

Desktop Assessment

Dawros Priority Area for Action

(AFA0058)

Version F01

24th October 2019

Western Region



Kylemore River in the Dawros_010 waterbody

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1 Introduction

1.1 Background to the PAA

The Dawros Priority Area for Action (PAA) is largely a coastal area of 62 km² in north-west Connemara, Co. Galway and forms part of the wider 32_Erriff Clew Bay Catchment. The PAA comprises four river waterbodies (RWBs) and one lake waterbody: Traheen_010, Cloonederowen_010, Cloon_010, Dawros_010 and Aughrusbeg Lake (**Figure 1** and **Figure 2** below). The PAA contains the headwaters of the Dawros *Margaritifera* Sensitive Area, which is one of the top 8 freshwater pearl mussel catchments in the country and is currently included within the Pearl Mussel Project (PMP) European Innovation Partnership Locally Led Scheme. The four river water bodies are hydrologically separate and do not interact with each other i.e. none are upstream/downstream of each other. The fifth water body is the oligotrophic Aughrusbeg Lake located on the most westerly point of the Dawros PAA within the Cloon_010 sub-basin.

A catchment assessment workshop was held in Castlebar on 26th to 28th April 2017. It was attended by representatives of local authorities (Mayo, Galway, Roscommon, Leitrim, Sligo), the Local Authority Waters and Communities Office (LAWCO), Irish Water, Inland Fisheries Ireland (IFI), Forest Service, Coillte, National Parks and Wildlife Service (NPWS), Teagasc, Geological Survey of Ireland (GSI), Department of Agriculture, Food and the Marine (DAFM), Marine Institute and the Environmental Protection Agency (EPA). Based on the draft River Basin Management Plan priorities, a set of agreed principles and the local priorities of the workshop attendees, 34 areas were recommended for action in the Western Region, of which the Dawros PAA was one. The Dawros PAA was selected for the following reasons:

- Includes top 8 Freshwater Pearl Mussel water body.
- Includes headwaters to top 8 Freshwater Pearl Mussel water body
- Building on improvements made with respect to forestry activities and septic tanks systems.
- Two *At Risk* High Ecological Status objective water bodies.
- One deteriorated water body.
- One protected area objective not met: 3110 (Oligotrophic lake).

1.2 Information Sources Consulted

Several information sources were consulted during the preparation of the desk study for the Dawros PAA including:

- WFD web application – EPA characterisation data
- NPWS Dawros Freshwater Pearl mussel sub-basin management plan - http://www.wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/Freshwater%20Pearl%20Mussel%20Plans%20March%202010/
- IFI Fish Report from 2013 survey of Aughrusbeg lake - <http://wfdfish.ie/index.php/aughrusbeg-lough-2013/>
- Clifden-Castlebar GWB: Summary of Initial Characterisation - [Microsoft Word - Clifden Castlebar.doc \(geodata.gov.ie\)](#)
- Letterfrack Marbles GWB: Summary of Initial Characterisation - [Microsoft Word - Letterfrack Marbles.doc \(geodata.gov.ie\)](#)

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- Draft Plan for Forests & Freshwater Pearl Mussel in Ireland July 2018
<https://www.agriculture.gov.ie/forestservice/publicconsultation/planforforestsfreshwaterpearlmusselinireland/>
- Galway County Council workshops on 9th October 2018, 11th January 2019 and 15th January 2019.
- Discussions with the EPA biologist.

1.3 PAA Summary

Table 1 below provides a summary of the risk classification, ecological status, known pressures and significance for the water bodies within the Dawros PAA. Further details are provided below and in the Receptor Information section of this report (i.e. **section 2.2**).

Table 1: Summary of risk category, ecological status, pressures and significance for Dawros PAA water bodies

WB Code	WB Name	WB Type	Risk	High status objective	2009	2012	2015	2018	Pressure Category	Pressure Subcategory	Significant Pressure
IE_WE_32_436	Aughrusbeg	Lake	<i>At risk</i>	No	B	B	B	P	Unknown Anthropogenic	Unknown	Yes
									Agriculture	Pasture	No
IE_WE_32C150990	Cloonederowen_010	River	<i>Review</i>	No	U	U	U	U	Unknown Anthropogenic	Unknown	Yes
									Forestry	Forestry	No
									Domestic Waste Water	Nutrient Pollution	No
IE_WE_32C370900	Cloon_010	River	<i>Review</i>	No	U	U	U	U	Unknown Anthropogenic	Unknown	Yes
									Domestic Waste Water	Nutrient pollution	No
									Agriculture	Pasture	No
IE_WE_32T010100	Traheen_010	River	<i>At risk</i>	Yes	H	H	G	G	Hydromorphology	Overgrazing	Yes
									Domestic Waste Water	Nutrient pollution	Yes
IE_WE_32D010020	Dawros_010	River	<i>At risk</i>	Yes	M	G	G	H	Hydromorphology	Land Drainage	Yes
									Hydromorphology	River bank erosion	Yes
									Forestry	Forestry	Yes

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The initial characterisation sub-catchment assessments recommended that the following actions be undertaken:

Dawros_010:

- IA8 High Status RWB Pressures – LAWPRO to conduct visual assessment to focus on sources of sediment from forestry, field drainage, inadequate buffer strips and fencing of the stream, and accelerated erosion processes.
- IA1 Provision of Information - EPA to discuss how to capture accelerated erosion processes as a pressure in upland subcatchments.

Traheen_010:

- IA8 High Status RWB Pressures– Start at monitoring station and assess whether impacts are from siltation or enrichment. Complete IA, as appropriate.

Cloonederowen_010

- IA3 Determination of Water Quality (unassigned waterbody) - Complete IA3.

Cloon_010

- IA3 Determination of Water Quality (unassigned waterbody) - Complete IA3.

Aughrusbeg Lake

- IA1 Provision of Information - What is driving fish status in the LWB? The remaining metrics for biological status are at Good. What measures, if any, can be implemented to improve fish status? This action is assigned to IFI.
- IA9 Lake Pressures – Pending feedback from IFI.

2 Receptor

2.1 Context and Setting

Aughrusbeg Lake is an *At Risk* water body consistently at Bad Ecological Status from 2009 to 2015, with slight improvement to Poor Status in 2018. It has a surface area of 50ha, a mean depth of less than 4m and a maximum depth of 14m. Oligotrophic lake habitat 3110 is a habitat listed on Annex I of the E.U. Habitats Directive and forms part of the Aughrusbeg Machair and Lake Special Area of Conservation (SAC). Aughrusbeg Lough has been assigned bad ecological status based on the fish populations present in 2013. The WFD fish survey 2007 and 2010 concluded the presence of the non-native species Rudd and the resultant reduced population of native species warranted bad status. All other metrics for biological status are good (or high) and the significant pressures identified within the WFD App are agriculture (pasture) and anthropogenic pressures (unknown).

Cloon_010 and Cloonederowen_010 are adjacent unassigned river water bodies, hydrologically separate and draining into the Western Atlantic Seaboard and Ballynakill Bay (a shellfish area), respectively. There are no EPA operational monitoring stations located within these sub-basins.

The Traheen_010 currently achieved Good Ecological Status between 2013 and 2015 (**Figure 2**) and was classified *At Risk* of failing to meet its high status objective. It consists of three distinct rivers which discharge into Ballynakill Bay. Monitoring data is available from the EPA operational monitoring station at Traheen Bridge in the lower part of the Traheen River in the west of this sub-basin (**Figure 2**). The Traheen_010 was at Moderate Ecological Status in 2009 improved to Good Ecological Status in 2012 and 2015. The available information suggests that siltation or enrichment are impacting the river status from either of the significant pressures identified: overgrazing (HYMO) or waste water discharge (DWWTS), respectively.

Dawros_010 is the most easterly RWB within the Dawros PAA. The ecological status in 2009 was Moderate Ecological Status and improved to Good Ecological Status in 2012 and 2015 but was identified as being *At Risk* of failing to meet its High Ecological Status objective during EPA characterisation undertaken in 2015. An EPA operational monitoring station is located at the lowest point in this RWB (Ford u/s Kylemore Lough). The Dawros_010 is the headwaters to Dawros_020, Dawros_030 and Dawros_040, all which constitute a *Margaritifera* Sensitive Area (**Appendix A**) and contain a SAC population of Freshwater Pearl Mussel (FPM). Significant pressures identified for this water body are HYMO (land drainage and river bank erosion) and Forestry.

Receptor information is detailed in **Tables 2–4** below and details the available water quality information for Dawros_010, Traheen_010 and Aughrusbeg Lake. The unassigned RWB's have no water quality data. The primary land use is pasture grazing and peat cutting, with some headwater forestry, and the area supports fishing and tourism.

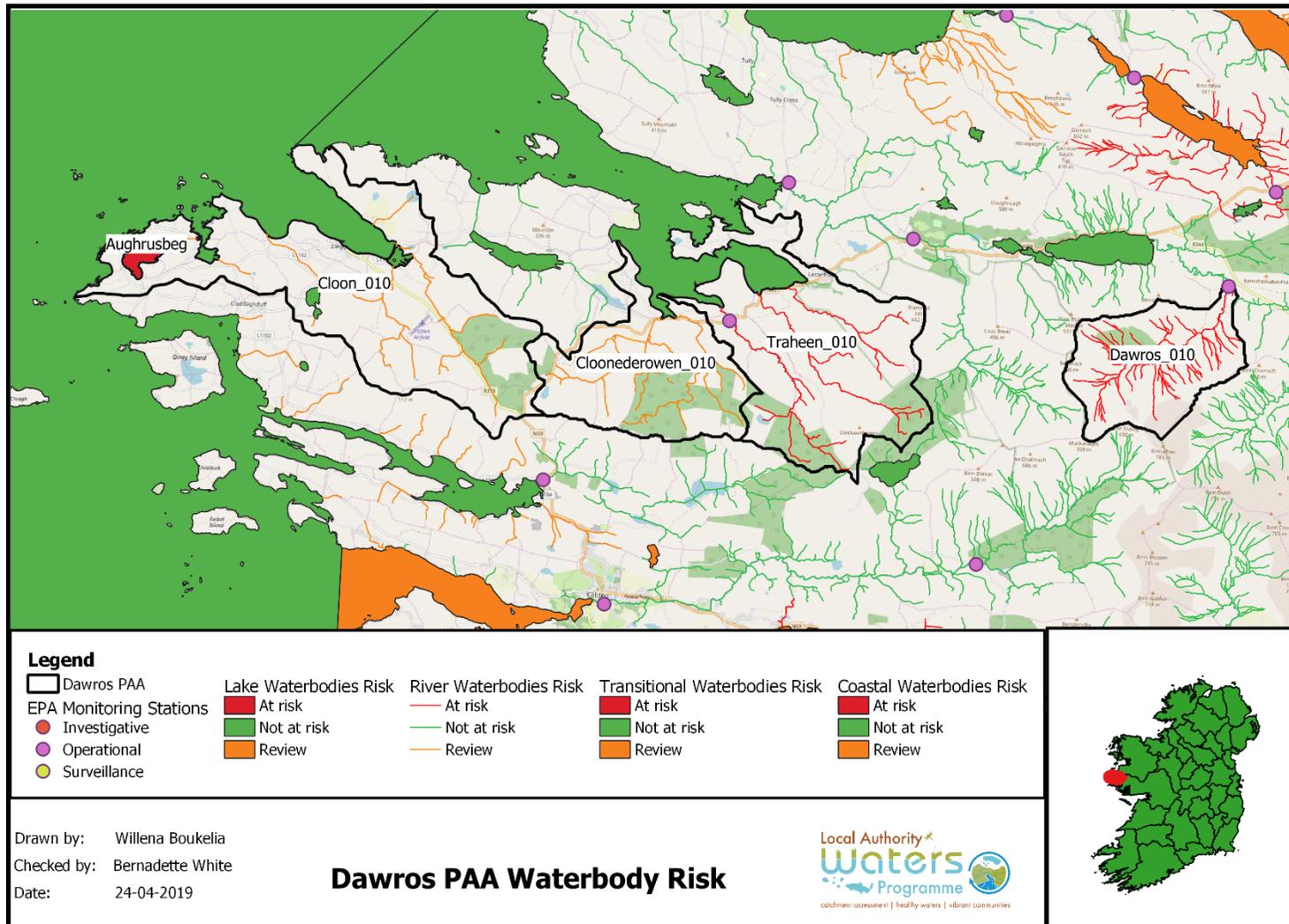


Figure 1: Dawros PAA Waterbody Risk

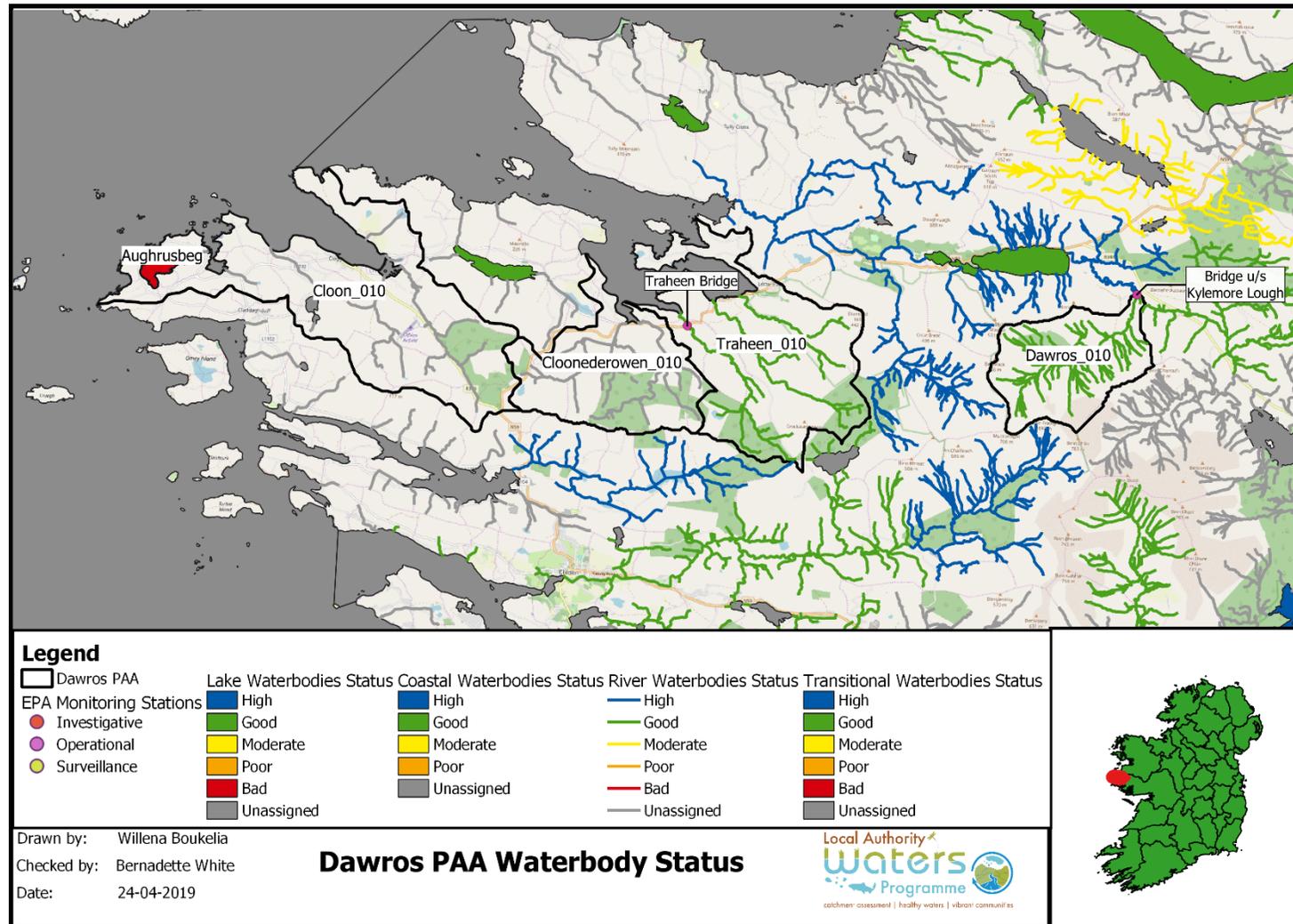


Figure 2: Dawros PAA Waterbody Status with the operational EPA monitoring sites.

2.2 Receptor Information

Table 2, Table 3 and **Table 4** present water quality information for the Dawros_010, Traheen_010 and Aughrusbeg Lake waterbodies, respectively, and include the status and trends of the monitored quality elements and the significant issues that may be impacting on water quality in these waterbodies. The unassigned river waterbodies Cloonederowen_010 and Cloon_010 are not monitored and have no water quality data available. **Figure 2** shows the location of EPA monitoring stations within the PAA.

Table 2: Receptor Information for the Dawros_010

Factor		Figures/Tables	IE_WE_32D010020 Dawros_010
Monitoring Stations		Figure 2	Ford u/s Kylemore Lough. (RS32D010020) Biological monitoring only
Risk Category		Figure 1	<i>At Risk</i>
Biological Status (2007-2015)		Appendix B	Good Q4
Q-values	2009		3-4
	2010		
	2011		
	2012		4
	2013		
	2014		4
	2015		
	2016		
	2017		4-5
	2018		4-5
Fish			-
Hydrochemistry Data			Not monitored
Supporting Conditions			Not monitored

Factor	Figures/Tables	IE_WE_32D010020 Dawros_010
Chemical		Not monitored
Specific Pollutant Conditions		Not monitored
Hydromorphology		Not monitored
RHAT Score		Not monitored
Evidence of arterial drainage		No
Ecological Status (2010-2015)	Figure 2	Good
Protected Areas	Appendix A	Yes. Margaritifera Sensitive Areas: Catchments of SAC populations listed in S.I. 296 of 2009 and part of the The Twelve Bens/Garraun Complex SAC (Site code: 002031, Latitude: 53.5342 Longitude: -9.85434).
WFD Objective		High
EPA biologist notes (if any)		2017: community indicating High ecological condition was established for the upper tributary of Kylemore Lough at station (0020). 2018: Highly satisfactory condition was noted in the headwaters of the Dawros upstream of Kylemore Lough (0020) although sensitive Perlida encountered in the 1990's remain absent from this waterbody
Significant issue		Unknown – No chemistry data available. In 2009 Q4-5* indicates siltation may be an issue. Possibly forestry related?
Notes		Headwaters to Freshwater Pearl Mussel

Table 3: Receptor Information for the Traheen_010

Factor		Figures Tables	IE_WE_32T010100 Traheen_010
Monitoring Stations		Figure 2	Traheen Bridge (RS32T010100)
Risk Category		Figure 1	<i>At Risk</i>
Biological Status (2007-2015)		Appendix B	Good Q4
Q-values	2009		4-5
	2010		
	2011		
	2012		4-5
	2013		
	2014		4
	2015		
	2016		
	2017		4-5
2018		4	
Fish			Not monitored
Hydrochemistry Data			
PO4+ (as P) (mg/l)	2010		0.025
	2011		0.018
	2012		0.011
	2013		0.006
	2014		0.005
	2015		0.005
	2016		0.005
	2017		0.005
	2018		0.005
	2019		0.005 (n=1)
	2020		0.006
	Baseline 2014		0.009

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Factor		Figures Tables	IE_WE_32T010100 Traheen_010
NH₃ (as N) (mg/l)	2010		0.015
	2011		0.015
	2012		0.015
	2013		0.021
	2014		0.015
	2015		0.010
	2016		0.010
	2017		0.142 (n=5) One high value 0.66mg/l 28/02/2017
	2018		0.010
	2019		0.010 (n=1)
	2020		0.01
	Baseline 2014		0.025
NO₃ - (as N) mg/l¹	2010		0.2
	2011		0.2
	2012		0.2
	2013		0.25
	2014		0.1
	2015		0.165
	2016		0.1
	2017		0.1
	2018		0.1
	2019		0.1 (n=1)
	2020		0.1
	Baseline 2014		0.147
BOD₅ mg/l	2010		0.65
	2011		0.65
	2012		0.5
	2013		0.5
	2014		0.675

¹ Recommended limit 3.5-4.5mg/l.

Factor		Figures Tables	IE_WE_32T010100 Traheen_010
	2015		0.625
	2016		0.5
	2017		1
	2018		1.06
	2019		0.76
	2020		0.62
	Baseline 2014		0.685
Summary & Trends in PO₄, NH₃ and NO₃			Generally High / Far from thresholds / Downward trends Ammonia Spike in February 2019 grossly exceeds threshold.
Other water quality data			
Baseline Concentration 2014 (mg/l)			NH3-N: 0.011 mg/l Ortho-P: 0.005 mg/l DON-N: 0.172 mg/l
Other relevant values			
Distance to threshold			Far
Indicative Quality			High
Supporting Conditions			Pass
Chemical			Pass
Oxygenation Conditions (DO % saturation) N=12	2010		97.5 (95-100 range) n=4
	2011		97.75 (97-99 range) n=4
	2012		99 (97 -108 range) n=3
	2013		99 (95-103 range) n=4
	2014		99.25 (96-101 range) n=4
	2015		100 (96-102 range) n=4
	2016		104 (90-124 range) n=5
	2017		94.2 (28/02/2017 88%) (88-98 range) n=5
	2018		95.8 (92-98 range) n=5
2019		100 (n=1)	
Acidification Conditions (pH)	2010		7.125 n=4

Factor		Figures Tables	IE_WE_32T010100 Traheen_010
	2011		6.975 n=4
	2012		6.77 n=3
	2013		6.8 n=4
	2014		6.78 n=4
	2015		6.7 n=4
	2016		7.16 n=5
	2017		7.16 n=4
	2018		7.36 n=4
	2019		6.7 n=1
Specific Pollutant Conditions			Not monitored
Hydromorphology			High
RHAT Score			High (2010-2012 and 2007-2009)
Evidence of arterial drainage			No
Ecological Status (2010-2015)		Figure 2	Good
Protected Areas		Appendix A	Illaunnanoon SPA & Drinking Water (Galway County Council). The Twelve Bens/Garraun Complex SAC (Site code: 002031, Latitude: 53.5342 Longitude: -9.85434). RWB discharges into Ballinakill Shellfish Area (PA2_0028). Letterfrack Drinking Water Source, more information from GCC has been requested.
WFD Objective			High
EPA biologist notes (if any)			From 2017 Assessment: The Traheen was satisfactory and returned to high ecological condition in 2017.
Significant issue			Altered habitat due to morphological changes and nutrient pollution identified by the characterisation process.
Notes			Note: There are four streams in this river water body, but only one has a monitoring site.

Factor	Figures Tables	IE_WE_32T010100 Traheen_010
		<p>Letterfrack UWWTP (Certificate of Authorisation A056 1-0) within this water body in a previously unmapped tributary.</p> <p>Pers. Comm. EPA Biologist: The Traheen was satisfactory and returned to high ecological condition in 2017, however, has deteriorated again in 2018. It may be one of those waterbodies that straddles the boundary between HES/GES. A discussion with the EPA is required in relation to how such sites are to be managed.</p>

Table 4: Receptor Information for Aughrusbeg Lake

Factor	Figures Tables	IE_WE_32_436 Aughrusbeg Lake
Monitoring Stations	Figure 2	Sampling only at one site – Midlake (E56069, N258346)
Risk Category	Figure 1	<i>At Risk</i>
Biological Status (2007-2015)	Appendix B	Bad
Biological monitoring	2007 - 09	Bad
	2010 - 12	Bad
	2010 - 15	Bad
	2016-18	Poor
Fish		Bad Status for last 3 WFD Monitoring Cycles with minimal improvements in recent monitoring cycle.
Hydrochemistry Data		
Total Phosphorous (as P) (mg/l)	2010	0.019
	2011	0.015
	2012	0.018

Factor		Figures Tables	IE_WE_32_436 Aughrusbeg Lake
	2013		0.015
	2014		0.012
	2015		0.008
	2016		0.022 One high TP 0.097 mg/l 14/11/2016 ²
	2017		0.009
	2018		0.011
	2019		Not available
	Baseline 2014		0.011
Chlorophyll (mg/l)³	2010		10.32 n=12 (5.6 – 16 range)
	2011		8.18 n=4 (6.0 – 9.7 range)
	2012		9.23 n=4 (6.0 – 13 range)
	2013		8.35 n=4 (6.4 – 10 range)
	2014		8.19 n=10 (4.4 – 16 range)
	2015		4.0 n=5 (2.8 – 6.0 range)
	2016		2.58 n=12 (0.5 – 6.7 range)
	2017		4.0 n=4 (2.8 – 5.1 range)
	2018		3.85 n=4 (3.1 – 4.3 range)
	2019		Not available
Baseline 2014		6.847	
Ammonia-N mg/l	2010		0.019
	2011		0.015
	2012		0.015
	2013		0.021
	2014		0.015
	2015		0.01
	2016		0.01
	2017		0.01

² EU Environmental Objectives (Surface Waters) (Amendment) Regulations 2019: Lake total phosphorus conditions for High Status ≤ 0.01 (mean) and Good Status ≤ 0.025 (mean)

³ From WFD Data download as recent data has not yet been updated to the EDEN App

Factor		Figures Tables	IE_WE_32_436 Aughrusbeg Lake
	2018		0.019
	2019		Not available
	Baseline 2014		0.015
Summary & Trends in PO₄, NH₃ and NO₃			Generally Good/High / Far from thresholds / Downwards trends
Other water quality data			
Baseline Concentration 2014 (mg/l)			Chlorophyll: 6.847 mg/l TP: 0.011 mg/l NH3-N: 0.015 mg/l
Other relevant values			
Distance to threshold			Far
Indicative Quality			High
Supporting Conditions			Pass
Chemical			Supporting Chemistry Conditions (until 2015) Good. Chemical Surface Water Status (until 2015): Failing to achieve good. An isolated event with exceedances in priority hazardous substances (Sum 4_IWW of 0.032 µg/l and Indeno(1,2,3-c,d) pyrene 0.023µg/l) where measured on 17/07/2013. Repeated analysis in August 2013 found levels returned below exceedance limits. No new chemical data after 2014.
Oxygenation Conditions (DO % saturation) N=12	2010		98.08 (94 – 108 range) n=12
	2011		100 (99 – 101 range) n=4
	2012		105.25 (99 – 120 range) n=4
	2013		101 (97 – 106 range) n=4
	2014		100.4 (96 – 104 range) n=10
	2015		101.5 (99 – 103 range) n=4
	2016		105 (100 – 110 range) n=4
	2017		100 (99 – 101 range) n=4
2018		105 (100 - 110 range) n=4	

Factor		Figures Tables	IE_WE_32_436 Aughrusbeg Lake
	2019		Not available
Acidification Conditions (pH)	2010		7.68 n=12
	2011		7.75 n= 4
	2012		7.93 n=4
	2013		7.925 n=4
	2014		7.95 n=10
	2015		7.9 n=4
	2016		7.82 n=12
	2017		7.98 n=4
	2018		8.0 n=4
	2019		Not available
Specific Pollutant Conditions			Pass
Hydromorphology			High
MImAS Data			unavailable
Evidence of arterial drainage			No
Ecological Status (2010-2015)		Figure 2	Bad
Protected Areas		Appendix A	Aughrusbeg Machair and Lake SAC (Site code: 001228, Latitude: 53.5576 Longitude: -10.1662), Aughrusbeg lough forms part of this SAC and is a lowland oligotrophic lake)
WFD Objective			Good
EPA biologist notes (if any)			Pers. Comm. EPA: Aughrusbeg Lake has improved from Bad to Poor in the latest monitoring cycle however, it straddles the boundary, improvements have been minimal.
Significant issue			The presence of the fish rudd and its impact on the native brown trout population is driving fish status in this lake.
Notes			Pers. Comm. IFI: The status for fish is driver by the lower than expected abundance of indicator species. Also, rudd have been introduced to the lake, they are not an invasive species, but non-native to this area, so any introduction such as this

Factor	Figures Tables	IE_WE_32_436 Aughrusbeg Lake
		<p>would have an impact of the native species - competing for space and food. MEASURES: The ideal measure would be to remove rudd, however this is likely not feasible. The second measure would be to assess spawning potential for trout and introduce any measures that would improve trout recruitment to the lake. There is no spawning stream inflowing to the lake, so most likely they are spawning on the shoreline.</p> <p>Ask GCC if any reported incidents of pollution in the area.</p> <p>Levels of Chlorophyll a in the lake have halved compared to previous years from 2015 onwards.</p> <p>Nutrient concentrations consistently low (HES) with exception of one sample 14/11/16 Total Phosphate-P 0.1 mg/l (an order of magnitude greater than the norm.) To be investigated in LCA.</p>

Please note that receptor tables for the Cloon_010 and Cloonederowen_010 unassigned RWBs have not been included as no data exists.

2.2.1 Receptor information for Cloonederowen_010

- Two Section 4 discharge licences exist within this sub-basin close to the Moyard River
- An investigative monitoring station CLOONEDEROWEN - Interstitial, Moyard Br. (RS32C150990) is located at E67230.91 N256720.13 however no data exists for this site
- RWB discharges into Ballnakill Shellfish Area (PA2_0028)

2.2.2 Receptor information for Cloon_010

- A LWB within the Cloon_010 called Lake Courhoor (unassigned status) is a local drinking water source (WE_WTP0005) known as Cleggan/Claddaghduff, located at E59658, N257559. More information has been requested from Galway County Council
- An investigative monitoring station CLOON 32 - Interstitial, Br d/s from Courhoor R conf. (RS32C370900) is located at E61286.72 N257572.93, however no data exists for this site
- NHAs within or intercepting the sub-basin include two low-lying blanket bogs: Cloon and Laghtanabba Bog NHA (Site code: 002374, Latitude: 53.5367 Longitude: -10.0893) which is almost wholly within the sub-basin, and Tooreen Bog NHA (Site Code: 002436, Latitude: 53.549, Longitude: -10.0578) which is partially within the sub-basin
- A mine is located in the south-east of this sub-basin

2.3 Conclusions

- Two river water bodies in this area for action are unassigned (Cloonederowen_010 and Cloon_010) and require an IA3 to determine their water quality before further action is determined. Their objective is for Good Ecological Status.
- One LWB Aughrusbeg Lake is at Bad Ecological Status because of fish, with a slight improvement to Poor Ecological Status in the most recent monitoring cycle. Status is determined by the presence of the invasive species Rudd in the lake, which is impacting the native brown trout population. Two potential measures have been proposed by IFI for consideration. IFI have an IA1 action for provision of information with LAWPRO, which has been provided. Based on this information, an IA9 action (Lake Pressures) is not deemed required. Exceedances in priority hazardous substances seem to be short lived and do not extend into the current WFD monitoring cycle.
- Dawros_010 has returned to High Ecological Status in 2017 and 2018. Galway County Council do not know the reason why the status dropped or returned to High Ecological Status. A catchment walk during the LCA will be used to investigate this further. Pressures to this RWB include forestry and Hydromorphology. Both LAWPRO and the EPA have further characterisation actions. The EPA are to discuss how to capture accelerated erosion processes as a pressure in upland sub catchments. A query has been submitted to the EPA in order to advance discussions related to this IA.
- The Traheen_010 returned to High Ecological Status in 2017 but dropped to Good Ecological Status in 2018. It is unknown why. The LCA will be used to determine the pressures to this High Ecological Status objective RWB. Significant pressures to this RWB include hydromorphology (overgrazing) and domestic wastewater. An IA8 is required for this RWB.

3 Pathway Information and Analysis

3.1 Overview of Pathways in the PAA

The significant issues within the Dawros PAA varies spatially and include forestry, DWWTS, unknown anthropogenic and hydromorphology.

The regional pathway framework is provided by the aquifer in the PAA and sub-compartments are determined by soil drainage and groundwater vulnerability. For this PAA only one compartment has been identified due to the similarity of the underlying geology and the principal flow path has been determined to be overland flow.

- The PAA is wholly on a poor aquifer (PI: bedrock which is generally unproductive except for local zones).
- The bedrock is primarily igneous rock: Precambrian Quartzites, Gneisses & Schists and Precambrian Marbles.
- Soil drainage is poorly drained, primarily peat.
- Groundwater vulnerability is largely X extreme to extreme. However, GW/SW interactions are likely to be low due to the bedrock and aquifer type.

3.2 Pathways Conceptual Model

One main compartment was identified in the Dawros PAA (**Table 5**).

Table 5: Pathway information for the Dawros PAA

	Compartment 1
Topography (map aerial)	Steep and mountainous (0-200m along Aghrusbeg Peninsula and 600m in Dawros_010) sloping to the shore in the west – promote surface runoff. The land surface is characterised by steep terrain. Obvious peat cover with forestry evident in Dawros_010, Cloonederowen_010 and Traheen_010. Extensive peat cover in Traheen, Cloonederowen, and less so in Cloon. Field improvements obvious in lower Traheen, Cloonederowen.
Soil	Large areas of Blanket peat (BkPt): poorly drained and shallow. Some smaller areas of Till derived from granite or metamorphic rocks (TGr or TMp) with poor drainage, mainly shallow. Areas of exposed rock at or near the surface particularly in the headland areas.
Soil wet/dry	Predominantly wet soils, Blanket peat (BkPt) with areas of exposed rock and some lakes.
Subsoil	Rock (RckNCa) with patches of Blanket peat (BkPt). For subsoil thickness <3m. Thickness of the blanket peat ranges from 0-6m depending on topography.
Subsoil Permeability	Mostly low permeability, with large areas where depth to bedrock is <3m
Aquifer	Poor Aquifer (PI)
Rock Units	Precambrian Quartzites, Gneisses & Schists and some Precambrian Marbles throughout the catchment. Clifden-Castlebar GWB: Shallow groundwater is likely to discharge to streams and lakes, but the limited bedrock transmissivity means that the baseflow component of the total streamflow will be low. Small springs and seeps are likely to issue at the stream heads and along their course. Seepages will develop on the coastal cliff faces.

	Compartment 1
Groundwater Vulnerability	Rock near surface (X) and small patches of E
Karst Features	None
Hydrology ▪ Drainage density	High drainage density multiple streams and tributaries.
Susceptibility ▪ PO₄ to SW, NO₃ to GW, NO₃ to SW	Near Surface Nitrate susceptibility is generally very low or low across the whole PAA with very small pockets of very high susceptibility near to the coast. However, larger areas of very high susceptibility exist around Aughrusbeg Lake. Subsurface Nitrate susceptibility is very low or low throughout the entire PAA. Near surface phosphate susceptibility is generally moderate with high susceptibility along the coastline.
PO₄ PIP	Rank 4 and lower mainly thorough the majority of the PAA. Corine land cover denotes these areas as peat bogs. Rank 1 and 2, very high PIP near coastline for RWBs Traheen, Cloonederowen and Cloon and around Aughrusbeg Lake. Corine land cover characterises these areas as “land principally occupied by agriculture, with significant areas of natural vegetation”. Sanicose Potential Impact P Risk: very high potential impact from OSWWTS occurs all along the high PIP area along the coast. Moreover, one OSWWTS is located beside the Traheen_010 EPA monitoring location. Approximately 50+ OSWWTS within the Aughrusbeg Lake Catchment are identified as a very high potential impact.
NO₄ PIP	Surface water receptor nitrate PIP Rank 7 over peat and poorly-drained soils covers most of the PAA. A small area of Rank 1 and 2 occur surrounding parts of Aughrusbeg Lake within the Cloon_010 RWB. Sanicose Potential Impact N Risk is high for approximately 50 OSWWTS within the Aughrusbeg Lake catchment where DTB is <3m and large areas of exposed rock at the surface.
Likely main pathway(s)	Poorly drained soil on low transmissivity bedrock. Overland flow and near surface flow. Minimal diffuse losses to GW via bedrock outcropping. Flashy surface runoff. Flow directions are expected to be in general to the west, toward the coast. Groundwater will discharge locally to streams and rivers crossing the aquifer and also to small springs and seeps. Owing to the poor productivity of the aquifers in this body it is unlikely that any major groundwater to surface water interactions occur. Baseflow to rivers and streams is likely to be relatively low.
Likely CSA(s)⁴	Rank 1 and 2, very high PO ₄ PIP near coastline for RWBs Traheen, Cloonederowen and Cloon and around Aughrusbeg Lake.
Direct⁵	Section 4 discharges within Traheen_010 and Cloonederowen_010 RWBs (Section 0). Drains – unknown but highly likely drains will exist within the forested areas.
Monitoring St.	Traheen Bridge (RS32T010100) & Ford u/s Kylemore Lough (RS32D010020)
Sig. pressures	Hydromorphology, Fish, Forestry and unidentified anthropogenic pressures such as peat cutting.

⁴ CSAs are defined as the places within a catchment where the sources of a contaminant are hydrologically linked to the aquatic receptors of interest and contribute disproportionate amounts of pollutants to receptors.

⁵ Point discharges to the water body

4 Significant Pressures

4.1 Fish

In the case of Aughrusbeg Lake fish status has remained at Bad Ecological Status for several years (2007 – 2015). The non-native species Rudd is present in this lake. An IFI WFD Fish Monitoring Report on Aughrusbeg from 2013 survey details 4 species found during surveys in July/August 2013 with percentage of total catch of 285 fish i.e. Three-spined stickleback (52.3%), Rudd (36.8%), brown trout (1.1%) and European Eel (9.8%). Three-spined stickleback was the dominant species in terms of abundance (CPUE) and Rudd was the dominant species in terms of biomass (BPUE).

In 2010 to 2012 surveillance monitoring reporting period, the EPA assigned Bad Ecological Status to Aughrusbeg Lake based on all monitored physico-chemical and biological elements, including fish. The EPA have confirmed that the lake will improve to Poor Ecological Status in the current monitoring period up to 2018. However, improvements are slight, and the lake remains on the Bad/Poor ecological status boundary.

IFI have commented on the fish status within the lake as containing lower than expected abundance of indicator species. Also, rudd have been introduced to the lake, they are not an invasive species, but non-native to this area, so any introduction such as this would have an impact of the native species - competing for space and food. The ideal measure would be to remove rudd, however this would most probably be impossible. Attempts have been made to remove perch from Lough Inagh and pike from some of the Owenriff catchment, but it would be an extremely difficult, if not impossible task to remove the rudd without having an impact on everything else. We have had queries from locals asking if they could do anything in relation to the rudd. The second measure would be to assess spawning potential for trout and introduce any measures that would improve trout recruitment to the lake. The map shows no spawning streams, so most likely they are spawning on the shoreline (IFI pers. Comm).

4.2 Hydromorphology (HYMO)

The WFD App had listed Hydromorphology – river bank erosion and Land drainage (causing altered habitat due to hydrological changes and altered habitat due to morphological changes) as significant pressures to both the Dawros_010 and Traheen_010 RWBs. The sub-categories range from river bank erosion, land drainage and overgrazing contributing to the HYMO pressure. The LCA will provide information on this pressure to water quality.

4.3 Forestry

Forestry is identified as a significant pressure for the Dawros_010 river water body due to nutrient pollution and altered habitat due to morphological changes. Drainage channels associated with forestry stands can transport silt and nutrients to surface waters. Forestry across the PAA is owned largely by Collite (857.55 ha), with some small areas of privately-owned forestry (88.57ha) (**Figure 3**).

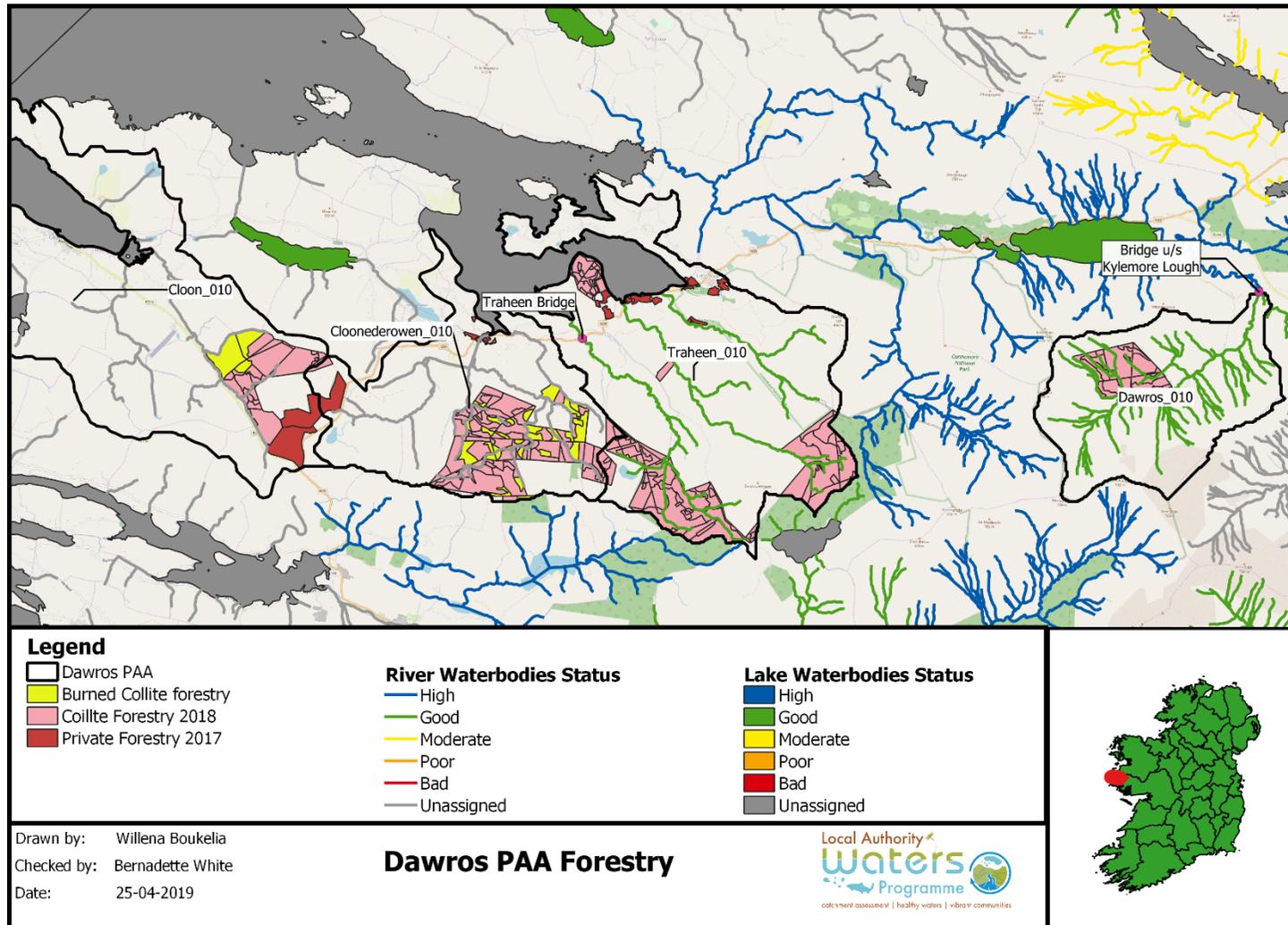


Figure 3: Collite and privately-owned forestry within the Dawros PAA

Communication with the Forest Service has indicated the following: There is only one area of forestry within Dawros_010, located at Loughermore. This property is called “Glencorbet” and is in Coillte ownership. The property was planted in 1967, however despite its age, there has been no harvesting there. Access for harvesting at this property is extremely difficult, and if there was to be harvesting there, it would require the construction of a road. There is no felling licence in place for the property, and it is unlikely that an application will be received given the difficulty with access, however there are concerns about the long-term stability of the site.

Discussions with Galway County Council (9th October 2018, 11th January 2019 and 15th January 2019) have highlighted the potential risk to water quality in the event of future clearfelling. Any future clearfelling applications should be flagged with the environment section to ensure that silt traps and adequate clearfelling best practises are observed.

GIS datasets provided by Coillte have identified 106ha of forestry within the Cloonederowen_010 and Cloon_010 RWBs that is listed as ‘Burned’ in the land use type (Figure 3). A query has been sent to the Forest Service for more information.

4.4 Urban Waste Water

Within the Traheen_010 the Letterfrack UWWTP (Certificate of Authorisation License Code: A056 1-0) supporting an agglomeration of PE 500-1,000 discharges to surface water into the most easterly tributary of this RWB. The plant currently operates at a P.E. of less than 500 and holds a Certificate of Authorisation (CoA) to discharge. The WWTP is a Package Plant with secondary treatment that discharges to reed bed on site and was a design build WWTP now operated by Galway County Council. The Plant is designed and constructed for an 800 P.E. currently operating at P.E. 221 (2017) and with a projected 2023 P.E of 232, well within its design build capacity of operation. The WWTP has been designed to the required effluent standard of 25 mg/l BOD and 35 mg/l SS. The treated effluent discharges directly to the Sruffaunboy Stream at the treatment plant site approximately 300m upstream from Ballynakill Harbour (**Figure 4**).

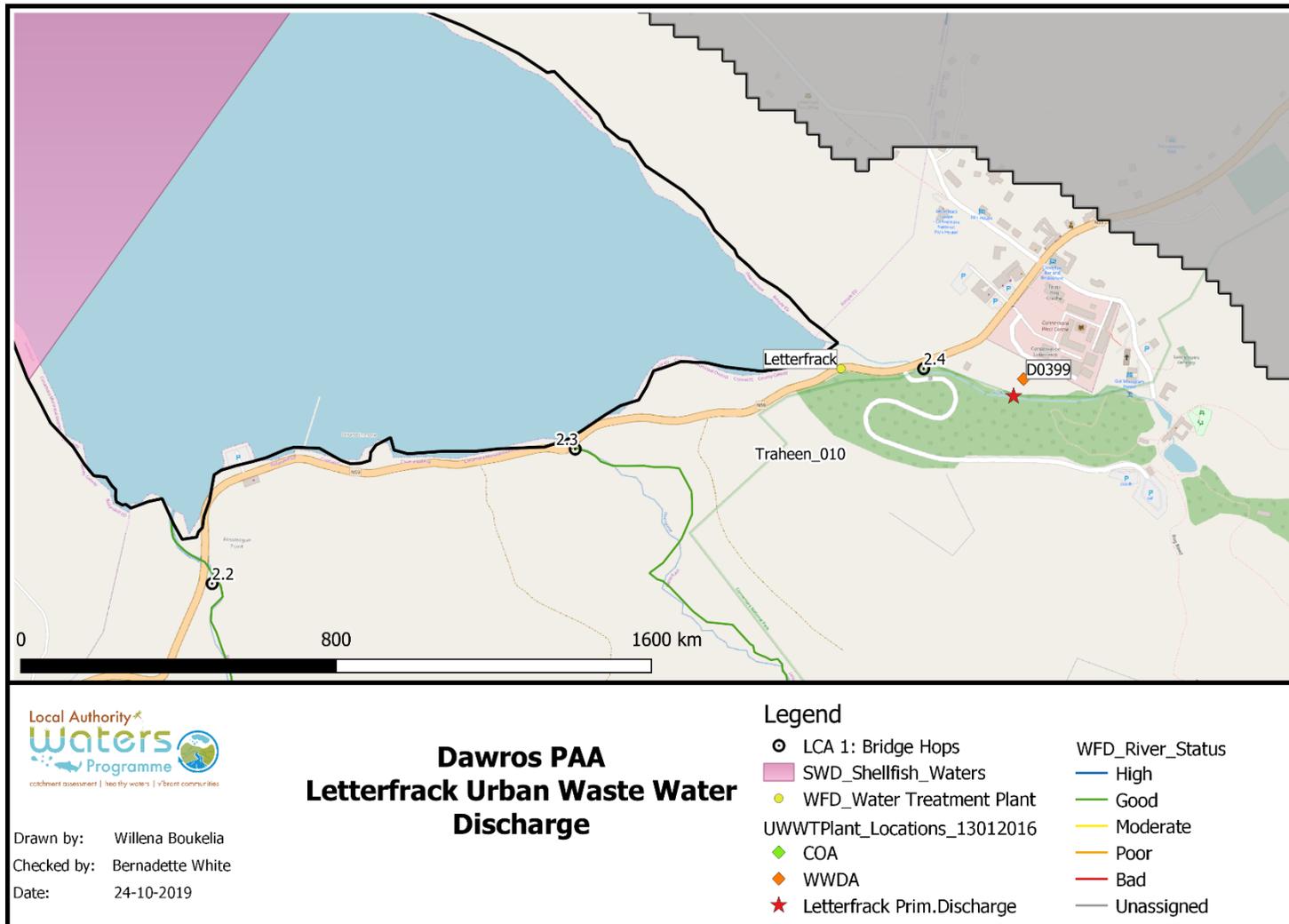


Figure 4: Context and location of Letterfrack’s UWWTP and Water Treatment Plant

An appropriate assessment of impact to the receiving waters has taken note of the location of the discharge location in relation to designated protected sites and concluded that no Natura 2000 site within a 15km radius will be adversely affected by current wastewater discharge⁶. However, this appropriate assessment screening lacks an assimilative capacity assessment, merely stating that dilution of effluent by the stream may cause a localised affect but will be further diluted as it enters the coastal receiving water body. It is important to note that a Class A Shellfish Protected Area is located within Ballinakill bay approximately 2km from the discharge location (Figure 4). A requirement of the Certificate of Authorisation licence is that the license holder shall carry out an assessment of the impact of the discharge(s) from the wastewater works on the microbiological quality (including viruses) of the shellfish in the adjacent designated shellfish waters in consultation with the Sea Fisheries Protection Authority, the Marine Institute and Bord Iascaigh Mhara. Any observed deleterious microbiological effect on shellfish will require the installation appropriate disinfection system to remove this from effluent.

Effluent chemistry data until April 2019 show multiple spikes of BOD, COD and SS since 2014, reaching 117mg/l, 264 mg/l and 51 mg/l, respectively in April 2016 with further exceedances such as 85mg/l SS in November 2018. Multiple exceedances have occurred across the measured parameters exceeding the comparable limits for these set for Urban Wastewater Discharges. The impact of effluent discharge to the receiving river water body will be assessed as part of the local catchment assessment.

4.5 Unknown Anthropogenic Pressures

The Dawros PAA covers a wide area of non-hydrologically linked river systems. Therefore, pressures within these water bodies vary spatially. For the unassigned river water bodies (Cloonederowen_010 and Cloon_010) as well as Aughrusbeg Lake, the pressures are unknown anthropogenic pressures. Other non-significant pressures listed in the WFD App include forestry, agriculture (pasture) and domestic wastewater. Verification or identification of the significant pressures will only be understood after a local catchment assessment (LCA) is carried out.

It is evident from aerial imagery and a catchment drive that peat cutting is very active and extensive in some areas of the PAA and may be contributing to water quality conditions. This activity occurs primarily within the Cloon_010 and Cloonederowen_010 river water bodies with tributaries criss-crossing areas of peat extraction (**Figure 5 & Figure 6**) and to a lesser extent within the Traheen_010.

⁶ Appropriate Assessment Screening Letterfrack Waste Water Treatment Plant: A056 1-0. Irish Water 2014.
<http://www.epa.ie/terminalfour/wwda/wwda-view.jsp?regno=D0399-01>

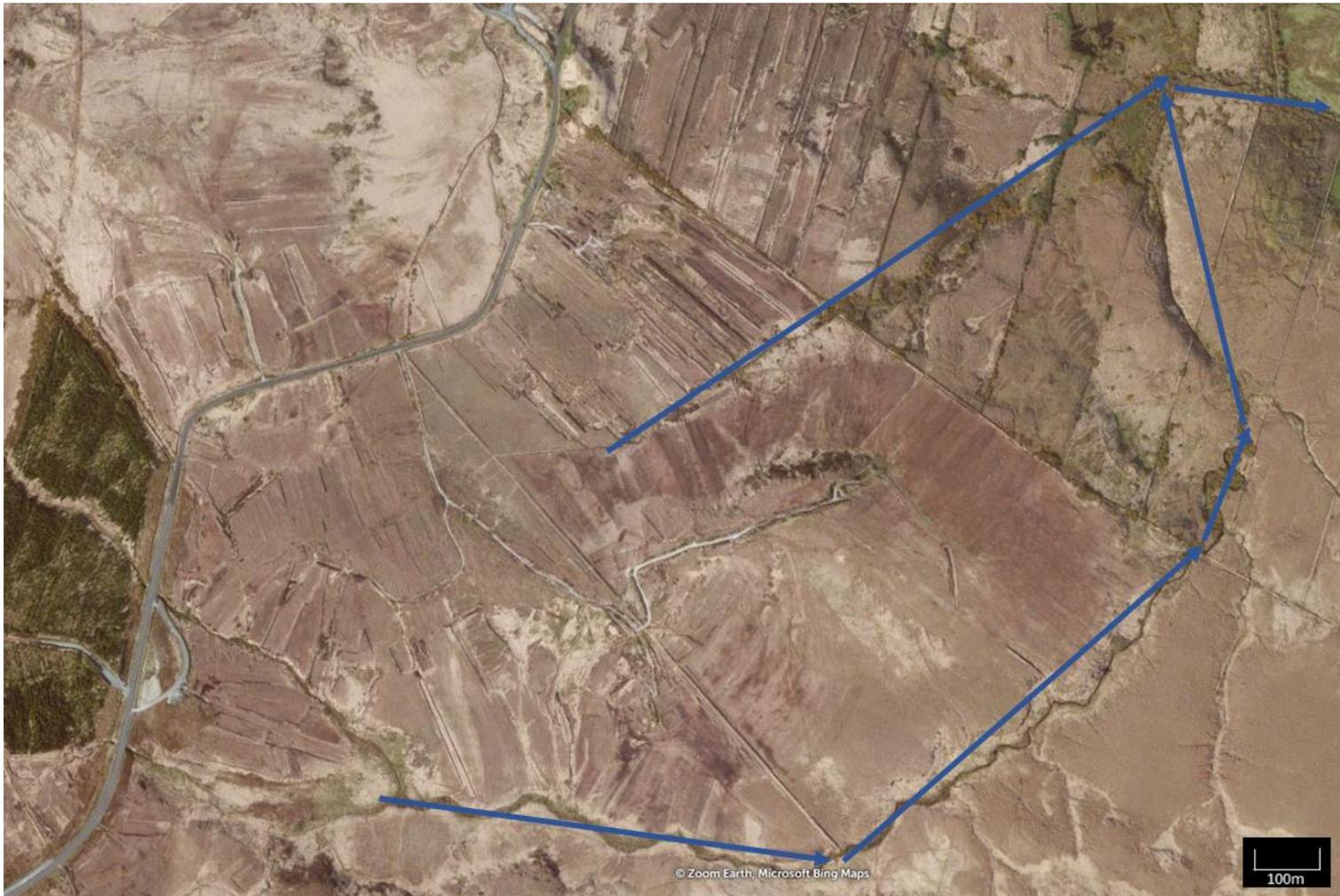


Figure 5: Aerial image illustrating extensive peat extraction within the Clonederowen_010



Figure 6: Aerial image of peat extraction within the Cloon_010 river water body

4.5.1 Other Licensed Activities

Traheen_010:

- One registered extractive industry close to the headwaters of the Traheen River
- A quarry is located just outside the sub-basin boundary in Letterfrack
- Letterfrack Water Treatment Plant

Cloonederowen_010:

- Two Section 4 discharge licences in the north of this sub-basin close to where the Moyard River enters the sea

Cloon_010:

- A mine is located in the south-east of this sub-basin

4.5.2 Corine Land Cover Mapping

The Corine Land Cover (CLC) mapping (**Figure 7**), illustrates the types of land use within the PAA. The principal land cover is peat bogs covering 58% of the area (**Table 6**) with land principally occupied by agriculture covering nearly 22%. Some agricultural areas, which are predominantly near the coast, has been due to reclamation of peatland that potentially may have resulted in the digging of drainage channels flowing directly into surface waters. There are also some substantial areas of coniferous forestry (8.5%) and transitional woodland shrub (6%) on higher ground away from the coastal areas within the PAA, particularly in the Traheen_010 and Cloonederowen_010 sub-basins. Direct pathways from forest drains to surface waters should also be considered as part of LCA in these RWBs.

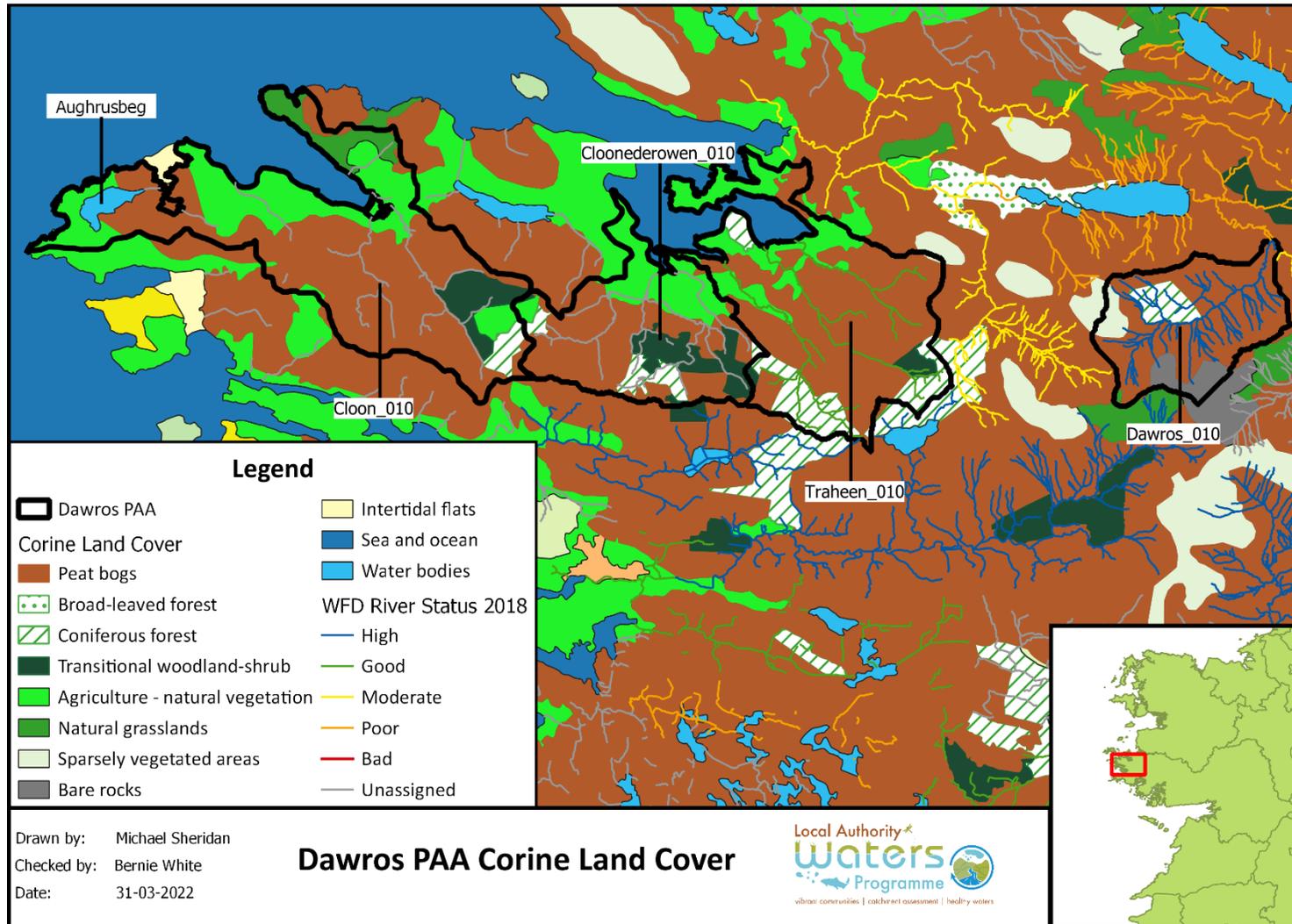


Figure 7: Corine Land Cover in Dawros PAA

Table 6: Corine Land Cover for Dawros PAA and each of the RWBs

Corine Land Cover	Area within the PAA		Area within each RWB in the PAA (%)			
	Area (Ha)	Area (%)	Dawros_010	Traheen_010	Cloon_010	Cloonederowen_010
Peat bogs	3606	58.29	73.63	60.38	55.27	49.69
Land principally occupied by agriculture, with significant areas of natural vegetation	1335	21.58		21.16	28.04	24.80
Coniferous forest	527	8.52	10.19	15.55	2.35	8.94
Transitional woodland-shrub	366	5.92		2.35	5.88	16.27
Natural grasslands	149	2.40	0.60		6.09	
Bare rocks	90	1.45	10.18			
Sparsely vegetated areas	53	0.85	5.41	0.28		
Waterbodies	50	0.82			2.14	
Sea and ocean	10	0.16		0.28	0.18	0.30
Intertidal flats	1	0.01			0.04	
Total Area	6186	100	100	100	100	100

4.5.3 Land Parcel Identification System (LPIS)

The LPIS dataset delineates the land parcels held by each farmer and provides information on the crop description, the area covered and if it forms part of a derogation. There are no derogation farmers within the PAA. The principal crop type identified is permanent pasture with circa 98% of the total area. Smaller areas (<2%) of other crop types such as species rich grassland occur in patches primarily within the Cloonederowen_010 RWB.

4.5.4 Pollution Impact Potential (PIP)

Surface water receptor phosphate PIP Rank 4 covers the majority of the PAA (**Figure 8**). Corine land cover denotes these areas as peat bogs. Very high phosphate PIP (rank 1 and 2) near coastline for Traheen_010, Cloonederowen_010 and Cloon_010 RWBs and around Aughrusbeg Lake. Corine land cover characterises these areas as “land principally occupied by agriculture, with significant areas of natural vegetation”.

Surface water receptor nitrate PIP Rank 7 over peat and poorly-drained soils covers most of the PAA. A small area of Rank 1 and 2 occurs near Aughrusbeg Lake within the Cloonerdowen_010 RWB (**Figure 9**).

4.5.5 Domestic Waste Water Treatment Systems (DWWTSs)

Sanicose Potential Impact P Risk: very high potential impact from DSWWTSs occurs all along the high phosphate PIP area along the coast. Moreover, one very high potential impact DSWWTS is located adjacent to the Traheen_010 EPA operational monitoring station. Approximately 50 DSWWTSs around Aughrusbeg Lake are identified as a very high potential impact for phosphate.

Sanicose Potential Impact N Risk is high for approximately 50 OSWWTS around Aughrusbeg Lake where depth to bedrock is <3m.

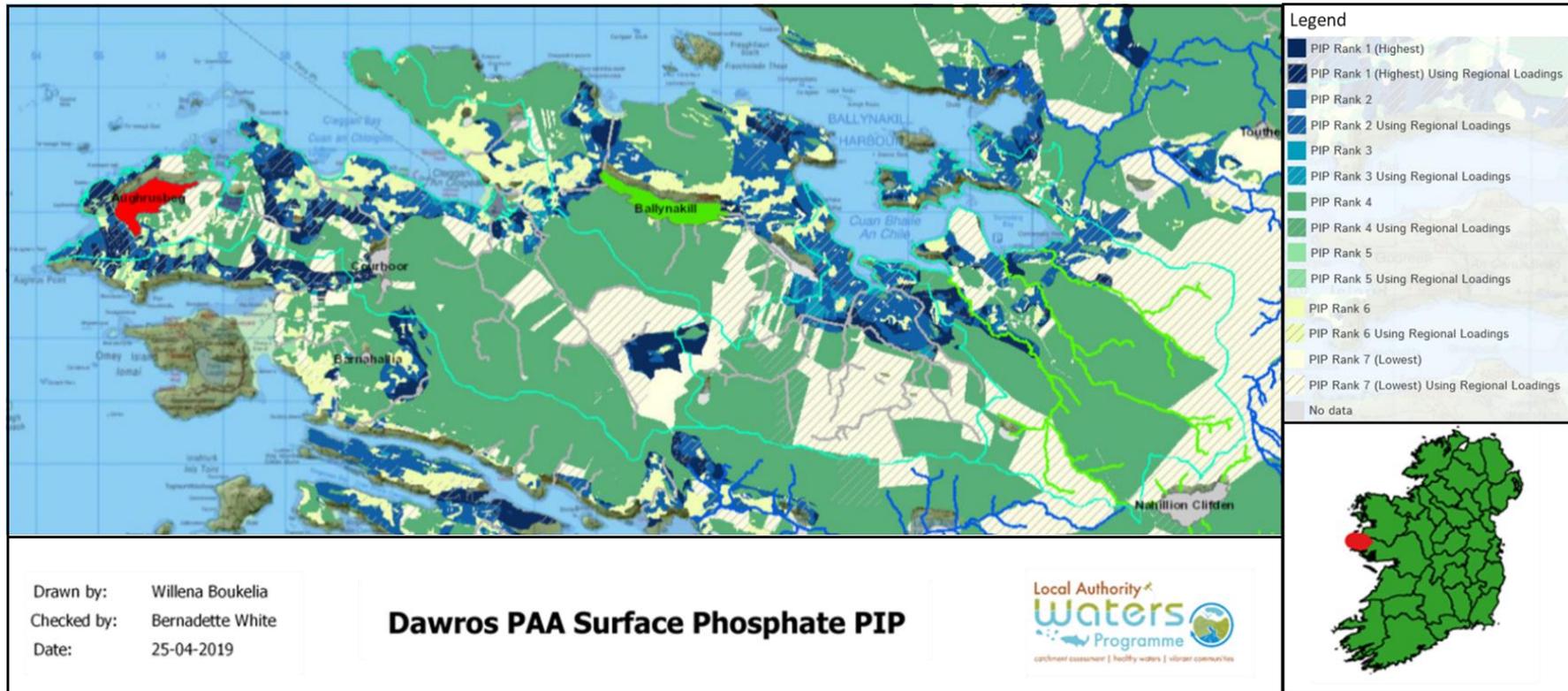


Figure 8: Surface Water Receptor Phosphate Pollution Impact Potential

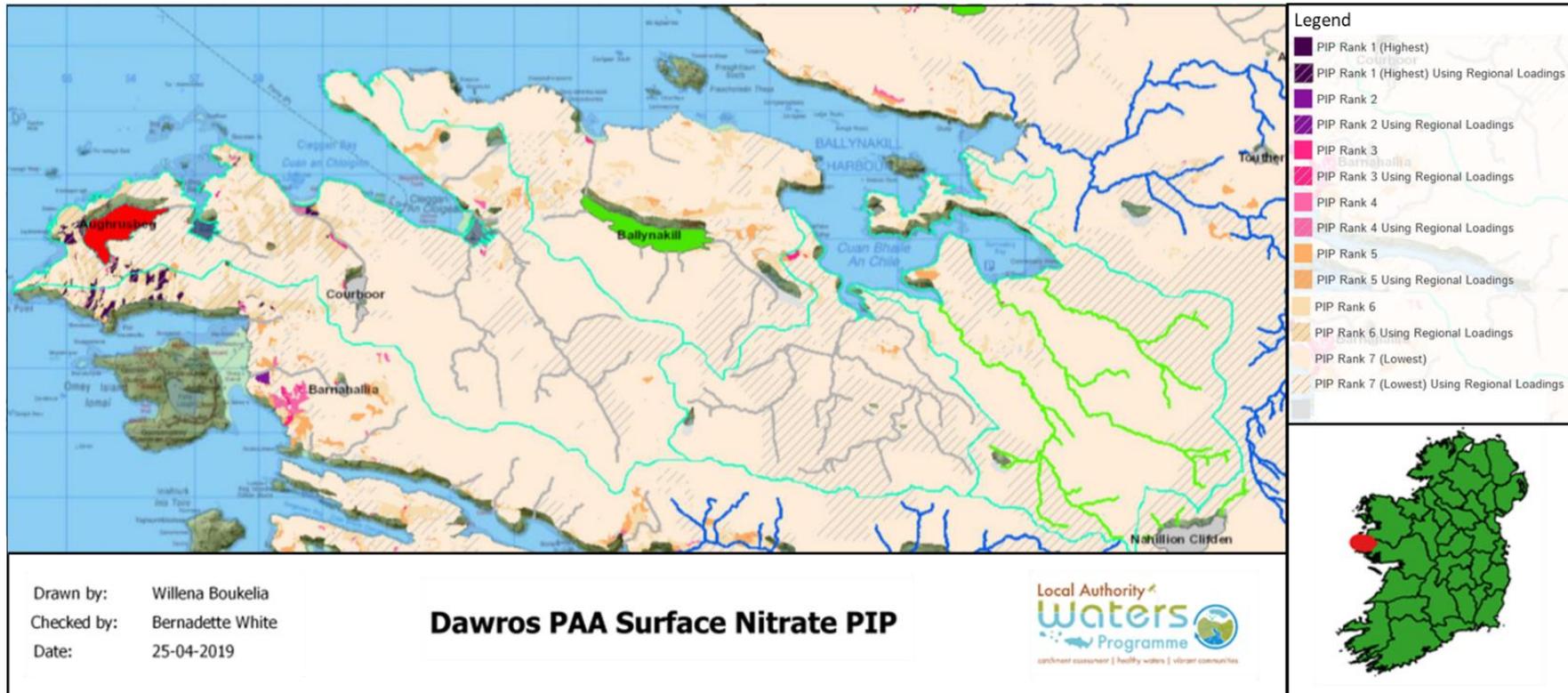


Figure 9: Surface Water Receptor Nitrate Pollution Impact Potential

5 Interim Story of the PAA

5.1 Introduction

Dawros Priority Area for Action (PAA) is largely a coastal area of 62 km² to the north of Clifden in north-west Connemara, Co. Galway. The area covered by the PAA is predominantly rural, with the villages of Letterfrack and Cleggan being the main urban centres within the PAA. Four river waterbodies (RWB) and one lake waterbody were selected for inclusion in the PAA for implementation of the 2nd cycle River Basin Management Plan (RBMP): Dawros_010, Traheen_010, Cloonederowen_010, Cloon_010 and Aughrusbeg Lake. The four RWBs are not hydrologically linked and do not connect with each other (i.e. none are upstream or downstream of each other). The oligotrophic Aughrusbeg Lake is located at the most westerly point of the PAA within the Cloon_010 sub-basin. The RWBs except for Dawros_010 are coastal waterbodies, each with multiple, non-hydrologically linked streams that discharge to the Atlantic. The waterbodies that comprise the Dawros PAA are part of the Dawros sub-catchment (Dawros_SC_010) which forms part of the wider Erriff-Clew Bay catchment.

5.2 Dawros_010

The Dawros_010 RWB is a High Ecological Status objective waterbody and is the headwaters of the Dawros River and the Dawros *Margaritifera* Sensitive Area, one of the top eight freshwater pearl mussel catchments in Ireland. The Dawros River ultimately discharges into Ballynakill Harbour, a protected shellfish area. EPA characterisation undertaken in 2015 determined that this waterbody was *At risk* for the 2nd WFD cycle as it was failing to achieve its High Status objective at the time. An EPA operational monitoring station is located at the furthest point downstream in the Dawros_010 (RS32D010020). Water quality has improved in recent years in this waterbody, from Moderate Ecological Status in 2009, to Good Status in 2012 and 2015 and High Status in 2018. Prior to this, an EPA Q value of Q3 (Poor) was recorded in 2006, the first time High Status had not been achieved. It is not known what caused this significant decline in 2006, but it took until 2017 for recovery to Q4-5 (High) to be achieved. In 2018, the EPA biologist noted that this waterbody was in a highly satisfactory condition, although sensitive Perlidae stoneflies encountered in the 1990s remained absent. There is no hydrochemistry data available for this waterbody. Land cover in this sub-basin is dominated by peat bogs (> 70%), with areas of coniferous forestry and bare rocks located in the headwaters. Initial EPA characterisation identified forestry and hydromorphology (land drainage and river bank erosion) as significant pressures impacting on water quality in this sub-basin. The deskstudy conceptual model shows that the Dawros_010 sub-basin is covered with peat and poorly draining soils which lie over a poor aquifer, therefore, nitrate losses and groundwater to surface water connectivity is unlikely, although pathways may be provided via bedrock outcropping which is widespread across the sub-basin. There is potential for diffuse losses of phosphate, ammonia and sediment to surface waters via overland flow on the wet soils, but pollution impact potential (PIP) and susceptibility maps indicate the risk is low across the sub-basin.

In 2017, significant declines in water quality were recorded by EPA in the High Status objective RWBs downstream of the Dawros_010 where the sensitive *Margaritifera* populations are located. The Dawros_020 RWB deteriorated from High Ecological Status to Poor, and both Dawros_030 and Dawros_040 deteriorated from High Status to Moderate. Whilst these waterbodies downstream of Dawros_010 were not selected for inclusion in the PAA for implementation of the 2nd cycle RBMP, LAWPRO will be providing support and advice to Galway County Council and EPA so that the significant pressures on water quality can be identified and mitigated in these sub-basins. The Dawros_010 and the waterbodies downstream are also included in a European Innovation Partnership (EIP) project called the Pearl Mussel Project.

5.3 Traheen_010

The Traheen_010 RWB is a High Ecological Status objective waterbody and a protected drinking water river supplying the village of Letterfrack. This waterbody comprises three distinct, non-hydrologically connected rivers, and a fourth unmapped stream that flows through Letterfrack. Each of these river's discharge into Ballynakill Harbour, a protected shellfish area. Only one of these rivers is currently monitored, with an EPA operational monitoring station located on the Traheen River (RS32T010100), the river furthest to the west in this waterbody. EPA characterisation undertaken in 2015 determined that this waterbody was *At risk* for the 2nd WFD cycle as it was failing to achieve its High Status objective at the time. Water quality in the Traheen_010 has deteriorated recently to Good Ecological Status for the two most recent monitoring periods in 2015 and 2018, having previously achieved High Status in both 2009 and 2012. The failure to achieve High Status in recent years has been due to the invertebrate and biological status, with a decline in EPA Q values from Q4-5 (High) in 2012 to Q4 (Good) in 2014, before improvement to Q4-5 in 2017 and another subsequent decline to Q4 in 2018. It is unknown what is causing these fluctuations in water quality, but the EPA biologist noted that this may be a waterbody that straddles the boundary between High and Good Ecological Status (*pers. comm.*). Hydrochemistry data available from this monitoring station indicates that nutrient concentrations and oxygenation conditions are consistent with High Status. A one-off ammonia concentration of 0.66 mg/l recorded in February 2017 resulted in the annual mean exceeding the environmental quality standards (EQS) for High Status. It is not known what caused this isolated spike in ammonia concentrations at the Traheen_010 monitoring station in 2017. Land cover in this sub-basin is dominated by peat bogs (> 60%), with areas of coniferous forestry in the headwaters and land principally occupied by agriculture in some coastal areas. Initial EPA characterisation identified hydromorphology (overgrazing) and domestic wastewater (single house discharges) as significant pressures impacting on water quality in this sub-basin. The Letterfrack waste water treatment plant discharges to the unmapped stream that flows through Letterfrack, approximately 300m upstream of where this stream enters Ballynakill Harbour, and may also be a potential pressure impacting on water quality. The deskstudy conceptual model shows that the Traheen_010 sub-basin is predominantly covered with peat and poorly draining soils which lie over a poor aquifer, therefore, nitrate losses and groundwater to surface water connectivity is unlikely. There is potential for diffuse losses of phosphate, ammonia and sediment to surface waters via overland flow on the wet soils, with pollution impact potential (PIP) and susceptibility maps indicating some high-risk areas on poorly draining soils along the lower reaches of the Traheen River and in some coastal areas where the land is principally occupied by agriculture. The Sanicose model developed by EPA to inform risk assessment of domestic waste water treatment systems (DWWTSs) on waterbodies, identifies approximately 30 DWWTSs with very high phosphorous risk and potential impact to waterbodies in coastal areas within this sub-basin. Many of these DWWTSs are in areas of high susceptibility of phosphate losses to surface waters.

5.4 Cloonederowen_010

The Cloonederowen_010 RWB is unassigned and not routinely monitored as part of WFD monitoring programmes, therefore, it is at *Review* status and has a Good Ecological Status objective. This waterbody comprises two distinct, non-hydrologically connected rivers that discharge into Ballynakill Harbour, a protected shellfish area. There is no hydrochemistry or biological data available for this waterbody. Land cover in this sub-basin is dominated by peat bogs (50%), with areas of transitional woodland shrub and coniferous forestry in the headwaters and land principally occupied by agriculture along the coast. Initial EPA characterisation identified unknown anthropogenic pressures as a significant pressure impacting on water quality in this sub-basin, and this is likely to be associated with peat harvesting. Forestry and domestic waste water (single house discharges) were

also initially characterised as non-significant pressures. The deskstudy conceptual model shows that the Cloonederowen_010 sub-basin is predominantly covered with peat and poorly draining soils which lie over a poor aquifer, therefore, nitrate losses and groundwater to surface water connectivity is unlikely. There is potential for diffuse losses of phosphate, ammonia and sediment to surface waters via overland flow on the wet soils, with pollution impact potential (PIP) and susceptibility maps indicating high-risk areas on poorly draining soils in coastal areas where the land is principally occupied by agriculture. The Sanicose model developed by EPA to inform risk assessment of domestic waste water treatment systems (DWWTs) on waterbodies, identifies approximately 20 DWWTs with very high phosphorous risk and potential impact to waterbodies in coastal areas within this sub-basin. Many of these DWWTs are in areas of high susceptibility of phosphate losses to surface waters.

5.5 Cloon_010

The Cloon_010 RWB is unassigned and not routinely monitored as part of WFD monitoring programmes, therefore, it is at *Review* status and has a Good Ecological Status objective. Aughrusbeg Lake (currently at Poor Ecological Status due to fish status) which is also part of the Dawros PAA is located in the far west of the Cloon_010 sub-basin. Aughrusbeg Lake and the surrounding area within the west of the Cloon_010 sub-basin forms the Aughrusbeg Machair and Lake Special Area of Conservation (SAC). The unassigned Courhoor Lake to the south-west of Cleggan was not selected for inclusion in the PAA for implementation of the 2nd cycle RBMP. The Cloon_010 comprises several distinct, non-hydrologically connected rivers that discharge into Cleggan Bay and the Atlantic. There is no hydrochemistry or biological data available for this waterbody. Land cover in this sub-basin is dominated by peat bogs (55%), with areas of transitional woodland shrub and coniferous forestry in the south-east of the sub-basin, and land principally occupied by agriculture and natural grasslands in coastal areas. Initial EPA characterisation identified unknown anthropogenic pressures as a significant pressure impacting on water quality in this sub-basin, and this is likely to be associated with peat harvesting. Agriculture (pasture) and domestic waste water (single house discharges) were also initially characterised as non-significant pressures. The deskstudy conceptual model shows that the Cloon_010 sub-basin is predominantly covered with peat and poorly draining soils which lie over a poor aquifer, therefore, nitrate losses and groundwater to surface water connectivity is unlikely, although pathways may be provided via bedrock outcropping which is evident in coastal areas near Cleggan and the area surrounding Aughrusbeg Lake. There is potential for diffuse losses of phosphate, ammonia and sediment to surface waters via overland flow on the wet soils, with pollution impact potential (PIP) and susceptibility maps indicating high-risk areas on poorly draining soils in coastal areas where the land is principally occupied by agriculture, and other small areas of agricultural land beside Courhoor Lake and in the south-east of the sub-basin. The Sanicose model developed by EPA to inform risk assessment of domestic waste water treatment systems (DWWTs) on waterbodies, identifies approximately 50 DWWTs with very high phosphorous risk and potential impact to waterbodies in areas surrounding Aughrusbeg Lake. Many of these DWWTs are in areas of high susceptibility of phosphate losses to surface waters.

5.6 Aughrusbeg

Aughrusbeg Lake is located in the far west of the Cloon_010 sub-basin. The stream that flows east out of this lake reaches the Atlantic coast after approximately only 300m. EPA characterisation undertaken in 2015 determined that this waterbody was *At risk* for the 2nd WFD cycle as it was failing to achieve its Good Ecological Status objective at the time. Aughrusbeg is an oligotrophic lake with a surface area of 0.5 km², a mean depth of less than 4m and a maximum depth of 14m. Oligotrophic lake habitat 3110 is a habitat listed under Annex I of the EU Habitats Directive, and this lake and the

surrounding area forms the Aughrusbeg Machair and Lake Special Area of Conservation (SAC). Aughrusbeg Lake had been at Bad Ecological status in 2009, 2012 and 2015, but improved to Poor Status in 2018. Fish status and biological status has been driving the inadequate ecological status due to the presence of non-native Rudd in the lake, with all other biological and chemical parameters consistently achieving at least Good Status. Hydrochemistry is monitored at an EPA midlake surveillance and operational monitoring station (LS32000u402300010) where nutrient and chlorophyll concentrations are consistently low. A one-off total phosphorous concentration of 0.097 mg/l, which exceeds the environmental quality standards (EQS) for Good Status was recorded in November 2016; it is unknown what caused this isolated spike in phosphorous concentration. Initial EPA characterisation identified unknown anthropogenic pressures as a significant pressure impacting on water quality in this sub-basin. Agriculture (pasture) was also initially characterised as a non-significant pressure. The deskstudy conceptual model shows that the area surrounding Aughrusbeg Lake is predominantly covered with poorly draining soils which lie over a poor aquifer, therefore, nitrate losses and groundwater to surface water connectivity is unlikely, although pathways may be provided via bedrock outcropping which is evident in many areas surrounding the lake. There is potential for diffuse losses of phosphate, ammonia and sediment to Aughrusbeg Lake via overland flow on the wet soils, with pollution impact potential (PIP) and susceptibility maps indicating some high-risk areas on poorly draining soils around the western half of the lake where the land is principally occupied by agriculture. The Sanicose model developed by EPA to inform risk assessment of domestic waste water treatment systems (DWWTSs) on waterbodies, identifies approximately 50 DWWTSs with very high phosphorous risk and potential impact to waterbodies in areas surrounding Aughrusbeg Lake. Many of these DWWTSs are in areas of high susceptibility of phosphate losses to surface waters.

6 Work Plan

In order to identify the source of the pressures impacting on each of the water bodies and to identify appropriate mitigation measures, a catchment walk including rapid assessments, Small Stream Impact Scores and targeted chemistry sampling will be required. An estimate of fieldwork resources is outlined in **Section 6.5**.

6.1 Cloon_010 and Cloonederowen_010 Unassigned River Water Bodies

LCA for unassigned RWBs will be followed. Each tributary of the river sub basin will be monitored using SSIS, physico-chemical probes (DO, pH, temperature and conductivity), water sampling for nutrient analysis supported by a detailed site description and catchment walks across two seasons. The location of initial “bridge hops” for each of the tributaries have been identified in **Figure 10**. If the results suggest that the RWB(s) are significantly impacted, both water bodies will be recommended for inclusion in 3rd cycle Areas for Action for detailed pressures assessment.

6.2 Aughrusbeg Lake

The LWB is failing to meet its WFD Objective of Good Status primarily due to low and small fish populations as a result of competition between the non-native Rudd and native fish species. On this basis, local catchment assessments will not be undertaken, and in lieu, engagement with IFI and the EPA lakes team will be undertaken on this issue.

6.3 Traheen_010

The RWB has three distinct tributaries and potentially a fourth unmapped tributary within the river subbasin that flows northerly into the coastal water body. Only the most westerly tributary is monitored by the EPA and is currently *At Risk* of failing to meet its High Status Objective. This tributary is known locally as the Traheen River. The LCA strategy will initially be as described above for Cloon_010 and Cloonederowen_010, starting at the EPA operational monitoring station at Traheen Bridge. A catchment walk upstream of Traheen Bridge will be undertaken. A total of 4 potential LCA sites have been identified of 850m in length (**Figure 10**).

6.4 Dawros_010

This RWB is comprised of one main river channel (i.e. Kylemore River) with multiple first order streams entering this main channel due to the high hydrological density which is typical of this mountainous landscape. Water quality in this RWB has steadily improved during the last three monitoring cycles and in both 2017 and 2018 has achieved its High Status Objective. Therefore, the LCA will examine if this improvement has been sustained and if there are any protection measures required to prevent future deterioration.

6.5 Estimated Fieldwork resources

The resources required will depend upon the results of the initial local catchment assessment and the extent (if any) of impact along the rivers. Initially survey locations are located in the lower sections of each tributary where they cross a regional or local road to enable access. The Dawros_010 has one large, branched tributary and will be sampled at the location of the EPA monitoring station. The Traheen_010 has four distinct tributaries that are not hydrologically connected, the

Cloonederowen_010 has two distinct tributaries with the Cloon_010 having six distinct tributaries. Each of these will be assessed at the survey sites selected (13 locations) (**Table 7**).

Table 7: Resource Requirements for Spring Local Catchment Assessments

PAA Water Body Name	Initial No. of LCA Locations
Dawros_010	1
Traheen_010	4
Cloonederowen_010	2
Cloon_010	6
Total	13
Total people days required⁷	4

⁷ Based on two days of fieldwork for two catchment scientists.

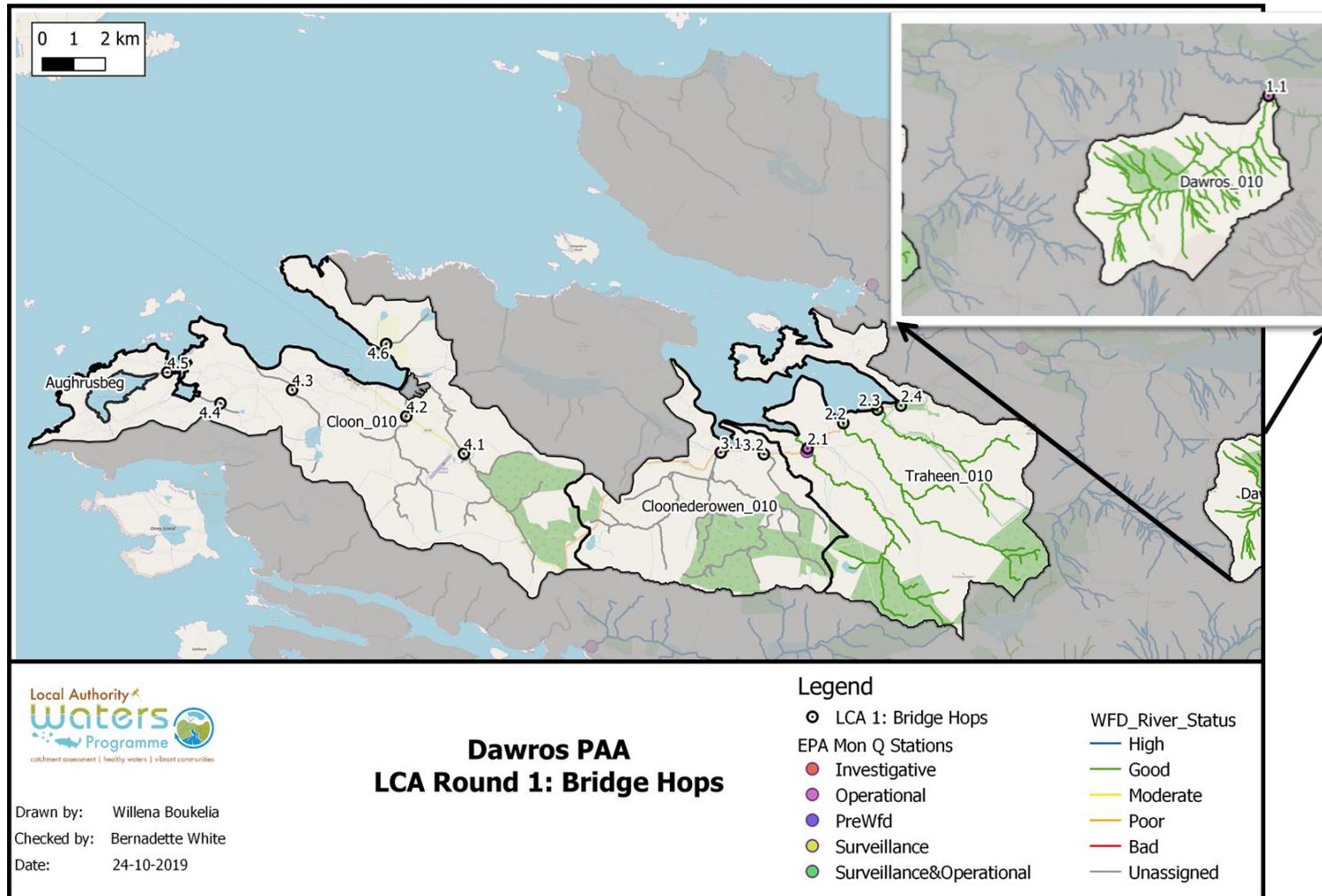


Figure 10: LCA Round one bridge hop locations

7 Mitigation Measures

Mitigation measures will be determined after the LCA has been completed and in consultation with relevant stakeholders.

The EPA have been tasked with investigating how to capture accelerated erosion processes as a pressure in upland sub catchments.

For Aughrusbeg Lake that is failing to meet it's WFD Objective due to the Fish element of Ecological Status. IFI have suggested two possible mitigation strategies (IFI pers. Comm).

- (1) The ideal measure would be to remove rudd, however this would most probably be impossible. Attempts have been made to remove perch from Lough Inagh and pike from some of the Owenriff catchment, but it would be an extremely difficult, if not impossible task to remove the rudd without having an impact on everything else.
- (2) The second measure would be to assess spawning potential for trout and introduce any measures that would improve trout recruitment to the lake. The catchment map shows no spawning streams, so most likely they are spawning on the shoreline.

8 Communications

8.1 Submissions on Draft RBMP

Submissions, observations and comments made by interested parties on the draft River Basin Management Plan (RBMP) for Ireland 2018-2021 were reviewed to identify any significant concerns raised about the waterbodies within the PAA or the surrounding area during the consultation process. Several submissions are listed below that emphasise the value of water bodies to fishing, recreation and a desired for a more targeted, joined up approach to tackling water quality issues was expressed.

Galway (all river waterbodies):

1. Details of your interest or concern: Misrepresentation of agriculture in the River Basin Management Plan for Ireland (2018-2021). More accurate figures should be produced to which reflect load factor impact from each of the sectors. Given that we have 43 direct discharge locations of raw sewage by local authorities.
2. Do you have a suggestion on how to improve the waterbody or address your concern? Yes, there is a need to streamline the huge number of inspections on farmers, and work with farming communities to deliver compliance with improved water quality rather than the current focus on enforcement and penalties.

Galway – IFI – Connemara:

1. What do you value most about this RWB? Sea Trout and Salmon
2. Relevant to interest? Fish, Trees, Public Access, Water Pollution, Water Quality, Invasive Species, Waste Water Sewage, Flooding, Erosion, Littering Dumping, Silt/Gravel.
3. Details of your interest or concern: Sea Trout Population
4. Do you have a suggestion on how to improve the waterbody or address your concern? Better management of fish farms.

5. Attended Maam Cross RBMP meeting.

Forum Connemara, Clifden Boat Club. (recreation group)

1. What do you value most about this waterbody? Maximising it's use while protecting and conserving it. Recreation and amenity valued.
2. Details of your interest or concern: Recreation & Conservation - To develop awareness & appreciation of our natural resources.
3. Do you have a suggestion on how to improve the waterbody or address your concern? To promote and ensure responsible recreation and use of our water. Education of our water and putting a value on it!

Connemara Environmental Education & Cultural Centre (CEECC) Letterfrack. (Community Group).

1. What do you value most about this waterbody? Not answered
2. Details of your interest or concern: Bigger role for education with emphasis on fieldwork.
3. Do you have a suggestion on how to improve the waterbody or address your concern? Real need for proper integrated planning - various bodies actually talking and working together over one overarching body!

Mayo (GMIT Third Level Education; Bundorragha river, Lough Lannath, Lough Mia, Lough Corrib, River Deel, Dawros River, Boluisce River.):

1. What do you value most about this RWB? The recreation opportunity - natural environment to tranquillity.
2. Relevant to interest? Trees, Heritage, Amenity, Recreational Activity, Public access, navigation, water pollution, water quality, invasive species, erosion,
3. Details of your interest or concern: Main concern is to ensure access to waterbodies for navigation and recreation.
4. Do you have a suggestion on how to improve the waterbody or address your concern? Unanswered.

8.2 Community Engagement Meeting

LAWPRO held a community information meeting at Forum Connemara in Letterfrack on the 4th of February 2019 to inform the public about our work and to hear about water quality concerns from people living in the area. The meeting involved two presentations by LAWPRO followed by a Q&A session with the attendees.

The meeting attendees queried how long it takes the macroinvertebrates to re-colonise a river after they have been killed off by a pollution event. A gentleman present stated that non-native rudd had been introduced to Aughrusbeg lake about 15 years ago by foreign anglers. Locals also outlined issues with algae in the lake in 1996 and 1997 and that the water became undrinkable.

For the Traheen_010 water body, locals recalled a significant forest fire taking place around 2007 that could have caused the decline in the water quality, and they commented that there is little else in the catchment with farming at low intensity. They also commented on domestic wastewater improvements made with upgrades to several faulty septic tanks in the area. A member of the Pearl Mussel Project Team attended the meeting and updated the group on the new EIP project involving a results-based agricultural scheme for farmers in the Dawros freshwater pearl mussel catchment.

8.3 Farmers Meeting

The Agricultural Sustainability Support and Advisory Programme (ASSAP) advisors from Teagasc held an information meeting for farmers within the PAA on 12th April 2019, where the advisors gave details of the supports available for farmers in this catchment. It was noted that the Pearl Mussel Project will be a significant opportunity for farmers in the Dawros River catchment as the farmers can be recognised and financially rewarded for delivering environmental benefits, for both biodiversity and for water. The LAWPRO and ASSAP Teams advised that they would be working closely with the Pearl Mussel Project Team throughout the lifetime of the Project.

Date of completion of desktop assessment: 24/10/2019

Appendix A – Protected Areas Within the Dawros PAA

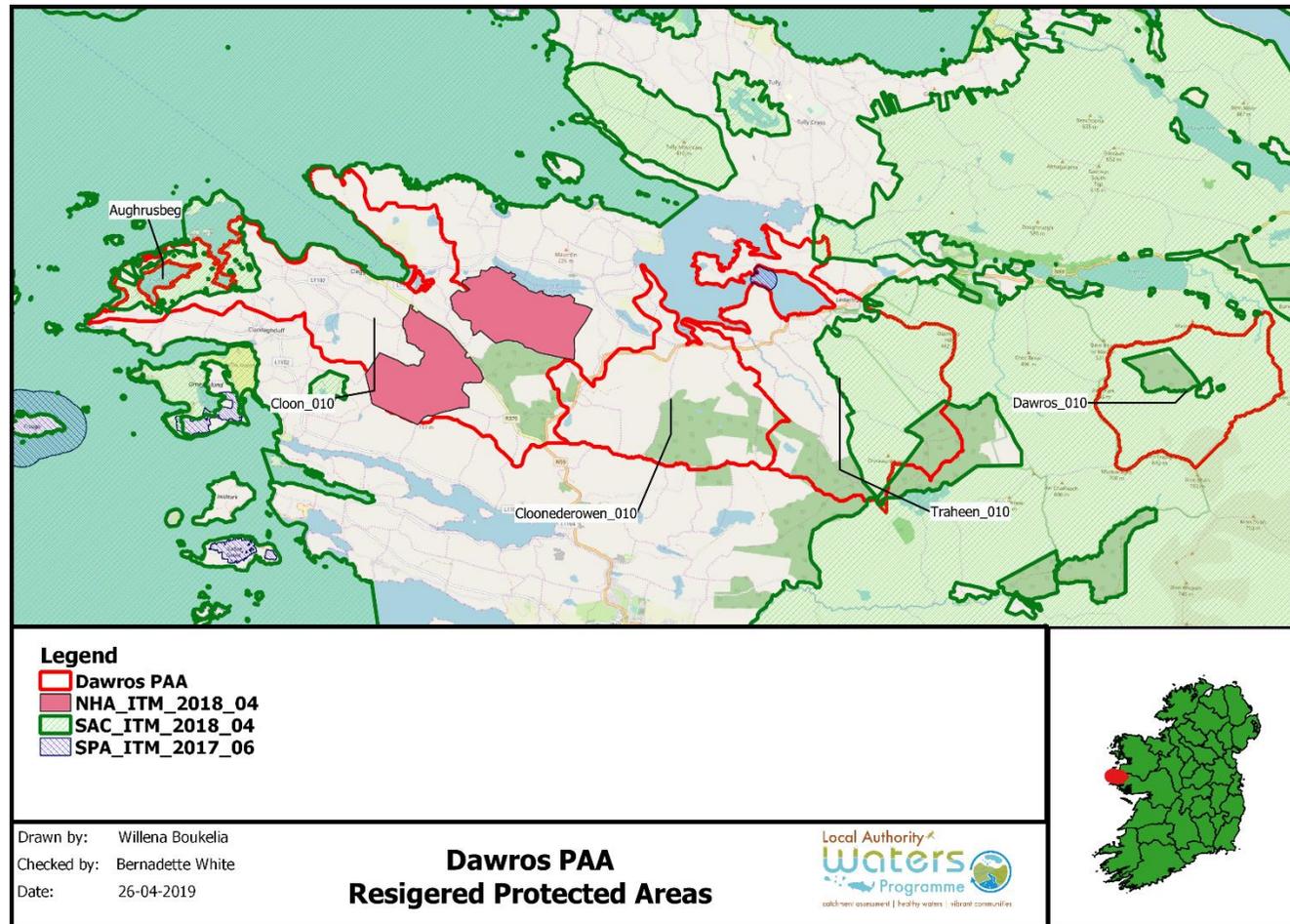


Figure A1: Conservation Sites in the vicinity of Dawros PAA

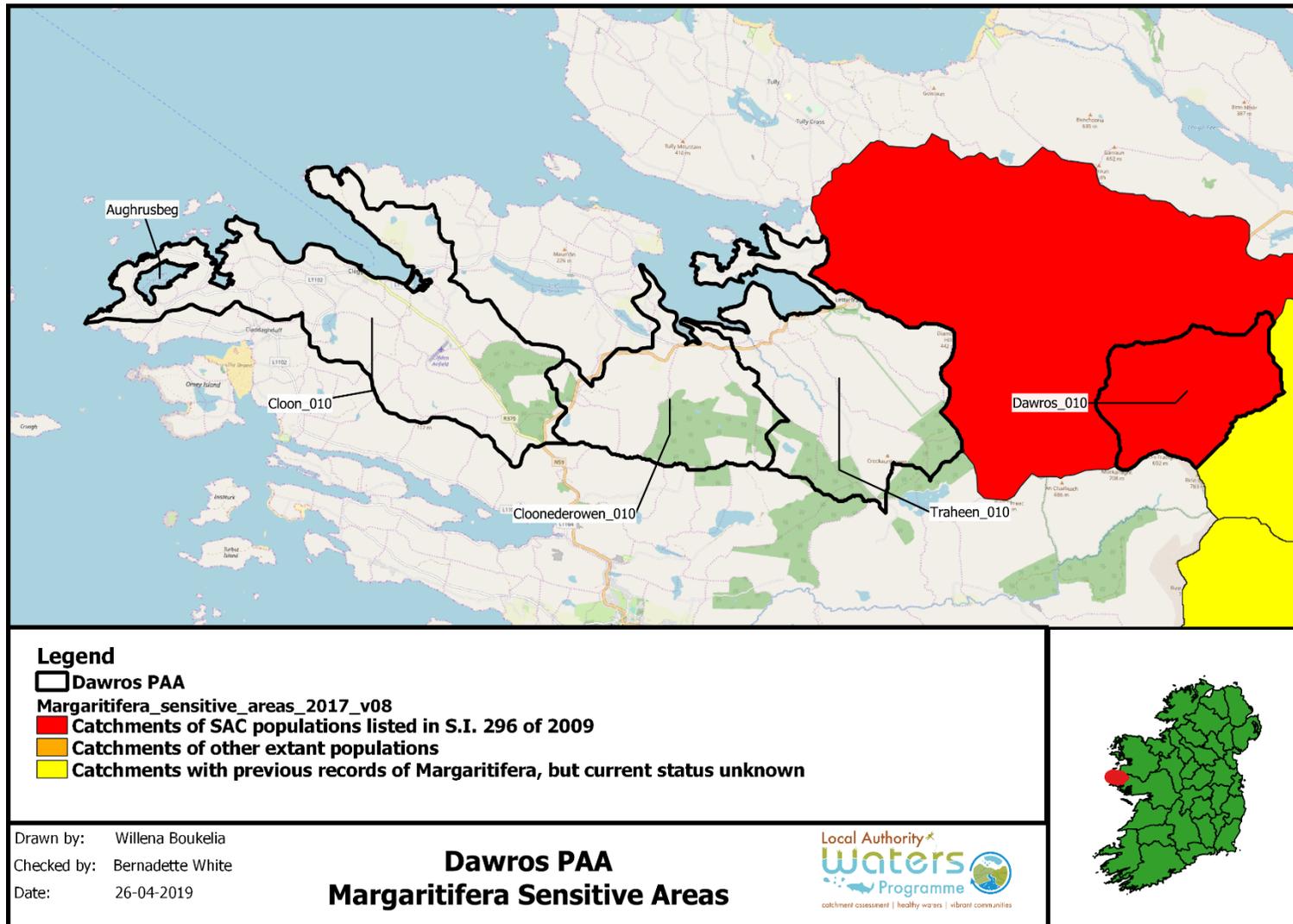


Figure A2: *Margaritifera* Sensitive Areas within Dawros PAA

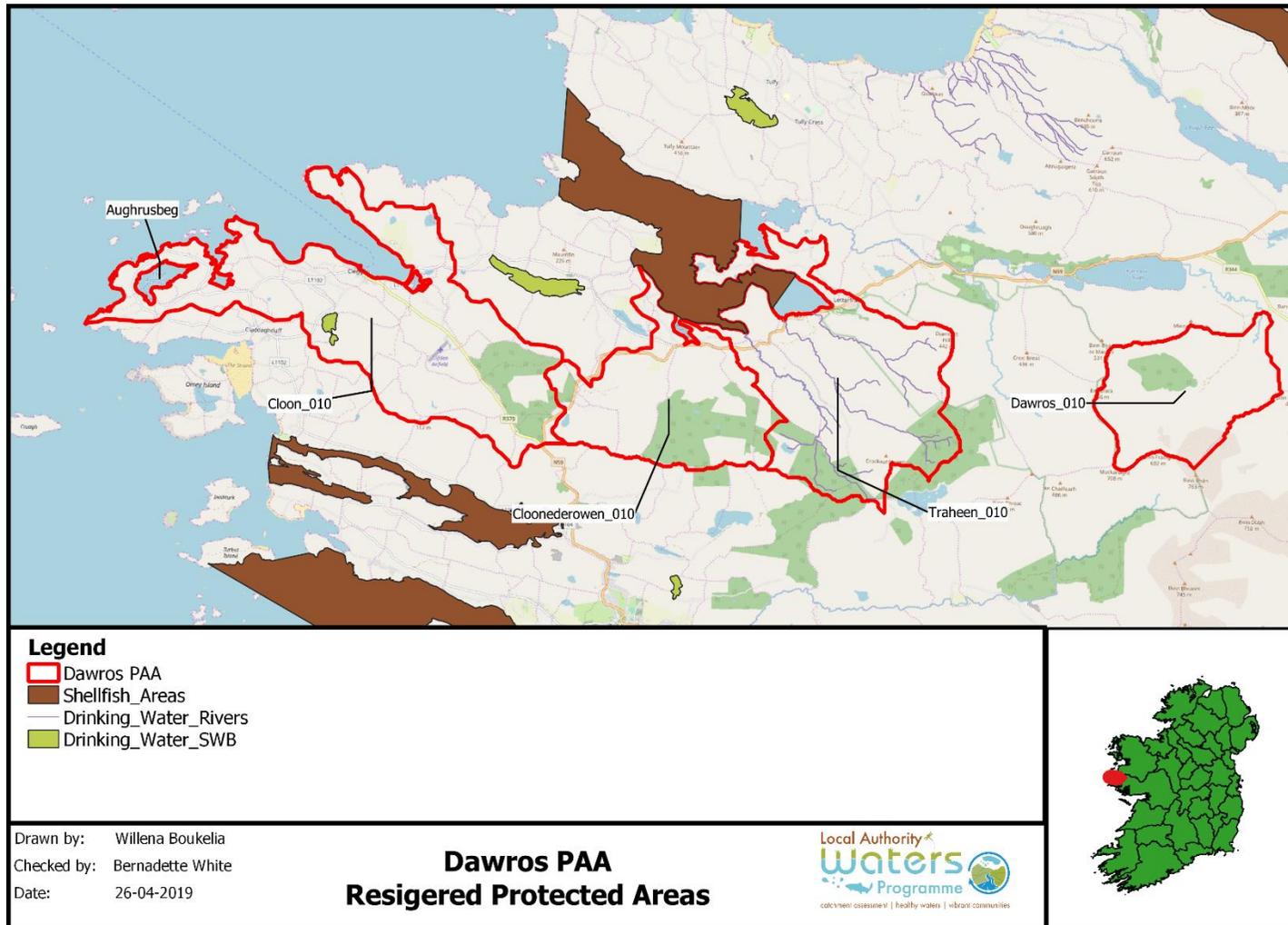


Figure A3: Shellfish areas and protected drinking waters within Dawros PAA

Appendix B – EPA River Quality Surveys: Biological for Hydrometric Area 32

Traheen_010

Date Report Generated: 26/04/2019

TRAHEEN

32T01

Date Surveyed (last survey year only): 29/08/18

Biological Quality Rating (Q Values)

Station Code	1982	1986	1990	1994	1997	1999	2006	2009	2012	2014	2017	2018
RS32T010100	4.5	5	5	4.5	4	4.5	4.5	4.5	4.5	4	4.5	4

Most Recent Assessment:

A return to good ecological condition from the previous high quality reported in 2017 was determined for the Traheen in 2018. Quality fluctuates between high and good in this river in the most recent assessments.

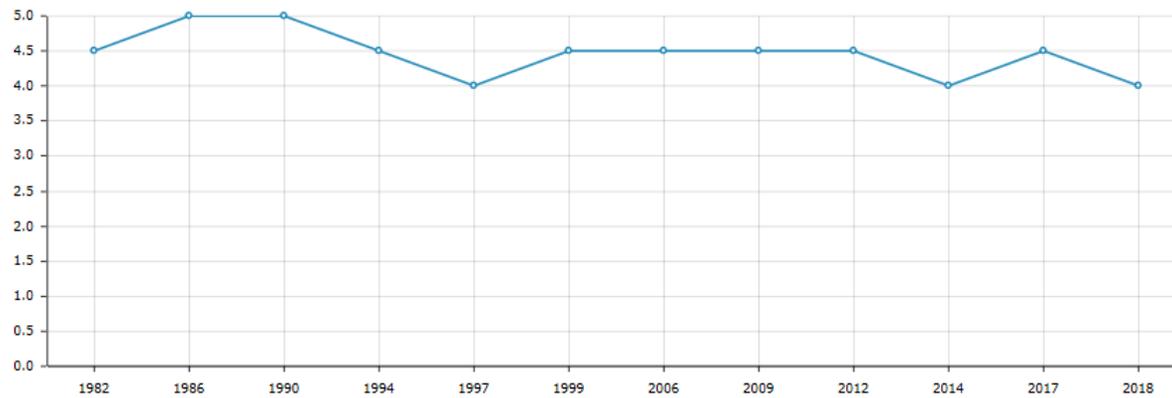
Station Details

Station Code	Station Location	WFD Waterbody Code	Easting	Northing	Local Authority
RS32T010100	Traheen Bridge	IE_WE_32T010100	68850	256673	Galway County Council

Monitoring Station: RS32T010100

Code	RS32T010100	Monitoring Type	RIVER_STATION
Station	Traheen Bridge	Easting	68850.24
Station Type	Operational	Northing	256673.94

Q Value - Chart



	1982	1986	1990	1994	1997	1999	2006	2009	2012	2014	2017	2018
Result	4.5	5	5	4.5	4	4.5	4.5	4.5	4.5	4	4.5	4
Classification	High	High	High	High	Good	High	High	High	High	Good	High	Good
Q-Value	4-5	5	5	4-5	4	4-5	4-5	4-5	4-5	4	4-5	4

DAWROS

32D01

Date Surveyed (last survey year only): 29/08/18

Biological Quality Rating (Q Values)

Station Code	1982	1986	1990	1994	1997	1999	2002	2006	2009	2012	2014	2017	2018
RS32D010020			5	4-5	5	4-5	4-5	3	3-4	4	4	4-5	4-5
RS32D010060							4						
RS32D010080							4-5				4-5	3	
RS32D010100	5	5	5	4-5	3-4	4-5	5		4-5	4-5	4-5	3-4	
RS32D010200	5	5	5	4-5	4-5	4-5	4-5	4-5	4-5*	4-5	4-5	3-4	3-4

Most Recent Assessment:

Highly satisfactory condition was noted in the headwaters of the Dawros upstream of Kylemore Lough (0020) although sensitive Perlida encountered in the 1990's remain absent from this waterbody. Station (0200) at Dawros Bridge has only seen slight improvement on the significant deterioration reported in 2017 and is still unsatisfactory in 2018.

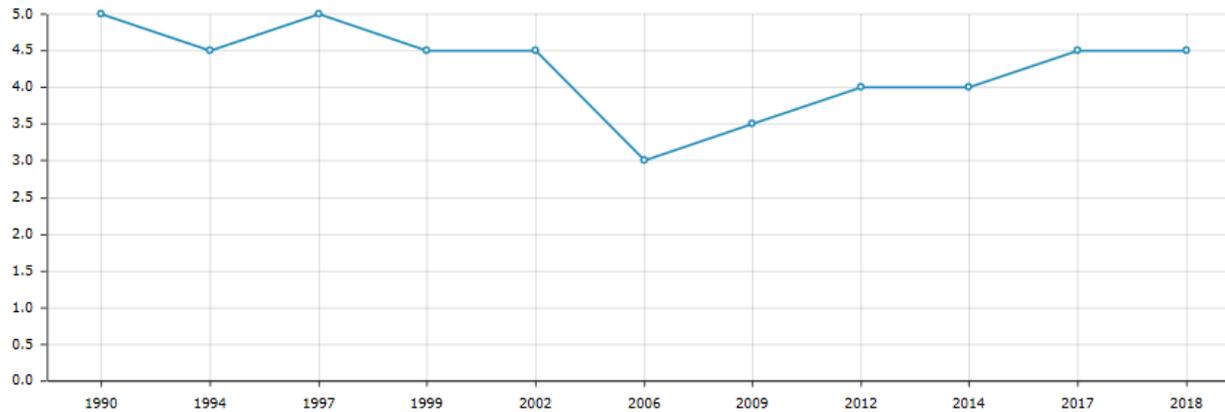
Station Details

Station Code	Station Location	WFD Waterbody Code	Easting	Northing	Local Authority
RS32D010020	Ford u/s Kylemore Lough	IE_WE_32D010020	80031	257438	Galway County Council
RS32D010060	DAWROS - Br d/s Pollacappul Lough	IE_WE_32D010080	74743	258316	Galway County Council
RS32D010080	DAWROS - D/s L. Maladrolaun	IE_WE_32D010080	74229	258595	Galway County Council
RS32D010100	Tullywee Bridge	IE_WE_32D010100	72966	258492	Galway County Council
RS32D010200	Dawros Bridge	IE_WE_32D010200	70177	259745	Galway County Council

Monitoring Station: RS32D010020

Code	RS32D010020	Monitoring Type	RIVER_STATION
Station	Ford u/s Kylemore Lough	Easting	80031.01
Station Type	Operational	Northing	257438.37

Q Value - Chart



	1990	1994	1997	1999	2002	2006	2009	2012	2014	2017	2018
Result	5	4.5	5	4.5	4.5	3	3.5	4	4	4.5	4.5
Classification	High	High	High	High	High	Poor	Moderate	Good	Good	High	High
Q-Value	5	4-5	5	4-5	4-5	3	3-4	4	4	4-5	4-5