Killmurrin Cove Stream_010 (Dunhill Priority Area for Action) LCA and Referral Report

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1 Introduction

This report details the findings from the local catchment assessment (LCA) carried out in Kilmurrin Cove Stream_010 which is part of the Dunhill Priority Area for Action. Local catchment assessment is the culmination of LAWPRO's desk study and fieldwork findings.

The Environmental Protection Agency identified Urban Waste Water (Kill – A0380-01) as the significant pressure during initial characterisation. During the Desk Study stage LAWPRO identified Agriculture, diffuse urban run-off, misconnections in Kill and DWWTS as potential pressures. The LCA outcomes in relation to the specific pressure of Urban Waste Water (Kill – A0380-01) are contained in this report.

2 Desk Study Assessment

2.1 Desk Study Findings

- The Kilmurrin Cove Stream_010 is *At Risk* of not achieving its WFD objectives.
- Its current status is Poor (ecological status 2016-2021).
    - A Q-Value of 3 (poor) was recorded in 2021 and again in 2022 at the Br near Kilbeg (d/s Kill village) monitoring point.
    - At Kilmurrin Cove Stream - Bridge N. of Kilmurrin Cove, the Q-Value was 4 in 2020 and in 2022.
- The Kilmurrin Cove Stream _010 discharges into the Eastern Celtic Sea at Kilmurrin Cove.
- Kilmurrin Cove is an undesignated small sized bathing area. It is monitored at least once during the bathing season and had excellent water quality in 2020.
- Ballinlough lake is an unmonitored *Review* waterbody located in the headwaters of the Kilmurrin Cove Stream_010. In 2022 the EPA assigned status[1] to unmonitored water bodies, Ballinlough Lake has been assigned Moderate status following a modelling exercise.
- The operational monitoring point for the waterbody is located at Br near Kilbeg (d/s Kill village).
- Annual average concentrations of Total Ammonia, Ortho-phosphate and TON are consistently greater than the relevant EQS/Indicative Threshold. BOD concentrations exceeded the Good Status 95%ile EQS on two occasions during 2019 and on one occasion during 2020.
- Total Ammonia, Ortho-phosphate and TON are the significant issues identified for this waterbody.
- The EPA have identified Urban Waste Water (Kill WWTP) as the significant pressure for the waterbody. Agriculture, diffuse urban run-off, misconnections in Kill and DWWTS have been identified as potential pressures.
- Kill WWTP is the main point source pressure in the catchment.
- The emission point from Kill WWTP is located approximately 1.2 km upstream of the Br near Kilbeg (d/s Kill village) monitoring station.
- The diffuse loss of nitrate to groundwater and near surface flow will occur mostly in the northern, middle and southern areas of the catchment. Diffuse loss of phosphate by overland flow will occur on the poorly drained and peat soils adjacent to the waterbody.
- The elevated concentrations of Total Ammonia detected at Br near Kilbeg (d/s Kill village) are likely as a result of a local point source or sources.

2.2 Significant pressure from initial characterisation

WFD Eden App: Cycle 2 characterisation – Kill WWTP included as a Significant Pressure.

[1] WFD update - assigning status to all unmonitored identified waterbodies - Catchments.ie - Catchments.ie

2.3 Assessment of pollution risk in 95 %ile and 30 %ile flow conditions

We estimated the pollution risk from Kill WWTP at the WFD monitoring point, Br near Kilbeg (d/s Kill village), using 95%ile flow, estimated effluent data and notional clean background upstream water quality data. In this modelled scenario the discharge consumed 234% of the available headroom for Ortho-phosphate and 542% of the available headroom for Total Ammonia (**Appendix**). At 30%ile flow the discharge used 32% of the available headroom for Ortho-phosphate and 73% of the available headroom for Total Ammonia at notional clean background concentrations.

Based on this assessment, at low flow conditions, Kill WWTP is using all of the available headroom capacity for both Ortho-phosphate and Total Ammonia at the nearest WFD monitoring point. Also, a significant proportion (73%) of the Total Ammonia headroom capacity is being utilised by the WWTP at average flow conditions.

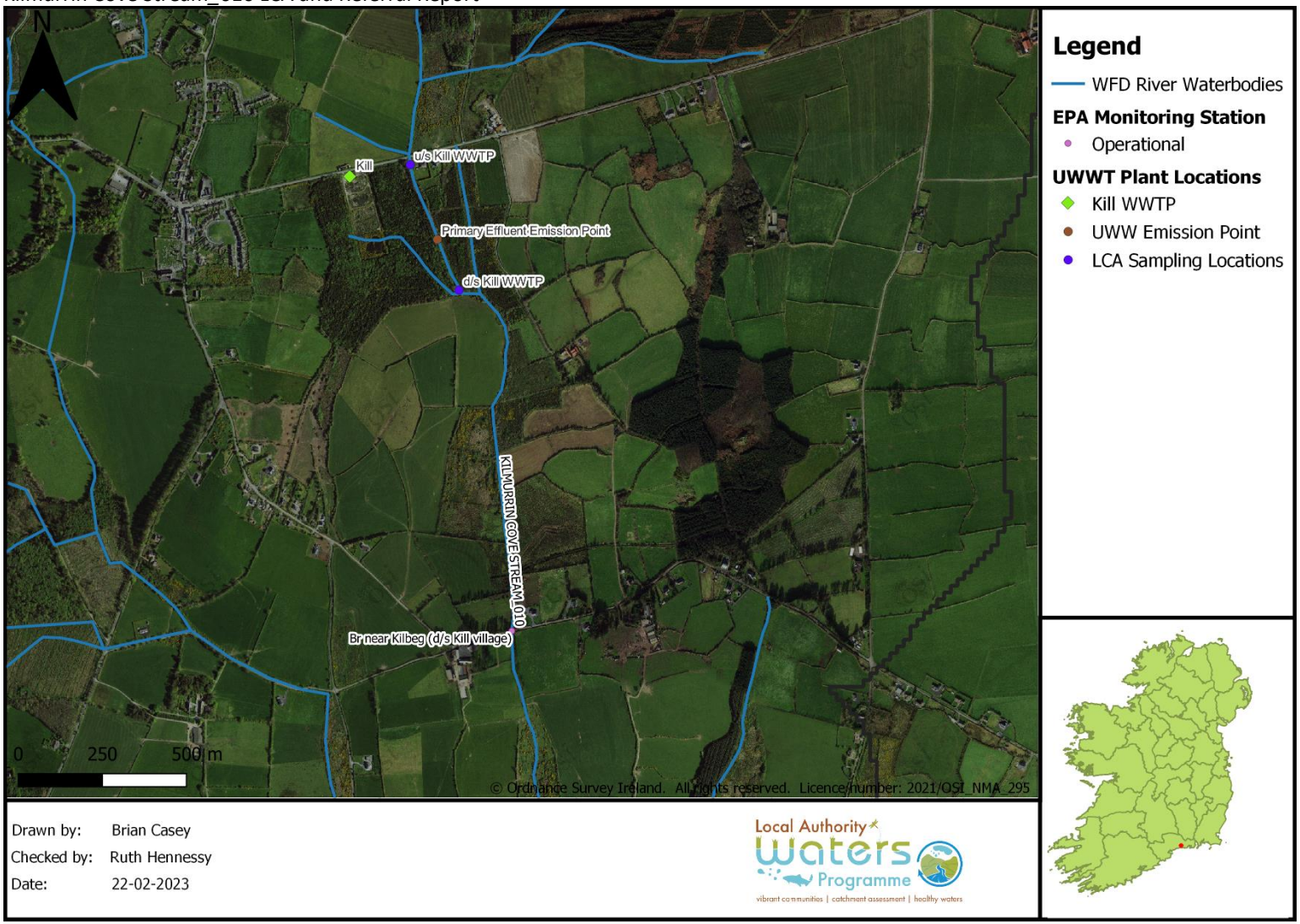

Figure 1 Kill WWTP and LCA Sampling Locations in Killmurrin Cove Stream_010

3 Fieldwork

3.1 Assessments Upstream and Downstream of Kill WWTP

To determine any potential impact on water quality from Kill WWTP, Small Stream Impact Score (SSIS) assessments and water chemistry samples were taken both upstream and downstream of the discharge from the WWTP (**Figure 1**).

The SSIS were carried out on the 3rd of September 2021 and both sites were found to be *Probably Impacted* (**Table 1**). The SSIS score at the downstream location was marginally better than what was recorded upstream. However, a direct comparison between the two locations was difficult due to a poorer substrate and an overall lower population of invertebrates at the downstream site. An additional Rapid Assessment was carried at d/s Kill WWTP on 7th September 2021. Similar to the SSIS assessment, the site was showing evidence of impact.

Table 1 LCA results at upstream and downstream of Kill WWTP

Site location	Sample Date	SSIS/RA	D.O (%)	Conductivity (µS)	pH (pH units)	Temperature (°C)	Ortho-P (EQS – 0.035 mg/l)	Ammonium (EQS – 0.065 mg/l)	TON (Indicative Threshold – 2.6 mg/l)	BOD (EQS – 1.5 mg/l)
u/s Kill WWTP	01/06/2021	-	94.20	270	7.34	13.6	0.034	0.1	5.2	<1
	03/09/2021	0.8	88.20	272	7.34	14.9	-	-	-	-
	06/01/2022	-	99.80	268	7.53	6.9	0.026	0.13	6.4	<1
d/s Kill WWTP	01/06/2021	-	91.30	276	7.45	11.8	0.078	0.14	5.2	<1
	03/09/2021	1.6	80.50	279	7.3	14.5	-	-	-	-
	07/09/2021	Impacted	102.30	306	6.57	15.7	-	-	-	-
	06/01/2022	-	102.70	287	7.58	8.2	0.053	0.24	6	1

Water chemistry samples were taken upstream and downstream of the emission point on 1st of June 2021 and 6th January 2022. Results of the analysis showed that concentrations of Ortho-phosphate were more than 100% greater downstream of the discharge compared to upstream on both occasions. Total Ammonia concentrations were 40% greater on 1st June 2021 and 85% greater on 6th January 2002 at the downstream site compared to upstream. Total Ammonia was in exceedance of the relevant Good Status EQS at the u/s Kill WWTP on both dates sampled, while Ortho-phosphate and Total Ammonia were in exceedance on both occasions at d/s Kill WWTP. The results show that the effluent discharge was having an adverse impact on nutrient levels in the Kilmurrin Cove Stream_010.

3.2 Assessment at the WFD monitoring point

Assessments were carried out at the Kilmurrin Cove Stream_010 operational monitoring point on three occasions between 2021 and 2022 (**Table 2**). The SSIS result in September 2021 was *Probably Impacted*. Water chemistry sampling found Ortho-phosphate in exceedance of the Good Status EQS in June 2021 and both Ortho-phosphate and Total Ammonia in exceedance in January 2022.

Table 2 LCA results at Br near Kilbeg (d/s Kill village)

Site location	Sample Date	SSIS	D.O (%)	Conductivity (µS)	pH (pH units)	Temperature (°C)	Ortho-P (EQS – 0.035 mg/l)	Ammonium (EQS – 0.065 mg/l)	TON (Indicative Threshold – 2.6 mg/l)	BOD (EQS – 1.5 mg/l)
Br near Kilbeg (d/s Kill village)	01/06/2021	-	95.20	290	7.49	13.6	0.056	0.041	5.4	<1
	07/09/2021	2.4	97.30	314	7.36	16.9	-	-	-	-
	06/01/2022	-	104.40	285	7.56	8.1	0.048	0.11	6.8	<1

The results from the LCA showed that Kilmurrin Cove Stream_010 was impacted at the monitoring point with Ortho-phosphate and Total Ammonia being significant issues. Water chemistry results also indicate that the elevated concentrations of these nutrients recorded at the monitoring point may be due to the emission from Kill WWTP.

4 Significant pressures in Kilmurrin Cove Stream_010

4.1 Urban Wastewater

Urban Wastewater was identified as a significant pressure for Kilmurrin Cove Stream_010 at the 2nd Cycle Characterisation stage. During the LCA, concentrations of Ortho-phosphate and Total Ammonia were found to be more elevated at d/s Kill WWTP compared to u/s Kill WWTP. Also, concentrations of these nutrients were in exceedance of their relevant Good Status EQS at the Br near Kilbeg (d/s Kill village) monitoring point.

The field work carried out during the course of the LCA along with assimilative capacity calculations, indicate that the discharges from Kill WWTP are having an impact on the water quality of Kilmurrin Cove Stream_010.

4.2 Agriculture

Agriculture has also been identified as a significant pressure in Kilmurrin Cove Stream_010. The elevated concentrations of Total Ammonia detected at u/s Kill WWTP are potentially due to agricultural sources. The high levels of TON seen at all sampling locations are due to diffuse losses from agriculture and a referral has been given to ASSAP to address this issue.

5 Recommended Actions

5.1 EPA Catchments Unit – Confirmation that Kill WWTP is a significant pressure

The urban wastewater treatment plant at Kill is having a direct impact on water quality in Kilmurrin Cove Stream_010. Although, there is another potential source of ammonia upstream of the WWTP, LCA has shown that Kill WWTP is contributing to the elevated concentrations of phosphate and ammonia at the monitoring point.

5.2 Uisce Éireann

As per the EPA Site Visit Report SV21573 issued on 19/01/2022:
'Irish Water (Uisce Éireann) should:
1. investigate why the levels of ortho-phosphate in the downstream samples are higher than the upstream samples; and
2. carry out additional monitoring upstream and downstream of the discharge point from the Kill agglomeration; '

6 Appendix

6.1 Appendix 1 – Assimilative Capacity

Facility Name	Kill WWTP	**Reference Number:** ***Licence/COA number as relevant***	A0380-01

1) 95%ile river flow at Br near Kilbeg (d/s Kill village)

either enter lps data in cell B3 or enter lpd data into cell D3, overwriting cell formula (1m3=1000 litres)

River Flow (95%ile)	0.018	m3/sec	1555200	lpd

2) Effluent Dry Weather Flow (DWF)

*usually determined by PE*200lpd*

Effluent DWF	52.8	m3/day	52800	lpd
Total D/S flow			1608000	lpd

3) Resultant concentration calculations for the discharge at Br near Kilbeg (d/s Kill village)

	Upstream conc using notional clean conc (mg/l)	U/S Conc (actual - average of grab samples taken) mg/l	Upstream load using notional clean conc (mg/l)	U/S Load (actual) (mg/d)	Annual Average Effluent Conc (mg/l)	Effluent Load (mg/d)	Total Load using notional clean (mg/d)	Real Total Load (mg/d)	Final D/S Conc using notional clean (mg/l)	Final D/S conc using actual results (mg/l)	95%ile EQS (Cmax)
BOD (mg/l)	0.26	0.50	404352	777600	105	5544000	5948352	6321600	3.70	**3.931**	2.60
P (mg/l)	0.005	0.03	7776	46656	5	264000	271776	310656	0.169	**0.193**	0.075
NH4-N (mg/l)	0.008	0.12	12441.6	186624	21.8	1151040	1163481.6	1337664	0.72	**0.832**	0.14

4) Headroom assessment (at nearest downstream WFD monitoring point), using existing water quality:

Head Room mg/l = Cmax-C

Cmax = Max permissible conc (EQS) (mg/l)

C = Background upstream conc. (mg/l)

	mg/l
BOD Headroom =	2.10
MRP Headroom =	0.05
Ammonia N Headroom=	0.02

	Upstream conc (mg/l)	Final D/S Conc mg/l	Percentage Headroom utilised
BOD	0.50	3.93	163
MRP	0.030	0.193	363
NH4N	0.120	0.832	3559

5) Headroom assessment (at nearest downstream WFD monitoring point), using notional clean figures:

Head Room mg/l = Cmax-C

Cmax = Max permissible conc (EQS) (mg/l)

C = Background upstream conc. (mg/l)

	mg/l
BOD Headroom =	2.34
MRP Headroom =	0.07
Ammonia N Headroom=	0.13

	Upstream conc (notional clean) (mg/l)	Final D/S Conc mg/l	Percentage Headroom utilised
BOD	0.260	3.699	147
MRP	0.005	0.169	234
NH4N	0.008	0.724	542

Facility Name	Kill WWTP	**Reference Number:** ***Licence/COA number as relevant***	A0380-01

1) 30%ile river flow at Br near Kilbeg (d/s Kill village)

either enter lps data in cell B3 or enter lpd data into cell D3, overwriting cell formula (1m3=1000 litres)

River Flow (30%ile)	0.137	m3/sec	11836800	lpd

2) Effluent Dry Weather Flow (DWF)

*usually determined by PE*200lpd*

Effluent DWF	52.8	m3/day	52800	lpd
Total D/S flow			11889600	lpd

3) Resultant concentration calculations for the discharge at Br near Kilbeg (d/s Kill village)

	Upstream conc using notional clean conc (mg/l)	U/S Conc (actual - average of grab samples taken) mg/l	Upstream load using notional clean conc (mg/l)	U/S Load (actual) (mg/d)	Annual Average Effluent Conc (mg/l)	Effluent Load (mg/d)	Total Load using notional clean (mg/d)	Real Total Load (mg/d)	Final D/S Conc using notional clean (mg/l)	Final D/S conc using actual results (mg/l)	95%ile EQS (Cmax)
BOD (mg/l)	0.26	0.50	3077568	5918400	105	5544000	8621568	11462400	0.73	**0.964**	2.60
P (mg/l)	0.005	0.03	59184	355104	5	264000	323184	619104	0.027	**0.052**	0.075
NH4-N (mg/l)	0.008	0.12	94694.4	1420416	21.8	1151040	1245734.4	2571456	0.10	**0.216**	0.14

4) Headroom assessment (at nearest downstream WFD monitoring point), using existing water quality:

Head Room mg/l = Cmax-C

Cmax = Max permissible conc (EQS) (mg/l)

C = Background upstream conc. (mg/l)

	mg/l
BOD Headroom =	2.10
MRP Headroom =	0.05
Ammonia N Headroom=	0.02

	Upstream conc (mg/l)	Final D/S Conc mg/l	Percentage Headroom utilised
BOD	0.50	0.96	22
MRP	0.030	0.052	49
NH4N	0.120	0.216	481

5) Headroom assessment (at nearest downstream WFD monitoring point), using notional clean figures:

Head Room mg/l = Cmax-C

Cmax = Max permissible conc (EQS) (mg/l)

C = Background upstream conc. (mg/l)

	mg/l
BOD Headroom =	2.34
MRP Headroom =	0.07
Ammonia N Headroom=	0.13

	Upstream conc (notional clean) (mg/l)	Final D/S Conc mg/l	Percentage Headroom utilised
BOD	0.260	0.725	20
MRP	0.005	0.027	32
NH4N	0.008	0.105	73