Annual average ortho-phosphate concentrations exceeded the EQS of 0.035 mg/l in 2014 and more recently in 2022. These exceedances, particularly for BOD and ammonia, even though they are based on limited data, coupled with the EPA biologist's observations of nutrient enrichment in 2017 and 2020 suggest point sources of organic pollution close to the monitoring station may be impacting on water quality in the Owennaforeesha_010.

Initial characterisation identified agriculture, hydromorphology (due to this waterbody being part of the OPW's Boyle arterial drainage scheme) and urban run-off (from Bellanagare) as significant pressures impacting on water quality in this sub-basin. Characterisation for the 3rd WFD cycle also identified domestic waste water as a significant pressure due to suspected waste water misconnections in Bellanagare and sewer overflow evidence at Bellanagare bridge, although such point sources had not been identified. The impact and significance of these pressures on the Owennaforeesha_010 RWB were investigated as part of LAWPRO's Local Catchment Assessments (LCA) in the Carricknabraher PAA.

2 Local Catchment Assessment Findings

LAWPRO catchment scientists began LCA in the Owennaforeesha_010 RWB in September 2021. Sampling was initially carried out at LCA site 3.1 which is the same location as the EPA operational monitoring station for the Owennaforeesha_010 (**Figure 2**). Visual observations were recorded, and physico-chemical parameters measured using handheld probes and a water sample for laboratory analysis was also collected at this site. Kick-sampling and analysis of the macro-invertebrate community present on the substrate of the river was carried out to determine a Small Stream Impact Score (SSIS); this follows a similar method to how the EPA carries out biological sampling to determine Q-values at monitoring stations. The SSIS of 4.8 indicated that water quality was probably impacted at this site and that there had been no improvement since the EPA last sampled this site in June 2020. Comparison of the macro-invertebrate community present in the 2020 EPA sample and the 2021 LAWPRO sample also suggests that further deterioration had occurred, with less pollution sensitive taxa and a greater proportion of pollution tolerant taxa now present. Light availability is good at this site with little shading, and the presence of high to excessive coverage of the macroalgae *Vaucheria* corroborated the EPA biologist's 2017 and 2020 observations of nutrient enrichment at this site (see Photo A, Appendix B). No instream macrophytes were present except for some mosses on exposed rocks. High to excessive levels of both surface and interstitial siltation covering the channel width was also noted at this site, with large volumes of silt trapped by the *Vaucheria*. The surrounding land use appears to be non-intensive pasture for cattle grazing, but with no fencing of the river bank. Livestock access points, bank erosion and undercutting were observed in places but was not thought to be solely responsible for the high levels of siltation in the channel, with greater input from further upstream suspected. Physico-chemical parameters were normal, and concentrations of ortho-phosphate, ammonia and biological oxygen demand (BOD) were below the EQS for these parameters in a river

waterbody[1] (see **Table 1**), although the ortho-phosphate concentration was equal to the Good Status threshold of 0.035 mg/l as an annual average. Just upstream of LCA site 3.1, potential point sources for pollutants to directly enter the Owennaforeesha River both immediately upstream and downstream of the N5 road bridge were also noted.

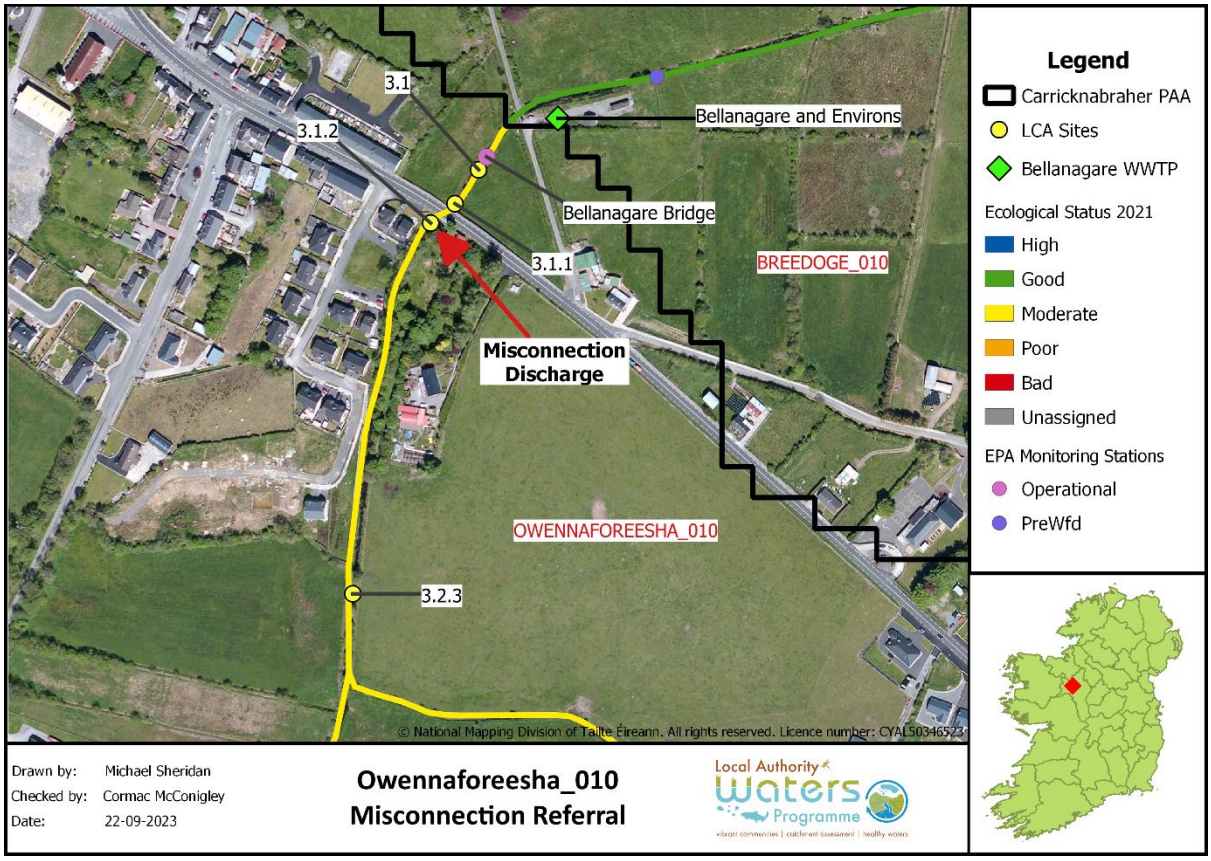


Figure 2: Owennaforeesha_010 LCA sites in Bellanagare

On the downstream side of the N5 road bridge, on the left bank of the Owennaforeesha River there is an old stone/concrete rectangular tank that is attached to the base of the bridge and from which a trickle of water was observed discharging from the bottom of the tank and entering the river (see Photo B, Appendix B). This discharge would later be sampled for physico-chemical analysis in March 2022 when the volume of discharge was greater following recent rainfall (LCA site 3.1.1), with results indicating it is unlikely to be a significant source of BOD or nutrients (see **Table 1**). It is suspected that run-off from the N5 road above enters this tank via a surface water drain. LCA to date has found no evidence that domestic waste water or any other significant pollutants enter the Owennaforeesha River via this discharge.

Immediately upstream of the N5 road bridge, a six-inch pipe protrudes from the left bank (see Photo C, Appendix B). On two occasions in September 2021 (7th and 23rd), only a small trickle of water was observed dripping from this pipe directly onto the bank below, preventing a sample for physico-chemical analysis from being taken. In January 2022, when the volume of discharge from this pipe was greater, a sample was collected directly from the pipe for analysis (LCA site 3.1.2, hereafter referred to as the misconnection discharge). It should be noted that this pipe and the section of river

[1] S.I. No. 77/2019 - European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019

immediately upstream of the bridge can only be accessed by walking under the bridge when the depth and flow rate of the river is generally low and allows for safe access. BOD and nutrient concentrations were elevated compared to the main channel of the Owennaforeesha River at LCA site 3.1, but not excessively so, and would have been easily diluted by the river. This is supported by comparison of the similar physico-chemical results recorded on the day at LCA site 3.1 which is downstream of Bellanagare and LCA site 3.2.3 which is upstream of Bellanagare and presumably not impacted by urban pressures associated with the village (see **Table 1**). High concentrations of *E. coli* in the sample taken from the pipe, however, indicate the discharge was contaminated with bacteria that are found in the intestines and faeces of humans and other warm-blooded animals. In water, high levels of faecal coliform bacteria such as *E. coli* indicate the presence of pathogens that cause waterborne diseases and that may pose risks to humans and animals that come into contact with that water, particularly if it is used for drinking. The high concentration of total coliforms on the day also indicates there may be other harmful pathogens entering the Owennaforeesha River via this discharge, which likely originates from a nearby domestic source as a result of a waste water misconnection.

On the 14/3/2022 and 21/11/2022, the Owennaforeesha River was in flood following heavy rainfall and on both occasions the misconnection discharge pipe was submerged and so it was unclear if the pipe was discharging on these days. Physico-chemical results from LCA site 3.1 (EPA operational monitoring station) on 14/3/2022 showed exceedances of the 95%ile EQS for both ortho-phosphate and ammonia and exceedance of the annual average EQS for BOD. On the 21/11/2022, only the annual average EQS for BOD and ortho-phosphate was exceeded. Physico-chemical results from samples taken at LCA sites further upstream in the Owennaforeesha_010 on these days indicate that urban pressures in Bellanagare were not responsible for these exceedances, instead, they were attributed to issues associated with agriculture. These agricultural issues had already been identified at the time and had previously been referred to Teagasc's Agricultural Sustainability Support and Advisory Programme (ASSAP).

On 15/2/2023, it had been planned to kick-sample at LCA site 3.1 for SSIS, but the presence of raggings (i.e. toilet paper) and sewage fungus in the channel, accompanied by a foul smell when the substrate of the river was disturbed meant kick-sampling was not carried out due to health and safety concerns (see photo D, Appendix B). The density of the raggings and sewage fungus instream increased further upstream and continued under the N5 road bridge. Walking upstream and under the bridge, the presence of raggings and sewage fungus instream began below the pipe on the left bank (i.e. the misconnection discharge), immediately upstream of the bridge (see **Figure 3** and photo E, Appendix B). Raggings and sewage fungus were not present upstream of this point. It was also noted that coverage of filamentous diatoms was high downstream of the discharge and at LCA site 3.1 but were almost absent upstream of the discharge. While at the site for around 30 minutes, slightly cloudy water was observed discharging from the pipe at a constant rate of approximately 1 litre per second. Physico-chemical results from samples taken on the day show that the discharge from the pipe had a BOD of 3.1 mg/l, ortho-phosphate of 0.12 mg/l and ammonia of 0.459 mg/l (see **Table 1**). The concentrations of total coliforms and *E. coli* (689300 and 131700 MPN/100 mls, respectively) were significantly greater than those previously recorded from this discharge in January 2022, and provides further evidence that domestic wastewater is being discharged to the Owennaforeesha River in Bellanagare via this pipe. Suspended solids of 3 mg/l was low, but it is clear that greater levels of solid material are discharged via this pipe at times, as evidenced by the raggings instream.

At LCA site 3.1, downstream of the misconnection discharge, dissolved oxygen levels on the day were adequate but the BOD of 7.2 mg/l was more than double the 95%ile EQS and was greater than the 4.7 mg/l recorded upstream of the discharge at LCA site 3.2.3. Further sampling upstream in the Owennaforeesha_010 sub-basin indicated that this exceedance of the BOD 95%ile EQS at LCA site 3.2.3 on the day was due to the known agricultural issues that had previously been referred to ASSAP.

On the day, the BOD concentration at LCA site 3.1 was greater than the concentrations coming from both the misconnection discharge and further upstream at LCA site 3.2.3, and is likely due to the high levels of raggings, sewage fungus and filamentous diatoms present at the site and immediately upstream which can be largely attributed to the misconnection discharge of untreated waste water.

Figure 3: Raggings and sewage fungus below discharge from pipe at LCA site 3.1.2 on 15/2/2023

3 Conclusions

The LCA findings, particularly those recorded in February 2023, indicate that the EPA operational monitoring station for the Owennaforeesha_010 is being significantly impacted by an untreated domestic waste water discharge due to a misconnection in the village of Bellanagare, Co. Roscommon. Untreated waste water is being directly discharged to the Owennaforeesha River via a pipe at the bridge immediately upstream of the monitoring station. This discharge, in combination with the agricultural pressures further upstream that have previously been referred to ASSAP are both contributing factors to the current failure of the Owennaforeesha_010 to achieve its WFD objective of Good Ecological Status. The close proximity of the misconnection and discharge site to the monitoring station, however, means that it is likely resulting in a greater level of impact than the agricultural pressures further upstream. This waste water discharge is likely contributing significantly to nutrient enrichment at the monitoring station, as evidenced by the high levels of macroalgae sometimes present, as well as increased siltation of the river channel due to the solid material being discharged.

The high levels of coliforms, particularly *E. coli* and potentially other harmful pathogens that are being discharged to the Owennaforeesha River may pose a risk to livestock that rely on the river for drinking water, as well as humans that come into contact with the river downstream of the discharge. The Owennaforeesha River is also part of the Breedoge sub-catchment that flows into Lough Gara, where water is abstracted for the North Roscommon Regional Water Supply Scheme. The high levels of coliforms and *E. coli* indicate that the discharge is likely contaminated with faeces, presumably from a nearby domestic source.

The high levels of sewage fungus observed downstream of the misconnection discharge in February 2023 indicates that the discharge had been a persistent issue for some time prior to this. The relatively dry weather experienced for the time of year in the days leading up to this assessment also meant that the waste water network for the Bellanagare WWTP agglomeration should not have been overloaded. Therefore, waste water would not have been getting discharged via old storm water overflows that may exist on the network. Therefore, it seems likely that there are domestic misconnections to this pipe that discharges directly to the Owennaforeesha River instead of the agglomeration network. During previous LCA carried out in 2021 and 2022, however, raggings and sewage fungus had not been observed underneath or downstream of this pipe, and at times there was no discharge to the river at all via this pipe. While the impacts observed in February 2023 were because of a recently persistent deleterious discharge, it does seem to be somewhat episodical, and not always as impactful on the receiving surface waterbody. Similarly, this pipe was opportunistically observed discharging on the 6/7/2023 during wet weather with some raggings and sewage fungus visible instream, but on 4/9/2023 during dry weather conditions, no raggings or sewage fungus were visible instream.

It is unclear what activates the discharge from this pipe or what domestic dwellings in Bellanagare it comes from, but a solution is required to address the impact it is having on the Owennaforeesha River and the failing ecological status of the Owennaforeesha_010 RWB.

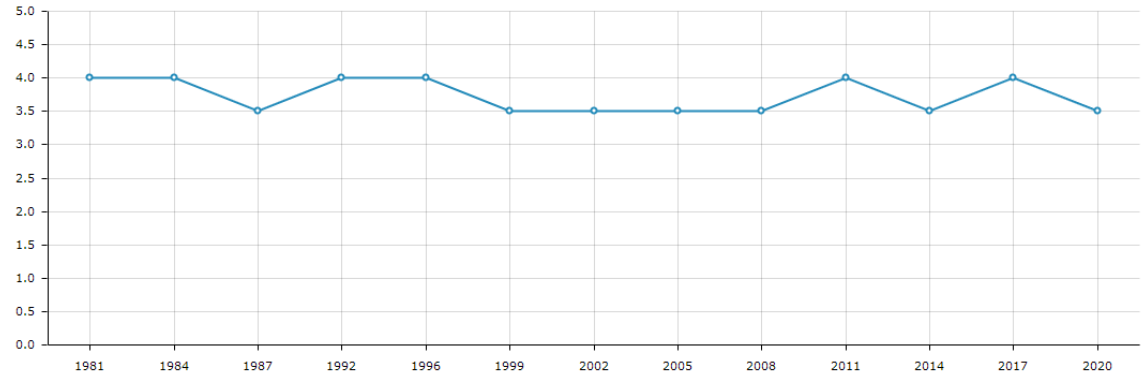
Table 1: Physico-chemical results from the Owennaforeesha_010 LCA sites in Bellanagare (annual average EQS exceedances for a RWB are highlighted in yellow, 95%ile EQS exceedances for a RWB are highlighted in orange)

Date	LCA Site	BOD	Ortho-P	Ammonia	Nitrate	Coliforms	E. coli	DO	Temperature	Conductivity	pH	Suspended Solids	COD
07/09/2021	3.1	< 1	0.035	0.036	0.397			104.8	17.1	473	6.7		
23/09/2021	3.1	< 1	0.025	0.02	0.358			96.4	13.6	410	8.37		
23/09/2021	3.2.3	< 1	0.021	< 0.02	0.337			91.8	13	393	8.34		
19/01/2022	3.1	< 1	0.021	0.052	0.496			91.9	7.9	452	8.05		
19/01/2022	3.1.2	1.8	0.086	0.25	1.121	48900	36200						
19/01/2022	3.2.3	< 1	0.02	0.049	0.47			94	7.8	456	7.63		
14/03/2022	3.1	1.6	0.107	0.157	1.133	17329	1725	Probes not available					
14/03/2022	3.1.1	< 1	0.034	0.038	1.538								
21/11/2022	3.1	2	0.059	0.057	0.337	9020	1203	88.7	7.7	228	6.43		
21/11/2022	3.2.3	2	0.065	0.071	0.35	1553	9820	81.6	8.3	228	6.54		
17/01/2023	3.1	< 1	0.022	0.027	0.698			Probes not available					
15/02/2023	3.1	7.2	0.01	0.084	0.509			93.5	7.45	431	8.1		
15/02/2023	3.1.2	3.1	0.12	0.459	0.808	689300	131700	70	7.02	623	9.2	3	< 20
15/02/2023	3.2.3	4.7	0.016	0.075	0.454			94.4	7.3	450	8.3		

Appendix A – Owennaforeesha_010 EPA biology and chemistry data

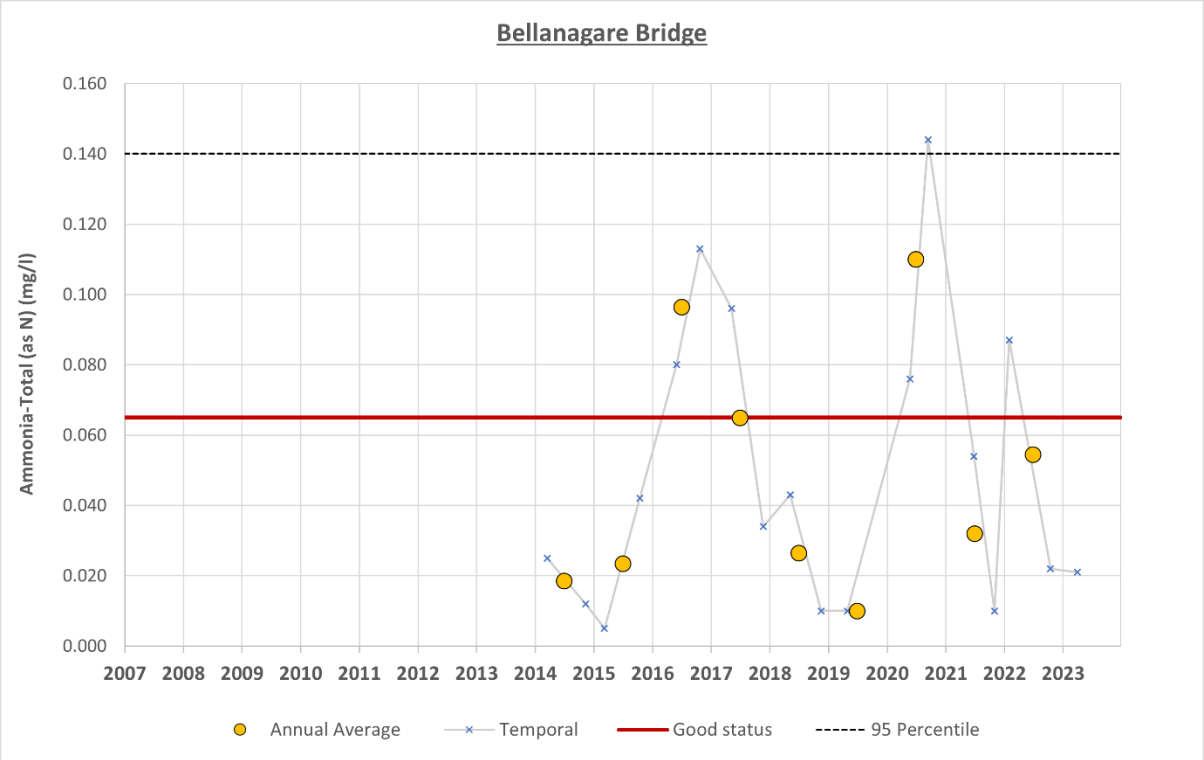
Bellanagare Bridge Operational Monitoring Station: RS26O040100

Q Value - Chart

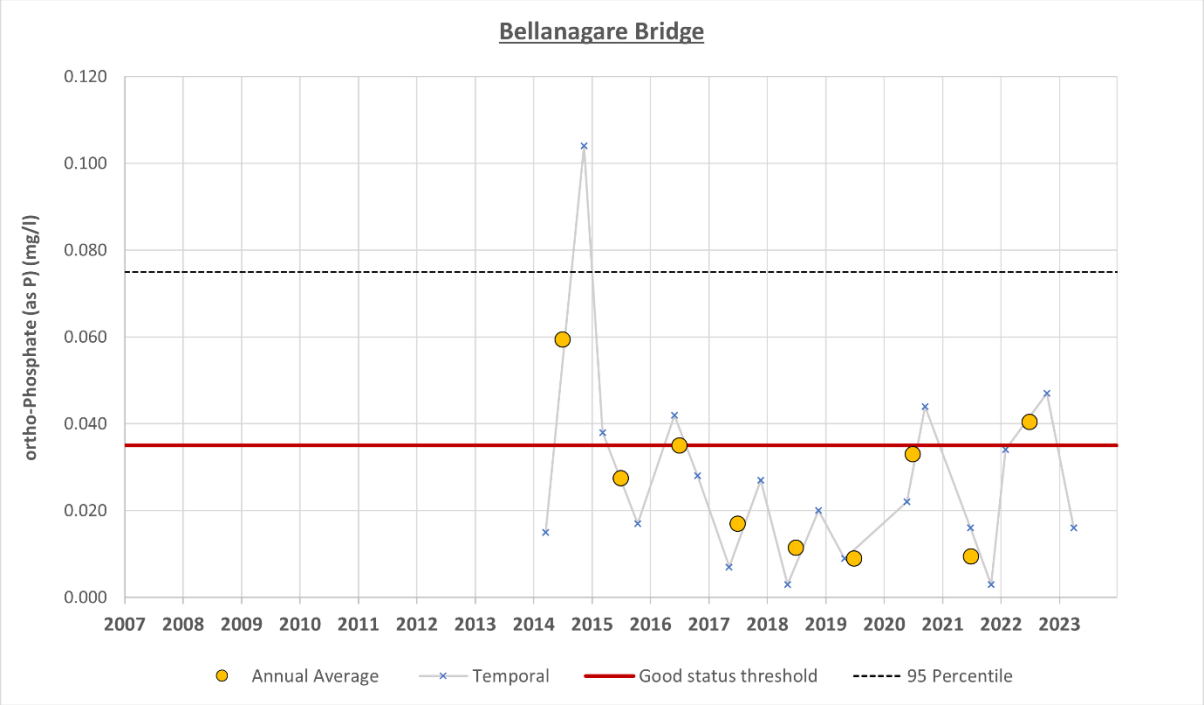


	1981	1984	1987	1992	1996	1999	2002	2005	2008	2011	2014	2017	2020
Result	4	4	3.5	4	4	3.5	3.5	3.5	3.5	4	3.5	4	3.5
Classification	Good	Good	Moderate	Good	Good	Moderate	Moderate	Moderate	Moderate	Good	Moderate	Good	Moderate
Q-Value	4	4	3-4	4	4	3-4	3-4	3-4	3-4	4	3-4	4	3-4

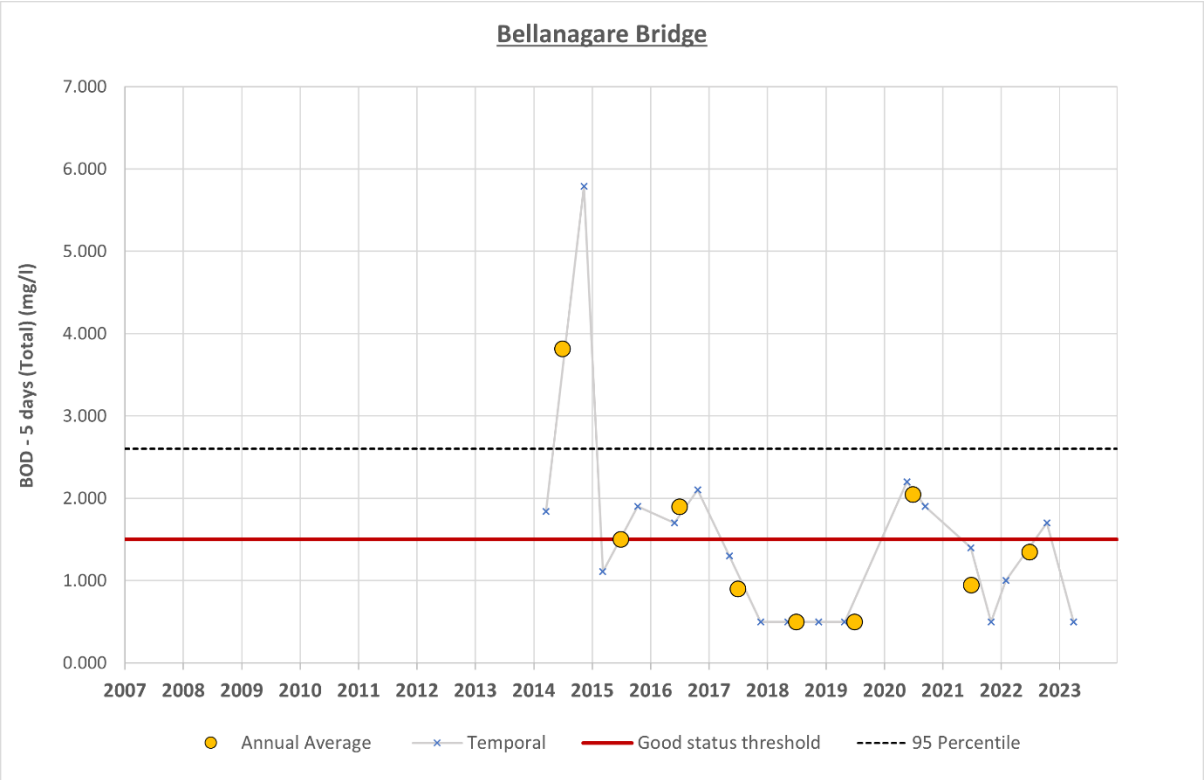
Ammonia – Total (as N)



Ortho-Phosphate (as P)



Biological Oxygen Demand



Appendix B – Local Catchment Assessment Photos

Photo A: High to excessive coverage of the macroalgae *Vaucheria* at the EPA operational monitoring station for the Owennaforeesha_010 (LCA site 3.1) on 7/9/2021.

Photo B: Old stone/concrete tank at the base of the N5 road bridge from which water discharges to the Owennaforeesha River (LCA site 3.1.1).

Photo C: Six-inch pipe protruding from the left bank, immediately upstream of the N5 road bridge as viewed from the bridge in September 2021 (LCA site 3.1.2, referred to as the misconnection discharge above).

Photo D: Raggings and sewage fungus instream at the EPA operational monitoring station for the Owennaforeesha_010 (LCA site 3.1) on 15/2/2023.

Photo E: Sewage fungus instream under the N5 road bridge, immediately downstream of the misconnection discharge and pipe at LCA site 3.1.2 on 15/2/2023.