TOBIN

Glanua

Macroom Wastewater Treatment Plant Upgrade Project

Assessment of Impact on Receiving Surface Waters Report

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1. INTRODUCTION

1.1 BACKGROUND

The Macroom Waste Water (WW) agglomeration is presently served by a 6,000 PE system. The existing Macroom Wastewater Treatment Plant (WWTP) is significantly hydraulically overloaded and not fit-for purpose, resulting in failure to meet the requirements of the existing EPA Waste Water Discharge Licence (WWDL)D0126-01 in recent years. Consequently, an upgrade of the WWTP is required.

The proposed future demand projections to which the proposed WWTP is to be designed are as follows:

Table 1.1 WWTP Load Summary

Loading data	Population Equivalent (PE)
Existing WWTP design capacity (As constructed)	6,000
25-year design horizon	8,300

1.2 PURPOSE OF REPORT

This document provides a summary of the Impact Assessments prepared to determine the impact of the operational discharges from the Macroom WW agglomeration on the receiving waters - River Sullane (IE_SW_19S020480) and addresses the criteria as outlined in Section D.2 of the EPA Guidance Document.

2. PROJECT DESCRIPTION

2.1 SITE LOCATION

The Macroom WWTP is situated on the north-east edge of the town of Macroom. The WWTP is situated approximately 20m from the south-west bank of the River Sullane, which flows through the centre of the town and which is a tributary of the River Lee. This section of the river is part of the Water Framework Directive (WFD) Sub-catchment Sullane_SC_010.

The River Sullane, which provides drinking water (and occasionally floods), joins the River Launa 1km east of the town, before joining the River Lee a further 1km east. It is also located 1.7km north of the Gearagh SAC (000108) and the Gearagh SPA (004109). The River Lee forms part of the Gearagh SAC (000108) and the Gearagh SPA (004109).

The WWTP is accessed directly off the Saint Colman's Park residential development public road. The WWTP site comprises areas of amenity grassland, planted trees and a concrete access road. The area towards the back of the site, which is utilised by the Roads Dept. of Cork County Council, comprises a stoned surface (Clause 804 or similar material). The Roads Dept also utilise an area immediately inside the entrance gate consisting of 3 No. sheds & a container and following completion of the proposed upgrade works, it is proposed that a portion of this area will be retained for use by the Roads Dept.

2.2 NEED FOR DEVELOPMENT

The existing Macroom WWTP has a design capacity of 6,000 Population Equivalent (PE). The existing Macroom Sewerage Scheme consists mainly of a combined collection network. Flows from the east of the catchment gravitate directly to the existing Macroom WWTP, while flows from the west gravitate to Masseytown Pumping Station (PS) where they are pumped east to a high point, from which they gravitate to the WWTP. There are a further 4 No. PS's on the network which service residential developments.

The emission limit values (ELVs) which are set out in the existing WWDL D0126-01 are as follows:

Table 2-1 Existing WDL D0126-01 ELV's

Parameter	Unit	ELV
pH	pH units	6 – 9
Biological Oxygen Demand (cBOD)	mg/l	15
Chemical Oxygen Demand (COD)	mg/l	125
Suspended Solids	mg/l	25
Ammonia (as N)	mg/l	2
Orthophosphate (as P)	mg/l	1

In its current design capacity (6,000 PE), the WWTP is unable to achieve the above ELVs. The existing WWTP is hydraulically overloaded and not fit-for purpose, resulting in failure to meet the above ELV requirements in recent years. Consequently, an upgrade of the WWTP is required.

Additionally, the site suffers from flooding issues. At present, the site of the WWTP experiences localised flooding from the River Sullane at least twice a year. In order mitigate the risk of flooding of the proposed upgraded development, it is proposed to construct a flood wall around the perimeter of the site.

3. DISCHARGE DESCRIPTION

3.1 DISCHARGE LOCATION

The following discharges will be present within the upgraded Macroom sewage scheme:

Macroom WwTP:

- SW001:
  - Primary Discharge Point
  - Location: 134957E, 72953N
- SW002:
  - Dual Storm Water Overflow (SWO) & Emergency Overflow (EO)
  - From: High Level Overflow from upgraded Formula A Chamber (upstream of Inlet Works)
  - Location: 134957E, 72953N (discharges through Primary Discharge SW001 outfall pipe)
- SW004
  - Storm Water Overflow (SWO)
  - From: Proposed Storm Water Holding Tank
  - Location: 134957E, 72953N (discharges through Primary Discharge SW001 outfall pipe)

Masseytown Pumping Station:

- SW003
  - Dual Storm Water Overflow (SWO) & Emergency Overflow (EO)
  - From: Masseytown Pumping Station
  - Location: 133877E, 73203N

All 3 No. discharges from the WWTP (i.e. SW001, SW002 & SW004) will discharge to the River Sullane via the same outfall pipe. As part of the upgrade of the WWTP, it is proposed to retain the existing outfall from the WWTP and all discharges will continue to be discharge through this pipeline.

3.2 WASTEWATER TREATMENT PROCESS

3.2.1 Existing Treatment Process

The existing WwTP includes the following treatment stages:

- Storm flow separation chamber using high level weir, with Storm Water Overflow (SW002) flowing to the Sullane River via the Primary Treated Effluent Outfall (Co-ords 134957E, 72953N);
- Preliminary treatment, consisting of a single 6mm automatic screen with a high-level bypass and 30mm manually raked screen downstream of the fine screen;
- Secondary treatment, consisting in the following:
  - Biological treatment: 1,240m^3, 1.5m deep, single oxidation ditch fitted with 3no. vortex aerators and 1no. original surface aerator;
  - Secondary settlement: single 15.2m diameter settlement tank with half bridge scraper;
- Ferric sulphate IBC dosing chemical at the outlet of the inlet works, currently not operational;
- Sludge treatment:
  - 26.5m^3 sludge holding/thickening tank;
  - Sludge dewatering provided by a single screw press with a capacity of 650kg/d and ancillary polymer make-up unit.

Following treatment, the secondary treated effluent from the WWTP is discharged by gravity to the Sullane river (which borders the WWTP site) through a 20m long outfall (SW001) (Co-ords 134957E, 72953N);.

3.2.2 Proposed Treatment Process

A brief description of the proposed treatment process is as follows:

Formula A Chamber:

Flows entering the WWTP shall be directed through a Formula A Chamber which shall be split into 2 No. cells divided by a weir. Flows shall enter the foul side of the chamber and on normal conditions (up to Formula A) shall be forwarded to the inlet works. If flows surpass Formula A, they will overflow through the weir to the storm side before been directed through a screen and onto the storm tank. Should the storm tank be full to capacity, the effluent will overflow via SW002 directly to the river through Primary Discharge outfall pipe @ 134957E, 72953N.

Inlet Works:

The proposed inlet works shall consist of the following:

- Inlet Screening;
- Full Flow to Treatment Pumping (FFT) Pumping Station;
- Grit and Fat Oils & Grease (FOG) Removal.

The first stage of the inlet works, effluent shall be screened to remove any large debris and solids. This shall be carried out by 2 No. mechanical band screens which shall be capable of screening up to 6mm in 2D. A further bypass screen is also provided which shall be capable of screening up to 19mm.

Following the initial screening, effluent shall be directed towards the FFT pumping station. Due to the existing ground profile at the Macroom WWTP, the gravity inlet sewer and the requirement to discharge to the river, gravity flow through the plant will not be achievable and a pumping station will be required to forward flows up to FFT PS to the grit trap and onto the biological treatment process. The FFT PS shall consist of a wet well equipped with 2 No. pumps which shall operate on a duty / standby basis. The FFT shall include for an overflow pipeline which shall be directed towards the storm tank.

Following influent pumping, a grit removal stage will be provided through a combination of air agitation (coarse bubble) and settling. The grit removal unit should be capable of removing 95% of grit particles by weight of incoming grit, with grit being defined as all inorganic particles greater than 0.2mm diameter with a specific gravity equal to or greater than 2.65mm at a settling velocity of 0.3m/s. Additionally, due to the sensibility of the IFAS process with FOG, the unit has been designed to ensure 70% reduction of removable FOG and a maximum outlet concentration of 50mg/l, thus minimizing the risk potential impact on the downstream process units. Collected grit and FOG will be forwarded to a grit classifier and FOG concentrator respectively to provide further treatment of collected materials.

Secondary Treatment:

Secondary Treatment shall consist of the following:

- Alkalinity Dosing;
- Integrated Fixed-Film Activated Sludge (IFAS) Reactors;
- Secondary Settlement Tanks;
- Ferric Sulphate Dosing;
- Return and Waste Sludge Pumping Station;
- Scum Pumping Station.

Alkalinity dosing is included as part of the treatment process in order to maintain a stable pH more favourable to biological growth. In order to maintain the required alkalinity the following measures have been included as part of the treatment process:

- Provision of an anoxic zone within the IFAS reactor to recover of the alkalinity consumed by the nitrification reaction;
- Alkalinity boosting through the use of calcium hydroxide/hydrated lime.

IFAS process was selected as the preferred process for the upgraded Macroom WwTP. The proposed design includes for 2 No. IFAS reactors each sized for 50% of the incoming loads, which will facilitate maintenance of the plant when required without disrupting significantly

the treatment process. Each of the proposed IFAS reactors will include 1 No. anoxic cell for denitrification, 2no. aerobic cells for carbonaceous oxidation and 1no. deaeration cell.

Ferric sulphate shall be added to the effluent discharging from each IFAS reactor in order to lower orthophosphate within the effluent to the required level.

Following biological treatment, the IFAS effluent will be forwarded to a secondary settlement stage, where both biological sludge and chemical sludge generated by the chemical phosphorus removal process will separate from secondary treated effluent by gravity. Settled sludge will then be collected into a central hopper for sludge return and wasting, whilst treated effluent will flow over a weir to the final effluent chamber before discharging to the River Sullane @ SW001 (Co-ords 134957E, 72953N).

Return activated sludge (RAS) shall be collected within the secondary settlement tank and shall be returned to the IFAS to boost the biological process via 2 No. dry mounted pumps which shall operate on a duty / standby basis. Waste activated sludge shall be pumped to the picket fence thickener (PFT) via a further 2 No. dry mounted pumps which shall operate on a duty / standby basis. Scum collected in the secondary settlement tanks will gravitate to a common scum sump, where flows will be forwarded to the PFT.

Stormwater Treatment:

All flows to the storm tank via the Formula A chamber & FFT Pumping Station will be screened by the inlet works 6mm fine screen or Formula A weir 6mm screen. Due to the profile of the existing sewer arriving to the WWTP, it will not be possible to discharge wastewater from the storm tank to the river by gravity without surcharging the upstream network, and discharge from the storm tank will therefore be through pumping under normal operation (SW004).

The storm pumps will be located in the storm tank itself, thus removing the need for an additional sump and facilitating constructability of the project.

Pumped flows will be pumped to a high-level chamber where they will combine with the treated effluent prior to discharge through the existing Primary Discharge outfall to the River Sullane @ SW001 (Co-ords 134957E, 72953N).

In the event of a power failure, an actuated valve will fail in the closed position at the inlet to the storm tank to prevent localised flooding, and a separate overflow will discharge from the upstream Formula A Chamber weir directly to the river (SW002). It should be noted that this will require surcharging of the upstream network.

Once incoming flows subside below FFT, stormwater stored in the stormwater holding tank will be returned to the FFT PS by 2 No. pumps located in a sump within the tank.

Sludge Treatment Process:

Sludge treatment shall consist of the following:

- PFT;
- Sludge Dewatering;
- Mixed Liquor Returns (MLRs);
- Odour Abatement.

PFTs consist in circular roofed tank fitted with a bottom scraper and a conical collecting bottom. Sludge is fed through a central drum and released at a low velocity near the surface of the tank, allowing solids to settle to the bottom of the tank by gravity. The scrapers then

slowly move the settled, thickened solids to a discharge pipe at the bottom of the tank to allow for their pump-out to the sludge dewatering system. A v-notch weir located at the top of the tank allow the supernatant to flow by gravity to the mixed liquor return pumping station. The proposed system will be able to achieve a thickened sludge concentration of at least 3% dried solids, thereby minimising the required hydraulic capacity of the dewatering feed pumps and dewatering system.

As part of the project, it is proposed to retain the existing sludge dewatering system. To increase the robustness of the existing system, a second standby dewatering feed pump be provided.

A new MLRs pumping system shall be provided in order to return MLRs directly to the flow splitting chamber to the IFAS reactors.

3.3 Influent Characteristics

The summary of the influent monitoring data for the WWTP is presented on the table below.

Table 3.1 Influent Characteristic Summary

Annual Environmental Report	2018	2019	2020	2021	Average
BOD (mg/l)	253.14	314.00	211.87	192.00	242.75
COD (mg/l)	834.29	843.00	710.77	550.00	734.52
Suspended Solids (mg/l)	512.39	335.00	295.35	244.00	346.69
Nitrogen Total (mg/l)	40.43	65.00	49.99	58.00	53.36
Phosphorous Total (mg/l)	8.03	8.46	4.65	7.44	7.15
Hydraulic Capacity	1923.00	1303.06	1655.00	1316.00	1549.27

3.4 Effluent Characteristics

The summary of the effluent monitoring data for the WWTP is presented on the table below.

Table 3.2 Effluent Characteristic Summary

Annual Environmental Report	2018	2019	2020	2021	2022	Average
BOD (mg/l)	7.51	16.00	10.53	13.00	16.56	12.72
COD (mg/l)	34.82	86.10	53.18	62.00	70.08	61.24
Suspended Solids (mg/l)	18.54	60.07	15.03	28.00	30.85	30.50
Nitrogen Total (mg/l)	15.00	16.02	14.34	21.00	25.49	18.37
Phosphorous Total (mg/l)	1.24	1.83	0.78	1.22	2.22	1.46
pH (pH units)	7.43	7.18	7.49	7.41	7.54	7.41
Ammonia Total (mg/l)	6.30	2.25	7.51	11.00	19.56	9.32
Ortho-Phosphate (mg/l)	0.99	0.59	0.65	0.99	1.86	1.02

3.5 Ambient Monitoring Data

Ambient monitoring is carried out along the River Sullane both upstream & downstream of the of the Macroom WWTP at the following monitoring stations:

- Upstream Quality Point: RS19S020450 (aSW1u);
- Downstream Quality Point: RS19S020480 (aSW1d).

The location of the ambient monitoring points are presented in Figure 3.1 below.

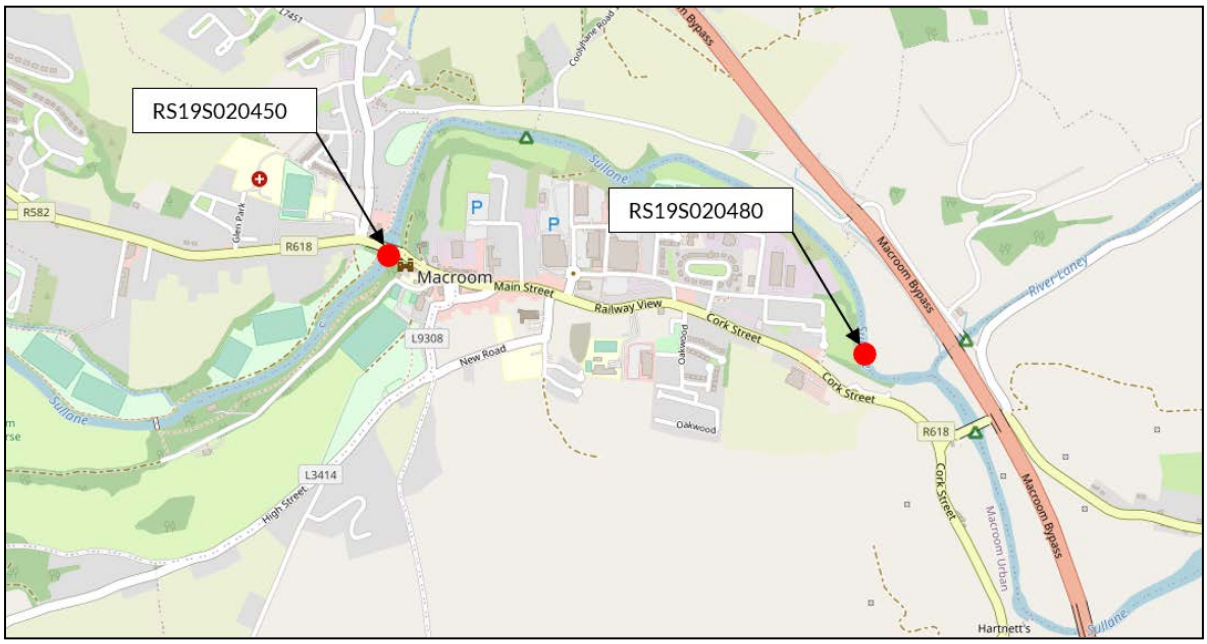

Figure 3.1 Ambient Monitoring Locations

Ambient water quality data was obtained for the designated monitoring points from the Catchments database[1]. The ambient monitoring was analysed for a 3 year period from February 2020 to June 2023.

With regards to the ambient water quality data for the upstream monitoring point, it was noted that the sample obtained for the 12th of February 2020 identified an ammonia concentration of 0.7mg/l. This reading was circa 30 times greater that the average of the remaining 13 No. samples obtained during the study period. As such, this sample has been considered an outlier and has been omitted from the WAC analysis.

Details of the ambient water quality data is included in Appendix A of this report while a summary is presented on Table 3.3 below.

Table 3.3 Ambient Monitoring Summary

	Ammonia Total (mg/l)	BOD (mg/l)	Ortho P (mg/l)
Upstream monitoring point EPA Station Ref: RS19S020450 **Irish Grid Ref:** 133805E, 72977N **Current WFD Status:** Good			
Average	0.024	0.929	0.019
95%ile	0.037	1.635	0.034
Downstream monitoring point EPA Station Ref: RS19S020480 **Irish Grid Ref:** 135048E, 72709N **Current WFD Status:** Good			
Average	0.491	1.927	0.046
95%ile	2.374	3.925	0.120

[1] Catchments.ie - Water, from source to sea.

Note: Ammonia results exclude sample obtained on the 12th February 2020

3.6 Licensed Emission Limit Values

The existing EPA WWDL D0126-01 for Macroom WW agglomeration ELVs for the final effluent are listed previously in Table 2-1.

4. DESCRIPTION OF RECEIVING WATERBODY

The Macroom WW agglomeration discharges to the River Sullane (IE_SW_19S020480). The river originates in County Kerry near the village of Cúil Aodha. The river flows eastwards through the centre of Macroom town and is a tributary of the River Lee. This section of the river which the WWTP discharges is part of the WFD Sub-catchment Sullane_SC_010.

The River Sullane, provides drinking water to the Macroom WTP. The abstraction point is located circa 2.2km upstream of the existing/proposed Primary Discharge Point SW001 from the Macroom WWTP.

The River Sullane joins the River Laney circa 1km east of Macroom town, before joining the River Lee a further 1km east.

4.1 Adjacent Abstraction & Discharge Points

There are a number of abstraction and discharge points located along the River Sullane & Lee Estuary both upstream & downstream of Macroom WWTP. A summary of the abstractions and discharges are as follows:

- Macroom Water Treatment Plant: Water for the Macroom WTP is currently abstracted from the River Sullane at a location circa 2.2km upstream of the Primary Discharge Point SW001 from the Macroom WwTP;
- Macroom WWTP: The Primary Discharge Point SW001, Dual SWO & EO SW002 and SWO SW004 all discharge to the River Sullane;
- Masseytown Pumping Station: The Dual SWO & EO SW003 from the Masseytown pumping station is located along the River Sullane circa 1.2km upstream of the main Macroom WwTP;
- Coolcower WWTP: The Primary Discharge Point for the Coolcower WWTP is located along the Lee Estuary, circa 1.2km downstream of the Primary Discharge Point SW001 from the Macroom WWTP.

4.2 Proximity to Designated Sites

The following designated sites are located within a 15km radius of the Macroom existing/proposed Primary Discharge Point SW001:

Table 4-1 Proximity to Designated Sites

Site Code	Site Name	Designation	Distance to the designated site
IE000108	The Gearagh SAC	SAC	1.7km
IE000106	St. Gobnet's Wood SAC	SAC	15km
004109	The Gearagh SPA	SPA	2.6km
004162	Mullaghanish to Musheramore Mountains SPA	SPA	6.8km

4.3 Receiving Water Quality Analysis

Biological Quality Ratings (Q Values) are recorded annually at a permanent monitoring point adjacent to the Macroom WWTP. The details of the monitoring station are noted below.

Table 6.2: Macroom WwTP Q-Values monitoring Location

Station Code	Station Location	WFD Waterbody Code	Easting	Northing	Local Authority
RS19S020480	Ford u/s Laney R confluence	IE_SW_19S020480	135048	72709	Cork County Council

Table 6.3: Review of the Q-Values Recorded at the Macroom WwTP Monitoring Location

Station Code	2002	2005	2008	2011	2014	2017	2020
RS19S020480	4	4	4	4	4	4	4

The River Sullane, upstream and downstream of the Macroom WW agglomeration has a recent assigned ecological status 'Good' under the Water Framework Directive (WFD) reaching a Q4 value in 2020.

4.4 Water Body Ecological Status

The River Sullane is assessed as part of Water Framework Directive (WFD) reviews. This assesses both the chemical and biological status of the watercourse on an annual basis. The previous 3 iterations of the ecological status of the water course are as follows:

Table 6.4: Ecological Status of the River Sullane

Period	Site Name	Ecological Status
SW 2016 - 2021	SULLANE_060	Good
SW 2013 - 2018	SULLANE_060	Good
SW 2010 - 2015	SULLANE_060	Good

It is noted that the waterbody (name LEE (CORK)_060) circa 200m downstream of the WwTP has a rating of 'High' Ecological Status.

4.5 Waterbody Risk Category

At present the water body is currently deemed 'Not at Risk'.

4.6 Waterbody Objectives

The main aims of the WFD are to:

- Prevent deterioration and enhance status of aquatic ecosystems, including groundwater;
- Promote sustainable water use;

- Reduce pollution;
- Contribute to the mitigation of floods and droughts.

With regards to the River Sullane, the primary objective for the watercourse is to 'Maintain Good Ecological Status'.

4.7 WATERBODY SIGNIFICANT PRESSURES

Based on the 3rd Cycle Draft Lee, Cork Harbour and Youghal Bay Catchment Report (HA 19) (Lee, Cork Harbour and Youghal Bay (catchments.ie)), there are no significant pressures identified for the waterbody.

5. AA SCREENING

A Stage 1 Screening for Appropriate Assessment was completed in respect to the Macroom WWTP proposed upgrade works (Attachment D.2.3). The AA Screening concluded that one European site, the Gearagh SAC is within the Zone of Influence (ZoI) of the proposed upgrade works, based on distance from the site boundary. The remaining 3 No. relevant European sites that were initially considered were found to be outside of the ZoI as they are located too far away and there is no hydrological links present for any significant effects to occur.

Following an evaluation of the relevant information, including details of the proposed upgrade works and its relationship with European sites, it was not considered possible to rule out the potential for likely significant effects on the Otter which is a Qualifying Interest of The Gearagh SAC based on the application of the precautionary principle and in the absence of mitigation.

It was therefore recommended that a NIS (Attachment D.2.2) be prepared to assist the competent authority in undertaking an AA of the effects of the proposed upgrade works either alone or in-combination with other plans and projects on the integrity of The Gearagh SAC.

6. NATURA IMPACT STATEMENT

The NIS concluded that in the absence of mitigation, the potential risks to the Gearagh SAC is disturbance to Otter during construction. However, it was concluded that following the application of the detailed mitigation measures, that potential significant adverse effects will be avoided or reduced. Consequently, it was determined that there will be no risk of adverse effects on the qualifying interests habitats and species, or on overall site integrity, nor in the attainment of their specific conservation objectives for The Gearagh SAC. The potential for reduction in water quality from the release of suspended solids, pollutants and/or untreated wastewater (during the upgrade works) into the surface water system and entering the River Sullane will also be avoided or reduced following the application of the detailed mitigation measures.

Following an analysis and evaluation of the relevant information including, in particular, the nature of the proposed development, characteristics of the qualifying interests, the potential link between the proposed development and The Gearagh SAC, no significant adverse effect on the integrity of the European site during development and operation of the proposed upgrade at the Macroom WWTP is anticipated alone or in-combination with any other plans or projects.

7. WASTE ASSIMILATIVE CAPACITY (WAC) ASSESSMENT SUMMARY

A Waste Assimilative Capacity (WAC) Assessment was carried out for the proposed development based on the 25-year design projection identified within Section 1 of this Report. The purpose of the WAC assessment was to confirm whether the receiving waterbody has sufficient assimilative capacity for the proposed Primary Discharge SW001 and to confirm the maximum permissible discharge limits for the specified parameters.

The WAC assessment was carried out in accordance with Uisce Eireann's (UE's) Interim Technical Guidance for Water Impact Assessments (Freshwater) (UÉ-AMT-GL-028).

A copy of the WAC Assessment is attached in Appendix A of this report.

The WAC Assessment concludes that the receiving water body has sufficient assimilative capacity to accept the discharge from Primary Discharge SW001, while maintaining its objectives under the Water Framework Directive. The proposed maximum permissible discharge limits identified for the proposed development are as follows:

- pH - 6-9;
- BOD - 25mg/l;
- COD - 125mg/l;
- Suspended solids - 25mg/l;
- Ammonia - 1.7mg/l;
- Orthophosphate - 0.8mg/l.

8. PRIORITY SUBSTANCE ASSESSMENT

A Desktop Priority Substance Assessment has been prepared to inform this WWDL Review Application. This assessment is based only on loads to the WWTP and was carried out in accordance with the Guidance on the Screening for Priority Substances for Waste Water Discharge Licences, issued by the EPA.

Sample data was utilised for parameters where available and where no sample data was available, estimates utilising the PRTR reporting tool were utilised. The assessment considered the Primary Discharge SW001 relevant to Environmental Quality Standards (EQS) for priority substances in surface waters, as set out in the European Communities Environmental Objectives (Surface Waters) Regulations 2009, as amended (now S.I No. 77 of 2019).

It was concluded that none of the substances listed in the Specific Pollutants, Priority and Priority Hazardous Substances as outlined in the Surface Water Regulations, are likely to be present in the WWTP discharge at concentrations above the specified standards as per European Communities Environmental Objectives (Surface Waters) Regulations 2009, as amended (now S.I No. 77 of 2019).

This Report is contained in **Attachment D.2.4 - Priority Substances Assessment** of the WWDL Review Application.

9. SHELLFISH WATERS

There are no shellfish waters identified downstream of the Macroom WWTP.

10. BATHING WATERS

The nearest designated Bathing Waters downstream of the Macroom WWTP is Fountainstown beach which is located in the Outer Cork Harbour. The beach is located circa 70km downstream of the existing/proposed Primary Discharge Point (SW001) from the WWTP.

Water quality at the beach is currently classified as been of 'Excellent' water quality. It is not anticipated that Macroom WW agglomeration will have any impact to water quality at this location.

11. COMBINED APPROACH

The European Union (Waste Water Discharge) Regulations 2007 to 2020, specify that a 'Combined Approach' in relation to licensing of waste water works must be taken, whereby the emission limits for the discharge are established on the basis of the stricter of either or both, the limits and controls required under the Urban Waste Water Treatment Regulations, 2001, as amended, and the limits determined under statute or Directive for the purpose of achieving the environmental objectives established for surface waters, groundwater or protected areas for the water body into which the discharge is made.

According to the Urban Wastewater Treatment Directive (91/271/EEC):

- *'Member States shall ensure that all agglomerations are provided with collecting systems for urban wastewater at the latest by 31 December 2005 for those with a p.e. of between 2,000 and 15,000'.*
  The predicted 25-year design horizon for the Macroom WW agglomeration is 8,300 PE. The proposed WWTP shall provide for a collection system to meet this requirement.
- '*Member States shall ensure that urban wastewater entering collecting systems shall before discharge be subject to secondary treatment or an equivalent treatment at the latest by 31 December 2005 for discharges to fresh-water and estuaries from agglomerations of between 2,000 and 10,000 p.e'.*
  The predicted 25-year design horizon for the Macroom WW agglomeration is 8,300 PE. The proposed WWTP shall include for secondary treatment in the form of secondary settlement tanks to satisfy this requirement.

As referenced in Section 7 above, a WAC Assessment was carried out for the proposed Primary Discharge SW001 from the development. The WAC concluded that the River Sullane has sufficient assimilative capacity to cater for the proposed discharge from the upgraded WWTP while meeting its objectives under the WFD.

12. COMPLIANCE WITH RELEVANT NATIONAL OR EU LEGISLATION

As noted in **Attachment B.6. - Compliance with EU Directives & National Regulations**, where national or EU legislation is relevant, the Primary Discharge SW001 is in compliance with its requirements.

13. CUMULATIVE AND IN COMBINATION EFFECTS

This Screening for Appropriate Assessment (**Attachment D.2.3**) addresses 'In-combination Effects'. It was not considered possible to rule out the potential for likely significant effects on the Otter which is a qualifying interest of the Gearagh SAC based on the application of the precautionary principle and in the absence of mitigation. It was therefore recommended that an NIS was prepared to assist the competent authority in undertaking an AA of the effects of the proposed upgrade alone or in-combination with other plans and projects on the integrity of the Gearagh SAC.

The NIS (**Attachment D.2.2**) was carried out and following an analysis and evaluation of the relevant information including, in particular, the nature of the proposed development, characteristics of the qualifying interests, the potential link between the proposed development and The Gearagh SAC. The NIS concluded that no significant adverse effect on the integrity of the European site during development and operation of the Proposed Upgrade at the Macroom WwTP is anticipated alone or in-combination with any other plans or projects.

14. MIXING ZONE OR TRANSITIONAL AREAS OF EXCEEDANCE

Not applicable, as no discharge to marine environments.

15. DILUTIONS AND RETENTION TIMES FOR LAKES

Not applicable, as no discharges to lake environments.

16. THE IMPACT OF THE DISCHARGES ON ANY ENVIRONMENTAL MEDIA OTHER THAN THOSE INTO WHICH EMISSIONS ARE TO BE MADE

Not applicable, as no other relevant media into which the emissions are to be made.

17. GROUNDWATER DETAILS

Not applicable, as no discharge to groundwater.

18. HIGH STATUS WATERBODIES

The waterbody (name LEE (CORK)_060) circa 200m downstream of the WWTP has a rating of 'High' Ecological Status.

19. FRESH WATER PEARL MUSSELS

A data request was sent to National Parks and Wildlife (NPWS) for the current and historic records of fresh water pearl mussel (FWPM) (*Margaritifera margaritifera*) on the Sullane River. Confidential records of FWPM on the Sullane River were received on the 20th May 2022. The content of this data is provisional in that it is a record of the NPWS current data holdings. This data is strictly the copyright of The Department of Culture, Heritage and the Gaeltacht and cannot be shared in detail. These records date from the 17th century up until the present time.

There are in total 35 No. recorded sites of FWPM on the Sullane River. These records include, alive and dead mussels as well as mussel shells. The total number of FWPM at each recorded

location is unknown. Of these 35 No. records of FWPM, 31 records are located upstream of the Macroom WWTP. The nearest record is >7km upstream. There is one record of FWPM located >1km downstream of the WWTP on the Sullane River. There are another 3 No. records located downstream on the Laney River just before it flows into the Sullane River.

Records by NPWS also show that the Sullane River is recorded as been a sensitive area for FWPM in 2017. The current population recorded on Sullane River is not protected under the 2009 FWPM Regulations. The Sullane River is also not an SAC and the FWPM in this river is therefore not listed as a Conservation Objective under the Habitats Directive.

As the data from the NPWS does not reference the current status of the recorded populations, a FWPM survey was commissioned to assess whether the recorded population within the Sullane & Laney were currently active. The FWPM survey was carried out by Sweeney Consultancy Ltd. on the 17th August 2022.

With regards to the site of the recorded FWPM population downstream of the WWTP, as identified within the information obtain from the NPWS, no FWPM were observed concluding that this population was no longer live. As part of the report, Sweeney Consultancy Ltd. also references that as part of the pre-visit assessment, previous surveys carried out by Sweeney Consultancy Ltd. for an adjacent road project concluded that the nearest live mussel population to the WwTP on the river Sullane was located circa 7km upstream and that previous populations of FWMP located within the river Laney were also no longer alive.

Therefore, it can be concluded that there is currently no live populations of FWPM downstream of the existing WwTP.

The Aquatic Ecology Assessment of Sullane River: FPM Population and Habitat Quality Downstream of Macroom WwTP 2022 Report is contained in **Appendix B** of this Report.

20. FOR WASTEWATER TREATMENT PLANTS WITH COASTAL DISCHARGES, PROVIDE EVIDENCE THAT THE END OF THE DISCHARGE PIPE IS BELOW THE MEAN SPRING TIDE LOW WATER LINE

Not applicable, as no discharge to marine environments.

Appendix A

Macroom WWTP Upgrade Project Waste Assimilative Capacity Assessment Report

(TOBIN, 2023)

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Macroom Waster Water Treatment Plant Upgrade Project

Waste Assimilative Capacity Assessment

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Document Control Sheet	
Document Reference	Waste Assimilative Capacity Assessment – Macroom WwTP Upgrade Project
Client:	Glanua
Project Reference	10981

Rev	Description	Author	Date	Reviewer	Date	Approval	Date
P01	First Issue	JR	05/07/2021	BG	05/07/2021	BG	05/07/2021
P02	Second Issue	JR	27/10/2021	NG	27/10/2021	SK	27/10/2021
P03	Third Issue	JR	31/01/2022	NG	31/01/2022	SK	31/01/2022
P04	Forth Issue	KG	01/09/2023	NG	01/09/2023	SK	01/09/2023
P05	Fifth Issue	KG	12/12/2023	KG	12/12/2023	KG	12/12/2023

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1. INTRODUCTION

1.1 BACKGROUND

The Macroom Waste Water (WW) agglomeration is presently served by a 6,000 PE system. The existing Macroom Wastewater Treatment Plant (WWTP) is significantly overloaded and not fit-for purpose, resulting in failure to meet the requirements of the existing EPA Waste Water Discharge Licence (WWDL)D0126-01) in recent years. Consequently, an upgrade of the WWTP is required.

The proposed future demand projections to which the proposed WWTP is to be designed are as follows:

Table 1.1 WwTP Load Summary

Loading data	Population Equivalent (PE)
WwTP design capacity (As constructed)	6,000
25-year design horizon	8,300

1.2 PURPOSE OF REPORT

A Waste Assimilative Capacity (WAC) assessment was carried out for the proposed primary discharge (SW001) from Macroom WwTP to the River Sullane to confirm whether the waterbody has sufficient assimilative capacity for the proposed discharge and to confirm the maximum permissible discharge limits for the specified parameters.

It is proposed that the WAC Assessment is carried out in accordance with the requirements outlined within Uisce Eireann's (UE's) Interim Technical Guidance for Water Impact Assessments (Freshwater) (UÉ-AMT-GL-028).

2. PROJECT DESCRIPTION

2.1 SITE LOCATION

The Macroom WWTP is situated on the north-east edge of the town of Macroom. The WWTP is situated approximately 20m from the south-west bank of the River Sullane, which flows through the centre of the town and which is a tributary of the River Lee. This section of the river is part of the Water Framework Directive (WFD) Sub-catchment Sullane_SC_010.

The River Sullane, which provides drinking water (and occasionally floods), joins the River Launa 1km east of the town, before joining the River Lee a further 1km east. It is also located 1.7km north of the Gearagh SAC (000108) and the Gearagh SPA (004109). The River Lee forms part of the Gearagh SAC (000108) and the Gearagh SPA (004109).

The WWTP is accessed directly off the Saint Colman's Park residential development public road. The WWTP site comprises areas of amenity grassland, planted trees and a concrete access road. The area towards the back of the site, which is utilised by the Roads Dept. of Cork County Council, comprises a stoned surface (Clause 804 or similar material). The Roads Dept also utilise an area immediately inside the entrance gate consisting of 3 No. sheds & a container and following completion of the proposed upgared works, it is proposed that a portion of this area will be retained for use by the Roads Dept.

2.2 NEED FOR THE DEVELOPMENT

The existing Macroom WWTP has a design capacity of 6,000 Population Equivalent (PE). The existing Macroom Sewerage Scheme consists mainly of a combined collection network. Flows from the east of the catchment gravitate directly to the existing Macroom WWTP, while flows from the west gravitate to Masseytown Pumping Station (PS) where they are pumped east to a high point, from which they gravitate to the WWTP. There are a further 4 No. PS's on the network which service residential developments.

The emission limit values (ELVs) which are set out in the existing WWDL D0126-01 are as follows:

Table 2-1 Existing WDL D0126-01 ELV's

Parameter	Unit	ELV
pH	pH units	6 – 9
Biological Oxygen Demand (cBOD)	mg/l	15
Chemical Oxygen Demand (COD)	mg/l	125
Suspended Solids	mg/l	25
Ammonia (as N)	mg/l	2
Orthophosphate (as P)	mg/l	1

In its current design capacity (6,000 PE), the WWTP is unable to achieve the above ELVs. The existing WWTP is hydraulically overloaded and not fit-for purpose, resulting in failure to meet the above ELV requirements in recent years. Consequently, an upgrade of the WWTP is required.

Additionally, the site suffers from flooding issues. At present, the site of the WWTP experiences localised flooding from the River Sullane at least twice a year. In order mitigate the risk of flooding of the proposed upgraded development, it is proposed to construct a flood wall around the perimeter of the site.

2.3 UPGRADE WORKS

The Proposed Upgrade works will include the following infrastructure:

- Preliminary treatment:
  - Upgrade and replacement of the existing storm water overflow (SWO) immediately upstream of the inlet works with new screened Dual SWO & EO (SW002);
  - Decommissioning of the existing preliminary treatment works including the screen;
  - Construction of a new inlet works and screening system;
  - Construction of a new grit removal system;
  - Construction of a new full flow to treatment (FFT) pumping station; and
  - Construction of a new stormwater storage tank, equipped with storm water pumps.
- Secondary treatment:
  - Decommissioning of the existing oxidation ditch;
  - Construction of a new flow splitting chamber;
  - Construction of 2 No new integrated fixed-film activated sludge (IFAS) reactor tanks (Aeration Tanks);
  - Decommissioning of the existing final settlement tank;
  - Construction of 2 No. new final settlement tanks;
  - Construction of both return & waste activated sludge (RAS/WAS) pumping stations;
  - Installation of a lime batching & dosing facility, and;
  - Installation of ferric sulphate dosing system including bunded chemical storage tank.
- Sludge management system:
  - Decommission existing sludge holding tank;
  - Construction of a new sludge picket fence thickener (PFT);
  - Construction of an odour control system;
  - Installation of a new polymer make-up system, to be located within the existing building which is to be retained;
  - Decommissioning of the existing dewatering equipment within the existing building; and
  - Installation of a new sludge dewatering equipment/system (to be installed within the existing building, which is to be retained).
- Outfall:
  - Construction of a new final effluent sampling manhole on the existing outfall pipeline, within the WWTP site;
  - Discharge of final effluent through the existing outfall to the River Sullane – SW001 (Co-ords 134957E, 72953N).
- Ancillary works:
  - Construction of a solar PV panel installation capable of a maximum power generation of 42.32kWp;

- Construction of a new sheet pile flood protection wall. This wall is to be constructed within the site boundary to a level of 300mm above the 0.1% Annual Exceedance Probability (AEP) (1-in-1000 year) flood level;
- New standby energy generator & bunded fuel tank;
- Relocation of the existing shed from the southern side of the WWTP site to the northern side of the WWTP site;
- Demolition of existing sheds adjacent to the site entrance to create a designated area with a separate site entrance to be used by Cork County Council Roads Department;
- Construction of a new control and administration building;
- Construction of new surface water drainage system with oil interceptor and attenuation system, in accordance with Sustainable Drainage Systems (SuDS); and;
- Site landscaping and finishes.

2.3.1 Construction Activities

- Site clearance;
- Establishment of site offices, welfare facilities & compound area ;
  - It is proposed that the temporary contractors compound area shall be provided within an area under the ownership of Cork County Council adjacent to the WwTP site. A letter of consent has been provided from Cork County Council in relation to this area, and this letter is included with the supporting documentation as part of this application.
- Construction of flood protection wall to the site to mitigate flooding risks.
  - It is proposed that construction of the flood wall shall be one of the first construction tasks undertaken , to mitigate the potential for flooding events during the construction period.
- Decommissioning & demolition of existing tanks & structures (Note, decommissioning & demolition of existing tanks & structures will be carried out in sequence during the construction stage following the commissioning of the new infrastructure);
  - The existing WwTP shall remain operational during construction works and until such time as the Proposed Upgrade is operational.
- Excavations for tanks;
- Pouring of concrete bases;
- Installation of precast tanks;
- Laying of process pipework, ducting and services;
- Reinstatement to the site including internal access driveways and landscaping;
- Surface water drainage (including oil interceptor, attenuation tank); and
- New security fence and gate, 2.4m high;
- Monitoring of noise levels using standard noise meters

The Works extents within which the Contractor shall construct the WwTP upgrade include the existing WwTP site access road off St Colman's Park Road as well as the pipeline route between the WwTP and outfall to River Sullane. The proposed site layout can be seen in Figure 2 1 of this report.

The maximum depth of excavations shall be circa 7.5m below the existing ground level (the proposed storm water holding tank shall be installed with a finished floor level circa 7m below ground level).

Concrete will be poured on site as there are some reinforced concrete (RC) bases required, such as for the IFAS, final settlement tanks & storm water holding tank.

There are no bankside/instream works required on the site.

It is envisaged that removal of vegetation and trees within the site will be required in order to facilitate the works. A landscape management plan has been prepared for the site which includes details of the reinstatement of vegetation, removed as part pf the works.

The proposed works will generate construction waste. Construction waste will include a range of materials such as: hardcore, stone, gravel and concrete, plastics and lubricating oils. Operational waste will also include materials such as normal domestic waste and lubrication and cooling oils from the servicing equipment. Although every effort will be made to recycle and re-use of materials on site, some waste will require to be disposed of off site. The Contractor will be required to prepare a Construction & Demolition Waste Management Plan and any waste produced as part of the development will be dealt with in accordance with the relevant waste management legislation & guidance. Any waste removed from the site will be collected by a Contractor with a valid Waste Collection Permit & will be disposed of to a suitable licenced facility. An Outline Construction & Demolition Waste Management Plan has been prepared.

The Contractor shall be required to prepare a detailed Construction Environmental Management Plan, in line with ISO 14001 to address all construction activities to be carried out as part of the development prior to construction works commencing. An Outline Construction Environmental Management Plan has been prepared.

2.3.2 Operational Activities

Once the construction works are complete, the WwTP will continue to be regulated by the EPA under a reviewed WWDL D0126-02 on the basis the completion of the upgrade works set out in this report any non-compliance issues previously experienced at the WwTP will be remediated.

Following the completion of works, operational phase activities will be minimal and will include occasional maintenance works within the Proposed Upgrade site. These include maintenance and calibration of equipment, delivery of necessary chemicals, removal of sludge from site, replacement of faulty or damaged structures and related hardware as required.

3. DISCHARGE DESCRIPTION

3.1 DISCHARGE LOCATION

The following discharges will be present within the upgraded Macroom sewage scheme:

Macroom WwTP:

- SW001:
  - Primary Discharge Point
  - Location: 134957E, 72953N
- SW002:
  - Dual Storm Water Overflow (SWO) & Emergency Overflow (EO)
  - From: High Level Overflow from upgraded Formula A Chamber (upstream of Inlet Works)
  - Location: 134957E, 72953N (discharges through Primary Discharge SW001 outfall pipe)
- SW004
  - Storm Water Overflow (SWO)
  - From: Proposed Storm Water Holding Tank
  - Location: 134957E, 72953N (discharges through Primary Discharge SW001 outfall pipe)

Masseytown Pumping Station:

- SW003
  - Dual Storm Water Overflow (SWO) & Emergency Overflow (EO)
  - From: Masseytown Pumping Station
  - Location: 133877E, 73203N

All 3 No. discharges from the WWTP (i.e. SW001, SW002 & SW004) will discharge to the River Sullane via the same outfall pipe. As part of the upgrade of the WWTP, it is proposed to retain the existing outfall from the WWTP and all discharges will continue to be discharge through this pipeline.

3.2 WASTEWATER TREATMENT PROCESS

3.2.1 Existing Treatment Process

The existing WwTP includes the following treatment stages:

- Storm flow separation chamber using high level weir, with Storm Water Overflow (SW002) flowing to the Sullane River via the Primary Treated Effluent Outfall (Co-ords 134957E, 72953N);
- Preliminary treatment, consisting of a single 6mm automatic screen with a high-level bypass and 30mm manually raked screen downstream of the fine screen;
- Secondary treatment, consisting in the following:
  - Biological treatment: 1,240m^3, 1.5m deep, single oxidation ditch fitted with 3no. vortex aerators and 1no. original surface aerator;

    - Secondary settlement: single 15.2m diameter settlement tank with half bridge scraper;
- Ferric sulphate IBC dosing chemical at the outlet of the inlet works, currently not operational;
- Sludge treatment
    - 26.5m^3 sludge holding/thickening tank;
    - Sludge dewatering provided by a single screw press with a capacity of 650kg/d and ancillary polymer make-up unit.

Following treatment, the secondary treated effluent from the WWTP is discharged by gravity to the Sullane river (which borders the WWTP site) through a 20m long outfall (SW001) (Co-ords 134957E, 72953N);.

3.2.2 Proposed Treatment Process

A brief description of the proposed treatment process is as follows:

Formula A Chamber:

Flows entering the WWTP shall be directed through a Formula A Chamber which shall be split into 2 No. cells divided by a weir. Flows shall enter the foul side of the chamber and on normal conditions (up to formula A) shall be forwarded to the inlet works. If flows surpass Formula A, they will overflow through the weir to the storm side before been directed through a screen and onto the storm tank. Should the storm tank be full to capacity, the effluent will overflow via SW002 directly to the river through Primary Discharge outfall pipe @ 134957E, 72953N.

Inlet Works:

The proposed inlet works shall consist of the following:

- Inlet Screening;
- Full Flow to Treatment Pumping (FFT) Pumping Station;
- Grit and Fat Oils & Grease (FOG) Removal.

The first stage of the inlet works, effluent shall be screened to remove any large debris and solids. This shall be carried out by 2 No. mechanical band screens which shall be capable of screening up to 6mm in 2D. A further bypass screen is also provided which shall be capable of screening up to 19mm.

Following the initial screening, effluent shall be directed towards the FFT pumping station. Due to the existing ground profile at the Macroom WWTP, the gravity inlet sewer and the requirement to discharge to the river, gravity flow through the plant will not be achievable and a pumping station will be required to forward flows up to FFT PS to the grit trap and onto the biological treatment process. The FFT PS shall consist of a wet well equipped with 2 No. pumps which shall operate on a duty / standby basis. The FFT shall include for an overflow pipeline which shall be directed towards the storm tank.

Following influent pumping, a grit removal stage will be provided through a combination of air agitation (coarse bubble) and settling. The grit removal unit should be capable of removing 95%

of grit particles by weight of incoming grit, with grit being defined as all inorganic particles greater than 0.2mm diameter with a specific gravity equal to or greater than 2.65mm at a settling velocity of 0.3m/s. Additionally, due to the sensibility of the IFAS process with FOG, the unit has been designed to ensure 70% reduction of removable FOG and a maximum outlet concentration of 50mg/l, thus minimizing the risk potential impact on the downstream process units. Collected grit and FOG will be forwarded to a grit classifier and FOG concentrator respectively to provide further treatment of collected materials.

Secondary Treatment:

Secondary Treatment shall consist of the following:

- Alkalinity Dosing;
- Integrated Fixed-Film Activated Sludge (IFAS) Reactors;
- Secondary Settlement Tanks;
- Ferric Sulphate Dosing;
- Return and Waste Sludge Pumping Station;
- Scum Pumping Station.

Alkalinity dosing is included as part of the treatment process in order to maintain a stable pH more favourable to biological growth. In order to maintain the required alkalinity the following measures have been included as part of the treatment process:

- Provision of an anoxic zone within the IFAS reactor to recover of the alkalinity consumed by the nitrification reaction;
- Alkalinity boosting through the use of calcium hydroxide/hydrated lime.

IFAS process was selected as the preferred process for the upgraded Macroom WwTP. The proposed design includes for 2no. IFAS reactors each sized for 50% of the incoming loads, which will facilitate maintenance of the plant when required without disrupting significantly the treatment process. Each of the proposed IFAS reactor will include 1no. anoxic cell for denitrification, 2no. aerobic cells for carbonaceous oxidation and 1no. deaeration cell.

Ferric sulphate shall be added to the effluent discharging from each IFAS reactor in order to lower orthophosphate within the effluent to the required level.

Following biological treatment, the IFAS effluent will be forwarded to a secondary settlement stage, where both biological sludge and chemical sludge generated by the chemical phosphorus removal process will separate from secondary treated effluent by gravity. Settled sludge will then be collected into a central hopper for sludge return and wasting, whilst treated effluent will flow over a weir to the final effluent chamber before discharging to the River Sullane @ SW001 (Co-ords 134957E, 72953N).

Return activated sludge (RAS) shall be collected within the secondary settlement tank and shall be returned to the IFAS to boost the biological process via 2 No. dry mounted pumps which shall operate on a duty / standby basis. Waste activated sludge shall be pumped to the picket fence thickener (PFT) via a further 2 No. dry mounted pumps which shall operate on a duty / standby basis. Scum collected in the secondary settlement tanks will gravitate to a common scum sump, where flows will be forwarded to the PFT

Stormwater Treatment:

As all flows to the storm tank via the Formula A chamber & FFT Pumping Station will be screened by the inlet works 6mm fine screen or Formula A weir 6mm screen. Due to the profile of the existing sewer arriving to the WWTP, it will not be possible to discharge wastewater from the storm tank to the river by gravity without surcharging the upstream network, and discharge from the storm tank will therefore be through pumping under normal operation (SW004).

The storm pumps will be located in the storm tank itself, thus removing the need for an additional sump and facilitating constructability of the project.

Pumped flows will be pumped to a high-level chamber where they will combine with the treated effluent prior to discharge through the existing Primary Discharge outfall to the River Sullane @ SW001 (Co-ords 134957E, 72953N).

In the event of a power failure, an actuated valve will fail in the closed position at the inlet to the storm tank to prevent localised flooding, and a separate overflow will discharge from the upstream Formula A Chamber weir directly to the river (SW002). It should be noted that this will require surcharging of the upstream network.

Once incoming flows subside below FFT, stormwater stored in the stormwater holding tank will be returned to the FFT PS by 2 No. pumps located in a sump within the tank.

Sludge Treatment Process:

Sludge treatment shall consist of the following:

- PFT;
- Sludge Dewatering;
- Mixed Liquor Returns (MLRs);
- Odour Abatement.

PFTs consist in circular roofed tank fitted with a bottom scraper and a conical collecting bottom. Sludge is fed through a central drum and released at a low velocity near the surface of the tank, allowing solids to settle to the bottom of the tank by gravity. The scrapers then slowly move the settled, thickened solids to a discharge pipe at the bottom of the tank to allow for their pump-out to the sludge dewatering system. A v-notch weir located at the top of the tank allow the supernatant to flow by gravity to the mixed liquor return pumping station. The proposed system will be able to achieve a thickened sludge concentration of at least 3% dried solids, thereby minimising the required hydraulic capacity of the dewatering feed pumps and dewatering system.

As part of the project, it is proposed to retain the existing sludge dewatering system. To increase the robustness of the existing system, a second standby dewatering feed pump be provided.

A new MLRs pumping system shall be provided in order to return MLRs directly to the flow splitting chamber to the IFAS reactors.

3.3 INFLUENT CHARACTERISTICS

The summary of the influent monitoring data for the WWTP is presented on the table below.

Table 3.1 Influent Characteristic Summary

Annual Environmental Report	2018	2019	2020	2021	Average
BOD (mg/l)	253.14	314.00	211.87	192.00	242.75
COD (mg/l)	834.29	843.00	710.77	550.00	734.52
Suspended Solids (mg/l)	512.39	335.00	295.35	244.00	346.69
Nitrogen Total (mg/l)	40.43	65.00	49.99	58.00	53.36
Phosphorous Total (mg/l)	8.03	8.46	4.65	7.44	7.15
Hydraulic Capacity	1923.00	1303.06	1655.00	1316.00	1549.27

3.4 EFFLUENT CHARACTERISTICS

The summary of the effluent monitoring data for the WWTP is presented on the table below.

Table 3.2 Effluent Characteristic Summary

Annual Environmental Report	2018	2019	2020	2021	2022	Average
BOD (mg/l)	7.51	16.00	10.53	13.00	16.56	12.72
COD (mg/l)	34.82	86.10	53.18	62.00	70.08	61.24
Suspended Solids (mg/l)	18.54	60.07	15.03	28.00	30.85	30.50
Nitrogen Total (mg/l)	15.00	16.02	14.34	21.00	25.49	18.37
Phosphorous Total (mg/l)	1.24	1.83	0.78	1.22	2.22	1.46
pH (pH units)	7.43	7.18	7.49	7.41	7.54	7.41
Ammonia Total (mg/l)	6.30	2.25	7.51	11.00	19.56	9.32
Ortho-Phosphate (mg/l)	0.99	0.59	0.65	0.99	1.86	1.02

3.5 AMBIENT MONITORING DATA

Ambient monitoring is carried out along the River Sullane both upstream & downstream of the of the Macroom WwTP at the following monitoring stations:

- Upstream Quality Point: RS19S020450
- Downstream Quality Point: RS19S020480

The location of the monitoring points is presented in Figure 3.1.

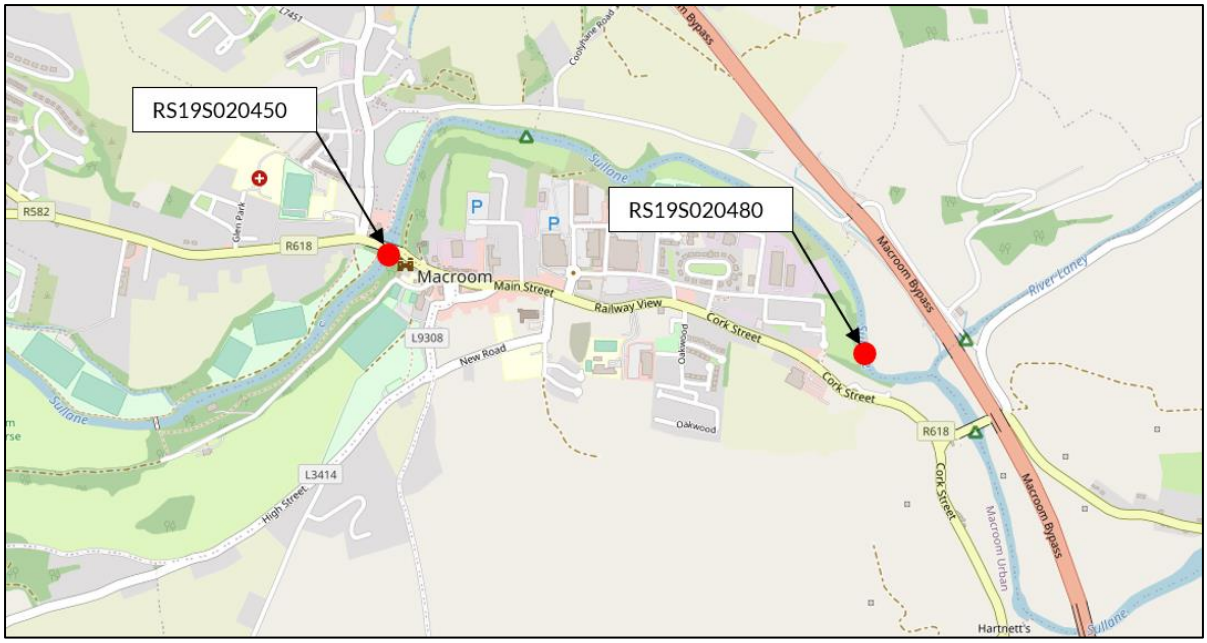


Figure 3.1 Ambient Monitoring Locations (EPA Maps)

Ambient water quality data was obtained for the designated monitoring points from the Catchments database[1]. The ambient monitoring was analysed for a 3 year period from February 2020 to June 2023.

With regards to the ambient water quality data for the upstream monitoring point, it was noted that the sample obtained for the 12th of February 2020 identified an ammonia concentration of 0.7mg/l. This reading was circa 30 times greater that the average of the remaining 13 No. samples obtained during the study period. As such, this sample has been considered an outlier and has been omitted from the WAC analysis.

Details of the ambient water quality data is included in Appendix A of this report while a summary is presented in Table 3.3.

Table 3.3 Ambient Monitoring Summary

	Ammonia Total (mg/l)	BOD (mg/l)	Ortho P (mg/l)
Upstream monitoring point EPA Station Ref: RS19S020450 **Irish Grid Ref:** 133805E, 72977N **Current WFD Status:** Good			
Average	0.024	0.929	0.019
95%ile	0.037	1.635	0.034
Downstream monitoring point EPA Station Ref: RS19S020480 **Irish Grid Ref:** 135048E, 72709N **Current WFD Status:** Good			

[1] Catchments.ie - Water, from source to sea.

	Ammonia Total (mg/l)	BOD (mg/l)	Ortho P (mg/l)
Average	0.491	1.927	0.046
95%ile	2.374	3.925	0.120

Note: Ammonia results exclude sample obtained on the 12th February 2020

An assessment with regards to the ambient water quality values in comparison with the Environmental Quality Standard (EQS) values for High & Good Status within the River Sullane is completed as part of the WAC assessment included in Section 6 of this Report.

3.6 Licensed Emission Limit Values

The existing EPA WWDL D0126-01 for Macroom WW agglomeration ELVs for the final effluent are listed previously in Table 2-1.

4. RECEIVING ENVIRONMENT

4.1 DESCRIPTION OF RECEIVING WATERBODY

The Macroom WW agglomeration discharges to the River Sullane (IE_SW_19S020480). The river originates in County Kerry near the village of Cúil Aodha. The river flows eastwards through the centre of Macroom town and is a tributary of the River Lee. This section of the river which the WWTP discharges is part of the WFD Sub-catchment Sullane_SC_010.

The River Sullane, provides drinking water to the Macroom WTP. The abstraction point is located circa 2.2km upstream of the existing/proposed Primary Discharge Point SW001 from the Macroom WwTP.

The River Sullane joins the River Laney circa 1km east of Macroom town, before joining the River Lee a further 1km east.

4.2 ADJACENT ABSTRACTION & DISCHARGE POINTS

There are a number of abstraction and discharge points located along the River Sullane & Lee Estuary both upstream & downstream of Macroom WWTP. A summary of the abstractions and discharges are as follows:

- Macroom Water Treatment Plant: Water for the Macroom WTP is currently abstracted from the River Sullane at a location circa 2.2km upstream of the Primary Discharge Point SW001 from the Macroom WwTP;
- Macroom WWTP: The rimary Discharge Point SW001 , Dual SWO & EO SW002 and SWO SW004all discharge to the River Sullane;
- Masseytown Pumping Station: The Dual SWO & EO SW003 from the Masseytown pumping stationis located along the River Sullane circa 1.2km upstream of the main Macroom WwTP.
- Coolcower WWTP: The Primary Discharge Point for the Coolcower WWTP is located along the Lee Estuary, circa 1.2km downstream of the Primary Discharge Point SW001 from the Macroom WWTP.

4.3 PROXIMITY TO DESIGNATED SITES

The following designated sites are located within a 15km radius of the Macroom existing/proposed Primary Discharge Point SW001:

Table 4-1 Proximity to Designated Sites

Site Code	Site Name	Designation	Distance to the designated site
IE000108	The Gearagh SAC	SAC	1.7km
IE000106	St. Gobnet's Wood SAC	SAC	15km
004109	The Gearagh SPA	SPA	2.6km
004162	Mullaghanish to Musheramore Mountains SPA	SPA	6.8km

4.4 Receiving Water Quality Analysis

Biological Quality Ratings (Q Values) are recorded annually at a permanent monitoring point adjacent to the Macroom WWTP. The details of the monitoring station are noted below.

Table 6.2: Macroom WwTP Q-Values monitoring Location

Station Code	Station Location	WFD Waterbody Code	Easting	Northing	Local Authority
RS19S020480	Ford u/s Laney R confluence	IE_SW_19S020480	135048	72709	Cork County Council

Table 6.3: Review of the Q-Values Recorded at the Macroom WwTP Monitoring Location

Station Code	2002	2005	2008	2011	2014	2017	2020
RS19S020480	4	4	4	4	4	4	4

The River Sullane, upstream and downstream of the Macroom WW agglomeration , has a recent assigned ecological status "Good" under the Water Framework Directive (WFD) reaching a Q4 value in 2020.

4.5 Water Body Ecological Status

The River Sullane is assessed as part of Water Framework Directive (WFD) reviews. This assesses both the chemical and biological status of the watercourse on an annual basis. The previous 3 iterations of the ecological status of the water course are as follows:

Table 6.4: Ecological Status of the River Sullane

Period	Site Name	Ecological Status
SW 2016 - 2021	SULLANE_060	Good
SW 2013 - 2018	SULLANE_060	Good
SW 2010 - 2015	SULLANE_060	Good

It is noted that the waterbody (name LEE (CORK)_060) circa 200m downstream of the WwTP has a rating of 'High' Ecological Status.

4.6 Waterbody Risk Category

At present the water body is currently deemed 'Not at Risk'.

4.7 Waterbody Objectives

The main aims of the WFD are to:

- Prevent deterioration and enhance status of aquatic ecosystems, including groundwater;

- Promote sustainable water use;
- Reduce pollution;
- Contribute to the mitigation of floods and droughts.

With regards to the River Sullane, the primary objective for the watercourse is to 'Maintain Good Ecological Status'.

4.8 WATERBODY SIGNIFICANT PRESSURES

Based on the 3rd Cycle Draft Lee, Cork Harbour and Youghal Bay Catchment Report (HA 19) (Lee, Cork Harbour and Youghal Bay (catchments.ie)) there are no significant pressures identified for the waterbody.

5. HYDROLOGICAL INPUTS

5.1 WATERBODY FLOW ESTIMATION

The flow estimation for the WAC Assessment was obtained via the EPAs Hydrotool which is available via the EPA Water Maps portal (EPA Maps).

The monitoring station for hydro catchment ref: 19_888 (E135180, N72680) is located along the River Sullane circa 300m downstream of the discharge point from the Macroom WwTP.

Hydro catchment ref: 19_888 has a catchment area of circa 218km^2 and comprises of the following WFD sub-catchments:

- Sullane_SC_10
- Sullane_SC_020 (partial)
- Foherish_SC_010

The area of hydro catchment ref: 19_888 is presented in Figure 5.1 below.

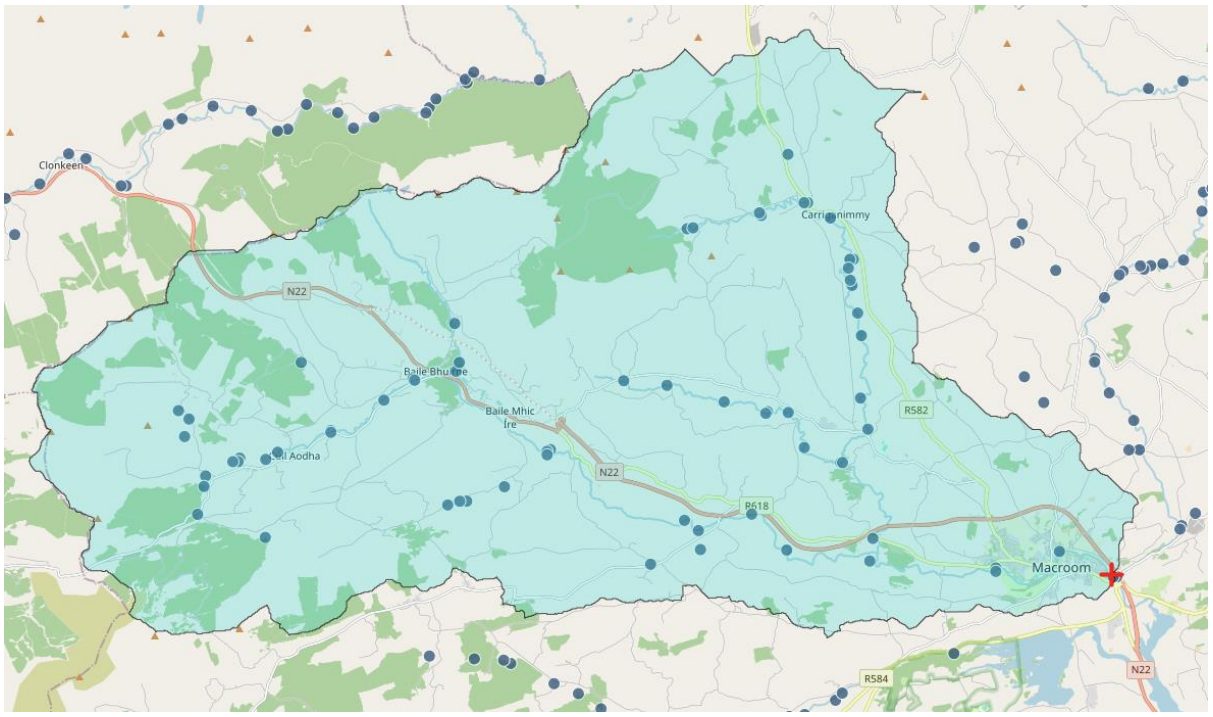


Figure 5.1 Hydro Catchment Ref: 19_888 (EPA Maps).

The naturalised flow percentiles (NATQ1-99%) are presented in Table 5.1.

Table 5.1 Naturalised Flow Percentiles (NATQ1-99%)

Percetile	Flow (m^3/sec)
1	37.702
5	22.922
10	17.255
20	11.374
30	8.421
40	6.391
50	4.872
60	3.667
70	2.671
80	1.885
90	1.162
95	0.861
99	0.464

6. TIERED ASSESSMENT

As per the requirements of UE's Interim Technical Guidance for Water Impact Assessments (Freshwater) (UÉ-AMT-GL-028), the WAC Assessment shall be carried out utilising a tiered approach.

The analysis under the tiered approach is set out within the subsequent sections.

6.1 TIER 0 ASSESSMENT

The purpose of the Ter 0 assessment is to state whether pollutants subject to an EQS limits within the receiving watercourse are present within the effluent. If they are present, then proceed to Tier 1.

The following monitored pollutants subject to an EQS are present within the effluent:

Table 6.1 Pollutants within the Effluent subject to an EQS

Parameter	Unit	EQS (Good Status)	Effluent
BOD	mg/l	1.5	12.72
pH	Ph Units	Soft Water 4.5< pH < 9.0 Hard Water 6.0< pH < 9.0	7.41
Ammonia	mg/l	0.065	9.32
Ortho-Phosphate (as P)	mg/l	0.035	1.02

6.2 TIER 1 ASSESSMENT

The purpose of the Tier 1 state whether the concentrations of pollutants in the effluent exceeds the EQS. If they exceed EQS then proceed to Tier 2 assessment.

Table 6.2 Pollutants within the Effluent subject to an EQS

Parameter	Unit	EQS (Good Status)	Effluent	Result
BOD	mg/l	1.5	12.72	Fail
pH	Ph Units	Soft Water 4.5< pH < 9.0 Hard Water 6.0< pH < 9.0	7.41	Pass
Ammonia	mg/l	0.065	9.32	Fail
Ortho-Phosphate (as P)	mg/l	0.035	1.02	Fail

Based on the above, BOD, ammonia & orthophosphate proceed to the tier 2 assessment.

6.3 TIER 2 ASSESSMENT

It is proposed to complete the Tier 2 assessment utilising the simple mass balance calculation in accordance with UE standard calculation sheet (UÉ-AMT-FM-007).

6.3.1 Available WAC to be Utilised Assessment

Based on the scoring system outlined within UE's Interim Technical Guidance for Water Impact Assessments (Freshwater), it has been determined that the River Sullane has a risk score of 2.5. The basis for this score is presented in Table 6.3:

Table 6.3: Waterbody Risk Scoring System for Identifying Appropriate Upper Limit for Available WAC Utilisation

Factor	Assessment	Score	River Sullane	Comment
Current watercourse status	Watercourse not at significant risk of WFD classification change	0	0	The waterbody Sullane_60 is identified as not been at Risk
	Watercourse "at risk" of WFD classification change / currently failing to meet Good	5	0	The waterbody Sullane_60 is identified as not been at Risk
Discharge Location Score			**0**	
Downstream Dilution	Q95 Flow increases by <20% at next confluence (within WFD Waterbody)	0	0	N/A
	Q95 flow increases by 20-50% at next confluence (within WFD Waterbody)	-2	-2	95%ile Flow River Sullane (Hydro-catchment Ref: 19_888): 0.861 95%ile Flow River Laney (Hydro-catchment Ref: 19_8880): 0.323 This represents a circa 31% increase at the next confluence
	Q95 flow increases by >50% at next confluence (within WFD Waterbody)	-2	0	N/A
	Q95 flow increases by >80% at next confluence (within WFD Waterbody)	-4	0	N/A
Downstream Dilution Score			**-2**	
Environmental Receptors	Discharge to SPA	5	0	The Macroom WwTP does not discharge to an SPA
	Discharge to SAC	5	0	The Macroom WwTP does not discharge to an SAC
	Discharge to Bathing Water	5	0	The Macroom WwTP does not discharge to Bathing Water
	Discharge to Drinking Water	3	3	The Sullane_60 is identified as a Drinking Water at the Macroom WwTP discharge location. Water for the Macroom WTP is currently abstracted from the River Sullane at a location circa 2.2km upstream of the main discharge point from the Macroom WwTP.

	Discharge to Salmonid River	4	0	The Macroom WwTP does not discharge to a Salmonid River
	Discharge to Shellfish Water	2	0	The Macroom WwTP does not discharge to Shellfish Water
	Discharge to Nutrient Sensitive Water	5	0	The Macroom WwTP does not discharge to Nutrient Sensitive Water
	Discharge within 1km of SPA	2.5	0	The Gearagh SAC is located circa 1.7km from the Macroom WwTp discharge location
	Discharge within 1km of SAC	3	0	The Gearagh SAC is located circa 2.6km from the Macroom WwTp discharge location
	Discharge to High Status Objective Waterbody under WFD or the Habitats Directive*	10	0	The Sullane_60 waterbody is currently identified as Good Ecological Status
	Discharge within 1km of Bathing Water	2.5	0	There are no Bathing Waters identified within 1km of the Macroom WwTP discharge location
	Discharge within 1km of Drinking Water	1.5	1.5	The Sullane_60 is identified as a Drinking Water at the Macroom WwTP discharge location. Water for the Macroom WTP is currently abstracted from the River Sullane at a location circa 2.2km upstream of the main discharge point from the Macroom WwTP.
	Discharge within 1km of Salmonid River	3	0	There are no Salmonid Rivers identified within 1km of the Macroom WwTP discharge location
	Discharge within 1km of Nutrient Sensitive Water	3	0	There are no Nutrient Sensitive Water identified within 1km of the Macroom WwTP discharge location
	Discharge within 1km of Shellfish Water	1	0	There are no Shellfish Water identified within 1km of the Macroom WwTP discharge location
Environmental Receptors Score			**4.5**	
TOTAL			**2.5**	

Based on the above, the suggested upper limits for available WAC utilisation at a single discharge point is as follows:

Table 6.4: Suggested Upper Limits for Available WAC Utilisation at a Single Discharge Point

Risk Score	Amount of Available WAC to be Taken (Using Ambient Data)	Amount of WAC to be Taken (Using Notionally Clean)
up to 4	Up to 75%	Up to 50%

6.3.2 Notionally Clean Approach & Target EQS Assessment

Prior to completing the Mass Balance calculation, an assessment of the upstream ambient concentration is required to confirm whether WAC calculation is to be carried out utilising the "notionally clean approach" and to confirm the target EQS status for the receiving waterbody (e.g. Good or High).

This assessment is carried out in accordance with the flow chart identified on Figure 4 of UE's Interim Technical Guidance for Water Impact Assessments (Freshwater) (UÉ-AMT-GL-028).

The results of this assessment is presented in Table 6.5.

Table 6.5: Calculation of Equivalent Downstream Limit Concentration for Compliance with Available WAC Limits (95%ile Scenario)

Substance	Ammonia	BOD	Ortho-P
Upstream mean concentration (mg/l)	0.037	1.635	0.034
High Status EQS (mg/l)	0.090	2.200	0.045
Good Status EQS (mg/l)	0.14	2.6	0.075
High status EQS exceeded?	0.053	0.565	0.011
	No	No	No
Good status EQS exceeded?			
Is the ambient concentration in the upper 25% of the good status band?			
Use notionally clean condition?	No	No	No
Is the ambient concentration in the upper 25% of the high status EQS?	41.6%	74.3%	74.9%
	No	No	No
Is the watercourse subject to a high status objective?	No	No	No
Target Good or High status?	**High**	**High**	**High**

Available WAC	0.122	0.942	0.066
Percent of Available WAC to be taken	**75%**	**75%**	**75%**
Equivalent downstream limit (mg/l)	**0.079**	**2.365**	**0.042**
Overall % WAC Used	**56%**	**91%**	**56%**

6.3.3 Tier 2 Assessment Summary

Based on the above referenced assessments, the ambient water quality and waterbody flow estimations, a calculation maybe carried out to identify the required ELV's to meet the equivalent downstream discharge limits for the target waterbody status. utilising UE's mass balance calculation sheet (UÉ-AMT-FM-007).

By utilising the calculation sheet, it identifies the required ELV's to meet the equivalent downstream limits for High Ecological Status are as follows:

Table 6.6: Maximum Permissible Discharge Limits

Parameter	ELV mg/l	EQS Status
Ammonia	1.7	High
BOD	37.4	High
Ortho-Phosphate	0.8	High

A copy of UE's mass balance calculation sheet (UÉ-AMT-FM-007) is included in Appendix B of this Report.

6.4 Tier 3 Assessment

N/A

6.5 Tier 4 Assessment

N/A

7. SUMMARY & CONCLUSIONS

A WAC assessment was undertaken of the River Sullane as per the requirements of UE Interim Technical Guidance for Water Impact Assessments (Freshwater) (UÉ-AMT-GL-028).

The Tier 0 assessment identified that monitored pollutants subject to an EQS are present within the effluent:

- BOD,
- pH
- Ammonia-
- Ortho

The Tier 1 assessment concluded that concentrations of the following pollutants exceed the EQS for the waterbody and should proceed to the Tier 2 assessment:

- BOD,
- Ammonia
- Ortho

The Tier 2 assessment was carried out utilising the simple mass balance calculation in accordance with UE mass balance calculation sheet (UÉ-AMT-FM-007).

By utilising the calculation sheet, it identifies the required ELV's to meet the equivalent downstream limits for High Ecological Status are as follows:

Table 7.1: Maximum Permissible Discharge Limits

Parameter	ELV mg/l	EQS Status
Ammonia	1.7	High
BOD	37.4	High
Ortho-Phosphate	0.8	High

Appendix A AMBIENT WATER QUALITY DATA

Date	Upstream Water Quality (RS19S020450)			Downstream Water Quality (RS19S020480)		
	Ammonia (mg/l)	BOD (mg/l)	Ortho P (mg/l)	Ammonia (mg/l)	BOD (mg/l)	Ortho P (mg/l)
12/02/2020		1.00	0.026	0.020	1.00	0.029
12/02/2020				0.331	0.90	
07/05/2020				0.111	3.10	
17/06/2020	0.021	1.20	0.006	0.095	0.90	0.038
17/06/2020				0.092	1.00	
02/09/2020	0.020	1.60	0.033	0.075	1.20	0.037
02/09/2020				0.084	1.00	
11/11/2020	0.026	1.70	0.030	0.025	2.00	0.034
11/11/2020				0.032	2.00	
18/02/2021				0.045	2.20	
25/02/2021	0.020	0.40	0.013	0.084	0.80	0.017
22/04/2021	0.020	1.10	0.006	0.020	1.20	0.008
22/04/2021				0.020	1.30	
16/06/2021	0.020	0.80	0.006	0.256	2.30	0.023
16/06/2021				0.230	1.20	
02/09/2021				2.900	7.30	
10/11/2021	0.020	0.90	0.021	0.940	2.60	
16/02/2022				0.240	1.80	
21/04/2022	0.020	0.200	0.01	0.695	2.50	0.191
21/04/2022				0.640	2.10	
15/06/2022	0.033	1.000	0.02	1.732	4.60	0.072
15/06/2022				1.500	2.50	
15/09/2022	0.044	0.800	0.03	0.194	0.60	0.024

16/09/2022				0.140	2.80	
10/11/2022	0.020	0.900	0.04	0.036	0.600	0.016
10/11/2022				0.190	1.500	
02/03/2023	0.020	0.700	0.03	0.218	1.700	0.071
02/03/2023				0.210	1.600	
26/04/2023				0.670	2.800	
21/06/2023	0.022	0.700	0.01	2.900	0.700	0.039
Average	**0.024**	**0.929**	**0.019**	**0.491**	**1.927**	**0.046**
95%ile	**0.037**	**1.635**	**0.034**	**2.374**	**3.925**	**0.120**

Appendix B MASS BALANCE EQUATIONS

Waste Assimilative Capacity (WAC) Calculation (Rivers)

Site Information	
Licence code	D0126-01
WWTP Name	Macroom WwTP
Emission ID	
Watercourse Name	River Sullane
River Waterbody Code	IE_SW_19S020480
EPA Waterbody Name	Sullane
Upstream Quality Point	RS19S020450
Downstream Quality Point	RS19S020480

Summary of Required ELVs	
Ammonia	1.7
BOD	37.4
Ortho-P	0.8

WWTP Licence Details & Current WWTP Performance	
Current Ammonia ELV (mg/l)	2
Current BOD ELV (mg/l)	15
Current Ortho-P ELV (mg/l)	1
Current Effluent Mean Ammonia Concentration (mg/l)	19.56
Current Effluent Mean BOD Concentration (mg/l)	16.56
Current Effluent Mean Ortho-P Concentration (mg/l)	1.86
Current Average Effluent Flow (m^3/s)	0.019
Current WWTP Hydraulic Capacity (m^3/s)	1318
Current Collected Load (PE)	4884
Future Design Horizon (year)	2040
Future Design Capacity (PE)	8300
Future Design Average Effluent Flow (m3/s)	0.0275
Calculation Date	29/08/2023

Summary Statistics

EQS Values	High Status EQS Mean (mg/l)	High Status EQS 95%ile (mg/l)	Good Status EQS Mean (mg/l)	Good Status EQS 95%ile (mg/l)
Ammonia	0.04	0.09	0.065	0.14
BOD	1.3	2.2	1.5	2.6
Ortho-P	0.025	0.045	0.035	0.075

	Upstream Water Quality Mean (mg/l)	Upstream Water Quality 95%ile (mg/l)	WAC Taken to High Status EQS Mean (%)	WAC Taken to High Status EQS 95%ile (%)	WAC Taken to Good Status EQS Mean (%)	WAC Taken to Good Status EQS 95%ile (%)	% Through Good Status Band Mean (%)	% Through Good Status Band 95%ile (%)
Ammonia	0.024	0.037	59	42	36	27	-66	-105
BOD	0.929	1.635	71	74	62	63	-186	-141
Ortho-P	0.019	0.034	76	75	54	45	-59	-38

	Downstream Water Quality Mean (mg/l)	Downstream Water Quality 95%ile (mg/l)	WAC Taken to High Status EQS Mean (%)	WAC Taken to High Status EQS 95%ile (%)	WAC Taken to Good Status EQS Mean (%)	WAC Taken to Good Status EQS 95%ile (%)	Use Notionally Clean? Mean	Use Notionally Clean? 95%ile
Ammonia	0.491	2.374	1227	2638	755	1696	**NO**	**NO**
BOD	1.927	3.925	148	178	128	151	**NO**	**NO**
Ortho-P	0.046	0.120	184	266	132	159	**NO**	**NO**

River Flow

	Present Day Flows
Q_{95} Flow (m^3/s)	0.861
Average Flow (m^3/s)	8.421

Environmental Sensitivity Score: 2.500

Basis of Future WWTP Flow Calculations

% WAC to be Utilised	Insert WAC % here	Use Notionally Clean?	Upstream Concentration Mean (mg/l)	Upstream Concentration 95%ile (mg/l)	Available WAC (absolute value) Mean (mg/l)	Available WAC (absolute value) 95%ile (mg/l)	Available WAC (% value) Mean (mg/l)	Available WAC (% value) 95%ile (mg/l)
Ammonia	75	No	0.024	0.037	0.016	0.053	41	58
BOD	75	No	0.929	1.635	0.371	0.565	29	26
Ortho-P	75	No	0.019	0.034	0.006	0.011	24	25

Target Downstream EQS

Target Status Class	High	High	High
	Ammonia	BOD	Ortho-P
Mean (mg/l)	0.04	1.3	0.025
95%ile (mg/l)	0.09	2.2	0.045

Final EQS Proxy Value (Predicted Downstream Concentration)

	Ammonia	BOD	Ortho-P
Mean (mg/l)	0.036	1.207	0.024
95%ile (mg/l)	0.077	2.059	0.042

Equations

$D = [(Q_{eff} \times C_{eff}) + (Q_{river} \times C_{river})] / (Q_{eff} + Q_{river})$ mg/l

Where D = Downstream concentration (mg/l)

Q_{river} = river flow (m^3/s) & Q_{eff} = discharge flow (m^3/s)

C_{river} = mean upstream concentration (mg/l) & C_{eff} = mean discharge concentration (mg/l)

Current Impact Calculation

Design Year	Population Equivalent Served by WWTP	WWTP Average Effluent Flow Rate (m^3/s)	Predicted Downstream 95%ile Concentration (mg/l) Ammonia	BOD	Ortho-P	Predicted Downstream Mean Concentration (mg/l) Ammonia	BOD	Ortho-P	No. of Available Dilutions Q_{95}	Average Flow
Current	5,230	0.019	**0.448**	**1.27**	**0.059**	**0.068**	**0.96**	**0.023**	45.02	440.28
			0.024	**0.93**	**0.019**	**0.024**	**0.93**	**0.019**		
			0.024	**0.93**	**0.019**	**0.024**	**0.93**	**0.019**		
			0.024	**0.93**	**0.019**	**0.024**	**0.93**	**0.019**		

Theoretical Current ELV Impact Calculation

Design Year	Population Equivalent Served by WWTP	WWTP Design Flow Rate (m^3/s)	Predicted Downstream 95%ile Concentration (mg/l) Ammonia	BOD	Ortho-P	Predicted Downstream Mean Concentration (mg/l) Ammonia	BOD	Ortho-P	No. of Available Dilutions Q_{95}	Average Flow
2040	8,300	0.028	**0.085**	**1.36**	**0.049**	**0.030**	**0.97**	**0.022**	31.31	306.22
			0.024	**0.93**	**0.019**	**0.024**	**0.93**	**0.019**		
			0.024	**0.93**	**0.019**	**0.024**	**0.93**	**0.019**		
			0.024	**0.93**	**0.019**	**0.024**	**0.93**	**0.019**		

Required Effluent ELV Calculation

Design Year	Population Equivalent Served by WWTP	WWTP Design Flow Rate (m^3/s)	Effluent ELV (mg/l) for 95%ile Condition Ammonia	BOD	Ortho-P	Effluent ELV (mg/l) for Mean Condition Ammonia	BOD	Ortho-P	No. of Available Dilutions Q_{95}	Average Flow
2040	8,300	0.028	**1.7**	**37**	**0.8**	**3.8**	**87**	**1.4**	31.31	306.22

ELVs Required for Each Design Year

Ammonia	BOD	Ortho-P
1.7	**37.4**	**0.8**

www.tobin.ie

TOBIN Consulting Engineers

@tobinengineers

Galway
Fairgreen House,
Fairgreen Road,
Galway,
H91 AXK8,
Ireland.
Tel: +353 (0)91 565 211

Dublin
Block 10-4,
Blanchardstown Corporate Park,
Dublin 15,
D15 X98N,
Ireland.
Tel: +353 (0)1 803 0406

Castlebar
Market Square,
Castlebar,
Mayo,
F23 Y427,
Ireland.
Tel: +353 (0)94 902 1401

Limerick
Unit 4, Crescent Court,
St Nessan's Road, Dooradoyle,
Limerick
V94V298
Ireland
Tel: +353 (0)61 976 262

Sligo
The Gateway Building, Floor 3
Northwest Business Park
Collooney, Sligo
F91W40H
Ireland
Tel: +353 (0)71 9318 844

Appendix B

Aquatic Ecology Assessment of Sullane River: FPM Population and Habitat Quality Downstream of Macroom WwTP 2022

(Sweeney Consultancy, 2022).

Aquatic Ecology Assessment of Sullane River:

FPM Population and Habitat Quality

Downstream of Macroom WwTP

2022

Prepared by

Pascal Sweeney, Sweeney Consultancy, Rahan, Mallow, Co. Cork

TABLE OF CONTENTS

1. INTRODUCTION

1.1 Background

Sweeney Consultancy was commissioned by Tobin Consulting Engineers to undertake an ecological assessment of the Sullane River downstream of the Macroom Wastewater Treatment Plant (WwTP), for which an upgrade is planned. The purpose of the assessment is to determine the current status of the Freshwater Pearl Mussel (FPM) (*Margaritifera margaritifera*) in this section of river and the quality of the habitat here for this legally protected species.

1.2 Scope

The scope of this survey is:

Biological Water Quality Assessment.

Freshwater pearl mussel Stage 1/2 survey.

Evaluation of the suitability of the habitat for FPM.

1.4 Pre-visit Assessments

Past biological water quality data on the EPA website were reviewed.

Previous FPM records (1987 to 2016) in the Sullane, obtained via a Data Request Form to NPWS, were reviewed, as well as results of surveys carried out by Sweeney Consultancy for the N22 Ballyvourney-Macroom Road Scheme in 2020 and the TII Macroom Bridge Repair Works in 2021. In addition, FPM records in the River Laney, which joins the Sullane downstream of the Macroom WwTP outfall were reviewed. This included the most recent (2021) comprehensive survey of the entire channel of the Laney by Sweeney Consultancy for a proposed windfarm at Ballinagree.

2. METHODOLOGY

2.1 Fieldwork conditions

Field surveys were carried out on 17/08/2022 by Pascal Sweeney M.Sc. The weather was dry with broken light cloud. The water was clear and only slightly coloured. The water level was low.

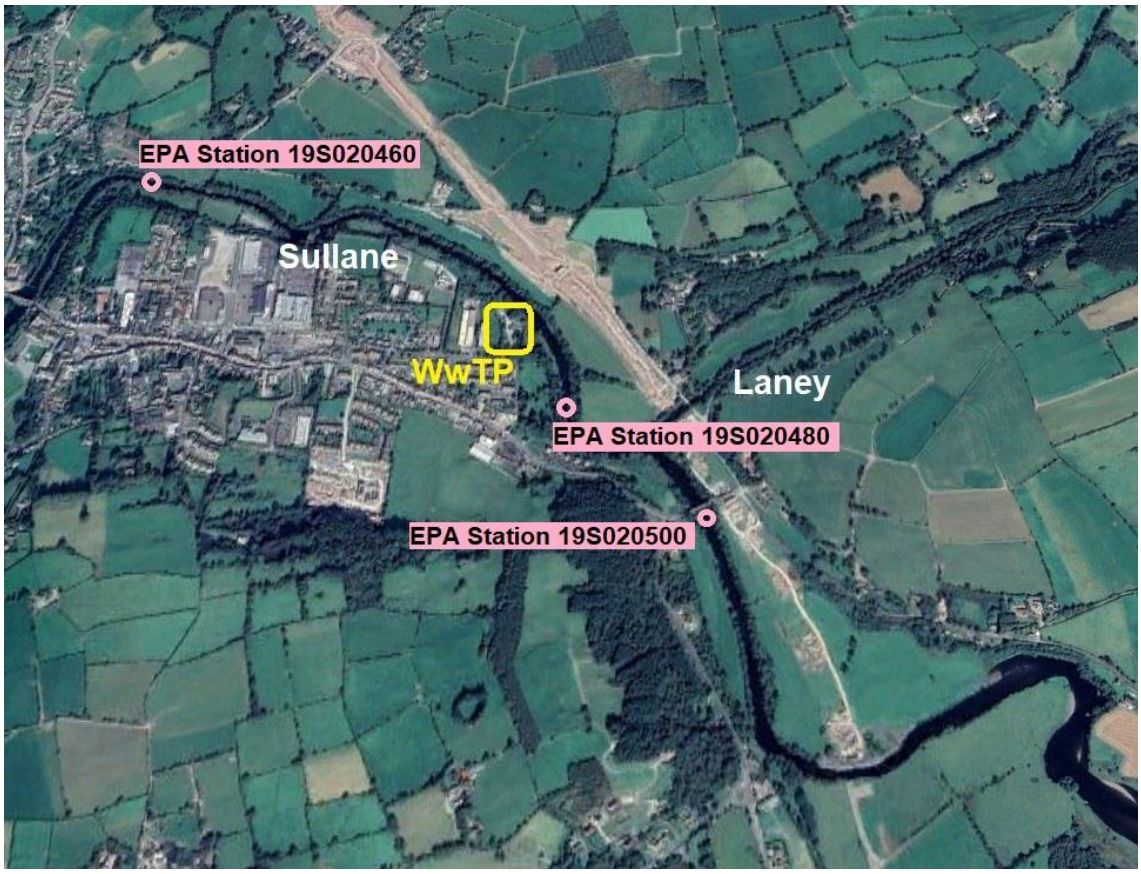
2.2 Biological Water Quality Assessment Method

At three EPA sampling Stations (Figure 1), biological water quality was assessed by the Q-value methodology, following the Standard Operating Procedures of the EPA (2021). At each site, notes on the physical habitat were recorded. A two-to-three-minute macroinvertebrate kick sample was collected, preferably 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.

2.3 Freshwater Pearl Mussel Survey Method

Visual assessment of the habitat quality for the freshwater pearl mussel was first made, based on the criteria outlined by Skinner et al. (2003). Surveys were carried out under Licence No C56/2022 from NPWS. The bed of the river was searched visually, by wading, where possible, using a bathyscope. Due to evidence of untreated waste downstream of the WwTP outfall (see Section 3.1 below), health and safety concerns precluded snorkelling of sections of the river that were too deep to wade.

Fig. 1. Biological Water Quality Sampling Sites



3. FIELD SURVEY RESULTS

3.1 Q-value Results

Sampling site co-ordinates and other site information are presented in Appendix 2. Photographs are shown in Appendix 3. The macroinvertebrate community recorded, giving relative abundance for each taxon at each site, 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 given in Table 1.

Table 1. Q-values

EPA Station Code	Location relative to WwTP outfall	Q-value August 2022	Water Framework Directive Ecological Status
19S020460	c. 900m upstream	Q4-5	High
19S020480	c. 200m downstream	Q3-4	Moderate
19S020500	c. 700m downstream	Q4	Good

The Q-values assigned to each site take into account that at this time of year, Group A (highly pollution sensitive) species are far lower in occurrence than at other times, due to several species stonefly (Plecoptera), as well as a few of the indicator species of mayfly (Ephemeroptera) being mainly in the adult or egg stages of their life cycles. At 19S020460, four Group A taxa were found, with two common in occurrence. At 19S020480, toilet tissue and other objects associated with toilet waste were caught on the stones (Photo 4) and one dead and one dying trout (Photo 5) were found. However, the invertebrate fauna indicates that this was probably due to a temporary overflow, rather than on ongoing situation, as one Group A species and one Group B species were present in low numbers and only a few pollution tolerant snails from Group D were found here. At 19S020500, an increase in the relative abundance of Group A taxa indicates an improvement to good ecological conditions.

Past EPA Q-values for the Sullane are presented in Table 2, for comparison

Table 2. Past EPA Q-values

Date Report Generated: 23/08/2022

SULLANE **19S02**

Date Surveyed (last survey year only): 01/06/21, 19/08/21

Biological Quality Rating (Q Values)

Station Code	1971	1976	1981	1986	1990	1994	1997	1999	2002	2005	2008	2011	2014	2017	2018	2019	2020	2021
RS19S020040					4													
RS19S020100	5	5	5	4-5	4	4	4-5	4-5	4-5	4	4	4-5	4-5	4-5			4	4
RS19S020150					4-5													
RS19S020170					4-5	4-5	4	4-5	4-5	4	4	4-5	4-5	4-5			4	4
RS19S020200	5	5	5	5	4-5	4-5	4-5	4-5	4-5	4-5			4-5	4-5			4-5	
RS19S020300			5	4-5	5	4-5	4-5	4-5	4-5	4-5	4-5	4-5	4-5	4-5	4-5	4-5	4-5	
RS19S020400	5	5	5	5	5	5	5	5	5	5	4-5	5	4-5	4-5	4-5		5	4-5
RS19S020460					4-5													
RS19S020480						4	4	4	4	4	4	4	4	4			4	
RS19S020500	5	5	5	4	4-5													

Most Recent Assessment:

Continuing satisfactory along its length. The two uppermost station at the bridge near Coolea (0100) and in Ballyvourney (0170) continue with Good ecological quality. The station at Linnamilla bridge (0400) upstream of Macroom continues with High ecological quality although it has declined from Q5 to Q4-5.

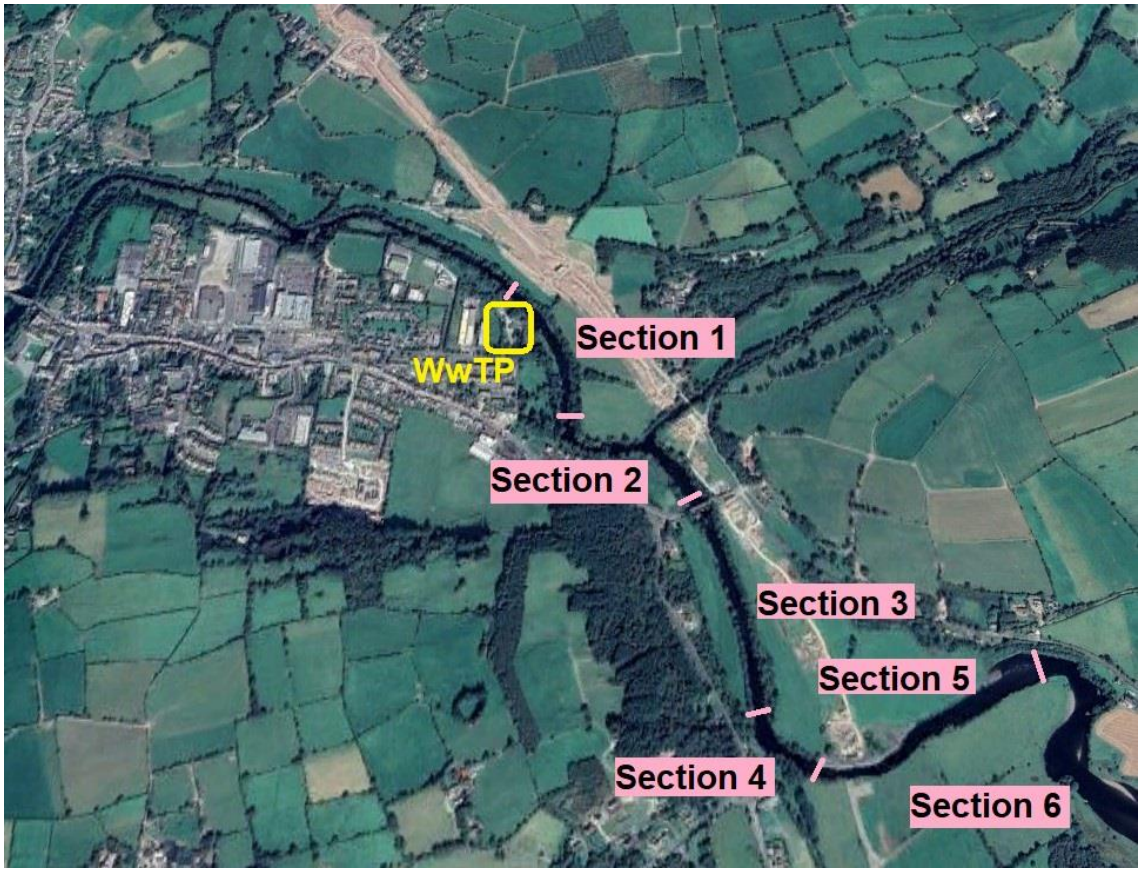
Station Details

Station Code	Station Location	WFD Waterbody Code	Easting	Northing	Local Authority
RS19S020040	SULLANE - Br N of Bard Inch	IE_SW_19S020100	113482	74001	Cork County Council
RS19S020100	Br nr Coolea	IE_SW_19S020100	116155	75912	Cork County Council
RS19S020150	SULLANE - Ballyvourney Br	IE_SW_19S020170	119570	77593	Cork County Council
RS19S020170	First Br d/s Ballyvourney Br	IE_SW_19S020170	120211	76947	Cork County Council
RS19S020200	SULLANE - Br d/s Douglas R confl	IE_SW_19S020200	122720	75580	Cork County Council
RS19S020300	Sullane Br	IE_SW_19S020300	126046	74088	Cork County Council
RS19S020400	Linnamilla Br	IE_SW_19S020400	131163	72788	Cork County Council
RS19S020460	SULLANE - 0.5km d/s Macroom Br	IE_SW_19S020480	134175	73276	Cork County Council
RS19S020480	Ford u/s Laney R confl	IE_SW_19S020480	135048	72708	Cork County Council
RS19S020500	SULLANE - New Br d/s Macroom	IE_SW_19L030400	135337	72493	Cork County Council

3.3 Freshwater Pearl Mussel Survey Results

No freshwater pearl mussels were found in the Sullane downstream of Macroom WwTP. Sections of the river, divided based on physical conditions and suitability for FPM are shown in Figure 2.

Fig. 2. River FPM Habitat Sections



Section 1: From the WwTP to just downstream of EPA Station 19S020480, the Sullane is shallow, with riffle and fast glide over stones (Photo 2). If the water quality were good enough, the habitat could support FPM, as evidenced by historical records here.

Section 2: Deep slow flow with silt deposits (Photo 6). The habitat of this section is not suited to FPM requirements.

Section 3: Mostly glide of varying depth over stones and two short sections of riffle. There is some physical habitat that would be suitable for FPM, particularly along the left hand side of the river, under light shade from bankside trees (Photo 7). While there are some historical records of FPM here, the current water quality is not good enough.

Section 4: Deep slow flow with boulders by the right bank and silt deposits to the right. The habitat of this section is not suited to FPM requirements.

Section 5: Mostly slow glide of varying depth over stones (Photo 8). Siltation and limited shade decrease the suitability of this section of river for FPM.

Section 6: As the river bends into lentic conditions (Photo 9), the suitability for FPM decreases further.

4. CONCLUSIONS & DISCUSSION

The biological water quality of the Sullane is suitable for FPM at EPA Station 19S020460, downstream of Macroom Bridge and upstream of Macroom WwTP. However, the nearest known live mussels are c. 7km upstream. Downstream of the WwTP, there are some sections of physical habitat where FPM were found historically, but where the water quality is currently unsuitable for this pollution sensitive species. If an upgrade of the WwTP results in an improvement in water quality downstream to that which is found upstream, conditions would again be favourable for FPM here. However, recruitment would have to come from the relatively sparse FPM population farther upstream, as mussels were found to be absent from the Laney in a thorough survey carried out in 2020.

APPENDIX 1
REFERENCES

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

Skinner, A, Young M. & Hastie L. (2003). Ecology of the Freshwater Pearl Mussel. *Conserving Natura 2000 Rivers Ecology Series No. 2 English Nature, Peterborough.*

APPENDIX 2
MACROINVERTEBRATE SAMPLING SITE DETAILS

EPA Station Code	19S020460
Grid Reference (ITM)	534105 573347
Photograph (Appendix 3)	1
Channel Width (m)	25
Wet Width (m)	20
Sampling depth (m)	0.25
Flow Type	Riffle 100%
Velocity	Fast
Substratum In order of occurrence	Cobble Boulder Gravel
Shade	Mixed
Instream vegetation (% cover)	*Ranunculus sp.* 10 *Hygrohypnum sp.* 5 *Cladophora sp.* 1

EPA Station Code	19S020480
Grid Reference (ITM)	535012 572770
Photograph (Appendix 3)	2
Channel Width (m)	25
Wet Width (m)	25
Sampling depth (m)	0.3
Flow Type	Riffle 100%
Velocity	Moderate
Substratum In order of occurrence	Cobble Gravel Sand
Shade	Mixed – Mostly unshaded
Instream vegetation (% cover)	*Ranunculus sp.* 20 *Cladophora sp.* 10 Other filamentous algae 10
Comments	Toilet tissue caught on stones (Photo 4) 1 dead and 1 dying trout (Photo 5)

EPA Station Code	19S020500
Grid Reference (ITM)	535302 572554
Photograph (Appendix 3)	3
Channel Width (m)	60
Wet Width (m)	50
Sampling depth (m)	0.3
Flow Type	Riffle 100%
Velocity	Fast
Substratum In order of occurrence	Cobble Gravel Boulder Sand
Instream vegetation (% cover)	*Fontinalis antipyretica* 10 *Fontinalis squamosa* 5 *Cladophora sp*. 10 *Vaucheria sp*. 5
Shade	Mixed – Mostly unshaded

APPENDIX 3

PHOTOGRAPHS

Photo 1: EPA Station 19S020460

Photo 2: EPA Station 19S020480

Photo 3: EPA Station 19S020500

Photo 4: Toilet tissue at EPA Station 19S020480

Photo 5: Dying Trout at EPA Station 19S020480

Photo 6: Habitat Section 2

Photo 7: Habitat Section 3

Photo 8: Habitat Section 5

Photo 9: Habitat Section 6

APPENDIX 4
INVERTEBRATES RESULTS

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

TAXON	*EPA Station* 19S020460	*EPA Station* 19S020480	*EPA Station* 19S020500
Group A (Sensitive)			
Ecdyonurus sp.	C	F	F
Heptagenia sp.	SS		
Rhithrogena sp			
Perla bipunctata	C		C
Nemoura sp.	SS		
Group B (Less Sensitive)			
Leuctra sp.		F	
Hydroptilidae			
Lepidostomatidae			
Limnephilidae	F		
Group C (Relatively Tolerant)			
Lumbriculidae			
Potamopyrgus antipodarum	F		C
Planorbis sp.		F	
Hydrachnidae			
Gammarus sp.	F		C
Baetis rhodani grp.	N	N	N
Seratella ignita	F		C
Hydropsyche sp.	F		
Cheumatopsyche lepida			
Rhyacophila sp.	F	F	F
Polycentropodidae		F	
Philopotamidae			
Elmis aenea	F		
Limnius volckmari			F
Dicranota sp.			
Simuliidae		C	N
Chironomidae (ex. *Chironomus*)		C	F
Group D (Very Tolerant)			
Crangonyx sp.	SS		
Radix balthica		F	F
Group E (Most Tolerant) – None Recorded			

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