Drumcomoge Priority Area for Action Desk Study

AFA 0070

South-West Region

Drumcomoge_010, 1km downstream of Knocklong. Photograph taken September 2020

F02

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Acknowledgements

The authors would like to acknowledge the contributions of Limerick City and County Council who have carried out a significant amount of work in the Drumcomoge catchment in recent years. We also wish to thank them for their support of the Local Authority Waters Programme.

Summary

The Drumcomoge Priority Area for Action comprises one river water body, Drumcomoge_010 (65km^2). This is the sole waterbody in the Drumcomoge subcatchment (DRUMCOMOGE_SC_010). The river rises in the east and southeast of the subcatchment and flows in a west/north westerly direction to the Camoge_010, downstream of Knockainey in County Limerick.

Land use is predominantly pasture with small areas of cut peat towards the north east and south east. The main towns are Knocklong, Hospital (part overlies), Emly, Kilross and Knockainey. There are three public drinking water abstractions in the sub-basin.

Most of the Drumcomoge river channel is under the Groody, Maigue and Deel OPW arterial drainage scheme and the channel profile is suggestive of fairly extensive channel modification here in the past.

The low gradient throughout much of the Drumcomoge waterbody is conducive to sediment deposition on the riverbed. Natural sediment accumulation maps show a small area to the east and north of Emly which is high to extensive for peat accumulation. Downstream of Knocklong village are areas of moderate sediment accumulation (clay).

River hydromorphology assessments (RHAT) undertaken in 2019 by Wetlands Survey Ireland as part of a survey of the wider Maigue catchment on behalf of the Maigue Rivers Trust classified one site near Knockainey as Good and eight sites as either moderate or poor. The report states that 'the main factors contributing to Poor assessments were the previous channel alteration, loss of riparian vegetation, and cattle access to the river leading to erosion and sedimentation'.

Drumcomoge_010 is not currently monitored under the Water Framework Directive (WFD) for either biology or chemistry. Historic Q data from pre-WFD monitoring stations (1998 and earlier) show predominantly poor biological status here. More recently (2019), four sites were monitored for biological status by Limerick City and Council staff for the Maigue Rivers Trust (MRT). All results were indicative of impact (Q3-4 or Q3). These results confirm that Driumcomoge_010 is *At Risk*.

Desk study information indicates that the significant issues are likely to be phosphate and sediment.

The significant pressures are agriculture and hydromorphology. Point source urban wastewater pressures are unlikely to be significant but limited assessment is required upstream and downstream of the Knocklong wastewater treatment plant to conclusively rule out this pressure.

The local catchment assessment (LCA) process will focus on sediment extent, type and possible sources throughout the waterbody. Tributary nutrient levels and flows will be assessed to quantify individual tributary nutrient load contribution to the main channel. Nutrient monitoring will also be undertaken upstream and downstream of potential point sources.

The initial information gathered by the local catchment assessment team will be collated and used to develop more targeted assessments/stream walks. Where significant pressures are identified, appropriate mitigation measures will be discussed and referred to the relevant Agency.

1 Background

Table 1.1: Background information on the Drumcomoge PAA.

Priority Area for Action	Catchment Number	Catchment Name	Sub catchment	Region	Local Authority
Drumcomoge	24	Shannon Estuary South	24_2 DRUMCOMOGE_SC_010	Southwest	Limerick

Priority Area for Action	No. of *At Risk* WBs	No. of *Review* WBs	No. of dRBMP Prioritised WBs	No of WBs for Status Improvement:		
				2021	2027	Beyond 2027
Drumcomoge	1	0	0	0	1	0

Reasons for selection	
	• Multi-agency effort/cross county opportunity. • Headwaters to the Camoge which is already a project. • Similar issues to the Arra WRAA. • Test case for poorly drained soils • Good tidy towns group that could be incorporated (Emly)

Table 1.2: Summary table of individual waterbodies within the Drumcomoge PAA.

Water body Code	Water body Name	Risk	Obj.	Ecological Status			Pressures		
				2012	2015	2018	Category	Sub-category	Sig? (Y/N)
IE_SH_24 D040400	Drum-comoge_01	At risk	Good	Un-assigned	Un-assigned	Un-assigned	UWWTP	Agglom PE < 500	N
							Agriculture	Farm yards	Y

Source: Summary information from WFD App.

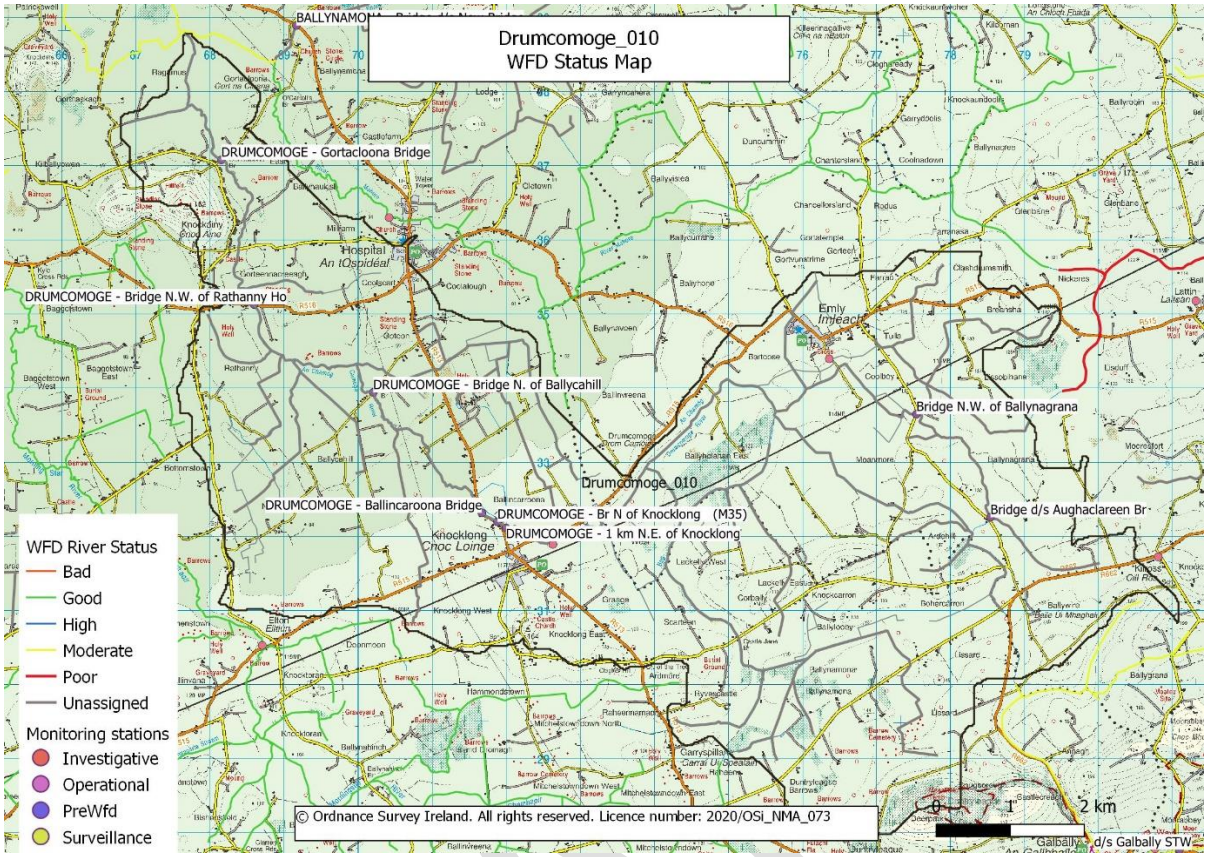


Figure 1.1: Drumcomoge Priority Area for Action WFD Status (unassigned).

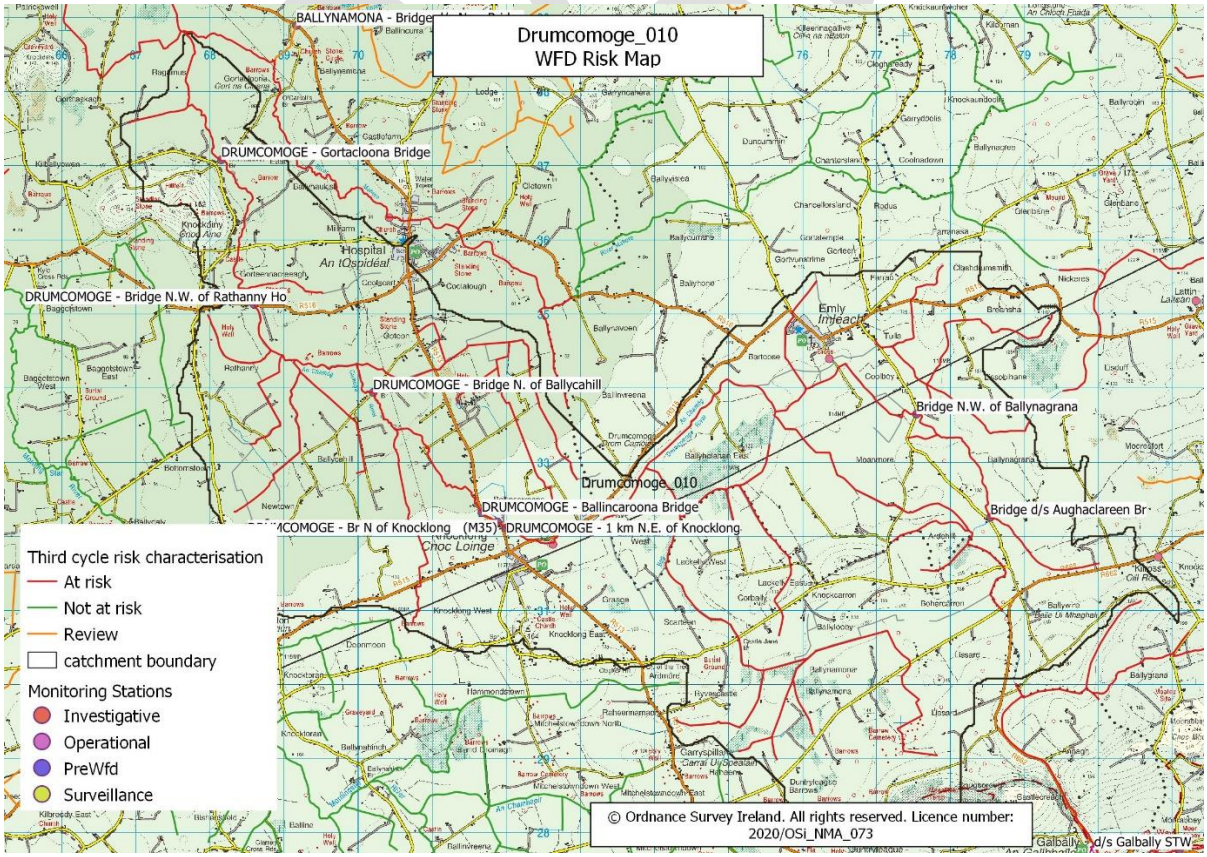


Figure 1.2: Drumcomoge Priority Area for Action WFD Risk Map.

2 Receptor information

2.1 Context and Setting

The Drumcomoge priority area for action comprises one waterbody, the Drumcomoge_010, which is unassigned, unmonitored and *At Risk* of not meeting its WFD Good status objective.

The Drumcomoge_010 forms part of the remit of the Maigue Rivers Trust. The Trust was established in 2016 and aims to work with local communities to ensure that the rivers and lakes of the Maigue catchment can achieve their full potential, both environmentally and recreationally.

In 2019, the Trust secured funding from the LAWPRO Community Water Development Fund for a project to look at ways of improving water quality in the Drumcomoge. As part of this project, Limerick City and County Council (LCCC) undertook a kick sampling survey of the Drumcomoge river. Locations and results of this assessment have been kindly provided by LCCC Environment Section staff (see figure 2.1 and table 2.1 below).

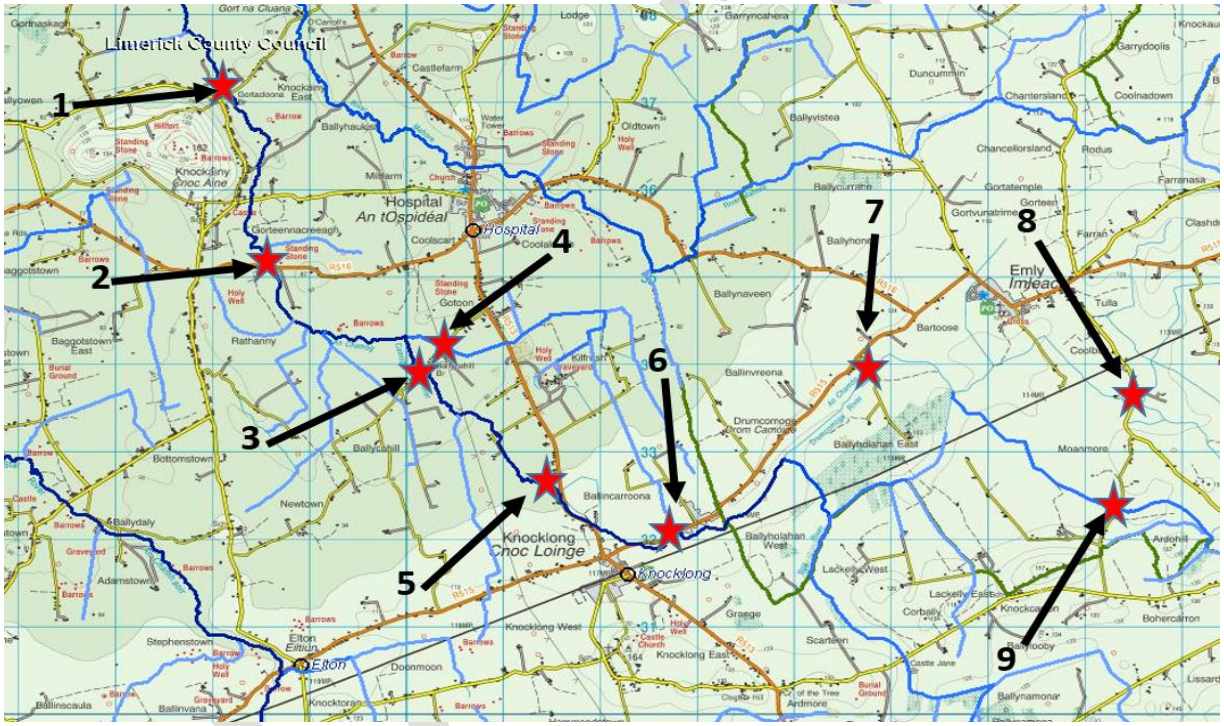


Figure 2.1: LCCC kick sampling survey locations.

Table 2.1: LCCC survey results

Site ID	SSRS	Q rating
1	4	3-4
2	Not suitable for sampling	
3	5.6	3-4
4	Not suitable for sampling	
5	7.2	3-4
6	4	3
7	Not suitable for sampling	
8	Not suitable for sampling	
9	Not suitable for sampling	

LCCC environment section staff advised that sites 2, 4, 7, 8 and 9 were unsuitable for biological assessment due to depth of water, steep banks and/or unsuitable habitat. All sites showed evidence of impact. These results indicate that hydromorphology is a potential significant pressure at several locations in the waterbody. The LCCC environment team has also advised that they have seen evidence of eutrophication with dissolved oxygen issues in the lower reaches of the river. The team has undertaken farm assessments in the catchment and informed LAWPRO staff that agricultural intensification has taken place in the catchment in the last ten years.

2.2 Receptor Overview

Table 2.2: Receptor information for Drumcomoge PAA

		Figures Tables	
Risk Category			*At Risk*
Biological Status	**2013-2015**		Unassigned
	2016-2018		Unassigned
	trends in Q values **2016-2018 Q value data** **Fish status**		NA. Q data available for 1980's only. Site results ranged from Q1 to Q 3-4 (see table 2-3)
Hydrochemistry Data			
Ortho-P (mg/l P)	**Baseline** **indicative quality** **Trends - significant?** **Distance to threshold**		No chemistry data available
NH4-N (mg/l N)	**Baseline** **indicative quality** **Trends - significant?** **Distance to threshold**		No chemistry data available
TON (mg/l N)	**Baseline** **indicative quality** **Trends - significant?** **Distance to threshold**		No chemistry data available
Supporting Conditions	**Chemical conditions** **Oxygenation Conditions** **Acidification Conditions**		No data
Hydromorphology			
RHAT score **Evidence of Arterial drainage**			Not assessed for WFD. See section 2.4 for details of a 2019 RHAT assessment for Maigue Rivers Trust No
Ecological Status (2013–2018) **Elements driving status**			Unassigned NA
Protected Areas			No
WFD Objective			Good
EPA biologist notes (if any)			NA
Significant issue/impact for receptor (e.g. PO_4)			Nutrients (orthophosphate) and sediment

2.2.1 Biological Monitoring Results

There are no current WFD biological monitoring data available for Drumcomoge_010. Historic data for seven pre-WFD sites indicate that in the 1980's, biological quality was at best at moderate status at two sites, with four sites at poor status and one bad status location in the southern headwaters. These results are included for information in table 2.3 below. The monitoring point locations are shown in figure 2.2.

Table 2.3: Historic Q values (no current data available):

Water body Name	Monitoring point	1981	1984	1986	1988
RS24D040100	DRUMCOMOGE - 1 km N.E. of Knocklong	Q3	Q3		Q2-3
RS24D040200	DRUMCOMOGE - Ballincaroona Bridge	Q3			Q2-3
RS24D040250	DRUMCOMOGE - Bridge N. of Ballycahill				Q3
RS24D040300	DRUMCOMOGE - Bridge N.W. of Rathanny Ho	Q3	Q3	Q3-4	Q3-4
RS24D040400	DRUMCOMOGE - Gortacloona Bridge	Q3	Q3	Q3-4	Q3-4
RS24E020050	Bridge d/s Aughaclareen Br			Q1	
RS24E020070	Bridge N.W. of Ballynagrana				Q2-3

Source: Summary information from WFD App

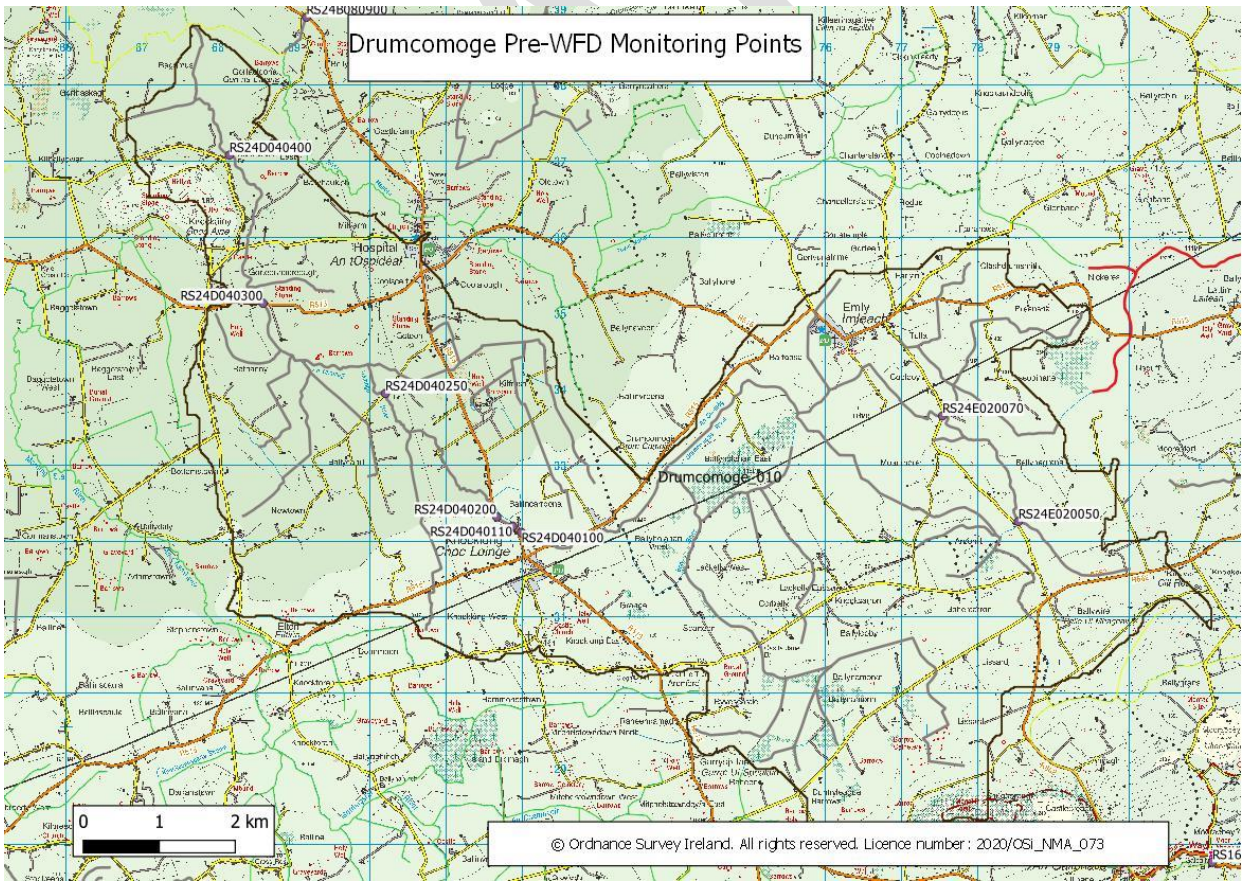


Figure 2.2: Pre-WFD monitoring points, Drumcomoge_010

2.3 Significant Issues

The majority of the Drumcomoge_010 river channel is under the Groody, Maigue and Deel OPW arterial drainage scheme (see Appendix I) and the channel profile is suggestive of extensive channel modification here in the past.

River hydromorphology assessments (RHAT) were undertaken at eight sites in the sub- basin as part of a survey of the wider Maigue catchment carried out by Wetland Surveys Ireland on behalf of the Maigue Rivers Trust, in Summer 2019. The site report states 'one site near Knockainey was classified as Good, 4 were classified as Moderate, and 4 were classified as Poor, 3 of which were upstream of Knocklong in a stretch heavily modified by arterial drainage. The main factors contributing to Poor assessments were the previous channel alterations (deepening and widening/straightening), loss of riparian vegetation, and cattle access to the river leading to erosion and sedimentation'.

The low gradient throughout much of the Drumcomoge waterbody is conducive to sediment deposition on the riverbed. Natural sediment accumulation maps show areas of moderate clay accumulation downstream of Knocklong. There is also a small area of high to extensive peat accumulation to the south west of Emly (see Appendix I).

Taking the above points into consideration, it can be concluded that sediment is likely to be a significant issue in Drumcomoge_010, caused or exacerbated by the arterial drainage works and other channel maintenance works here.

Drumcomoge_010 is not monitored under WFD but limited nutrient monitoring was undertaken by the LAWPRO team on the 14th July and 28th September 2020. Results for the Gortacloona Bridge site (RS24D040400) suggest that nutrients are also a significant issue in the waterbody (see table 2.4). Sources may be diffuse agricultural pressure, point sources (urban wastewater) or both.

Table 2.4: Nutrient monitoring results at Gortacloona Bridge:

	Date	MRP (mg/l)	NH4 N (mg/l)	NO3 N (mg/l)	Estimated River Flow
Pre WFD Site: Gortacloona Bridge	14/07/2020	0.424	0.161	0.7	Mean (Q30)
	28/09/2020	0.199	0.052	0.4	Low (Q90 and below)
	Mean	**0.312**	**0.107**	**0.550**	

3 Significant pressures

3.1 Initial EPA characterisation

Table 3.1: Initial EPA characterisation

Water body Name	Id	Category	Subcategory	Name	Significant?	Pressure & Impact details
Drumcomoge _010	WBP0000319	Urban Wastewater	Agglomeration PE < 500	Knocklong	No	NA
	WBP0000321*	Agriculture	Farmyards	n/a	Yes	Nutrient and organic pollution*

Source: Summary information from WFD App

3.2 Diffuse pollution pressures

Sediment and nutrients appear to be the significant issues in this waterbody. Agriculture is likely to be a significant pressure here in terms of nutrient (and possibly also sediment) pollution. Possible hydromorphology pressures include channel maintenance, channel alteration, land reclamation and bank erosion.

Soils across the sub-basin are a mix of well/moderately drained and poorly drained (Appendix III).

The surface water phosphate PIP map for the waterbody (Appendix IV) shows that highest risk areas (PIP Rank 1-3) are mainly concentrated towards the centre and south of the waterbody and make up approximately 30% of the catchment area. Land use throughout the catchment is under agriculture (pasture)(Appendix V).

Groundwater pathways are not likely to be significant in Drumcomoge_010 as most of the sub-basin overlies an unproductive aquifer with the exception of a narrow, WE band of Rkd towards the headwaters (North Kilmallock GWB) (Appendix VI). The N risk is much lower here than the surface P risk. The entire sub-basin is low rank for risk of N movement to groundwater except for small pockets overlying the Rkd aquifer which are unlikely to be significant in terms of the overall waterbody risk (Appendix VII).

3.3 Point source pressures

There are two urban wastewater treatment plants (UWWTPs) discharging to the sub-basin (Knocklong and Emly). Urban wastewater was not identified as a significant pressure in the EPA initial characterisation but both plants are assessed below under the LAWPRO desktop assessment methodology to determine whether the scope of the local catchment assessment needs to include these potential point sources.

Detailed information on the desktop assessment methodology is provided in Appendices VIII and IX. In summary, the methodology involved:

i) Confirmed significant pressure from initial characterisation (allows for some UWWTPs to be excluded from requirement for field assessment, see appendix VIII).
ii) Assessment of significant issue nutrient load contribution to the total nutrient load and required load reduction at the WFD monitoring point, in this case the pre WFD site at Gortacloona Bridge. This site is selected for assessment as it is the most downstream pre-WFD site in the waterbody.
iii) Assessment of the pollution risk posed by the combined discharge in 95%ile flow conditions at Gortacloona Bridge.
iv) Consideration of the proximity issue i.e. distance between the UWW discharge and the Gortacloona Bridge site

Both Knocklong and Emly treatment plants operate under certificates of authorisation, reference numbers A0210-01 and A409-01 respectively. The Knocklong plant comprises a secondary treatment (trickling filter) system. The Emly plant comprises an activated sludge membrane bioreactor system with tertiary treatment (P removal).

Drumcomoge_010 is unassigned and unmonitored under WFD. Nutrient monitoring data from two sampling rounds undertaken by LAWPRO staff in July and September 2020 were used in the assessment (mean results at Gortacloona Bridge: MRP = 0.312mg/l, NH4-N 0.107mg/l).

i) Significant pressure from initial characterisation?

No. UWW was not identified as a significant pressure on Drumcomoge_010.

ii) Assessment of load contribution to the total load at the WFD monitoring point.

Effluent monitoring results are not available for the Emly and Knocklong plants so the combined daily nutrient load from each (table 3.2) was estimated using the treatment reduction factors outlined in Appendix VIII.

The estimated contribution of the combined UWW discharges to the total daily load at Gortacloona Bridge and to the required load reduction at the bridge site, is shown below in table 3.3.

Table 3.2: UWW loading

	Discharge conc. Emly WWTP (mg/l)	Discharge load Emly WWTP (kg/day)	Discharge Conc Knocklong WWTP (mg/l)	Discharge Load Knocklong WWTP (Kg/day)	Combined load (Kg/day)
Volume	NA	68m^3/day	NA	56.6m^3/day	124.6m^3/day
BOD	60	4.08	105	5.94	10
MRP	1.9	0.13	5	0.283	0.42
NH4N	6	0.41	10.9	0.617	1.03

Table 3.3: UWW contribution to mean daily load at Gortacloona Bridge

	UWW load (Kg/d)	Flow at Gortacloona Br (Q30, lpd)	Water quality @ Gortacloona Br (mg/l)	Estimated Load @ Gortacloona Br (Kg/d)	UWW % contrib. to estimated total load @ Gortacloona Bridge	UWW % contrib. to estimated load reduction @ Gortacloona Bridge[1]
BOD	10	110566080	No data	No data	No data	No data
MRP	0.42		0.312	34.5	1.2	1.3%
NH4N	1.03		0.107	11.83	8.7	22%

*Note 1: required reduction: [average conc^n at bridge site – (0.9*EQS)] x Q30*

This assessment indicates that urban wastewater is not a significant pressure on the daily MRP load at the Gortacloona Bridge site, contributing only 1.2% to the total load here and 1.3% to the required reduction. The WWTP discharges are more significant in terms of ammonium, contributing 22% of the required reduction.

iii) Assessment of pollution risk posed by the combined discharge in river 95%ile flow conditions

A detailed assessment of pollution risk is provided in Appendix IX for the Knocklong and Emly systems in isolation and in combination.

Combined results are summarised below in table 3-4

Table 3.4: headroom utilisation in Q95, for combined discharges from Knocklong and Emly WWTPs

	Upstream Concentration (notional clean) (mg/l)	Final downstream concentration (mg/l)	Percentage headroom utilised by the combined discharge
BOD	0.26	0.887	27
MRP	0.005	0.031	37
NH4N	0.008	0.072	49

Headroom utilisation greater than 50% is considered to be indicative of possible pollution risk and therefore requires subsequent field assessment. This conservative approach is taken because i) effluent quality is estimated only and ii) flow data is also estimated; the error margin at the lower end of the Hydrotool data range (Q95) is 56%.

Results outlined in Table 3-4 above suggest that pollution risk associated with the combined wastewater treatment plant discharges is borderline, with effluent NH_4N utilising just under 50% of the river's assimilative capacity at the Gortacloona Bridge site in 95%ile flow conditions.

iv) Consideration of proximity of the discharge to the monitoring point

Proximity is not an issue for either the Emly or Knocklong plants, which are located approximately 15km and 10km upstream of Gortacloona Bridge, respectively.

Conclusion on UWW as a potential point source pressure on Drumcomoge_010

The combined effluent discharges from both WWTP's are unlikely to be a significant contributor to mean daily MRP and ammonium loadings at Gortacloona Bridge and the discharges do not pose a specific proximity risk for the Gortacloona Bridge site. However, in Q95 river flow and below, the discharges do carry slight pollution risk, mainly due to the estimated contribution from the Knocklong plant. From the UWW decision tree, results indicate that the UWW pressure (particularly Knocklong) needs to be assessed in the LCA process particularly in low flow conditions. The assessment should include several rounds of nutrient monitoring upstream and downstream of the wastewater treatment plant discharge location.

4 Pathways information (diffuse pollution)

4.2 Pathways description

Pathways for diffuse phosphate pollution are via overland flow/land drains particularly in the high PIP areas to the south. Pathways for sediment transfer are likely to be from the same areas but with potential for significant additional contribution directly from the river and tributary channels.

Assuming that sediment and phosphate are the significant issues in Drumcomoge_010, groundwater pathways are unlikely to be significant. In any event, most of the PAA overlies an unproductive aquifer with the exception of a narrow band of Rkd towards the headwaters (North Kilmallock GWB) (Appendix VI).

In terms of the potential critical source areas and pathways for diffuse pollution, the PAA has been divided into two compartments based only on wet and dry soils as there is little variation in either land use or aquifer type in the waterbody.

1. Soils in compartment 1 are poorly draining, predominantly under agriculture (pasture). Small areas of peat in the headwaters to the north east.
2. Soils in compartment 2 are moderate to well drained, also predominantly under agriculture (pasture).

The conceptual model is shown in Figure 4.1 with details provided in Table 4.1.

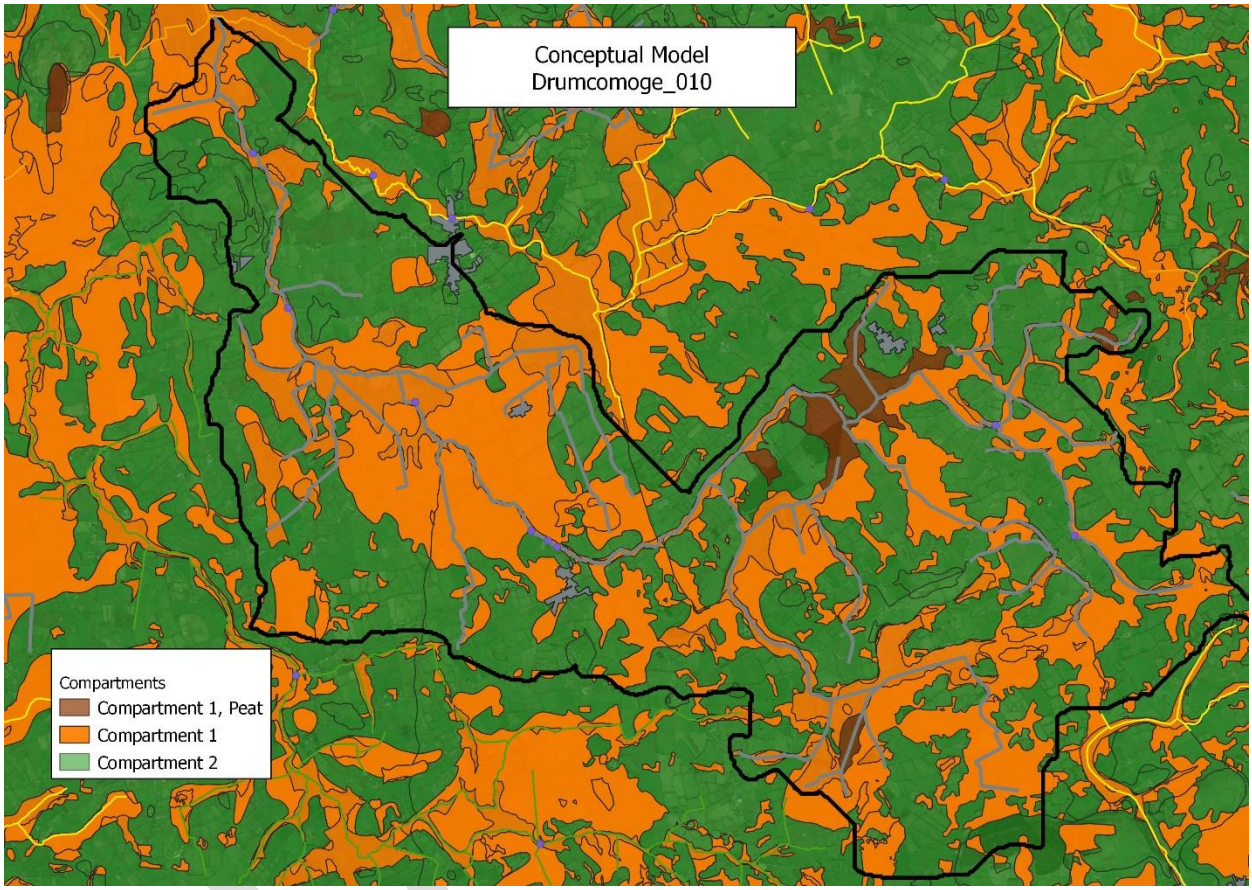


Figure 4.1: Conceptual model, Drumcomoge PAA

Main focus areas for assessment are in Compartment 1, where overland flow paths for nutrient and sediment would be expected.

Table 4.1: Pathways information check list

Factor	Map	Compartment 1	Compartment 2
Topography • Map • Aerial imagery	 Y Y	Relatively flat, particularly to the west. Centre and eastern portions show slight elevation (> 100m OD).	
Soil type	Y	Mix. Amin PD and BminPD . Small area of peat d/s Emly	Amin DW and BminDW
Subsoil type	N	Mainly TDSs, TLs.	Mainly TDSs, TLs.
Subsoil permeability	Y	Low	Moderate to High
Bedrock unit	Y	Mix: Dinantian upper and lower impure limestones	
Aquifer type	Y	Mainly unproductive (Ll with small areas of Pl). Narrow, WE band of Rkd towards the headwaters to the south	Mainly unproductive (Ll with small areas of Pl). Narrow, WE band of Rkd towards the headwaters to the south
Groundwater vulnerability	Y	Mainly moderate	Mainly moderate
Hydrology • Drainage density	 Y	 Unknown, possibly high (from sediment accumulation map)	 Likely to be low
Susceptibility • PO4 to SW • NO3 to GW • NO3 to SW	 Y Y Y	 High (mainly Rank 1 and 2) Mainly very low Mainly low	 Low Mainly low Mainly moderate
Likely main pathway(s)	N	Surface and near surface	Sub surface
Likely CSAs	Y	High surface P PIP areas on main channel and inputting tributaries particularly 4-5km d/s of Knocklong	CSA's for sediment may exist along bank margins where soils are erodible

From *Desk Studies for Areas for Action, EPA Recommendations. Version 3, January 2019*

5 Interim conclusions on the PAA

The Drumcomoge Priority Area for Action comprises one river water body, Drumcomoge_010 (65km^2). This is the sole waterbody in the Drumcomoge subcatchment (DRUMCOMOGE_SC_010). The river (part of the Maigue Rivers Trust) rises in the east and southeast of the subcatchment and flows in a west/north westerly direction to the Camoge_010, downstream of Knockainey in County Limerick.

Most of the Drumcomoge river channel is under the Groody, Maigue and Deel OPW arterial drainage scheme.

Drumcomoge_010 is not currently monitored for either biology or chemistry under WFD. Historic Q data from pre-WFD monitoring stations (1998 and earlier) show predominantly poor biological status here. More recently (2019), four sites were monitored for biological status by Limerick City and Council staff for the Maigue Rivers Trust (MRT). All results were indicative of impact (Q3-4 or Q3). These results confirm that Drumcomoge_010 is *At Risk*.

The significant issues are likely to be phosphate and sediment.

The significant pressures are agriculture and hydromorphology but assessments are needed upstream and downstream of point sources (particularly the Knocklong wastewater treatment plant) to rule out these potential pressures.

The local catchment assessment (LCA) process will focus on identifying sources of nutrients and sediment. Tributary nutrient levels and flows will be assessed to quantify individual tributary nutrient load contribution to the main channel.

6 Workplan

6.1 Table EPA further characterisation actions

WB Name	Id	Action	Responsible Organisation	Further Characterisation Action details
Drumcomoge_010	FC000178	IA7 Multiple Sources in Multiple Areas	LAWPRO	Take water samples and walk the river. IA6 through Knocklong.
	FC003309	IA6 Multiple Sources in Large Urban Area	LAWPRO	

Source: WFD App

6.2 Local Catchment Assessment

1. Undertake three rounds of nutrient monitoring at locations 1 to 10 (see figure 6.1 below, all accessible from public roads), sampling in low, medium and high flow situations. Site7 is upstream of the WWTP discharge at Knocklong. Sites 5 and 6 are both downstream of this site. Record field parameters at all locations and for all sampling events.
2. Undertake SSIS or rapid assessment and measure field parameters at all locations, 1 to 15. Assess sediment extent and type at each location and look for sediment sources.
3. Undertake stream walks along the main channel, particularly along the high PIP areas between sites 11 and 6, looking for evidence of impact/possible pressures.
4. Nutrient load assessment will be useful for this waterbody because of the likely extent of biological impact here. Measurement of concentration and flow at locations 4, 12, 14 and 15 will provide information on nutrient loading from the four main tributaries. Measure concurrently (for comparison) at points 1, 3, 11 and 13 on the main channel. If flow measurements cannot be taken, use average nutrient concentrations and estimated mean flow (from Hydrotool) for each sample location.

Findings of these assessments will be used to inform further, more detailed local catchment assessment.

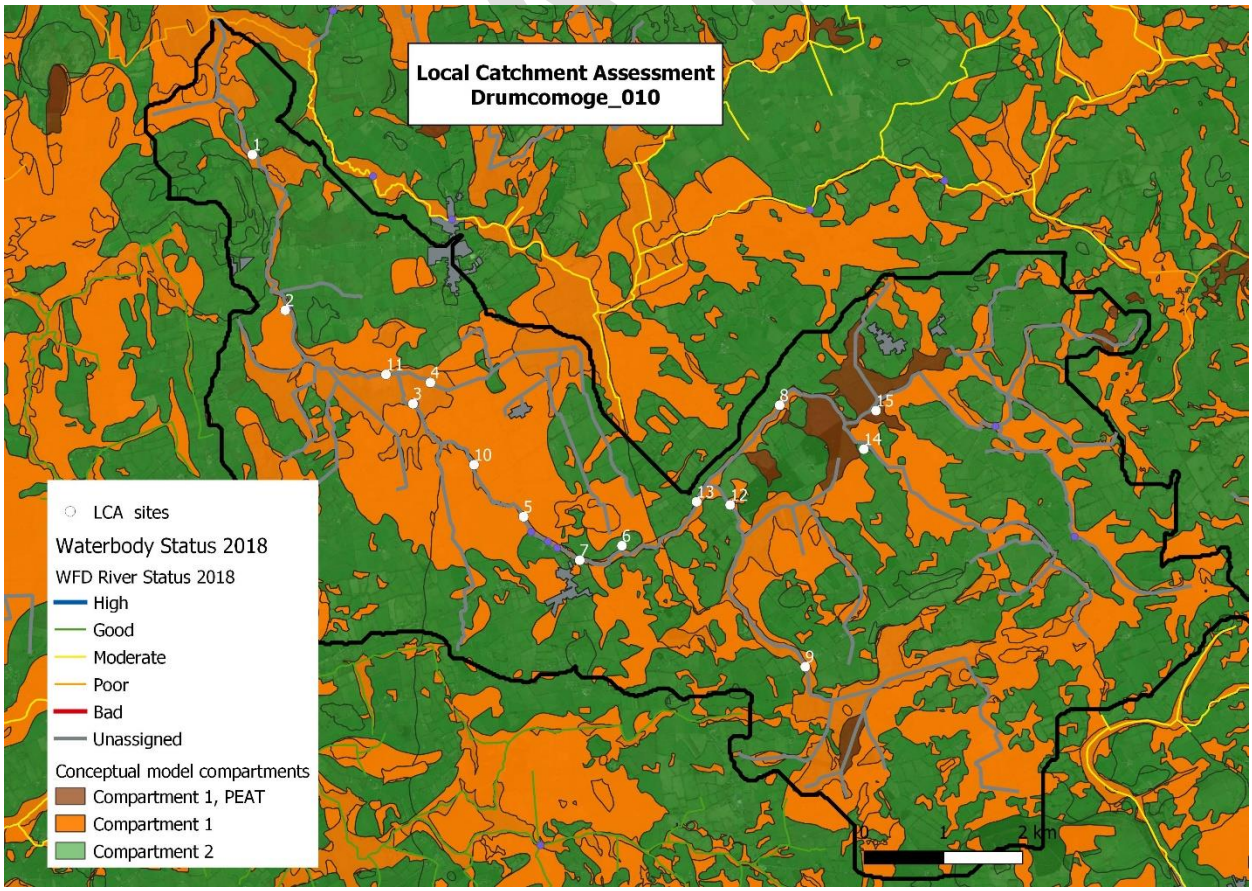


Figure 6.1: LCA monitoring locations.

7 Review of possible mitigation options

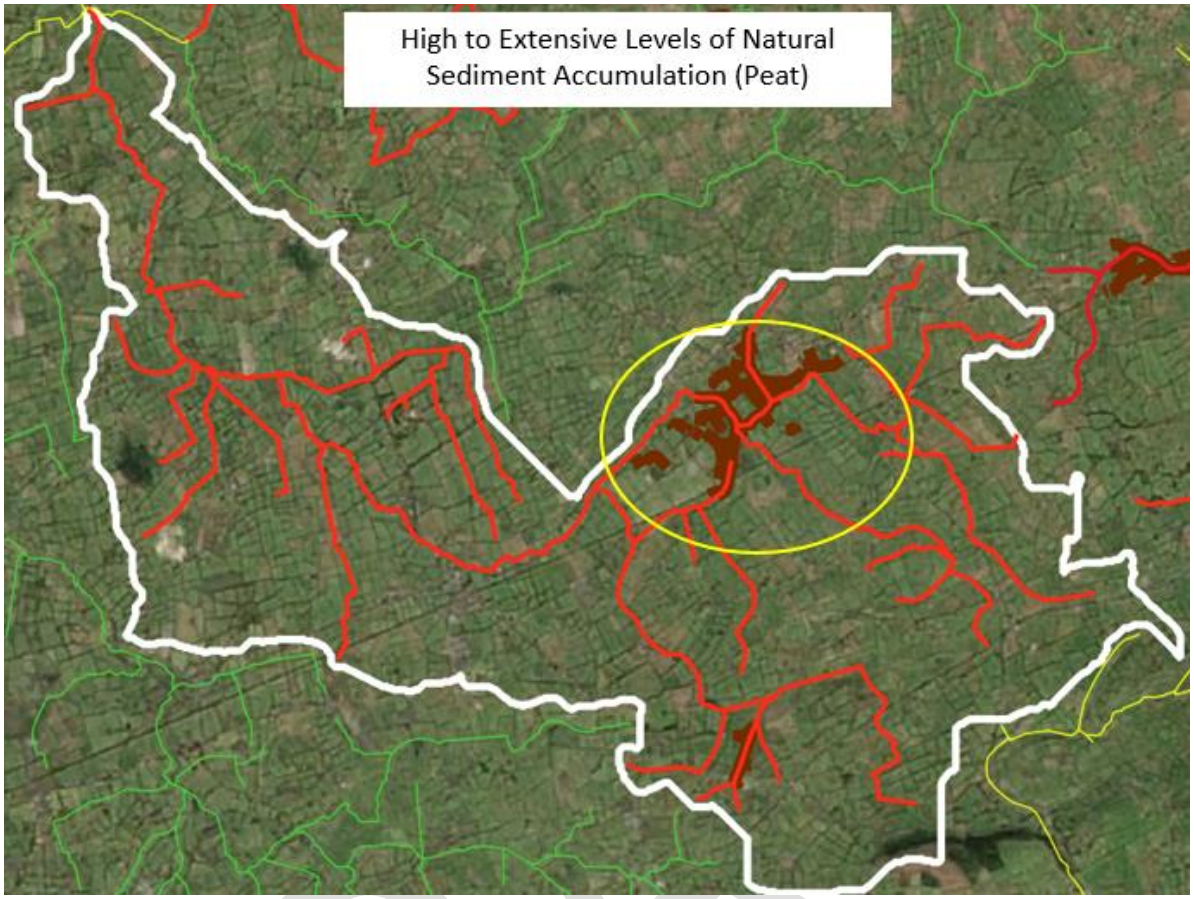
The nature of the mitigation measures will depend on the issues and pressures identified during local catchment assessment. For diffuse P and/or sediment significant issues, critical source areas will need to be identified so that pathways for pollutant transfer can be intercepted. Point source pressures will need to be addressed by the pressure owner/s.

8 Communications

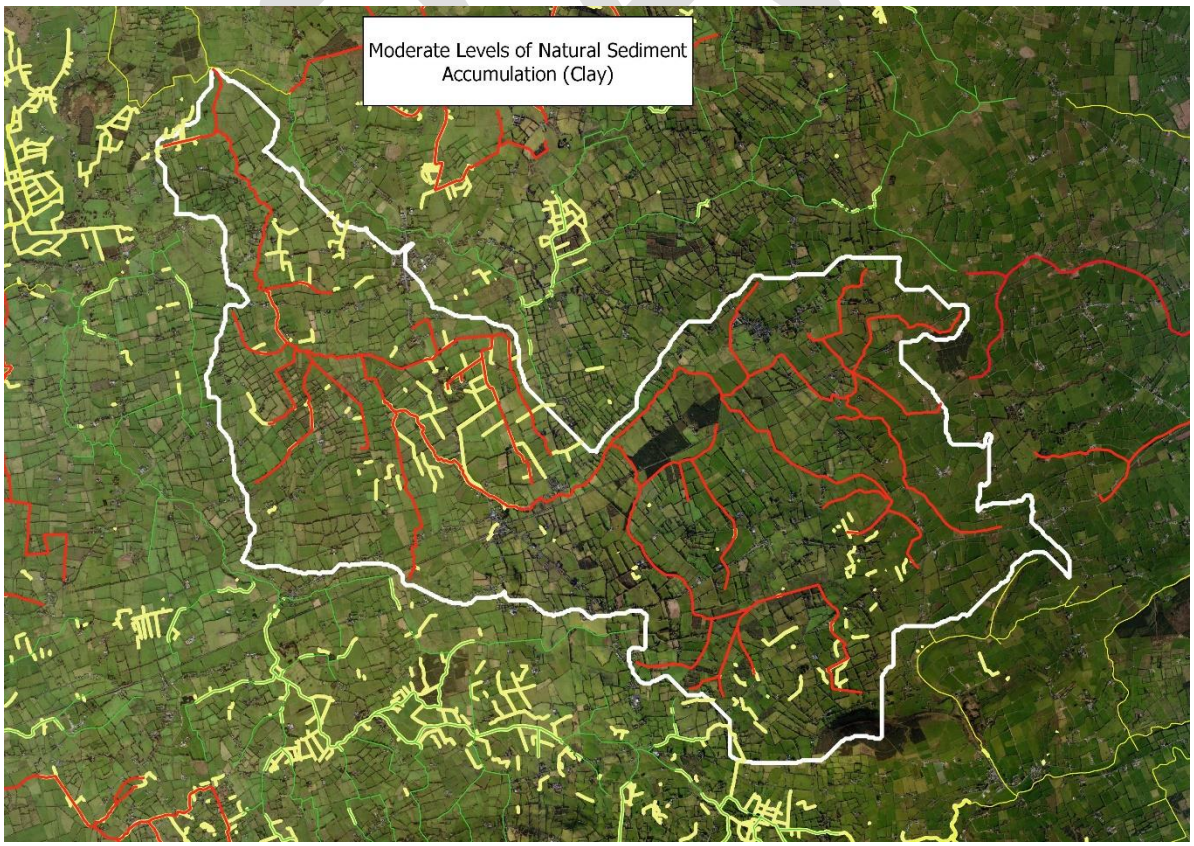
Public meetings were required for this PAA. The first public meeting was a community meeting held on the 15th October 2019 in Knocklong Community Hall in County Limerick.

The main purpose of the meeting was to inform attendees about the work programme of the local authority waters programme, including information on water quality risk and the possible pressures impacting on water quality in the Drumcomoge. The ASSAP approach was explained, for situations where agriculture is identified as a significant pressure. Attendees were informed that LAWPRO will work with the relevant stakeholders/implementing bodies to identify the appropriate local measures for the catchment, using the *Right measure in the right place.*

Appendix I: Natural Sediment Accumulation Maps

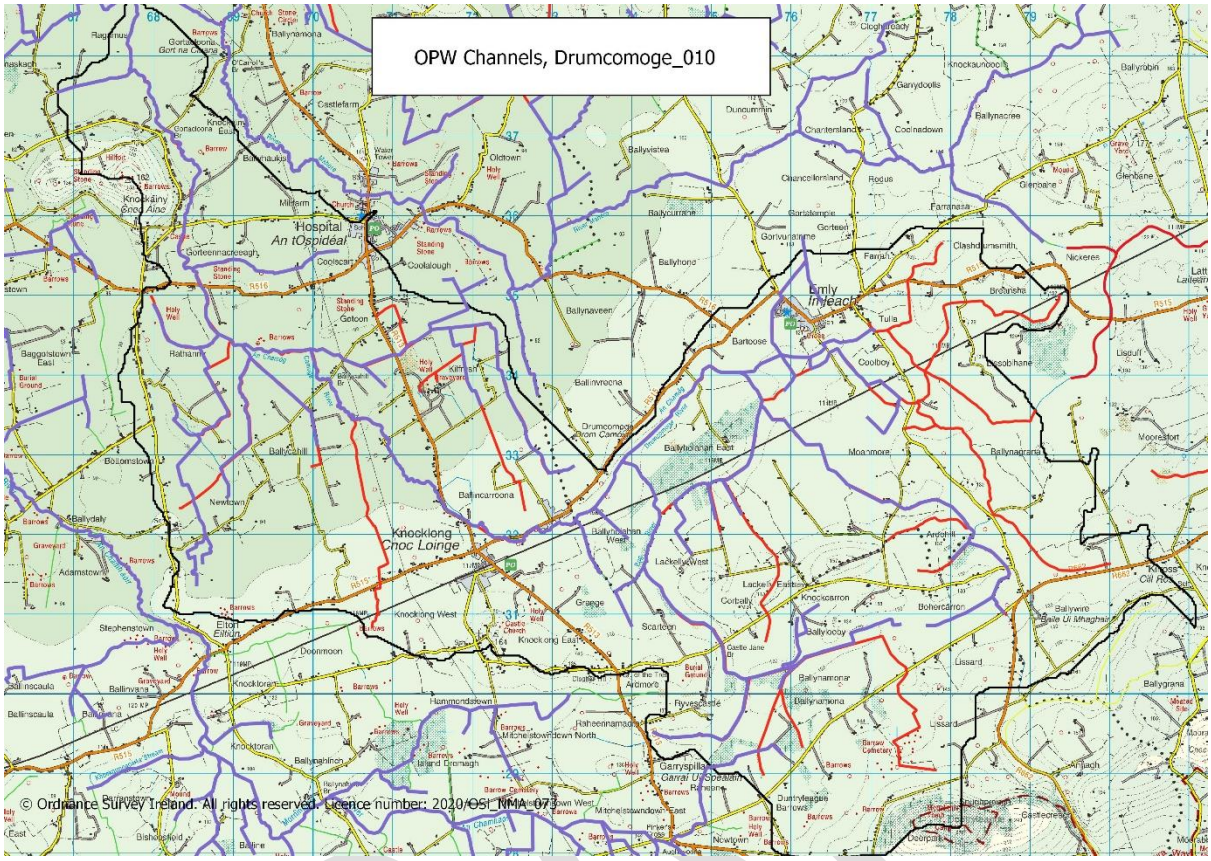


Source EPA

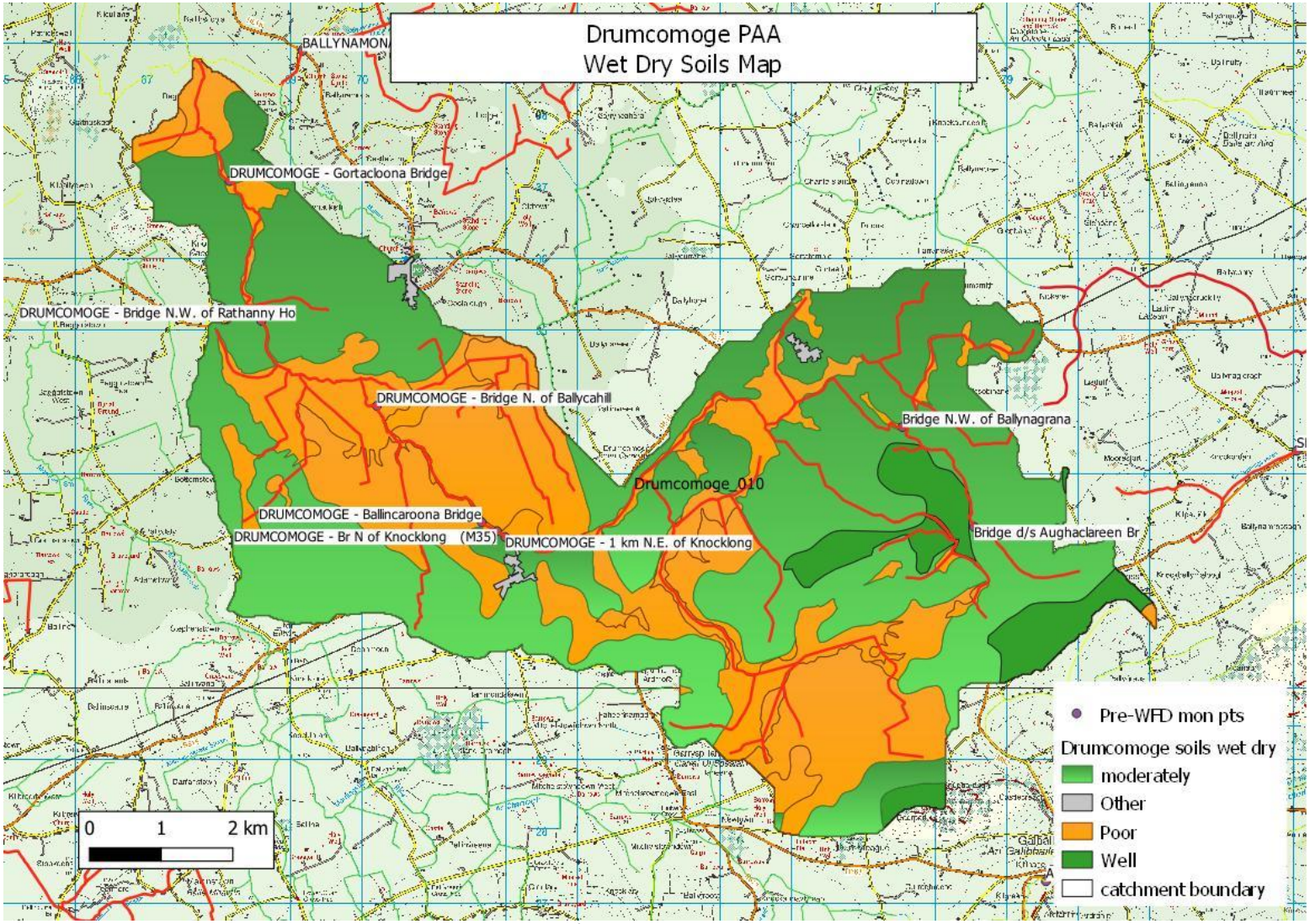


Source EPA

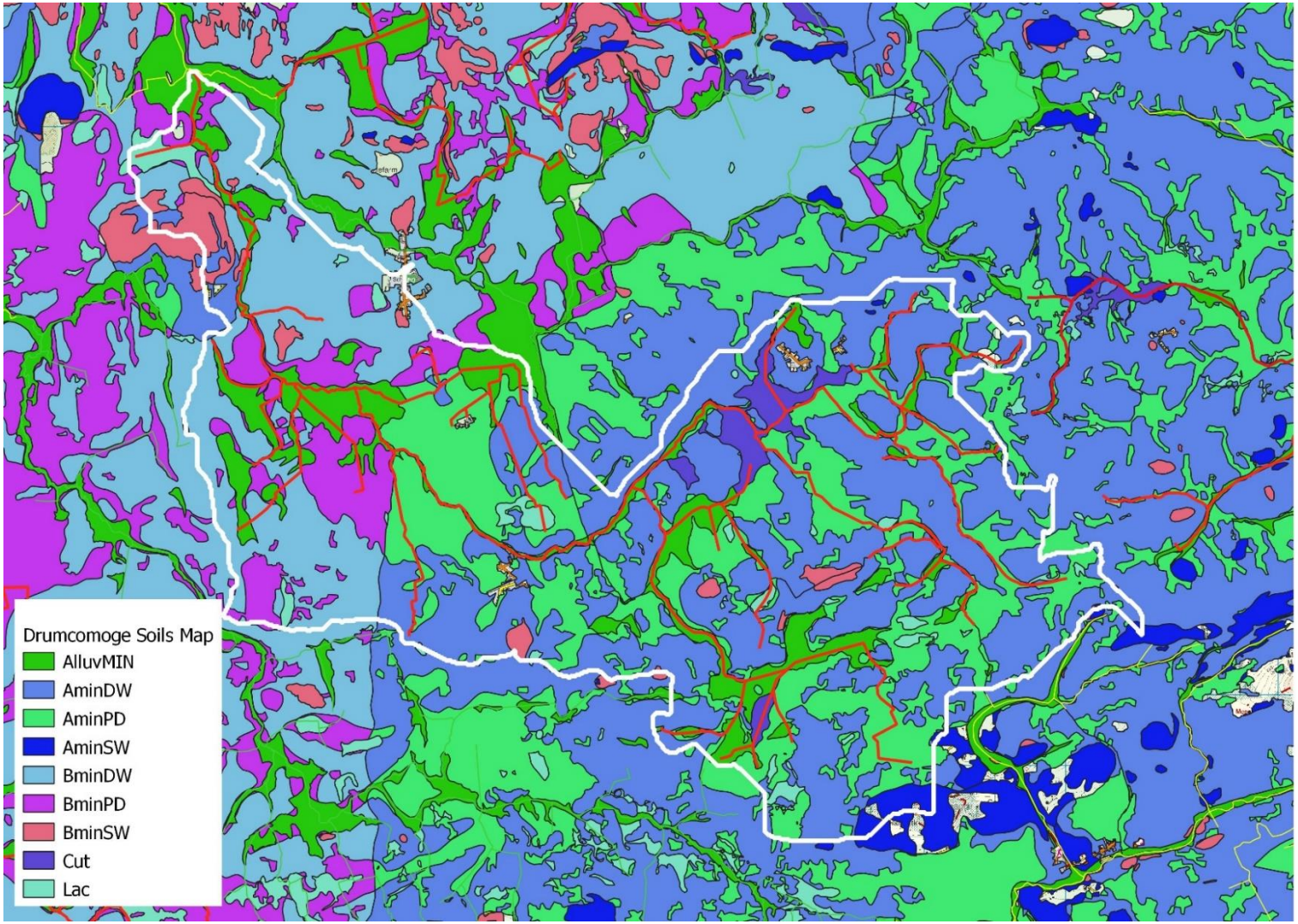
Appendix II OPW Drainage Channels, Drumcomoge_010



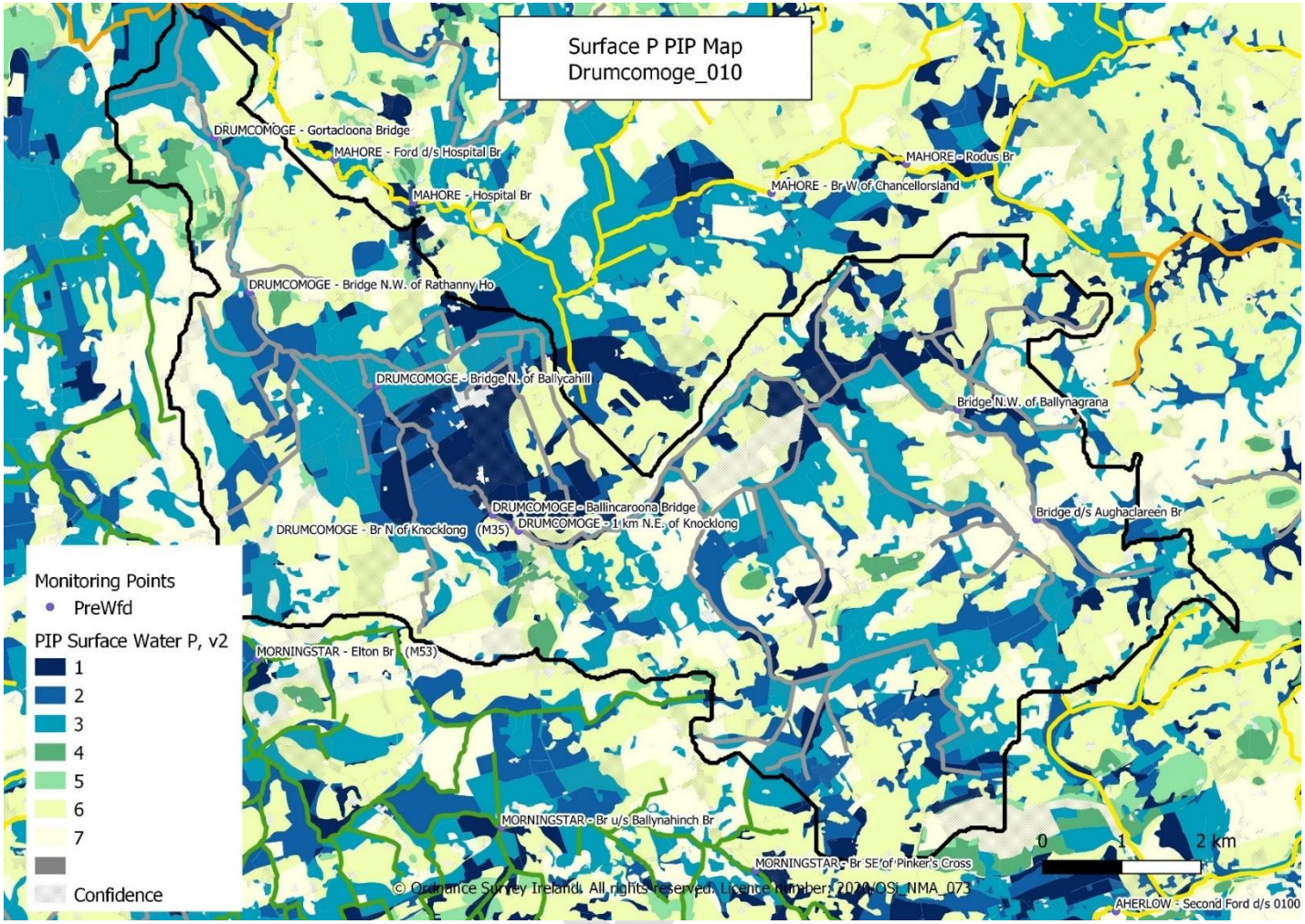
Appendix IIIa: Wet and Dry Soils Map



Appendix IIIb: Soils Map

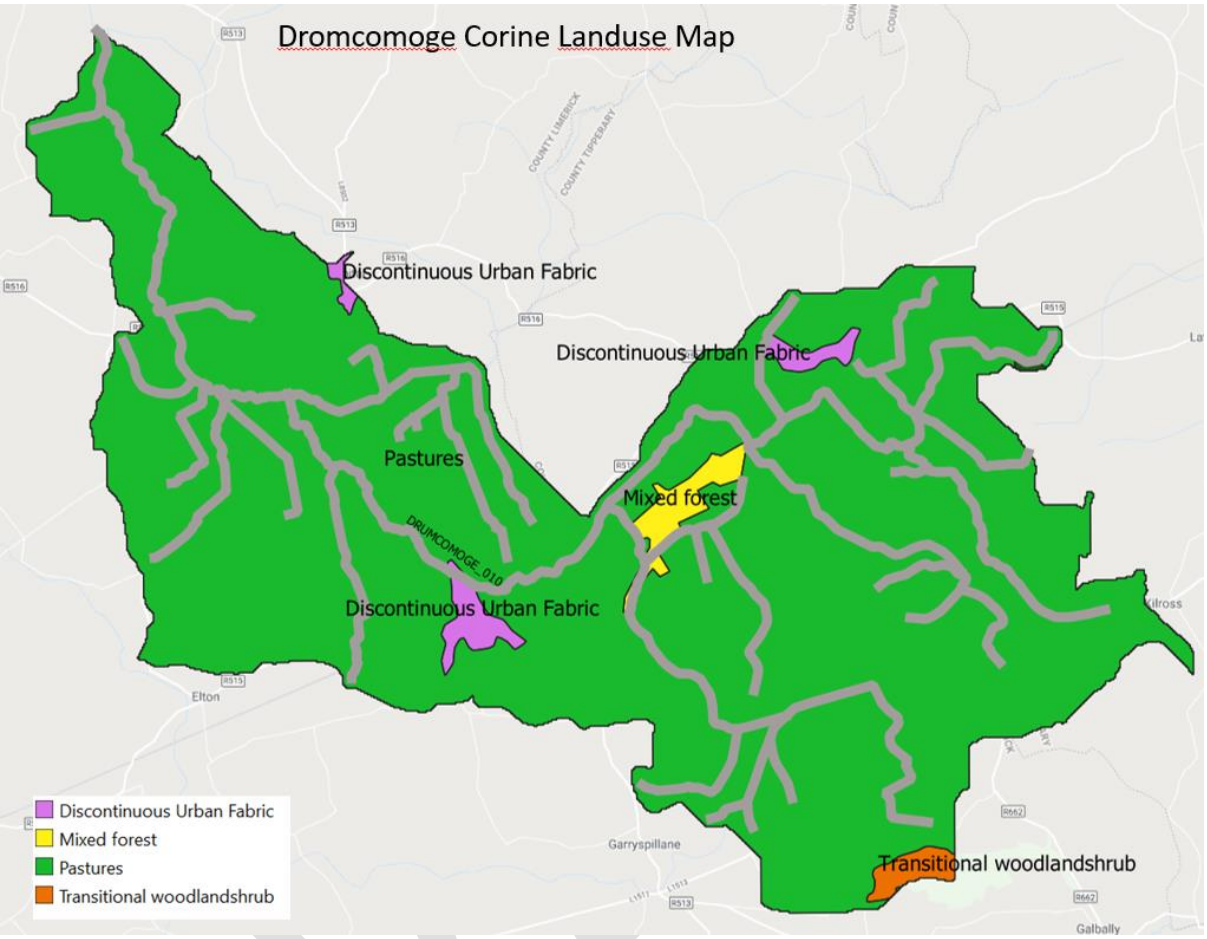


Appendix IV: Surface water receptor phosphate PIP map

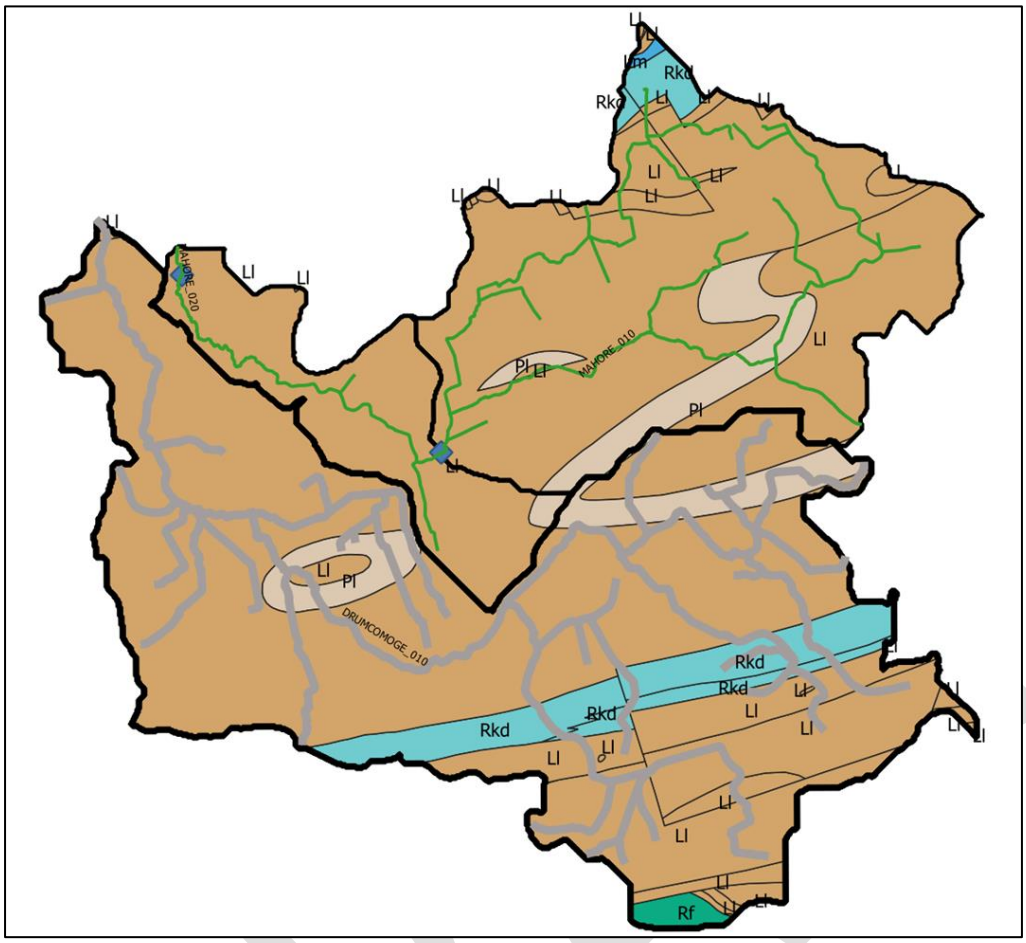


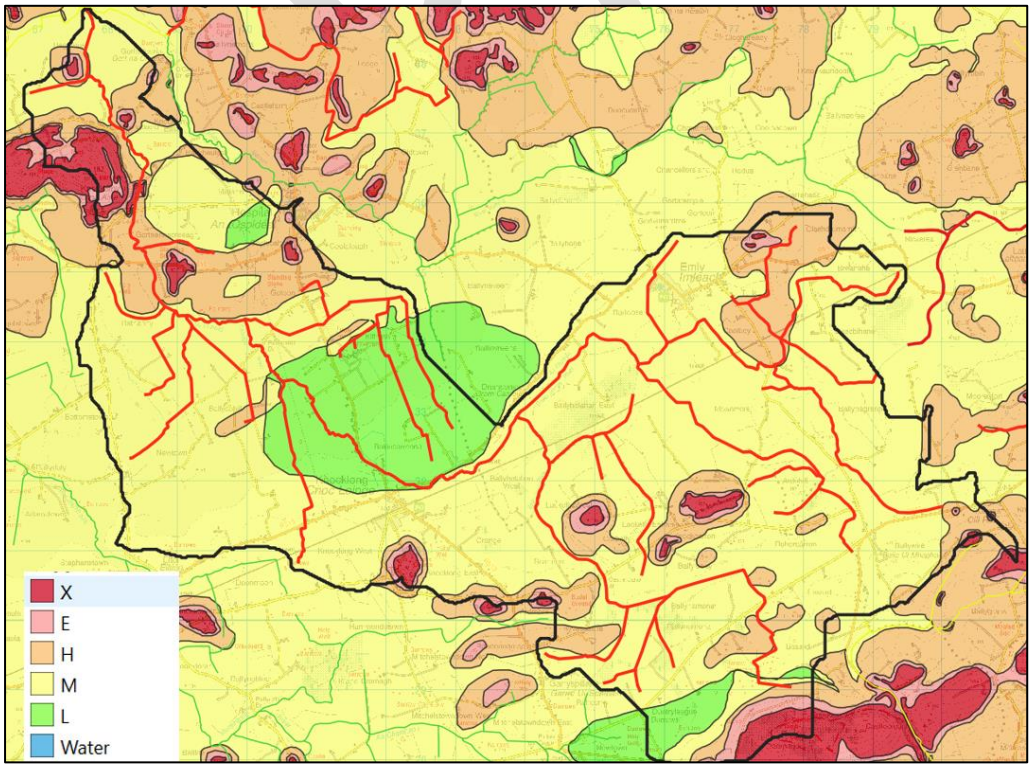
Source EPA

Appendix V: Corine Land use Map



Appendix VI: Aquifer and Groundwater Vulnerability Maps





Appendix VII: Surface water receptor nitrate PIP map.

Source: WFD Application

0 1 2 4
Kilometers

Appendix VIII: Desktop assessment of urban wastewater water pressure

LAWPRO's decision tree approach to UWW assessment follows four steps, considering nutrient loading, pollution risk and proximity to the WFD monitoring point.

1 Significant pressure from initial characterisation?

The purpose of this question is only to rule out the requirement for LCA for those plants which are i) a confirmed significant pressure, ii) with effective action plans in place and agreed with the licensing authority and iii) already on the IW investment programme. UWW was not identified as a significant pressure from the initial characterisation assessment of Drumcomoge_010.

2 Assessment of UWW nutrient loading, contribution to the loading at the WFD monitoring point and contribution to the required reduction

- Assess the significant issue 'average load' at the WFD monitoring point, using mean flow (normally Q30) and baseline monitoring data for the WFD monitoring point. For significant point sources it may be better to estimate load using individual flow estimates for each sampling event.
- What is the load reduction required at the WFD monitoring point? [(A-B)mg/l x C (lpd)]

  where *A= current nutrient MRP baseline*

  *B= desired conc (EQS *0.9 for e.g.)*

  C= mean flow (Q30) litres per day. If flow data are not available, use EPA Hydrotool. Adjust for catchment area if required.
- What is the contribution of the UWWTP in terms of the overall load reduction required?

3 Assessment of pollution risk in 95%ile flow conditions

Licensed facilities:

Estimate the resultant concentration of the discharge at the WFD monitoring station, using 95%ile flow at the WFD monitoring point, real effluent data (from facility AER's) and notional clean background upstream water quality data. The use of notional clean upstream allows you to assess the pollution risk associated with the discharge in isolation.

Certificates of Authorisation (COA):

Determination of resultant concentration is more challenging for COA facilities because effluent monitoring data are unlikely to be available. However there have been many studies on the quality of WWTP influent and effluent. The removal efficiencies applied in the calculations in Table i are the same as those used for secondary and tertiary treatment systems in the Irish Water Sole Pressure reports. A more conservative approach was taken for systems which have primary treatment only; it was assumed that ammonia and phosphorus levels do not reduce on primary treatment. This conservative approach is taken to ensure that LAWPRO does not prematurely eliminate systems from the requirement for local catchment assessment.

Table i: estimated removal efficiencies and final effluent concentration for COA facilities

Level of Treatment		***Total PE***	***BOD mg/l***	***NH4-N mg/l***	***PO4-P mg/l***	***Flow (per PE) lpd***
Raw Sewage	*g/person/day*		*60*	*8*	*2.18*	*NA*
	Influent concn (mg/l)		*300*	*20*	*10.9*	*200*
Primary Treatment	*Treatment redn. factor*	*A*	*0.7*	*0*	*0*	*NA*
	Effluent concn (mg/l)		*210*	*20*	*10.9*	*=A*200*
Secondary Treatment	*Treatment redn factor*	*A*	*0.35*	*0.545*	*0.467*	*NA*
	Effluent concn (mg/l)		*105*	*10.9*	*5*	*=A*200*
Tertiary Treatment	*Treatment redn factor*	*A*	*0.2*	*0.3*	*0.1*	*NA*
	Effluent concn (mg/l)		*60*	*6*	*1.9*	*=A*200*

The calculations in table 1-3 are based on domestic effluent only. This may result in errors where industrial contribution is significant but in general, industrial effluent is unlikely to be a significant component of a COA discharge.

If monitoring data are not available for the facility, estimate flow from the facility PE * 200 litres per person per day. Input this to the calculation spreadsheet. Depending on the level of treatment provided (primary, secondary, tertiary) use the estimated effluent concentrations from Table 1-3 in the calculation spreadsheet.

Q: Does the discharge take up more than 50% of the headroom, using notional clean for upstream water quality? If yes, then this indicates a possible assimilative capacity issue.

4 Considering the proximity of the discharge to the WFD monitoring point

Where the WFD monitoring point is close to the discharge, periodic plant incidents resulting in non-compliant effluent have the potential to impact on water quality at the WFD monitoring point. It is unlikely that this type pressure can be properly assessed at desk study stage but the desk study report should note that there may be a proximity issue and it should of course be included in the scope of the local catchment assessment, using biological monitoring to assess this 'proximity' potential pressure.

Appendix IX: Mass Balance calculations for UWWTPs located within the PAA

(i) Knocklong WWTP discharge at Gortacloona Bridge @Q95

Facility Name (only enter data in yellow cells!)	Knocklong (PE 283)	**Reference Number:** *Licence/COA number as relevant*	A0210-01

1) 95%ile river flow at nearest downstream WFD monitoring point

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

River Flow (95%ile)	0.182861	m3/sec	15799190.4	lpd

2) Effluent Dry Weather Flow (DWF)

*usually determined by PE*200lpd*

Effluent DWF	56.6	m3/day	56600	lpd
Total D/S flow			15855790.4	lpd

3) Resultant concentration calculations for the discharge at nearest downstream WFD monitoring point

	Upstream conc using notional clean conc (mg/l)	U/S Conc (actual) 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	2.40	4107789.5	37918057	105	5943000	10050789.5	43861057	0.63	**2.766**	2.60
P (mg/l)	0.005	0.06	78995.952	947951.42	5	283000	361995.952	1230951.42	0.023	**0.078**	0.075
NH4-N (mg/l)	0.008	0.115	126393.523	1816906.9	10.9	616940	743333.523	2433846.9	0.05	**0.153**	0.14

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

Head Room mg/l = Cmax-C

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

C = Background upstream conc. (mg/l)

	mg/l
BOD Headroom =	0.20
MRP Headroom =	0.02
Ammonia N Headroom=	0.03

	Upstream conc (mg/l)	Final D/S Conc mg/l	Percentage Headroom utilised
BOD	2.40	2.77	183
MRP	0.060	0.078	118
NH4N	0.115	0.153	154

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	0.634	16
MRP	0.005	0.023	25
NH4N	0.008	0.047	29

Knocklong WWTP provides secondary treatment (trickling filter system) for 283PE agglomeration. Updated PE loading data from IW

(ii) Emly WWTP discharge at Gortacloona Bridge @Q95

Facility Name (only enter data in yellow cells!)	Emly	**Reference Number:** *Licence/COA number as relevant*	A0409-01

1) 95%ile river flow at nearest downstream WFD monitoring point

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

River Flow (95%ile)	0.182861	m3/sec	15799190.4	lpd

2) Effluent Dry Weather Flow (DWF)

*usually determined by PE*200lpd*

Effluent DWF	68	m3/day	68000	lpd
Total D/S flow			15867190.4	lpd

3) Resultant concentration calculations for the discharge at nearest downstream WFD monitoring point

	Upstream conc using notional clean conc (mg/l)	U/S Conc (adjusted bckgnd) mg/l	Upstream load using notional clean conc (mg/l)	U/S Load (adj bckgnd) (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 adj bckgnd (mg/l)	95%ile EQS (Cmax)
BOD (mg/l)	0.26	2.40	4107789.5	37918057	60	4080000	8187789.5	41998057	0.52	**2.647**	2.60
P (mg/l)	0.005	0.06	78995.952	947951.4	1.9	129200	208195.952	1077151.42	0.013	**0.068**	0.075
NH4-N (mg/l)	0.008	0.115	126393.523	1816907	6	408000	534393.523	2224906.9	0.03	**0.140**	0.14

4) Headroom assessment (at nearest downstream WFD monitoring point), using adjusted background:

Head Room mg/l = Cmax-C

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

C = Background upstream conc. (mg/l)

	mg/l
BOD Headroom =	0.20
MRP Headroom =	0.02
Ammonia N Headroom=	0.03

	Upstream conc (mg/l)	Final D/S Conc mg/l	Percentage Headroom utilised
BOD	2.40	2.65	123
MRP	0.060	0.068	53
NH4N	0.115	0.140	101

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	0.516	11
MRP	0.005	0.013	12
NH4N	0.008	0.034	19

Emly WWTP provides tertiary treatment for agglomeration PE 340

(iii) Combined discharges (Emly & Knocklong) at Gortacloona Bridge @Q95

Facility Name	Emly & Knocklong	Reference Number: *Licence/COA number as relevant*	A 0409-01 & A0210-01

1) 95%ile river flow at nearest downstream WFD monitoring point

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

River Flow (95%ile)	0.182861	m3/sec	15799190.4	lpd

2) Effluent Dry Weather Flow (DWF)

*usually determined by PE*200lpd*

Effluent DWF	124.6	m3/day	124600	lpd
Total D/S flow			15923790.4	lpd

3) Resultant concentration calculations for the discharge at nearest downstream WFD monitoring point

	Upstream conc using notional clean conc (mg/l)	U/S Conc (actual) 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	2.40	4107789.5	37918057	NA	10023000	14130789.5	47941057	0.89	3.011	2.60
P (mg/l)	0.005	0.06	78995.952	947951.4	NA	412200	491195.952	1360151.42	0.031	0.085	0.075
NH4-N (mg/l)	0.008	0.115	126393.523	1816907	NA	1024940	1151333.52	2841846.9	0.07	0.178	0.14

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

Head Room mg/l = Cmax-C

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

C = Background upstream conc. (mg/l)

	mg/l
BOD Headroom =	0.20
MRP Headroom =	0.02
Ammonia N Headroom=	0.03

	Upstream conc (mg/l)	Final D/S Conc mg/l	Percentage Headroom utilised
BOD	2.40	3.01	305
MRP	0.060	0.085	169
NH4N	0.115	0.178	254

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	0.887	27
MRP	0.005	0.031	37
NH4N	0.008	0.072	49

These calculations do not reflect the actual effluent quality from the Knocklong and Emly WWTP's but in the absence of monitoring data are an estimate to allow assessment of potential risk.