



Islands Demonstration Catchment

Desk Study

October 2022

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Contents

Summary	8
1 Introduction	9
1.1 Background to Catchment	9
1.2 Summary Information	9
2 Receptor information & assessment.....	13
2.1 Context and Setting.....	13
2.2 WFD Information	13
2.3 Conclusion.....	20
3 Significant pressure information.....	21
3.1 Hydromorphology	21
Land Drainage.....	21
Historical Channelisation.....	23
3.2 Agriculture	24
3.3 Urban Wastewater.....	26
3.4 Peat Extraction.....	30
3.5 Forestry	30
4 Pathway information & analysis	32
4.1 Compartment 1.....	32
4.2 Compartment 2.1.....	32
4.3 Compartment 2.2.....	33
5 Interim Story of Islands Demonstration Catchment	40
5.1 Island_010.....	40
5.2 Island_020.....	40
5.3 Pollynoon_010	40
5.4 Springfield_010	41
5.5 Springfield_020	41
5.6 Island_030.....	42
6 Workplan.....	43
6.1 Island_010.....	43

6.2	Island_020.....	44
6.3	Pollynoon_010	46
6.4	Springfield_010	47
6.5	Springfield_020	49
6.6	Island_030.....	51
7	Review of mitigation options	54
	Appendix I: Protected area map, Islands Demonstration Catchment.....	55

Table of Figures

Figure 1: Schematic layout of the Islands Demonstration Catchment with 2013-2018 WFD status and risk data. Arrows are proportional to flow in the demonstration catchment.....	10
Figure 2: Overview of demonstration catchment waterbodies and their ecological status	11
Figure 3: High to extensive levels of natural sediment accumulation (peat) in Island_010.....	21
Figure 4: Land drains in Island_020	22
Figure 5: Land drains in Springfield_010.....	23
Figure 6: MQI map for the Islands catchment	24
Figure 7 Soil types in the Islands catchment.....	25
Figure 8: Surface water phosphate pollution impact potential map for the Islands catchment	26
Figure 9: Location of urban wastewater treatment plants in the Islands catchment	29
Figure 10: Forestry in the Islands catchment.....	31
Figure 11: Conceptual model compartments in Islands catchment	35
Figure 12: Bedrock Aquifer in Islands Catchment.....	35
Figure 13: Wet/dry soils map, Islands catchment	36
Figure 14: Rock units in Islands catchment.....	36
Figure 15: Groundwater vulnerability in Islands catchment	37
Figure 16: Subsoil permeability in Islands catchment	37
Figure 17: Karst features in the Islands catchment	38
Figure 18: Groundwater Nitrates Pollution Impact Potential map for the Islands catchment.....	39
Figure 19: Phosphate Pollution Impact Potential map for the Islands catchment.....	39
Figure 20: Location of LCA sites in Island_010.....	43
Figure 21: Location of LCA sites in Island_020.....	45
Figure 22: Location of LCA sites in Pollynoon_010	46
Figure 23: Location of LCA sites in Springfield_010.....	48
Figure 24: Location of LCA sites in Springfield_020.....	50
Figure 25: Location of LCA sites in Island_030.....	52

List of Tables

Table 1: Summary of ecological status and pressures for demonstration catchment.	12
Table 2 Summary of Q-Value, physico-chemical data for river waterbodies in Islands Demonstration Catchment.....	14
Table 3: Headroom utilisation (Q95 river flow) for Ballymoe UWW discharge.....	27
Table 4: Conceptual model table	33
Table 5: LCA sites in Island_010, parameters and reasons for selection.....	43
Table 6: LCA sites in Island_020, parameters and reasons for selection.....	45
Table 7: LCA sites in Pollynoon_010, parameters and reasons for selection	47
Table 8: LCA sites in Springfield_010, parameters and reasons for selection	48
Table 9: LCA sites in Springfield_020, parameters and reasons for selection	50
Table 10: LCA sites in Island_030, parameters and reasons for selection.....	52

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Information Sources Consulted

- EPA EDEN App
- Inland Fisheries Ireland, pers. comm.
- www.npws.ie
- Galway County Council environment section staff, pers. comm.
- Geohive maps
- www.centrestatisticsoffices.ie
- www.gsi.ie – groundwater body reports
- NFGWS, 2020. A Handbook for Source Protection and Mitigation Actions for Farming. Published by the National Federation of Group Water Schemes.
- National Certificate of Authorisation Programme SSRS Report for A0105 Ballymoe WWTP.

Summary

The Islands Demonstration Catchment (which is based on the Suck SC 020 subcatchment) is one of six pilot areas selected by the Waters of Life Project. The Waters of LIFE is an EU LIFE Integrated Project which aims to help reverse the deterioration of Ireland's most pristine waters.

The Islands catchment is in the west of Ireland, straddling counties Galway and Roscommon. It feeds into the larger River Suck and falls within the Upper Shannon Catchment. There are seven river waterbodies in the catchment. Only one of these (Island_030) is a Blue Dot waterbody, meaning that its Water Framework Directive (WFD) environmental objective is to achieve High ecological status. The remaining six waterbodies in the Islands catchment have a Good ecological status objective. However, the location of the Island_030 at the downstream point of the catchment means that all other rivers will influence it achieving its High status objective, which it is currently failing to do.

Across the catchment the most common pressure identified during initial characterisation was Agriculture, primarily pasture. In addition, urban wastewater was identified as a pressure in the Island_030 at Ballymoe and land drainage in Island_010.

Bedrock in the catchment is primarily pure bedded limestone with some areas of impure limestone. This results in conduit karst aquifers over the majority of the catchment. These are associated with Karst features which are quite common in the catchment. Soils vary across the catchment with peat and poorly drained soils most common though areas of well drained soils are present. This mix of soils results in surface pathways either overland or in drains being dominant in most of the catchment. However, in well drained areas or near karst features there are potential paths to groundwater and sub-surface pathways are important.

1 Introduction

1.1 Background to Catchment

The Waters of LIFE is an EU LIFE Integrated Project (IP) which aims to help reverse the deterioration of Ireland's most pristine waters. The Project will operate in five demonstration catchments nationally to test measures for the protection and restoration of High Status in Blue Dot rivers. The five demonstration catchments were selected from WFD subcatchments defined by the EPA. The selection process considered a number of criteria, including number and extent of significant pressures, status history and Q value amongst others. The project also includes one control catchment (the Sheen), which was selected on the basis that it consistently demonstrated High Status in the past and is currently *Not at Risk* of failing to meet its WFD objectives. See [Demonstration Catchment Selection Report](#) for further information on the catchment selection process.

The Islands was selected as one of the five demonstration catchments primarily due to the co-occurrence of agricultural pressures on High Status Objective rivers and the absence of the new ACRES Cooperation Project Areas. The Islands was selected using data for the Suck_SC_020 subcatchment. However, a small section of the subcatchment within the Suck_050 sub-basin was excluded from the demonstration catchment as it does not flow into the Blue Dot River of interest.

The Islands catchment is in the west of Ireland, and it straddles counties Galway and Roscommon. It feeds into the larger River Suck and falls within the Upper Shannon Catchment. There are seven river waterbodies in The Islands catchment which are Island_010, Island_020, Pollynoon_010, Springfield_010, Springfield_020, and Island_030 (**Figure 2**).

The Island_030 has a High status objective and is the largest sub-basin in the demonstration catchment. Its position at the lower reaches of the catchment means that all other rivers in the catchment are relevant to its condition as they contribute to it. All other rivers in the catchment are Good Status Objective. The status and risk classification of waterbodies in the catchment are outlined in **Table 1**.

1.2 Summary Information

A schematic layout of the Islands catchment, showing current WFD status and risk, is provided in **Figure 1**. **Figure 2** shows location of the Islands catchment, waterbodies within, monitoring locations and the latest ecological status. Summary information on WFD risk, objectives, ecological status, known pressures and associated significance for the waterbodies in the catchment is presented in **Table 1**. This is further summarised in the 'Receptor information and assessment' section.

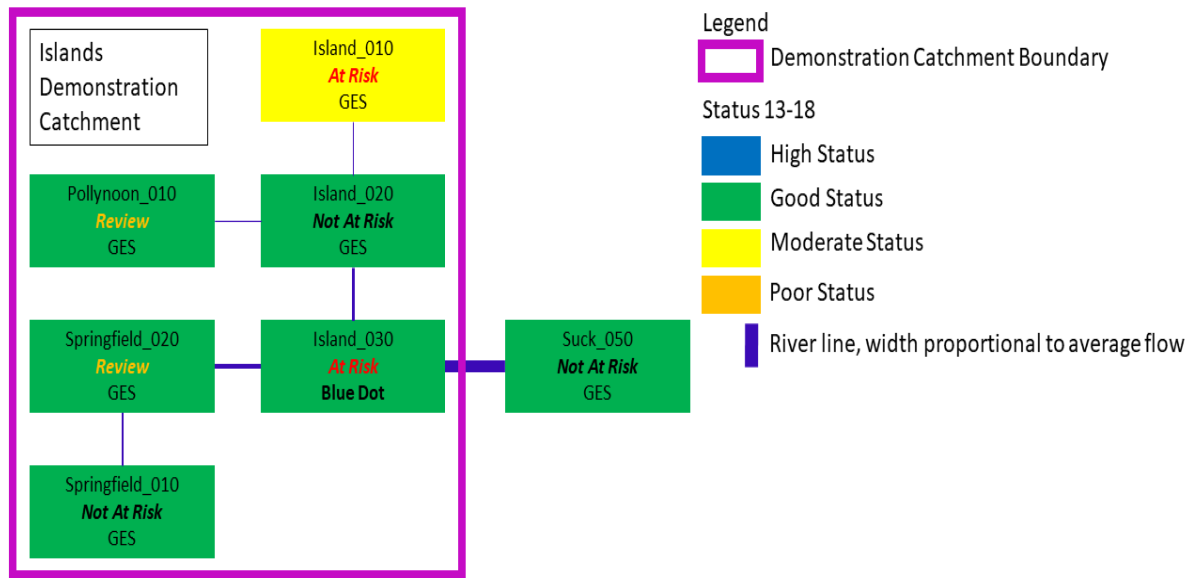


Figure 1: Schematic layout of the Islands Demonstration Catchment with 2013-2018 WFD status and risk data. Arrows are proportional to flow in the demonstration catchment

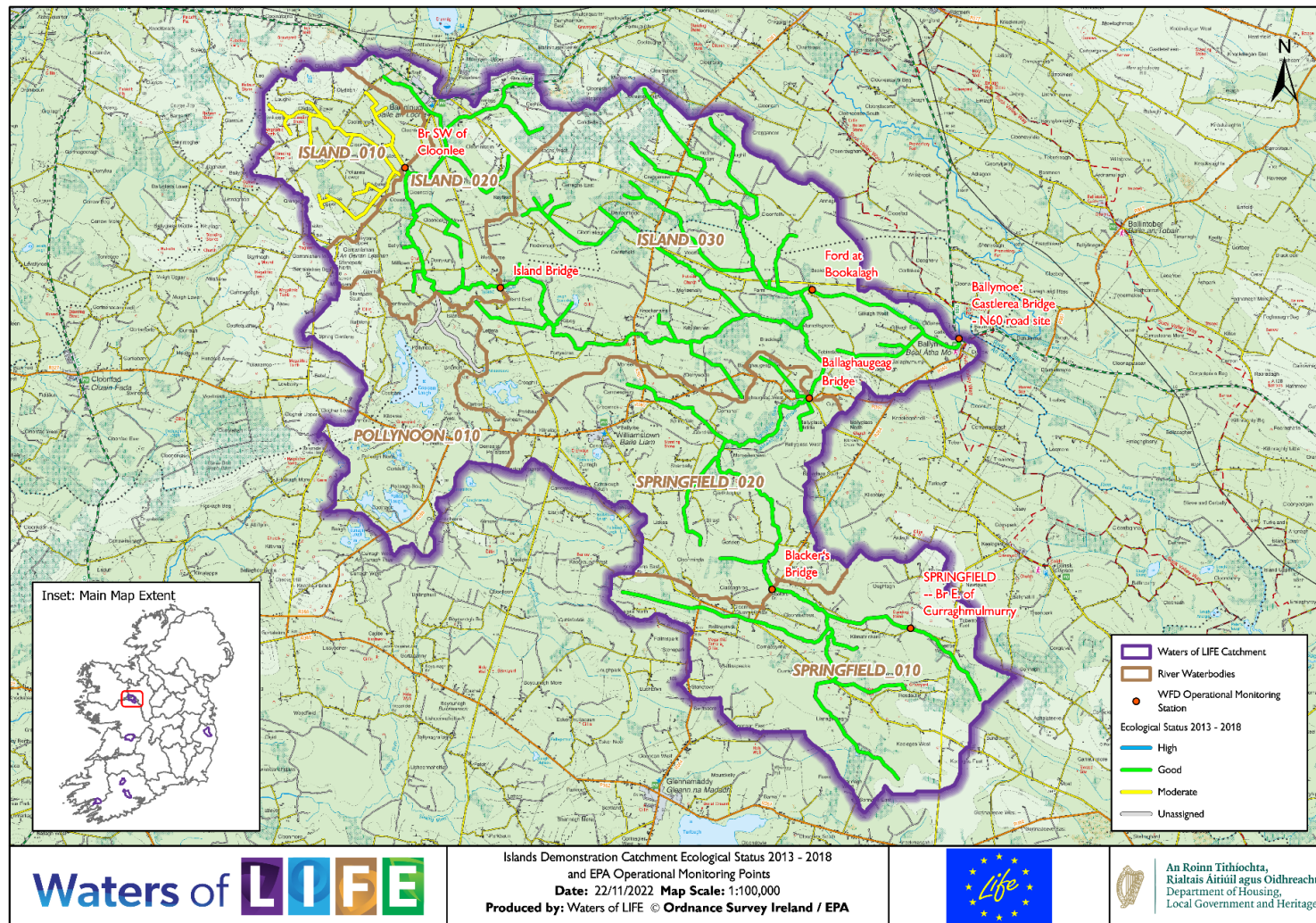


Figure 2: Overview of demonstration catchment waterbodies and their ecological status

Table 1: Summary of ecological status and pressures for demonstration catchment.

WB_Name	WB Code	WBType	Risk	High status obj.	Ecological Status				Pressure Category	Pressure Subcategory	Sig. Pressure?
					2007 – 2009	2010 – 2012	2010 – 2015	2013 – 2018			
Island_010	IE_SH_26I030040	RWB	AR	No	GES	GES	MES	MES	HYMO	Land Drainage	Yes
									Agriculture	Agriculture	
Island_020	IE_SH_26I030100	RWB	NAR	No	GES	GES	GES	GES	N/A	N/A	N/A
Springfield_010	IE_SH_26S050100	RWB	NAR	No	GES	GES	GES	GES	N/A	N/A	N/A
Springfield_020	IE_SH_26S050200	RWB	RE	No	GES	HES	GES	GES	Agriculture	Pasture	Yes
Island_030	IE_SH_26I030400	RWB	AR	Yes	HES	HES	GES	GES	Urban Wastewater	Agglomeration <500 - Ballymoe	Yes
Pollynoon_010	IE_SH_26P040810	RWB	RE	No	UN	UN	UN	GES	Agriculture	Pasture	Yes

RWB = River Waterbody, AR = At Risk, NAR = Not at Risk, RE= Review, GES = Good Ecological Status, HES = High Ecological Status

2 Receptor information & assessment

2.1 Context and Setting

The Islands Demonstration Catchment extends from the village of Ballinlough in the Northwest to the Townland of *Keeloges west* in the southwest and to the townlands of *Brackloon* and *Enfield* in the Northeast.

The Islands Demonstration Catchment is comprised of two major tributaries. In the southern section of the catchment, the Springfield river flows northwards from Kelloges West. The Springfield_010 becomes the Springfield_020 where it passes under the R364 at Blacker's Bridge. The Springfield continues northwards from here to enter the Island_030 sub-basin where it passes under the R360 in the townland of Ballaghaugeag.

The Island rises in the northwest of the catchment flowing towards the southeast. The Island_010 becomes the Island_020 south of Ballinlough and continues southeast to confluence with the Pollynoon_010 and form the border between Roscommon and Galway, becoming the Island_030 at Island Bridge. The Island_030, which is the Blue Dot waterbody of the demonstration catchment, continues flowing eastwards towards Ballymoe Village before leaving the demonstration catchment to join the river Suck.

There are a number of protected areas located in the Islands catchment. There are six Special Areas of Conservation and four National Heritage Areas. The National Heritage Areas are all bogs of various sizes while the Special Areas of Conservation are four turloughs and two bogs (Appendix I).

Topography is generally low lying within the catchment with a gentle undulating landscape. The land cover is primarily pasture interspersed with areas of cutover peat and transitional woodland scrub. There are two quarries in the catchment, located in Pollynoon_010.

The Islands catchment is primarily underlain by a regionally important karst conduit (Rkc) aquifer with some small areas of poorer aquifers in the north of the catchment. The main rock unit in the catchment is pure bedded limestones, with small pockets of impure limestones and mixed sandstone and shales. The bedrocks of the catchment result in a large number of Karst features throughout the area (**Figure 17**).

There is a mix of soils in the catchment with large areas of peat in the centre of the catchment and more well drained soils in the east and western edges Figure 7.

2.2 WFD Information

Table 2 presents water quality information for all the waterbodies in the Islands catchment. The status and trends of the quality elements monitored and the significant issues that may be impacting on the water bodies are also detailed.

Table 2 Summary of Q-Value, physico-chemical data for river waterbodies in Islands Demonstration Catchment

Waterbody		Island_010	Pollynoon_010	Island_020	Springfield_010		Springfield_020	Island_030	
Monitoring station		Br SW of Cloonlee (RS26I030040)	Pollynoon – Interstitial, Br u/s from Island 26 R conf (RS26P040810)	Island Bridge (RS26I030100)	Springfield–Br E. of Curraghmulmurry (RS26S050050)	Blacker’s Bridege (RS26S050100)	Ballaghaugeag Bridge (RS26S050200)	Ford at Bookalagh (RS26I030300)	Ballymoe: Castlereaa Bridge – N60 road site (RS26I030400)
Monitoring station type		Operational	Investigative	Operational	Operational	Operational	Operational	Operational (U/S of Ballymoe WWTP)	Investigative and Operational (D/S of Ballymoe WWTP)
Risk Category		At risk	Review	Not At Risk	Not At Risk		Review	At Risk	
Objective		Good	Good	Good	Good		Good	High	
Bio. Status			No Q value						
Q values	2011	4		4	4	4	4 – 5	4 – 5	4 – 5
	2014	3 – 4		4	4	4	4 – 5	4 – 5	4
	2017	3 – 4		4	4	4	4	4 – 5	4
	2018							4 – 5	4
	2019							4 – 5	
	2020	3 – 4		4	4		4 – 5	4 – 5	4
	2021					4		4 – 5	4
Fish		No Data	No Data	No Data	No Data		No Data	No Data	
Hydrochemistry Data									
PO4+ Ecological Threshold ≤0.025 (high status) ≤0.035 (good status) as an annual mean mg P/L									
PO4-P (mg/l)	2010		No Data	No Data	No Data		No Data		0.015
	2011								0.007
	2012								0.012
	2013								0.008
	2014								0.017
	2015								0.016
	2016							0.005	0.012
	2017							0.015	0.011
	2018								0.007
	2019								0.008

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Waterbody	Island_010	Pollynoon_010	Island_020	Springfield_010		Springfield_020	Island_030	
Monitoring station	Br SW of Cloonlee (RS26I030040)	Pollynoon – Interstitial, Br u/s from Island 26 R conf (RS26P040810)	Island Bridge (RS26I030100)	Springfield–Br E. of Curraghmulmurry (RS26S050050)	Blacker's Bridege (RS26S050100)	Ballaghaugeag Bridge (RS26S050200)	Ford at Bookalagh (RS26I030300)	Ballymoe: Castlerea Bridge – N60 road site (RS26I030400)
Baseline PO ₄ - P								0.011
NH ₄ ⁺ Ecological Threshold ≤0.040 (High status) ≤0.065 (Good status) as an annual mean mg N/L								
NH ₄ -N	2010							0.020
	2011							0.017
	2012							0.026
	2013							0.036
	2014							0.160
	2015							0.058
	2016							0.018
	2017							0.036
	2018							0.027
	2019							0.012
Baseline NH ₄ - N								0.044
NO ₃ -N. Surrogate Limit 0.9 (High status). 1.8 (Good status) as an annual mean mg N/l								
NO ₃ -N	2010							0.57
	2011							0.72
	2012							0.52
	2013							0.51
	2014							0.54
	2015							2.99
	2016						0.260	0.33
	2017						0.255	0.45
	2018							0.37
	2019							0.76
Baseline NO ₃ - N								0.78

Islands Desk Study

Waterbody	Island_010	Pollynoon_010	Island_020	Springfield_010		Springfield_020	Island_030	
Monitoring station	Br SW of Cloonlee (RS26I030040)	Pollynoon – Interstitial, Br u/s from Island 26 R conf (RS26P040810)	Island Bridge (RS26I030100)	Springfield–Br E. of Curraghmulmurry (RS26S050050)	Blacker’s Bridege (RS26S050100)	Ballaghaugeag Bridge (RS26S050200)	Ford at Bookalagh (RS26I030300)	Ballymoe: Castlereaa Bridge – N60 road site (RS26I030400)
Supporting Conditions: Chemical oxygenation and acidification conditions. BOD EQS for High Status: High status ≤1.3 (mean) or ≤2.2(95%ile)	No data available	No data available for this waterbody	No data available for this waterbody	No data available for this waterbody		No data available for this waterbody		BOD periodically elevated for a no. of years. 36% of BOD results exceeded the mean High status EQS from 2007 to 2016 . 9% of results exceeded the 95%ile limit. From 2017 no individual result has exceeded the 95%ile limit, with only one result marginally above the mean EQS. 18% of DO results have been below the lower EQS of 80% with 16% of results from 2017 below this lower limit.
Hydromorphology								
RHAT (2013-2015)	No data	No data	No Data	No Data		No Data	No Data	

Waterbody	Island_010	Pollynoon_010	Island_020	Springfield_010		Springfield_020	Island_030	
Monitoring station	Br SW of Cloonlee (RS26I030040)	Pollynoon – Interstitial, Br u/s from Island 26 R conf (RS26P040810)	Island Bridge (RS26I030100)	Springfield–Br E. of Curraghmulmurry (RS26S050050)	Blacker's Bridege (RS26S050100)	Ballaghageag Bridge (RS26S050200)	Ford at Bookalagh (RS26I030300)	Ballymoe: Castlereagh Bridge – N60 road site (RS26I030400)
Evidence of drainage (OPW Scheme, Drainage District or other)	There is no OPW Scheme or district drainage in the Island_010. The IFI have identified land drainage and animal access as a pressure in the Island_010. From aerial imagery the river seems to be straightened, at the monitoring point and upstream of the monitoring point. Viewing Geo Hive maps, there were waterbodies in the 1800s, that are no longer there in the present day. There are also a large number of land drains leading into the main channel of the river.	There is no OPW scheme or drainage district in this waterbody, however there are a significant number of land drains feeding into the main river channel. From aerial imagery, there are a number of channels that have been opened since the 1800s, leading away from peatland and agricultural land.	There is no OPW Scheme or district drainage in the Island_020. From aerial imagery the river seems to be straightened, especially around the peat areas, where peat is currently being extracted for individual domestic use.	There is no OPW Scheme or district drainage scheme in Springfield_010. From aerial imagery the river seems to be straightened, especially around the peat areas, where peat is currently being extracted for individual domestic use. There is also stretches of the river straightened in the headwaters in the northwest of the sub-basin.		There is no OPW Scheme or district drainage in Springfield_020. From aerial imagery the river seems to be straightened in sections. Immediately upstream of the EPA monitoring point there are two straightened channels flowing into the main river channel. Also, approximately 2.5km upstream of the monitoring point there is a 1 st order stream that is straightened and also a 2 nd order stream which has been straightened.	There is no OPW Scheme or district drainage in the Island_030, however there are drainage channels coming from agricultural land and peatland leading to the main river channel. Aerial imagery shows river spoil on the banks of the river upstream of the Ballymoe Castlereagh Bridge – N60 road site monitoring point. From aerial imagery, there are a number of channels that have been opened since the 1800s, leading away from forestry, peatland, and agricultural land to the river channel.	

Islands Desk Study

Waterbody	Island_010	Pollynoon_010	Island_020	Springfield_010		Springfield_020	Island_030	
Monitoring station	Br SW of Cloonlee (RS26I030040)	Pollynoon – Interstitial, Br u/s from Island 26 R conf (RS26P040810)	Island Bridge (RS26I030100)	Springfield–Br E. of Curraghmulmurry (RS26S050050)	Blacker's Bridge (RS26S050100)	Ballaghaugeag Bridge (RS26S050200)	Ford at Bookalagh (RS26I030300)	Ballymoe: Castlereagh Bridge – N60 road site (RS26I030400)
EPA Biologist comments	The site 26I030040 on the ISLAND river was sampled in 2017. A total of 18 invertebrate taxa were recorded. There were 0 sensitive mayfly and 0 sensitive stonefly found at the site. This absence of sensitive taxa is most often a key indicator of failure to achieve good ecological status or higher. The results of an examination of key tolerant taxa found: Simuliidae (Absent), Gammarus (Few) and Baetis rhodani (Common). The Q value assigned to this site was 3-4, indicative of moderate conditions.	Not monitored by EPA		Good ecological condition persists on the Springfield Stream in 2017 but a decline from highly satisfactory ecological conditions was noted at Ballaghaugeag Bridge (0200).				

Islands Desk Study

Waterbody	Island_010	Pollynoon_010	Island_020	Springfield_010		Springfield_020	Island_030	
Monitoring station	Br SW of Cloonlee (RS26I030040)	Pollynoon – Interstitial, Br u/s from Island 26 R conf (RS26P040810)	Island Bridge (RS26I030100)	Springfield–Br E. of Curraghmulmurry (RS26S050050)	Blacker's Bridge (RS26S050100)	Ballaghaugeag Bridge (RS26S050200)	Ford at Bookalagh (RS26I030300)	Ballymoe: Castlereagh Bridge – N60 road site (RS26I030400)
Significant issue: monitoring point	Hydromorphology. Unknown if nutrients are an issue due to lack of chemistry.	Unknown	Waterbody is achieving its Good status objective. No known issues here	Achieving Good status at this WFD monitoring point. No known issues here	Achieving Good status at this WFD monitoring point. No known issues here	Good status objective. Q4-5 in most recent survey (2020). No issues at the monitoring point.	No issue	Ammonium and BOD significant issues in the past but data show this hasn't been the case since 2016 and 2017 respectively.
Significant issue: Waterbody	Potentially Hydromorphology	Unknown	No known issues on a waterbody wide scale.	No known issues on a waterbody wide scale.		No known issues on a waterbody wide scale.	Ammonium and organic pollution up to 2017. Recent data indicate these are no longer an issue. Periodic low DO, which could be linked to organic pollution, excessive plant/algal growth or sediment issues. Further investigation needed	

2.3 Conclusion

- Island_010 status has remained at Moderate status in the 2013 – 2018 monitoring period due to the biological component. There are no chemistry data available. The significant pressures impacting upon this waterbody identified at initial characterisation stage were land drainage and agriculture. The desk study also highlights hydromorphology as a potential pressure.
- Pollynoon_010 is at Good status with status assigned via extrapolation. No monitoring data are available. One significant pressure was identified at initial characterisation which was agriculture. This waterbody is an inputting river to Island_020 and it is recognised by the IFI as an important river due to the presence of salmon and trout (IFI pers. comm.).
- Island_020 has been at Good ecological status, meeting its WFD objective, since monitoring began. There are no pressures assigned to this waterbody, although there is a high density of land drainage in the sub-basin.
- Springfield_010 has been at Good ecological status since monitoring began. Land drainage is a pressure that needs to be investigated as there is a significant network of drains upstream of the monitoring point, Blacker's Bridge.
- Springfield_020 has been at Good or High status since monitoring began. However, Risk is at *Review*. Agriculture has been listed as a pressure on this waterbody.
- Island_030 is a High status objective river waterbody. The ecological status of the river is determined by the biological component. At the monitoring point Ford at Bookalagh the biology is at High status, while status at the Ballymoe Castlerea Bridge monitoring point is Good. There have been spikes in both ammonium and BOD pre-2018, but more recent data indicate no issue with either. The significant pressure identified at initial characterisation stage (2015) was Urban Wastewater associated with Ballymoe WWTP. This is discussed further in Section 3 below.

3 Significant pressure information

3.1 Hydromorphology

Land Drainage

Hydromorphology in the form of land drainage was identified as a significant pressure on the Island_010 waterbody during initial characterisation (2015), while the impact identified was altered habitat. Land drainage is prominent throughout this demonstration catchment, a high proportion of land drains are located in Island_020, and Springfield_010 (see **Figure 4** and **Figure 5** below). These drains are in areas where the soil type is peat and poorly drained soil.

These networks of drains will add high volumes of water to the river waterbodies at a quicker rate than normal, the drains will also transfer excess sediment to the waterbody. **Figure 3** illustrates that the levels of natural sediment accumulation of peat would be expected to be high within the river channel.

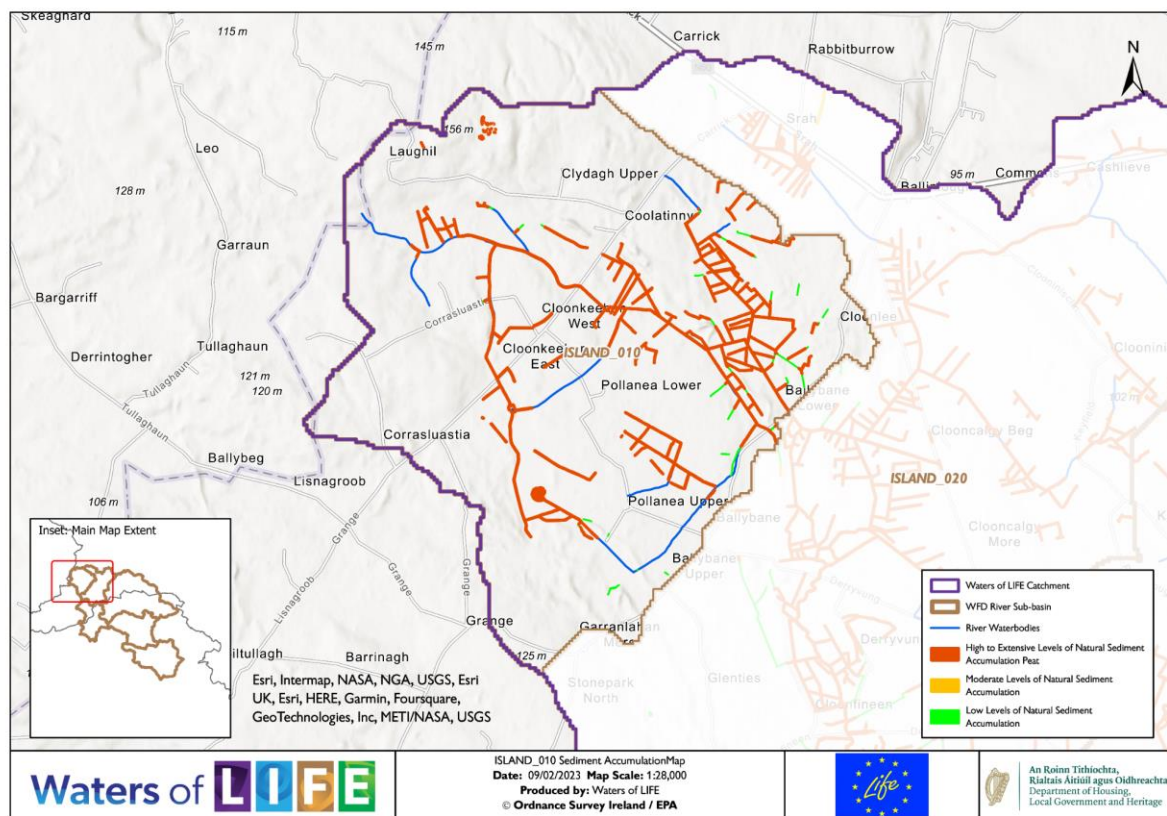


Figure 3: High to extensive levels of natural sediment accumulation (peat) in Island_010

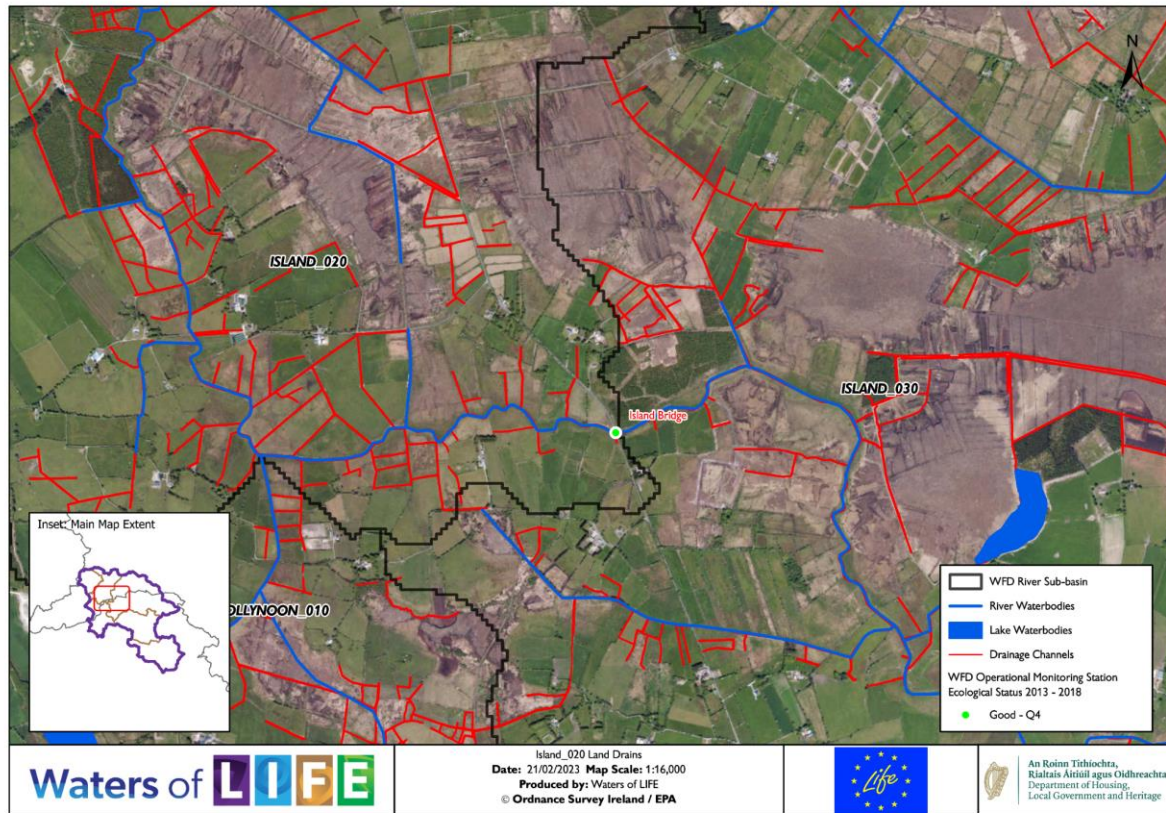


Figure 4: Land drains in Island_020

Land drains are situated immediately upstream of the WFD operational monitoring point, Island Bridge in Island_020, as seen in **Figure 4**. This monitoring point has remained at good biological status since 1996. There is also a large network of land drains immediately upstream of the EPA Operational monitoring point Blacker's Bridge in Springfield_010, seen in **Figure 5**. This monitoring point has remained at Good biological status since 2008, recovering from moderate biological status in 2006 and Poor in 2002.

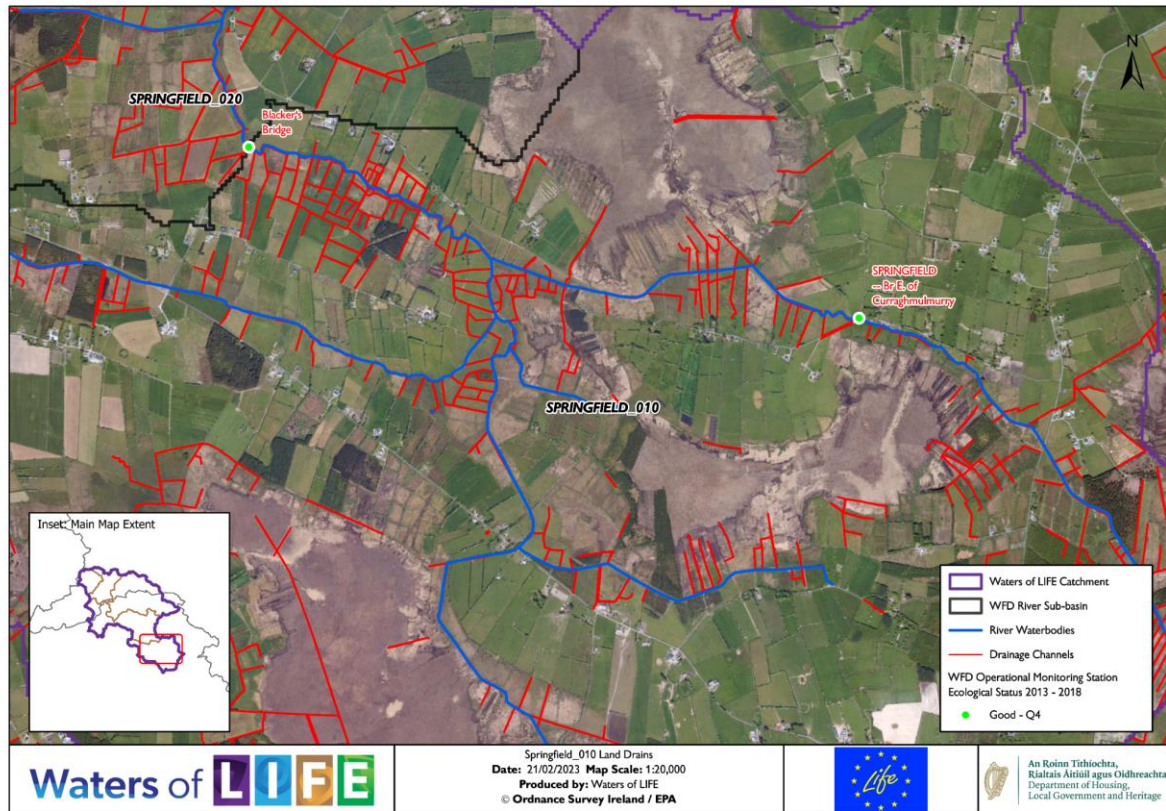


Figure 5: Land drains in Springfield_010

Historical Channelisation

The Suck drainage district includes sections of the Suck_050 immediately downstream of the Demonstration catchment. However, none of the rivers in the demonstration catchment are part of a drainage district or arterial drainage scheme.

A review of aerial imagery and historic mapping of the waterbodies in the demonstration catchment was undertaken.

Island_010 - has been historically channelised and also contains an old mill dam located just upstream of the EPA operational monitoring point. There may be some sediment deposition on the upstream side of the dam, protecting the downstream waterbody. This should be investigated in the local catchment assessment for Island_010

Island_020 - the main channel appears generally undisturbed. There are a number of small channels which were not present in the 1800s feeding into the river waterbody in the present day. There was a mill dam and race present on one of these new channels (Map or point on map?).

Island_030 - historical maps showed that there were also a number of mills which would have had dams present. These features would have altered the river channel and disrupted the natural flow regime and transport of sediment in the natural environment of the river waterbodies in this demonstration catchment.

Figure 6 highlights the Morphological Quality Index (MQI) of the Islands catchment, the majority of the catchment is dominated by moderate MQI stretches, features such as confining walls, farm bridges, roads and bridges are present on most of the MQI stretches in this catchment.

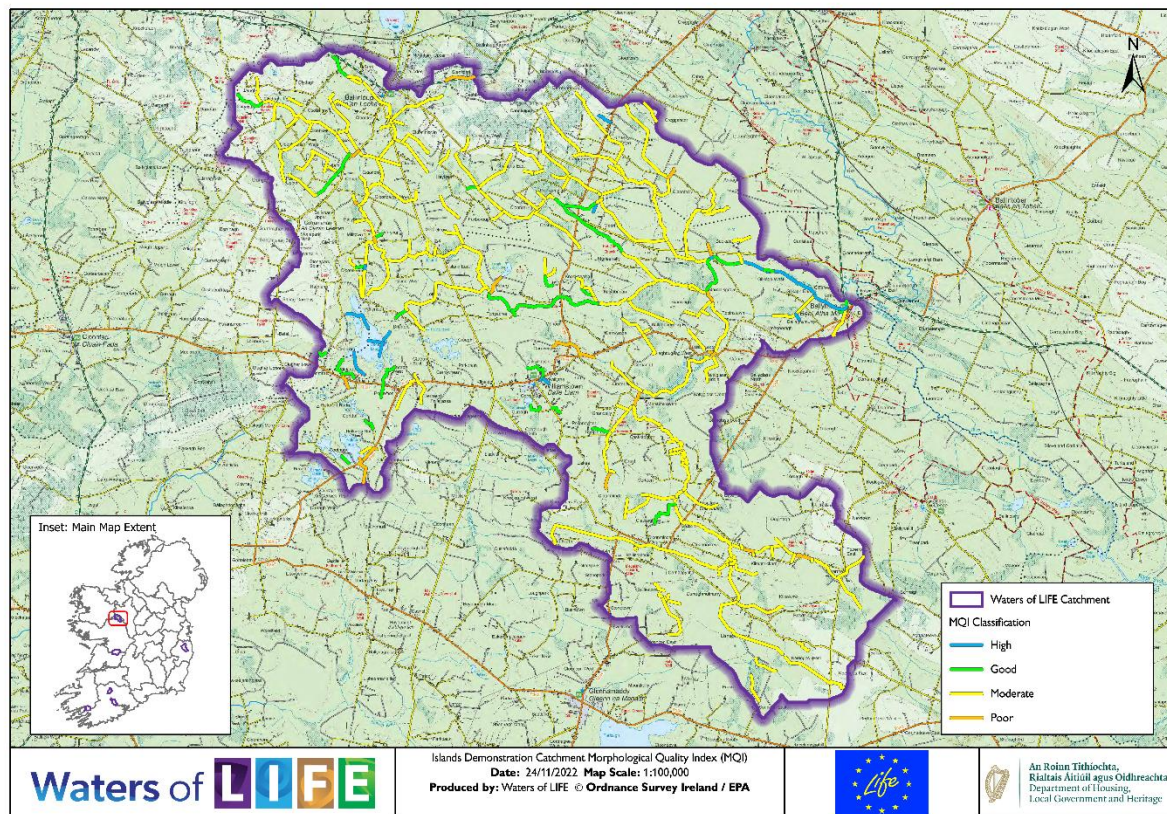


Figure 6: MQI map for the Islands catchment

3.2 Agriculture

Agriculture was identified as a significant pressure on the Island_010 and Pollynoon_010 river waterbodies in the EPA initial characterisation (2015). For Island_010, the impact was organic pollution while nutrient pollution (phosphate) was identified as the issue in Pollynoon_010. For the third cycle characterisation, agriculture in the form of pasture has been identified as a significant pressure in Springfield_020. Diffuse pollution is suspected of causing a decline in water quality here in 2017. However, biological status of the river improved to High in 2020.

Soil type in the Islands catchment is a mix of well drained and peat/poorly drained as seen in **Figure 7**. The majority of the catchment consists of peat/poorly drained soil, while there are small areas of well-drained soil in Island_010, Pollynoon_010, Springfield_010 and springfield_020.

In the peaty and poorly drained areas, where overland and near surface flow are the dominant pathways, loss of phosphorus and sediment to the river are the most likely issues. In areas where peat

has been drained, there is also potential for the loss of ammonium from decomposing peat. In contrast, in the well-drained areas of the catchment, deeper flow paths are dominant. Here there will be attenuation of phosphate in the soil. However, in these areas there will be little attenuation of nitrate which will travel through the well drained soil to the groundwater.

As noted in the land drainage pressure section, there are a number of land drains present in the waterbodies in this catchment, particularly Island_020 and Springfield_010. These drains can transport sediment to the waterbody and also ammonium released from worked peat soil where land is under agriculture or peat extraction. The majority of farms in the catchment are non-derogation farms, however there are a number of derogation farms located in Island_030 and Springfield_020.

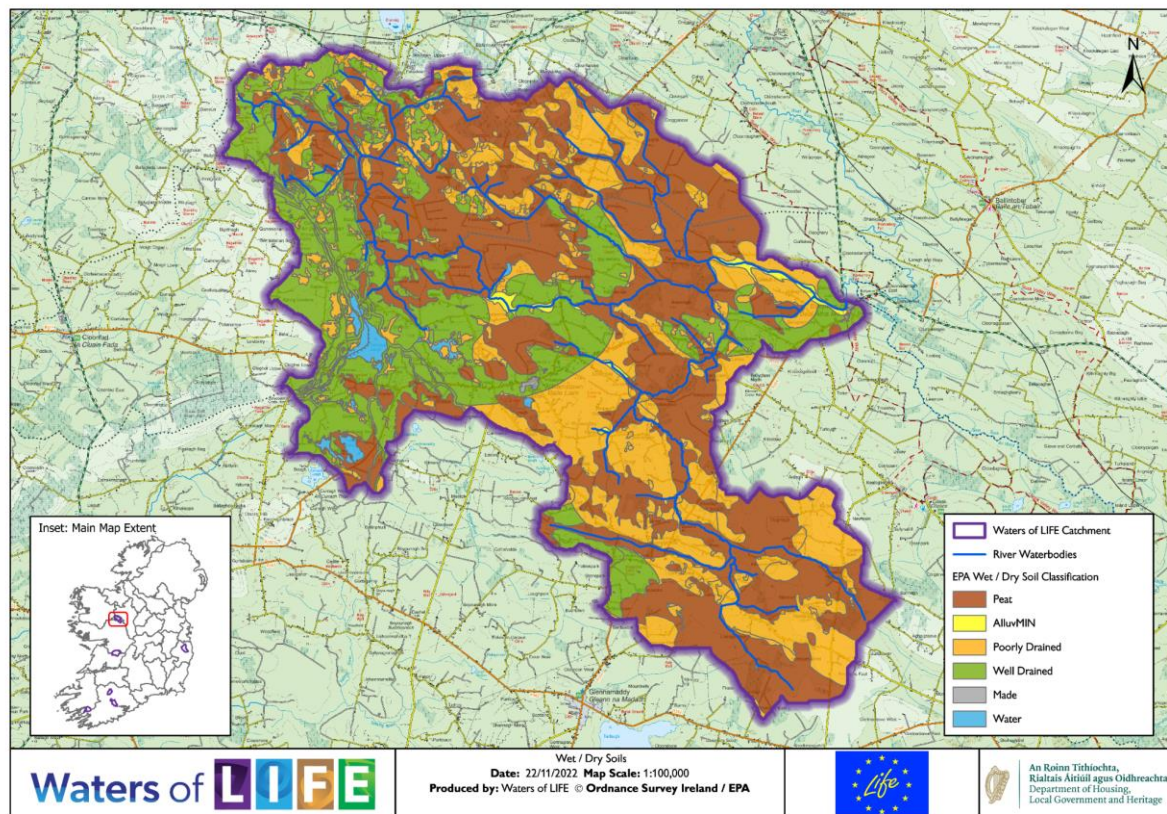


Figure 7 Soil types in the Islands catchment

The surface water phosphate Pollution Impact Potential (PIP) map is shown in **Figure 8**. In this figure, the darker the colour, the greater the potential risk of phosphate loss from critical source areas to the river. Large areas of rank 1 (highest risk of loss) to rank 3 PIP are located in Springfield_010 and Springfield_020 around the river. There are also large areas in Island_030 upstream of the EPA monitoring point in Ballymoe. These are high risk areas because, in the absence of mitigation measures, excess phosphate would be easily transported to the river. There is a lack of chemistry data for Springfield_010, Springfield_020, and no data for the EPA Operational monitoring point Ford at Bookalagh in Island_030, which makes assessment of the issue more difficult. However, the monitoring points on these rivers are returning Good or High biological status results.

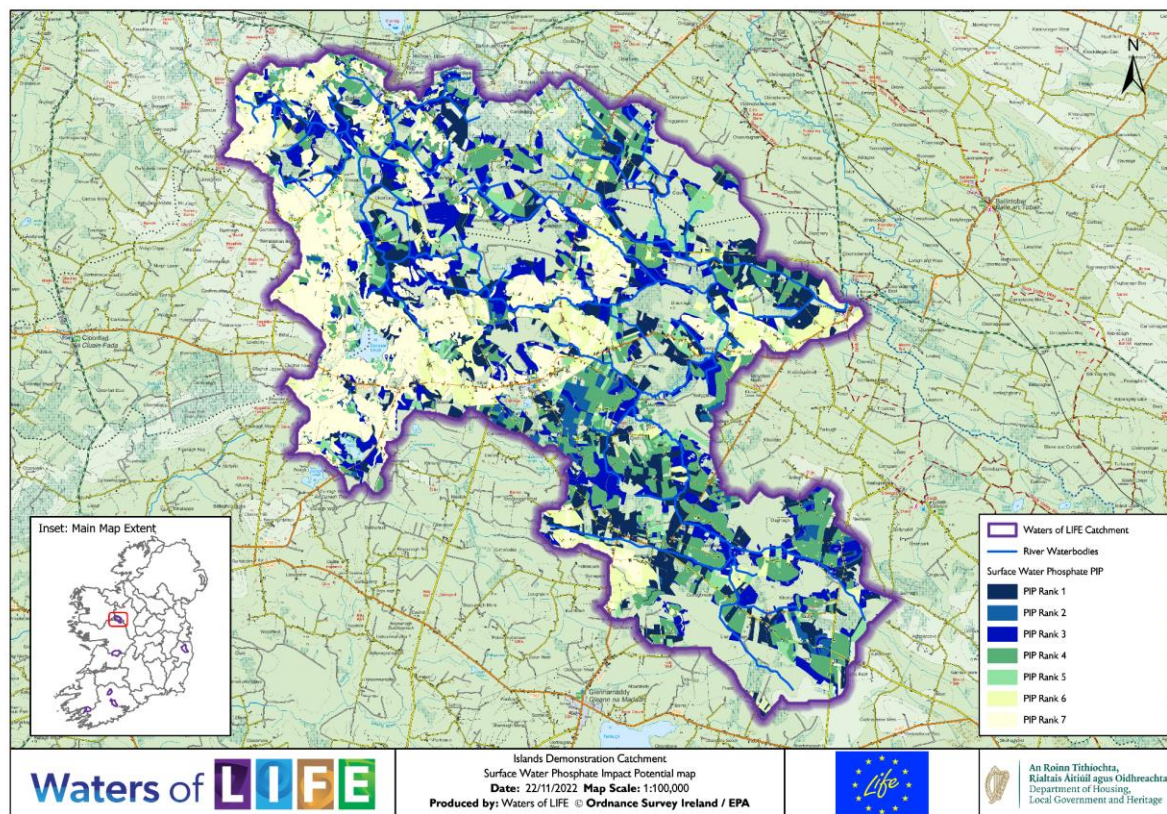


Figure 8: Surface water phosphate pollution impact potential map for the Islands catchment

3.3 Urban Wastewater

The wastewater treatment plant (WWTP) in Ballymoe (**Figure 9**) was identified as a significant pressure on the Island_030 waterbody during EPA initial characterisation (2015), with the impact identified as both organic and nutrient pollution. From characterisation information in the WFD App, the plant is susceptible to wash through due to lack of stormwater controls in the network and also flooding. The WWTP operates under Certificate of Authorisation (CoA) number A0105_01, with a population equivalent of <500. The plant comprises primary treatment (septic tank) only. According to application documents, the plant capacity is 290 PE and in 2011, the agglomeration PE was 221.

Effluent discharges into Island_030 approximately 140m upstream of the EPA monitoring point in Ballymoe, Castlerea Bridge - N60 road site, which is currently achieving Good biological status. The upstream monitoring point, Ford at Bookalagh, is at High biological status, consistently achieving a Q4-5 over fifteen surveys since biological monitoring commenced here in 1981. The WFD objective for the waterbody is High ecological status, therefore due to the Good biological status at the Castlerea Bridge station, this waterbody continues to fail to meet its objective.

More recent Q value assessments at the monitoring point downstream of the discharge (Castlerea Bridge - N60 road site) (2018, 2020 and 2021) all resulted in a Q4. The last survey in which a Q4-5 was achieved here was in 2011. Between the 2011 and 2014 biological surveys, WFD chemistry monitoring

data indicate that nutrient levels at the Castlerea Bridge site were generally satisfactory although there were occasional spikes in ammonium during that period.

The EPA inspector's report (accessed from www.epa.ie) for a site visit dated the 30th May 2018, states that results of the sample of the discharge taken during the site visit indicated high levels for several parameters including ammonium. High ammonium (0.12mg/l) was also detected on the same day from a sample taken at the downstream monitoring point. A dark algal growth was observed near the primary discharge pipe, which the report states may be sewage fungus.

The Ballymoe WWTP was assessed as a pressure following LAWPRO's desktop assessment methodology for urban wastewater. The methodology considers i) contribution to total load at the downstream impacted WFD monitoring point (where nutrients and/or BOD are the significant issues), ii) pollution risk posed by the discharge in low flow conditions and iii) proximity of the discharge to the WFD monitoring point.

i) Contribution of the discharge to the total load at the WFD monitoring point

Results of WFD chemistry sampling at Castlerea Bridge station indicate that nutrients and BOD are not currently an issue here. Therefore there is no requirement to undertake this step.

ii) Assessment of pollution risk posed by the WWTP discharge in river 95%ile flow conditions.

Headroom utilisation calculations were undertaken for the CoA discharge, using estimated effluent loading information from LAWPRO's urban wastewater assessment methodology and assuming a PE load of 290, as per plant design. It is understood that the actual plant PE loading is below this figure. 95%ile river flow estimates downstream of the discharge were obtained from the EPA HydroTool.

Headroom utilisation of greater than 50% is considered to be potentially indicative of pollution risk in low river flow conditions. This is a precautionary approach taken to ensure that risk is not underestimated.

Headroom utilisation calculations indicate that the WWTP discharge poses a potential pollution risk at Castlerea Bridge monitoring station in low flow (Q95) conditions. Key parameters in terms of immediate pollution risk are BOD and ammonium. Percentage headroom utilisation is at 89% for ammonium, marginally below 50% for MRP and well below 50% for BOD. This figure assumes a PE of 290 however. Actual plant loading may be lower. Field investigation in low flow conditions will be needed to confirm whether the plant effluent is causing an impact on the receiving water.

Table 3: Headroom utilisation (Q95 river flow) for Ballymoe UWW discharge

	Upstream concentration (notional clean) (mg/l)	Final downstream concentration (mg/l)	Percentage headroom utilised
BOD	0.26	0.641	20
MRP	0.005	0.025	49
NH ₄ N	0.008	0.081	89

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

Treated effluent from Ballymoe WWTP discharges to the Island_030 main channel approximately 140m upstream of the Castlerea Br WFD monitoring point. There are no tributaries flowing into the main channel between the two points. Therefore, there is a significant proximity issue here i.e. a risk of water quality deterioration at the WFD monitoring point resulting from one-off or occasional environmental incidents associated with the plant. Incidents of this nature will have a greater impact in low river flows. Chemistry sampling is unlikely to be useful in this type of scenario. Biological assessments should be undertaken upstream and downstream of the discharge.

Conclusion on Urban Waste Water as a potential point source pressure on Island_030

This desktop assessment supports the EPA initial characterisation conclusion that urban wastewater is a significant pressure on Island_030, due in part to pollution risk in low flow conditions but primarily to the proximity of the discharge location to the WFD monitoring point at Castlerea Bridge and resultant risk of impact from occasional or one-off incidents at the plant. Information available from www.epa.ie indicates that there have been issues with plant operation in the past, with wash-through due to stormwater control issues in the network and flooding. This could potentially result in deposition of sludge/sediment downstream of the discharge. Anoxic sediment can contribute to low water column dissolved oxygen levels. DO levels below the lower limit of 80% saturation have been periodically recorded at Castlerea Bridge station. Local catchment assessment in Island_030 should include biological monitoring upstream and downstream of the UWW discharge and DO monitoring upstream and downstream, particularly in low summer flows.

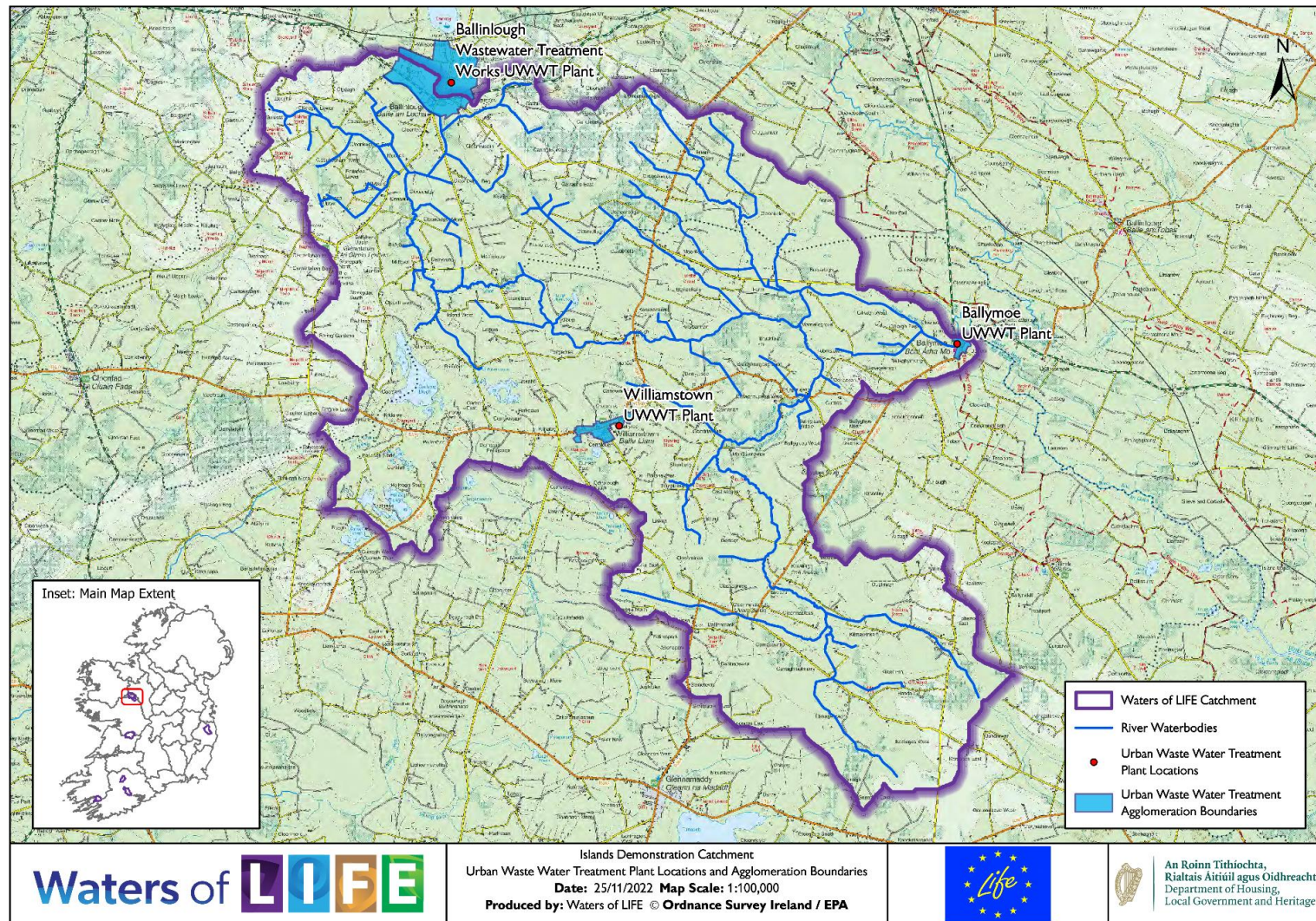


Figure 9: Location of urban wastewater treatment plants in the Islands catchment

LAWPRO has drafted a referral to Irish Water outlining the concerns above. Under Irish Water's River Basin Management Plan Enhanced Ambition Programme, Ballymoe WWTP will be upgraded, with the upgrades due to be completed by 2025.

3.4 Peat Extraction

Peat extraction is being carried out in a number of the waterbodies in the Islands Demonstration Catchment. In Springfield_010 peat extraction is being carried out in a number of locations in the sub-basin. The nearest peat extraction area to the EPA monitoring point Blacker's Bridge, is approximately 2km upstream of the point. There are a number of other peat extraction plots throughout the sub-basin. A viewing the OSI water layers indicated that most of peat extraction areas have direct links to Springfield_010 waterbody.

In Springfield_020, peat extraction is located approximately 1.6km upstream of the EPA monitoring point Ballaghaugaug Bridge. This area has a direct link to the waterbody.

3.5 Forestry

Forestry plantations are located in all of the waterbodies through this demonstration catchment (both Coillte and private forestry), as seen in **Figure 10**.

Island_010 has a relatively small proportion of forestry located in its sub-basin. These plantations are both Coillte and private forestry, with the main tree species being Sitka Spruce. All of these plantations were planted post 1991.

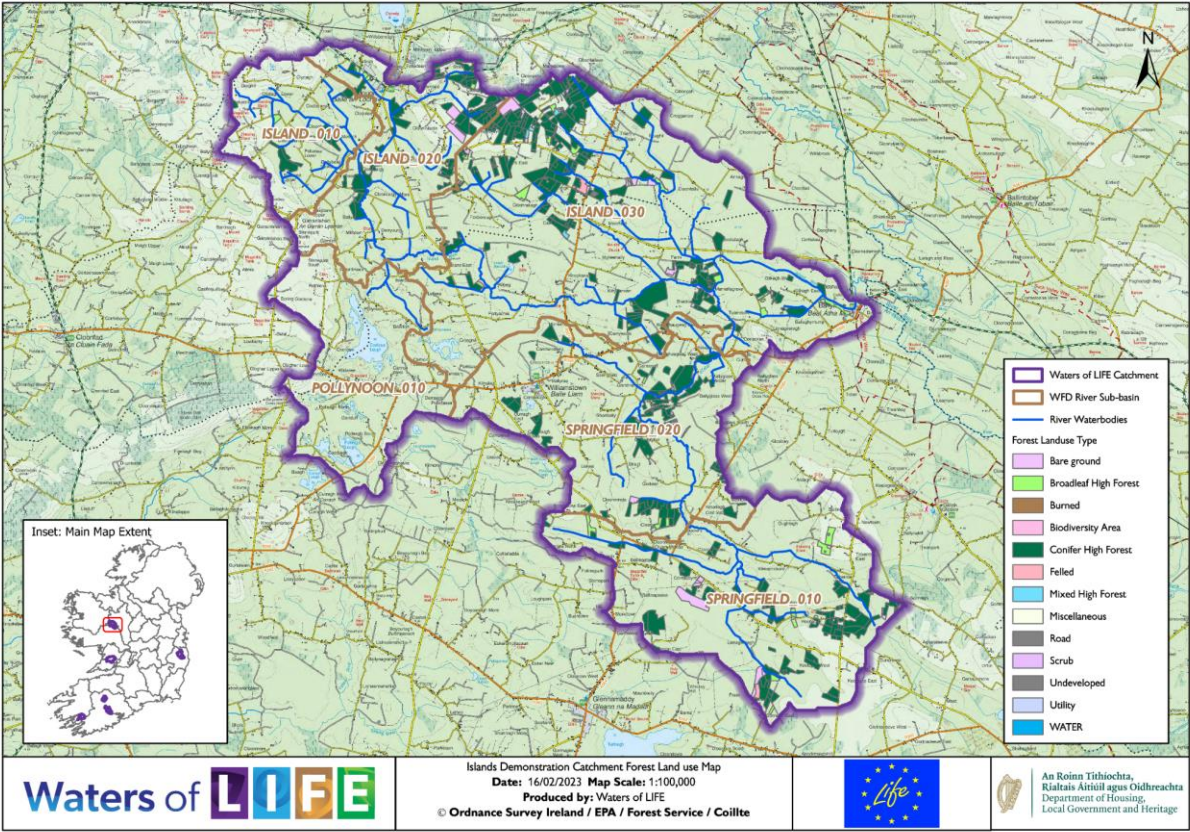


Figure 10: Forestry in the Islands catchment

4 Pathway information & analysis

The regional pathway framework is provided by the aquifer in the catchment and sub-compartments are determined by soil drainage and groundwater vulnerability.

The Islands catchment consists of three different aquifer types:

- Regionally Important Aquifer – Karstified (Conduit) (RKc)
- Locally Important Aquifer – Bedrock which is moderately productive only in local zones (LI)
- Poor Aquifer – Bedrock which is Generally Unproductive except for Local Zones (PI)

The catchment is divided into two compartments which are defined by the aquifer type (rock unit), with soils used to divided compartment 2 into sub compartments. See **Figure 11**.

4.1 Compartment 1

Compartment 1 is comprised of locally important and poor aquifers. This compartment is present in all waterbodies in the catchment to some degree (Figure 13). In this compartment groundwater pathways will be less important with flows mostly in the upper fractured zone. Soils in this compartment vary but are primarily peat and poorly drained. There are some areas of Extreme and X vulnerability for groundwater, particularly where soils are thin and around karst features (swallow holes).

Pathways – Overland flow, near surface flow and via drains. Increased surface/groundwater interaction in areas of X extreme vulnerability and around karst features.

4.2 Compartment 2.1

Compartment 2.1 is made up of the regionally important aquifer – karstified (Conduit) (RKc) overlain by poorly drained or peat soil. Springfield_010 and Springfield_020 are largely covered by this compartment. This aquifer type results in extensive groundwater pathways particularly via karst features. However, in this sub compartment the groundwater is protected by the generally poorly drained soils, with soil depth resulting in vulnerability being low overall. However there are some features offering direct pathways to ground e.g. swallow holes.

Phosphate susceptibility maps indicate that risk of phosphate runoff ranges from moderate to high throughout this compartment. The majority of Springfield_020, eastern part of Springfield_010 and most areas near the river in Island_030 are high phosphate susceptibility. Given that the soil is peat/poorly drained sub surface, nitrate susceptibility ranges from very low to low throughout this compartment.

Pathways – Overland flow, with areas of groundwater flow near the karst features

4.3 Compartment 2.2

Compartment 2.2 is also made up of the regionally important aquifer – karstified (Conduit) (RKc) overlain by well drained soils. This compartment is widely distributed in the catchment but in rather small areas with the only cohesive section being in the west of the catchment.

As in compartment 2.1 there are a number of karst features due to the bedrock. Of particular note are a number of enclosed depressions in Island_020 with tracer lines linked to swallows holes outside the catchment.

With well drained soils permeability is generally high and groundwater vulnerability is mostly high. Vulnerability is High and Extreme X around the areas where karst feature are present, increasing the chance of surface/groundwater interaction. The majority of the high groundwater vulnerability is located in the western areas. These coincide with the very high subsurface nitrate susceptible areas in the Pollynoun_010, Island_020 and Island_010. Phosphate susceptibility in this compartment is generally low, however there is an area of high susceptibility in Island_030 just upstream of the EPA monitoring point RS261030400 and upstream.

Pathway – Groundwater flow through free draining soil and karst features with overland flow in areas of low permeability soils

Table 4: Conceptual model table

		Compartment 1	Compartment 2	
		Compartment 1.1 (Figure 11)	Compartment 2.1 (Figure 11)	Compartment 2.2 (Figure 11)
Pathway Info	Direct (e.g. pipe)	No	No	Ballymoe WWTP
	Aquifer	PI and Li (Figure 12)	RKc (Figure 12)	RKc (Figure 12)
	Topography	Flat	Flat	Flat
	Soil	Peat/Poorly and well-drained soil (Figure 13)	Peat/Poorly drained (Figure 13)	Well drained (Figure 13)
	Subsoil	Cut, Limestone sands and gravels (Carboniferous), basic esker sand gravels sandstone till	Cut peat Sandstone till	basic esker sand gravels Sandstone till (Devonian) Limestone sands and gravels (Carboniferous)
	Rock Unit	Dinantian Lower Impure Limestones Dinantian Mixed Sandstones, Shales and Limestones Granites & other Igneous Intrusive rocks (Figure 14)	Dinantian Pure Bedded Limestone (Figure 14)	Dinantian Pure Bedded Limestone (Figure 14)

	Compartment 1		Compartment 2	
	Compartment 1.1 (Figure 11)	Compartment 2.1 (Figure 11)	Compartment 2.2 (Figure 11)	
Groundwater vulnerability	Low to high, with small pockets of extreme vulnerability (Figure 15)	Low to moderate, with small pockets of high and extreme vulnerability. (Figure 15)	High proportion of high groundwater vulnerability, there is low to extreme vulnerability through the compartment, Extreme X located around karst features. (Figure 15)	
Karst Features	No Karst features	Spring Turlough Enclosed Depression Swallow hole (Figure 17)	Swallow holes Enclosed depressions Turloughs (Figure 17)	
PO4 Susceptibility	Low to High, moderate to High areas in Island_030	Moderate to High	Low to moderate	
NO3 susceptibility	Subsurface = Very low to low Surface Water = Very low to Very high	Subsurface = Very low to low Surface water = Very low to moderate	Subsurface Water = Very low to very high Surface water = Low to moderate	
PO4 PIP	Rank 1 to 7 (Figure 19)	Rank 7. With Ranks 1 to 4 for the rest of the compartment (Figure 19)	Rank 4 to 7 (Figure 19)	
NO3 PIP	Groundwater: Rank 6 to 7 Near surface water: Rank 1 to 7 (Figure 18)	Groundwater: Rank 7 Near surface water: Rank 3 to 7 (Figure 18)	Groundwater: Rank 1 to 7 Near surface water: Rank 1 to 7 (Figure 18)	
Flowpaths	Overland flow, near surface flow, Drains	Overland Flow, with increased surface/groundwater interaction in the areas of the karst features.	Groundwater flow and overland flow pathways	
Significant issue	Unknown, but pathway would suggest phosphate or sediment	Unknown, but pathway would suggest phosphate or sediment	Ammonium and BOD	

PI – Poor bedrock aquifer, moderately productive only in local zones

LI – locally important bedrock aquifer, moderately productive only in local zone

RKc – Regionally important karstified bedrock aquifer (conduit)

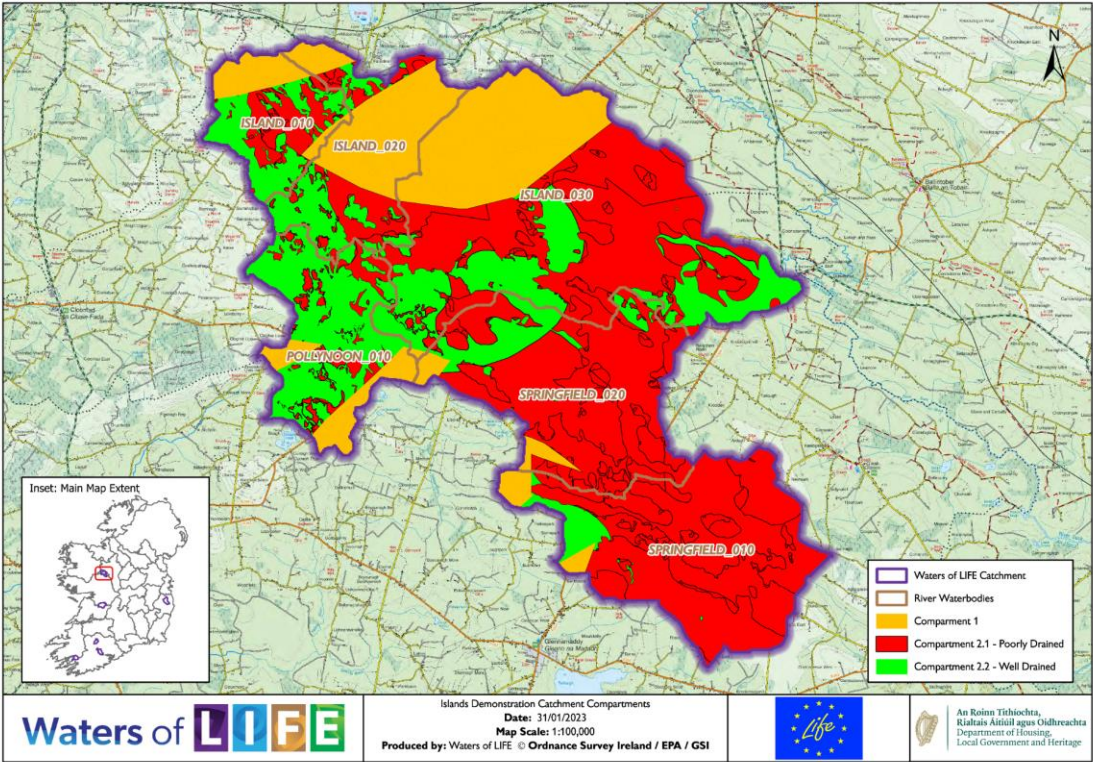


Figure 11: Conceptual model compartments in Islands catchment

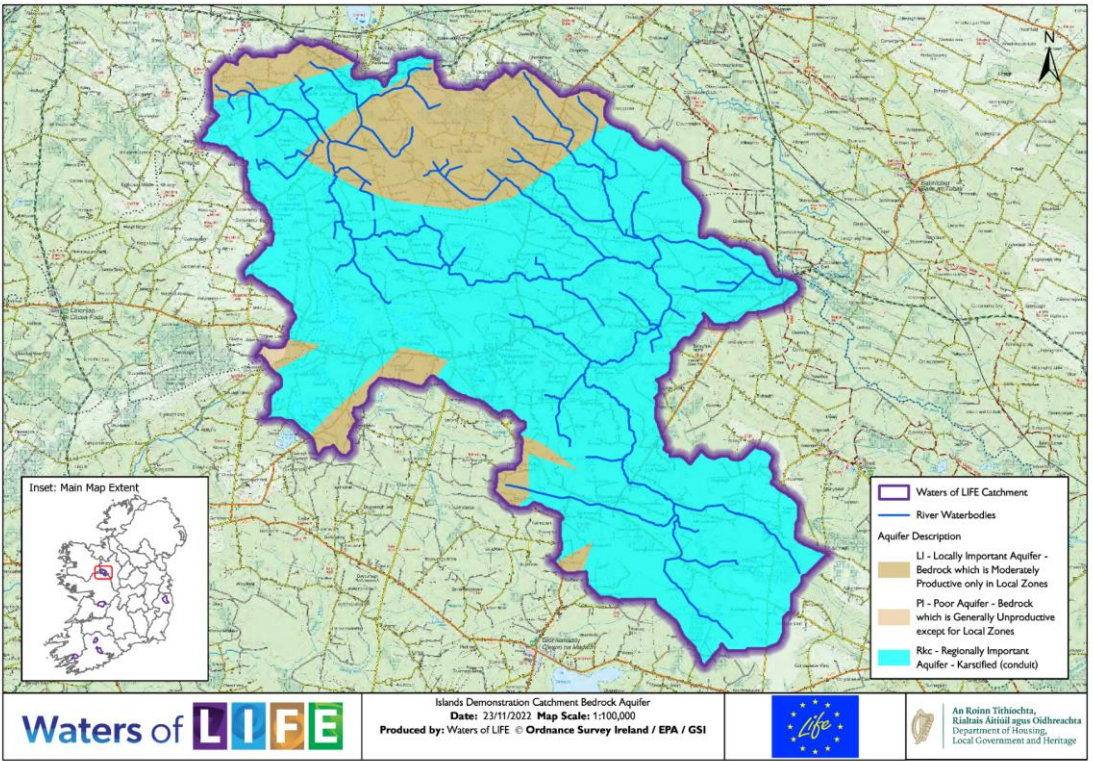


Figure 12: Bedrock Aquifer in Islands Catchment

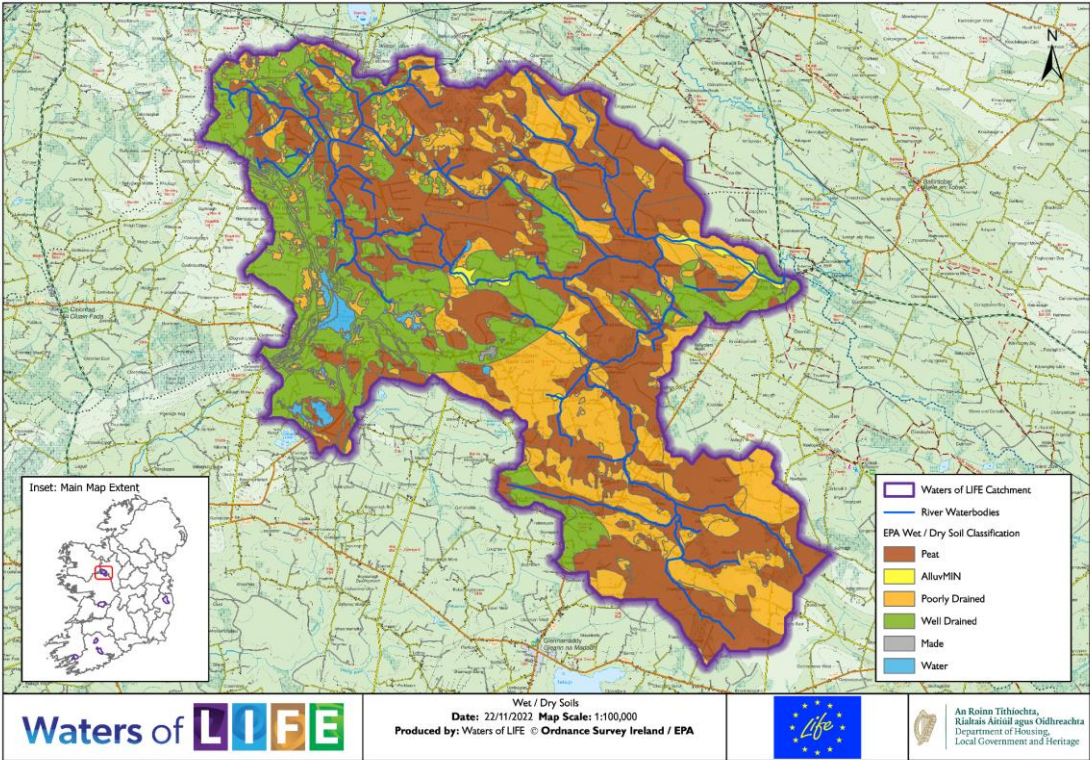


Figure 13: Wet/dry soils map, Islands catchment

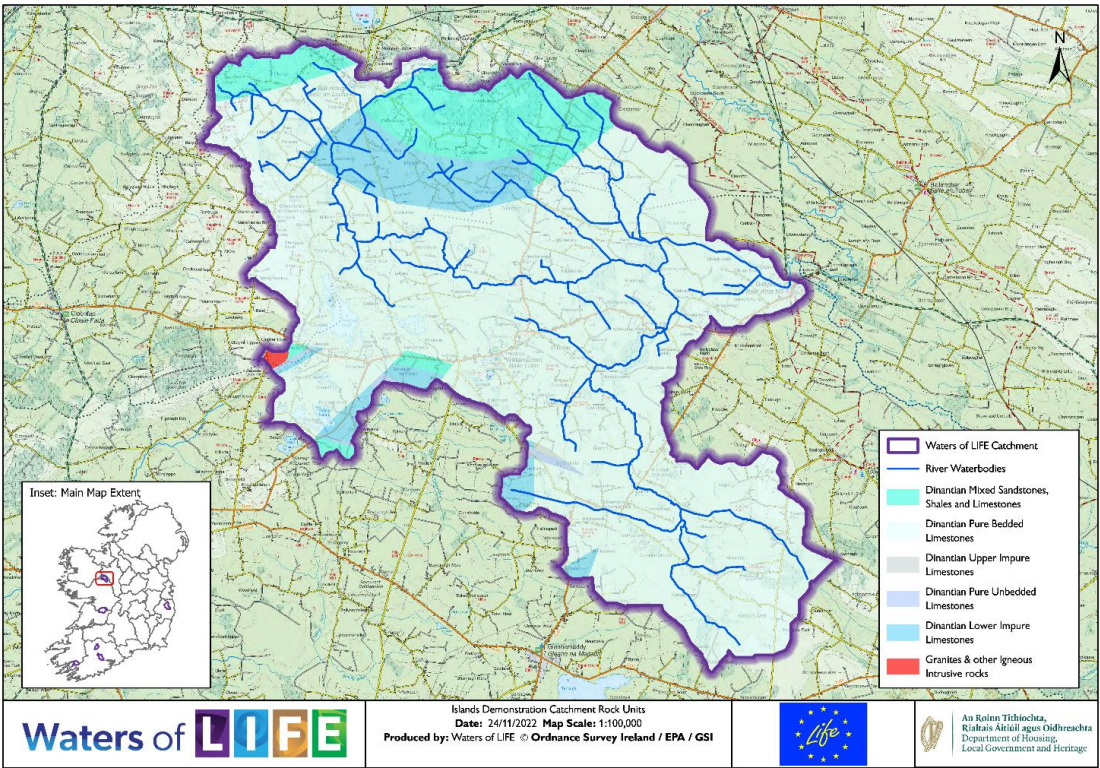


Figure 14: Rock units in Islands catchment

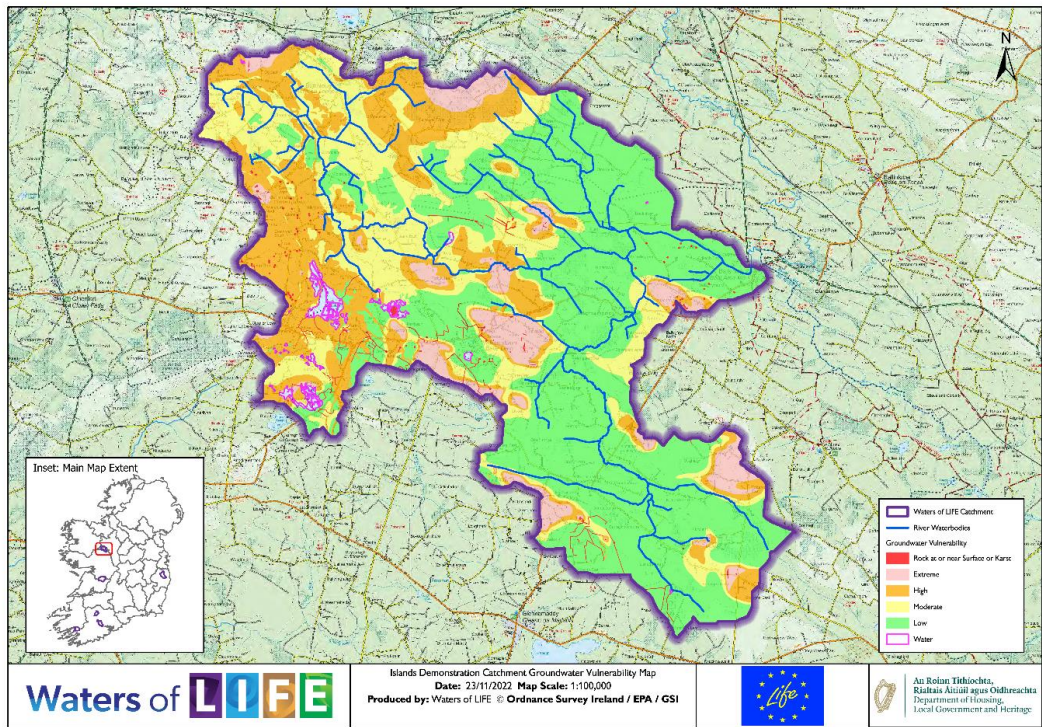


Figure 15: Groundwater vulnerability in Islands catchment

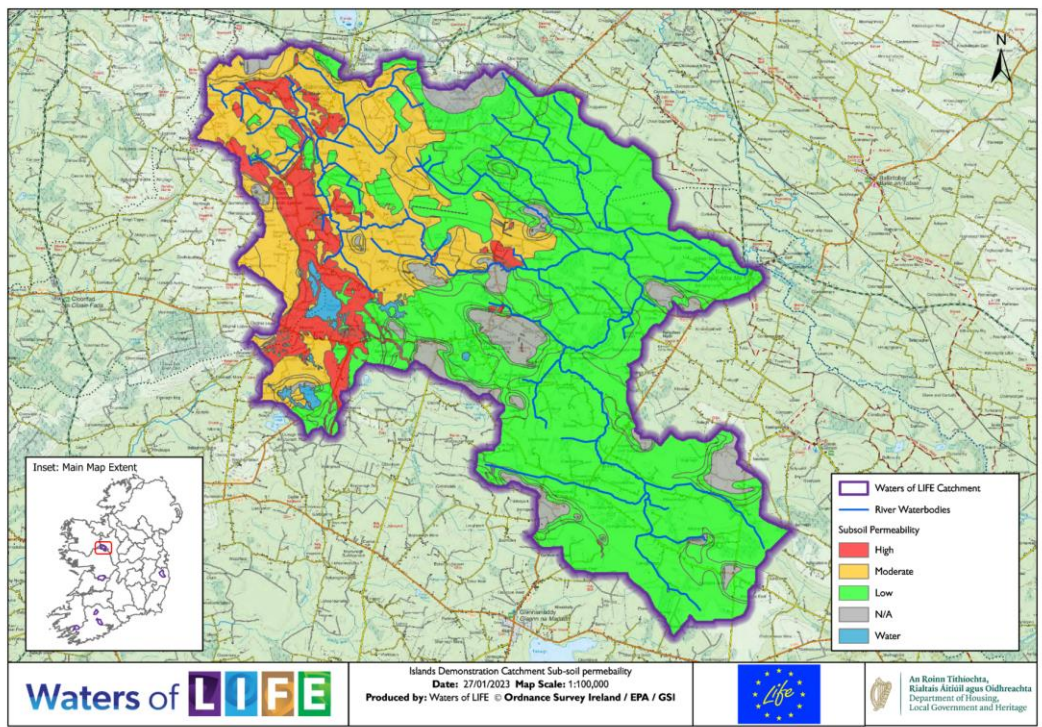


Figure 16: Subsoil permeability in Islands catchment

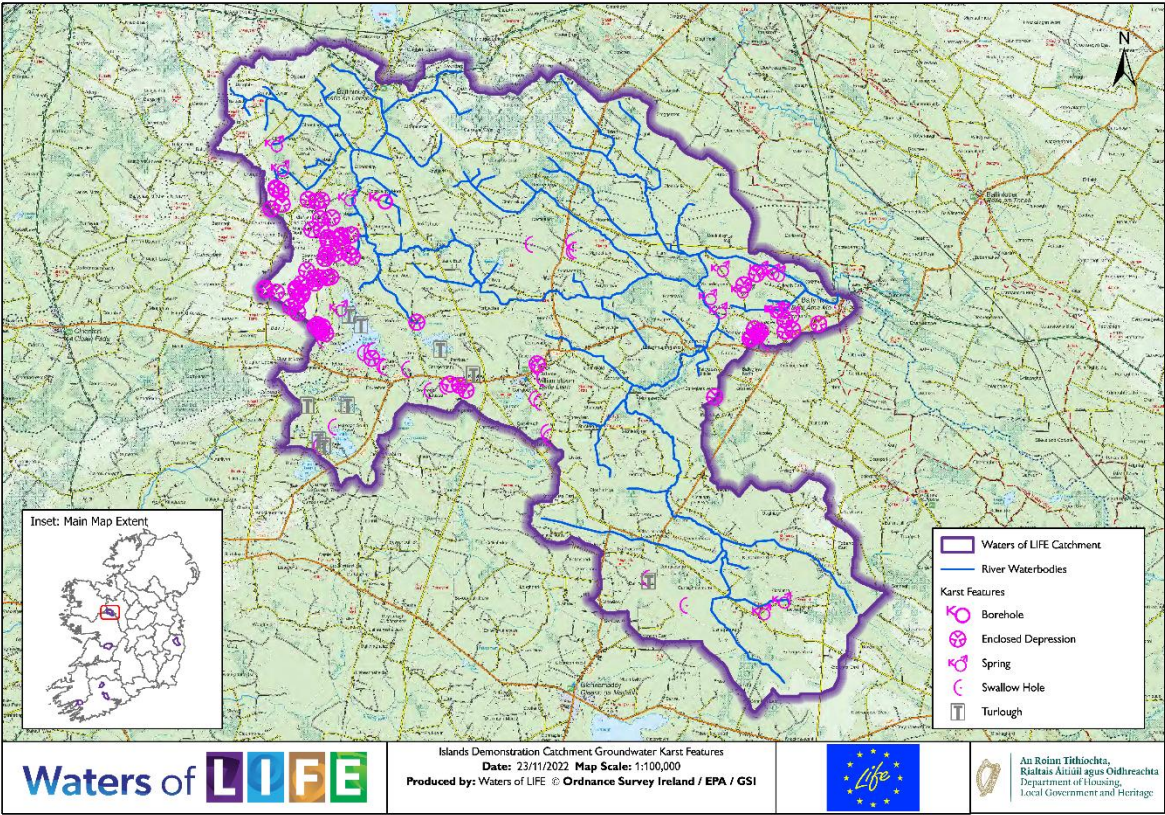


Figure 17: Karst features in the Islands catchment

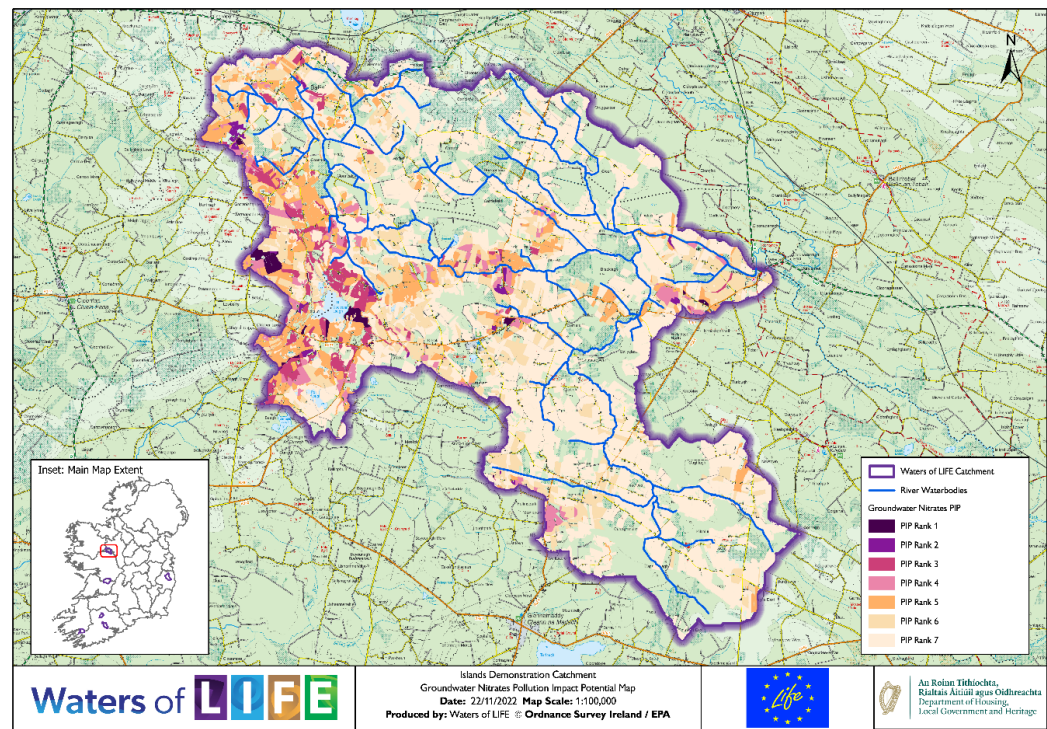


Figure 18: Groundwater Nitrates Pollution Impact Potential map for the Islands catchment

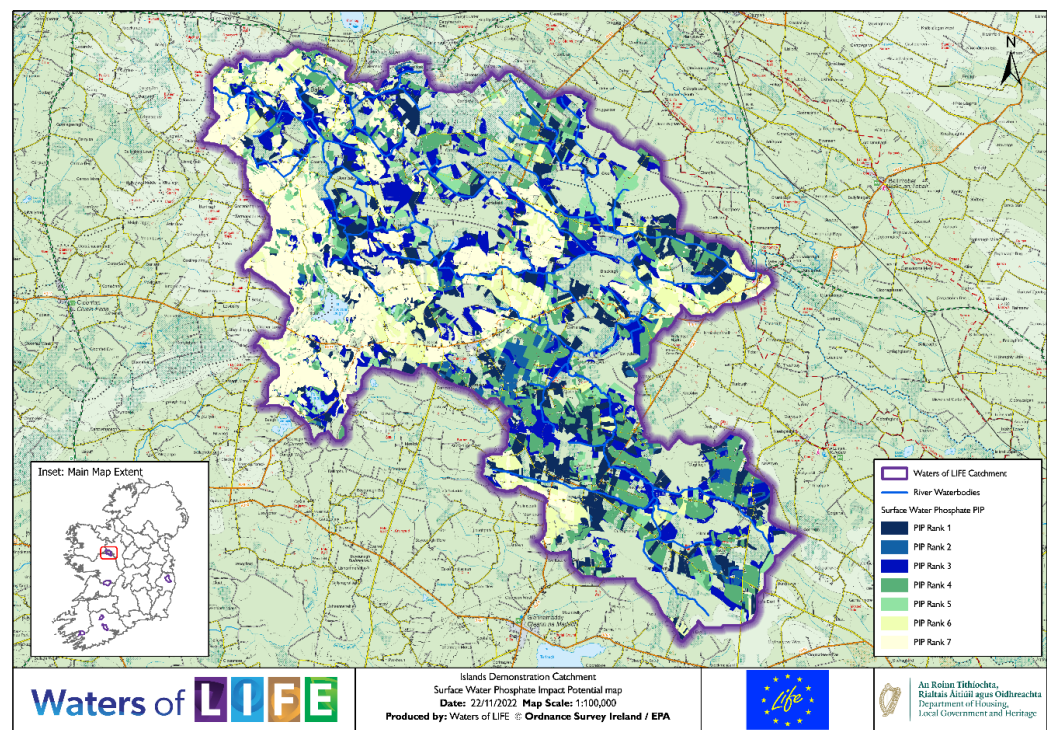


Figure 19: Phosphate Pollution Impact Potential map for the Islands catchment

5 Interim Story of Islands Demonstration Catchment

5.1 Island_010

- Island_010 is a Good status objective waterbody, currently at moderate ecological status and *At Risk*. Macroinvertebrates are the status driver of this waterbody.
- Island_010 is monitored at the EPA Operational monitoring point “Br SW of Cloonlee” where the Q – value is Q3 – 4 (2017). There are no WFD chemistry data for this waterbody.
- The significant pressures determined to be impacting the waterbody at initial characterisation stage (2015) were Hydromorphology in the form of land drainage and Agriculture which is impacting the waterbody via organic pollution and altering the habitat of the river morphologically. The desktop assessment has found that these would still be considered to be potential pressures. However the lack of chemistry data for the water body makes it difficult to confirm organic or nutrient pressures at this point.
- There is a mix of peat/poorly drained and well drained soils in the sub-basin.
- The pathways conceptual model divides the sub-basin into two compartments with two sub-compartments, indicating two pathways for pollutants: overland flow and groundwater pathways.

5.2 Island_020

- Island_020 is a Good status objective waterbody, meeting its WFD objective. Macroinvertebrates are the status driver here.
- Island_020 is monitored at the EPA Operational monitoring point “Island Bridge” where the Q – value is Q4 and has been Q4 since 1996. There are no chemistry data for the waterbody.
- Channelisation and land drain networks are present in Island_020.
- The majority of the Island_020 sub-basin consists of peat/poorly drained soil with small areas of well-drained soil.
- The pathways conceptual model divides the sub-basin into two compartments with two sub-compartments, indicating two pathways for pollutants, overland flow, and groundwater pathways.

5.3 Pollynoon_010

- Pollynoon_010 is not monitored under WFD and there are no biological or chemical data available for this waterbody. EPA assigned Good status here for the 2013-2018 reporting period, based on Grouping.
- The sole significant pressure identified at the initial characterisation stage (2015) was agriculture.

- The main soil type in the sub-basin is well drained. However the river channel itself is located in an area of peat/poorly drained soil.
- Two pathways exist in this sub-basin, overland flow and groundwater pathways.
- There are a number of karst features in the sub-basin, increasing the likelihood of surface/groundwater interaction, which would deliver nutrients to the river if present in excessive quantities.
- An IA3 has been proposed for LAWPRO to determine water quality for this waterbody. Further characterisation as per the LAWPRO unassigned water bodies protocol at a selected monitoring point on the water body upstream of its confluence with the Island_030, in three different seasons will be undertaken.

5.4 Springfield_010

- Springfield_010 is a Good ecological status objective waterbody which is meeting its WFD objective. Macroinvertebrates are the status driver.
- There are two WFD operational monitoring points on Springfield_010, Blacker's Bridge and Springfield – Br E of Curraghmulmurry. Both monitoring points are at Good biological status, Q4. There are no chemistry data for this waterbody.
- There is a significant network of land drains immediately upstream of Blacker's Bridge which would merit investigation as a potential pressure during the local catchment assessment.
- The sub-basin is dominated by peat/poorly drained soil with a small area of well-drained soil in the northwest.
- The pathways conceptual model divides the sub-basin into three compartments, indicating two different pathways: overland flow, and groundwater pathways.

5.5 Springfield_020

- Springfield_020 is a Good ecological status objective waterbody, which is currently meeting its WFD objective. WFD Risk is in *Review* for the 3rd cycle river basin management plan, due to a drop in biological status at Ballaghaugeag Bridge from High (Q 4-5) in 2014 to Good in 2017. Macroinvertebrates are the status driver of this waterbody. Note that biological status improved back to High here in the EPA 2020 assessment.
- There are no chemistry data available for this waterbody.
- Agriculture in the form of nutrient pollution from pasture is determined to be a significant pressure for the 3rd cycle of the River Basin Management Plan.
- Agriculture will be investigated as a significant pressure during the local catchment assessment work carried out by LAWPRO. Chemistry samples will be collected at a number of locations.

- Peat/poorly drained soils dominate this sub-basin, with a small area of well-drained soil in the north-eastern section. Two flow paths exist in this waterbody, overland flow being the dominant flow path and groundwater flow the minor flow path.

5.6 Island_030

- Island_030 is a High ecological status objective waterbody, currently at Good ecological status with macroinvertebrates as the status driver. The deterioration to good status occurred in 2011 and biological status has remained at Good through all subsequent surveys undertaken to date.
- There are two EPA monitoring points on the Island_030; the Ford at Bookalagh (RS26I030300), upstream of the Ballymoe WWTP, is at High biological status while Ballymoe: Castlerea Bridge – N60 road site (RS26I030400), which is downstream of Ballymoe WWTP, is at Good status.
- Similar to Island_010, there is a mix of well drained and peat/poorly drained soil in the sub-basin.
- The pathways conceptual model divides the sub-basin into one compartment and two sub compartments, indicating two pathways for pollutant movement, overland flow in poorly drained areas and groundwater pathways in areas of well drained highly permeable soils and through karst features, such as swallow holes, enclosed depressions and turloughs.
- There were exceedances in annual average ammonium levels in 2014 and 2015 at the Castlerea Bridge – N60 road site, but more recent results have remained below the high status mean EQS. BOD is also noted to have been elevated in the past but from 2017 to date, there have been no recorded exceedances of the upper limit and only one result above the mean EQS.
- The wastewater treatment plant in Ballymoe was identified as a significant pressure in the EPA initial characterisation (2015). Desk study conclusions support this assessment. Headroom assessment calculations indicate that there is a potential pollution risk in low flow conditions. There is also a proximity issue here as the WWTP discharge is only 140m upstream of the WFD monitoring point at the Castlerea Bridge monitoring station. Once off or occasional plant incidents have potential to impact biological status at this monitoring point. Plant wash through has been reported for this facility and also flooding. Both types of incidents could result in organic and nutrient pollution with deposition of sludge and development of anoxic sediment also a risk downstream of the discharge. Flood risk at the Ballymoe wastewater treatment plant site is a significant concern as data has shown that flooding has led to nutrient spikes at the downstream monitoring point RS26I010400.

6 Workplan

Location of local catchment assessment (LCA) sites and reasons for selection are outlined below under each waterbody.

6.1 Island_010

- Carry out an SSIS assessment and chemistry sampling at the EPA monitoring point.
- Take additional SSIS and Chemistry samples at various points in the waterbody as seen in **Figure 20** and explained in **Table 5**.

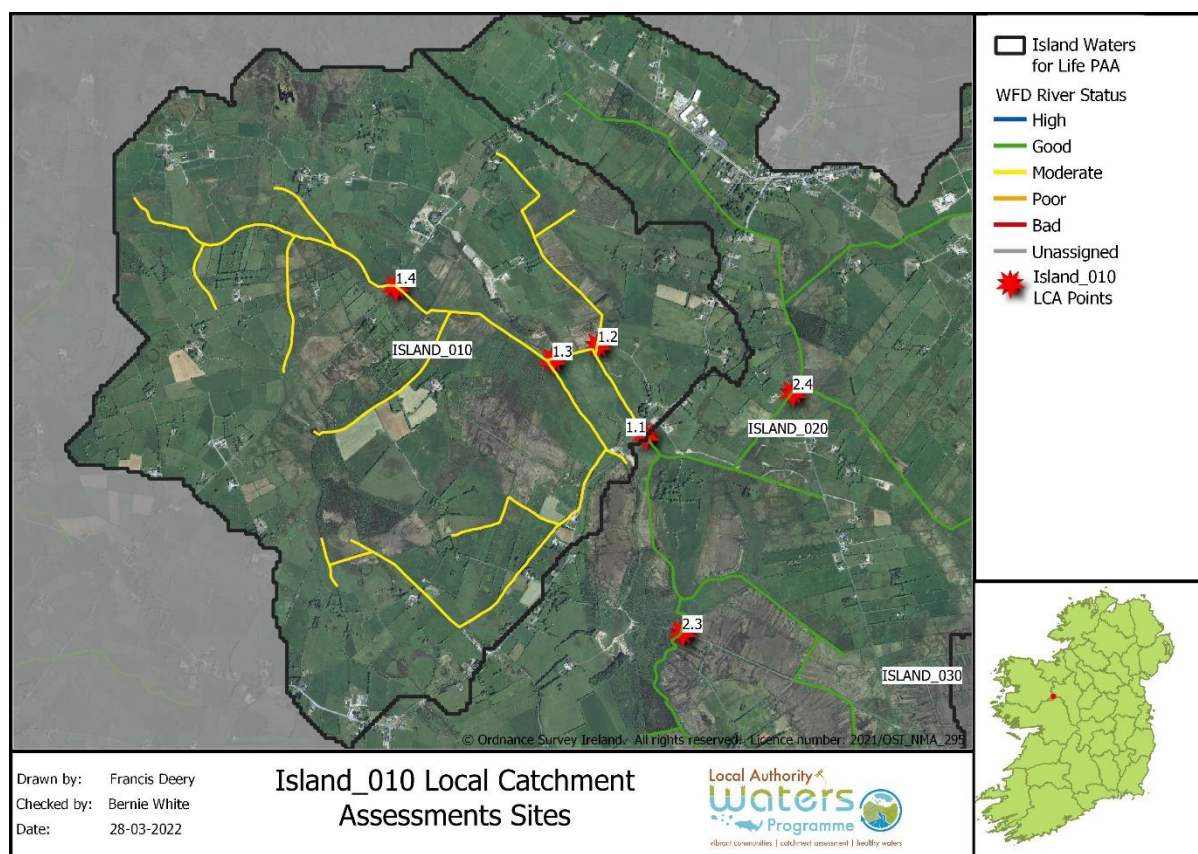


Figure 20: Location of LCA sites in Island_010

Table 5: LCA sites in Island_010, parameters and reasons for selection

Station	Station Name	SSIS/RA	Chemistry	Reason
LCA 1	EPA Monitoring Site – Bridge SW of Cloonlee (RS26I030040)	Yes	Yes	<p>Confirm condition at EPA monitoring station using SSIS.</p> <p>Collect chemistry samples to confirm if nutrients are a significant issue.</p> <p>Undertake Shuffle test if siltation is suspected as a significant issue.</p>

Station	Station Name	SSIS/RA	Chemistry	Reason
LCA 1.2	LCA Site north of Meelick	Yes	Yes	Carry out SSIS/RA and collect chemistry at this point. In an area of PIP rank 1. Downstream of land drainage. Shuffle test if siltation is suspected as a significant pressure.
LCA 1.3	Downstream of forestry in Cloonkeehan East	Yes	Yes	Carry out SSIS/RA and collect chemistry at this point. In an area of PIP phosphorus rank 1. Downstream of forestry. Shuffle test if siltation is suspected as a significant pressure.
LCA 1.4.	Bridge South of Clydagh lower	Yes	Yes	Carry out SSIS/RA and collect chemistry at this point. Investigate any impacts coming from the land use upstream. Shuffle test if siltation is suspected as a significant pressure.

6.2 Island_020

- Carry out an SSIS assessment and chemistry sampling at the monitoring point. Note macroalgae and macrophyte coverage.
- Take additional SSIS and chemistry samples at the other sites along the course of Island_020, as seen in **Figure 21. Table 6** explains site selection.

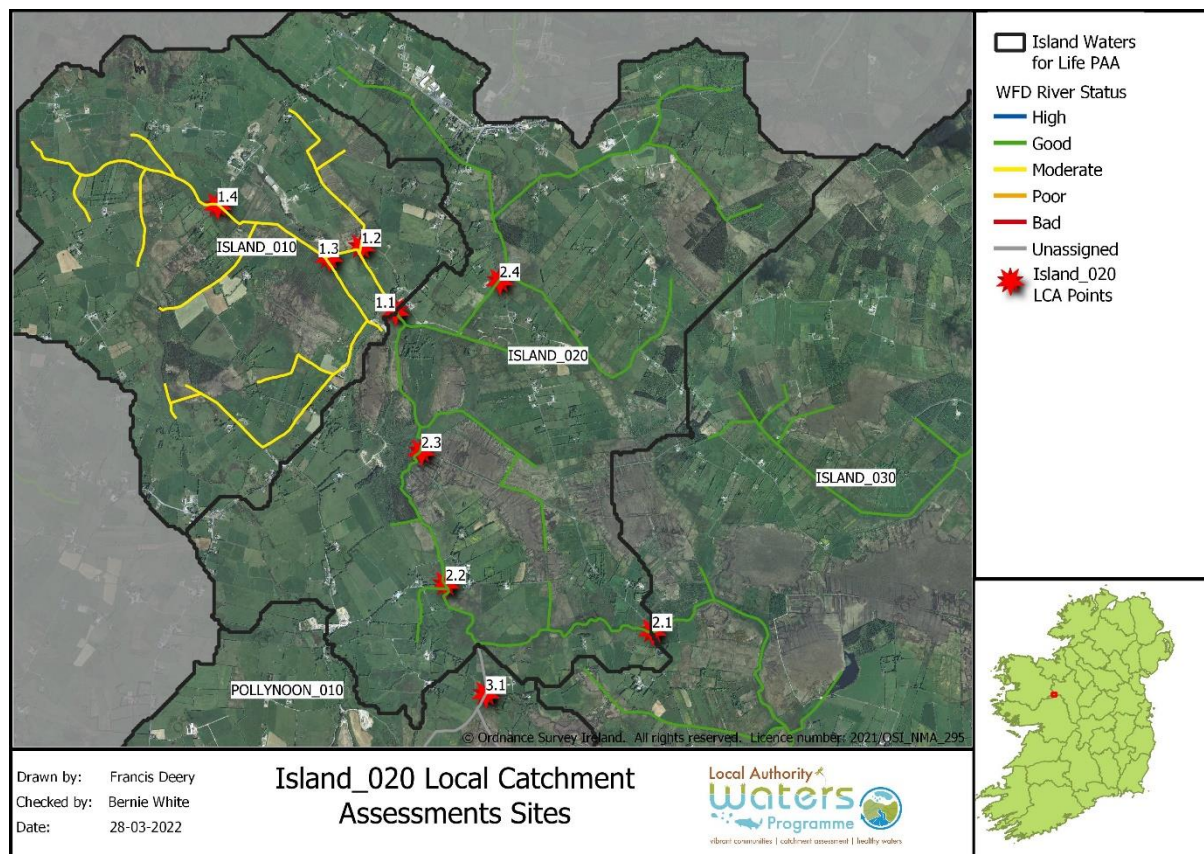


Figure 21: Location of LCA sites in Island_020

Table 6: LCA sites in Island_020, parameters and reasons for selection

Station	Station Name	SSIS/RA	Chemistry	Reason
LCA 2.1	EPA Operational Monitoring Point Island Bridge	Yes	Yes	Confirm if site is impacted or not. Collect chemistry to confirm if nutrients are a significant issue. Shuffle test if siltation is suspected as a significant pressure. Downstream of land drainage.
LCA 2.2	LCA 2.2 in the townland of Derryvung	Yes	Yes	Confirm if site is impacted or not. Collect chemistry to confirm if nutrients are a significant issue. Shuffle test if siltation is suspected as a significant pressure. Downstream of forestry and peat extraction area.
LCA 2.3	LCA 2.3 in the townland of Ballybane	Yes	Yes	Confirm if site is impacted or not. Collect chemistry to confirm if nutrients are a significant issue.

Station	Station Name	SSIS/RA	Chemistry	Reason
				Shuffle test if siltation is suspected as a significant pressure. Downstream of peat extraction.
LCA 2.4	LCA 2.4 in the townland of Clooncalgy Beg	Yes	Yes	Confirm if site is impacted or not. Collect chemistry to confirm if nutrients are a significant issue. Shuffle test if siltation is suspected as a significant pressure. Downstream of forestry and land drainage.

6.3 Pollynoon_010

- Carry out an SSIS and chemistry sampling three times in different seasons and in different flow conditions at the EPA monitoring point, as seen in **Figure 22** and explained in Table 7.

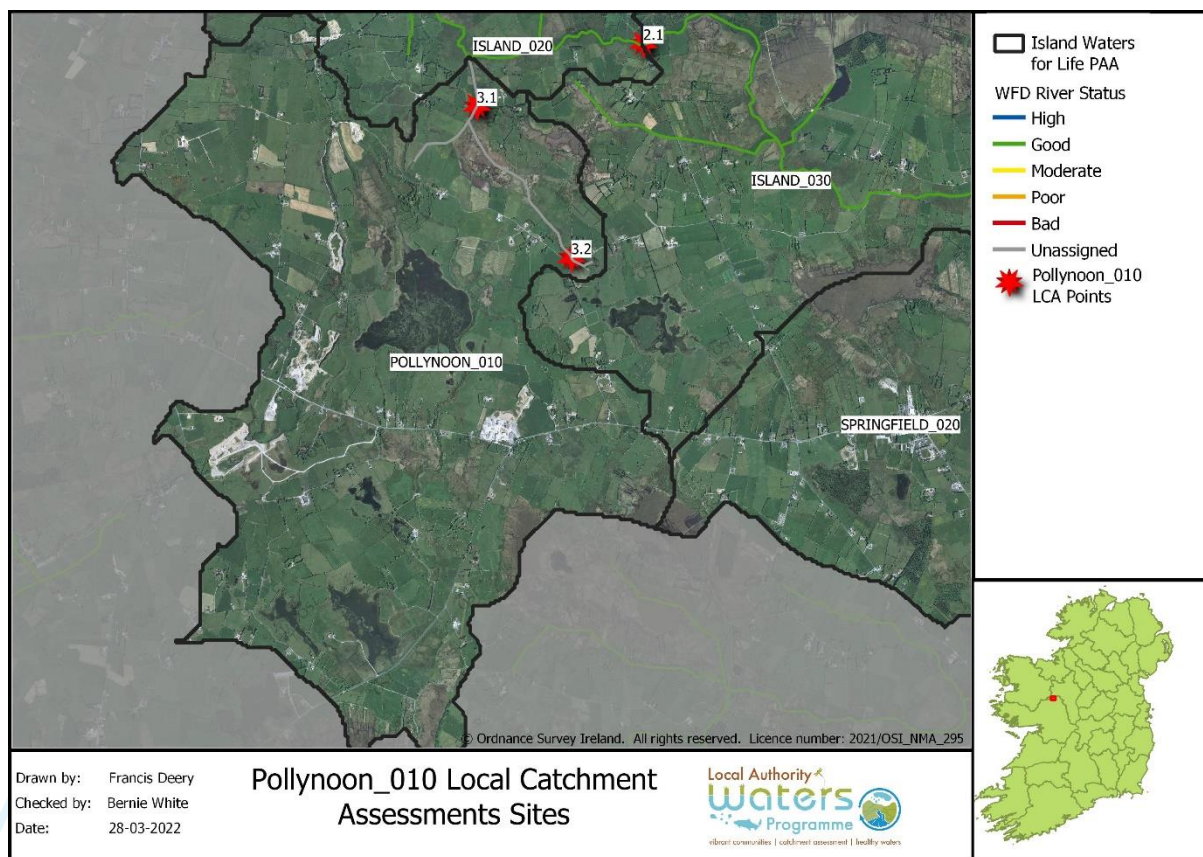


Figure 22: Location of LCA sites in Pollynoon_010

Table 7: LCA sites in Pollynoon_010, parameters and reasons for selection

Station	Station Name	SSIS/RA	Chemistry	Reason
LCA 3.1	Interstitial Br U/S from Island 26 R confluence	Yes	Yes	Confirm if site is impacted or not. Collect chemistry to confirm if nutrients are a significant issue. Shuffle test if siltation is suspected as a significant pressure.
LCA 3.2	LCA Site in the townland of Brierfort	Yes	Yes	Confirm if site is impacted or not. Collect chemistry to confirm if nutrients are a significant issue. Shuffle test if siltation is suspected as a significant pressure.

6.4 Springfield_010

- Carry out an SSIS and chemistry sample at the two EPA Operational Monitoring points.
- Undertake additional SSIS and chemistry samples in the wider sub-basin as seen in **Figure 23**, and explained in **Table 8**.

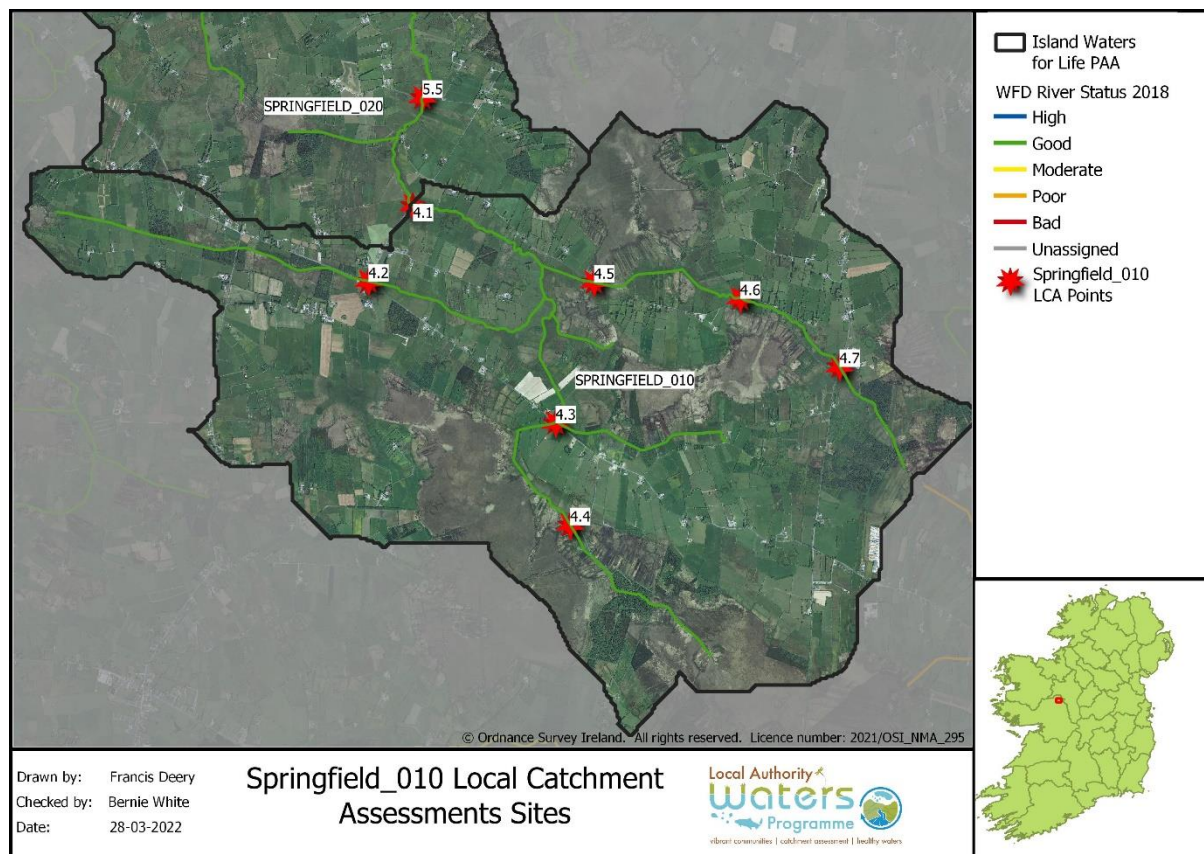


Figure 23: Location of LCA sites in Springfield_010

Table 8: LCA sites in Springfield_010, parameters and reasons for selection

Station	Station Name	SSIS/RA	Chemistry	Reason
LCA 4.1	EPA Operational Monitoring Point at Blacker's Bridge	Yes	Yes	Confirm if site is impacted or not. Collect chemistry to confirm if nutrients are a significant issue. Shuffle test if siltation is suspected as a significant pressure. Downstream of land drainage area and high P PIP area.
LCA 4.2	LCA Site at Cloonminda on the R364	Yes	Yes	Confirm if site is impacted or not. Collect chemistry to confirm if nutrients are a significant issue. Shuffle test if siltation is suspected as a significant pressure. Downstream of forestry plantation.
LCA 4.3	LCA Site 4.3 in the townland of Curraghmulmurry	Yes	Yes	Confirm if site is impacted or not. Collect chemistry to confirm if nutrients are a significant issue.

Station	Station Name	SSIS/RA	Chemistry	Reason
				Shuffle test if siltation is suspected as a significant pressure. Downstream of peat extraction and high P PIP area.
LCA 4.4	LCA 4.4 in the townland of Lisnageeragh	Yes	Yes	Confirm if site is impacted or not. Collect chemistry to confirm if nutrients are a significant issue. Shuffle test if siltation is suspected as a significant pressure. Downstream of peat extraction, forestry plantations and high P PIP area.
LCA 4.5	LCA Site in the townland of Kilmacrickard	Yes	Yes	Confirm if site is impacted or not. Collect chemistry to confirm if nutrients are a significant issue. Shuffle test if siltation is suspected as a significant pressure. Downstream of peat extraction area.
LCA 4.6	EPA Operational Monitoring Point at Springfield – Br E. of Curraghmulmurry	Yes	Yes	Confirm if site is impacted or not. Collect chemistry to confirm if nutrients are a significant issue. Shuffle test if siltation is suspected as a significant pressure. Downstream of peat extraction area and a high P PIP area.
LCA 4.7	LCA Site 4.7 in the townland of Toberroe West	Yes	Yes	Confirm if site is impacted or not. Collect chemistry to confirm if nutrients are a significant issue. Shuffle test if siltation is suspected as a significant pressure. Downstream of forestry plantation.

6.5 Springfield_020

- Carry out an SSIS and chemistry sample at the EPA Operational Monitoring Points.
- Undertake additional SSIS and chemistry samples in the wider sub-basin as seen in **Figure 24** and explained in **Table 9**.

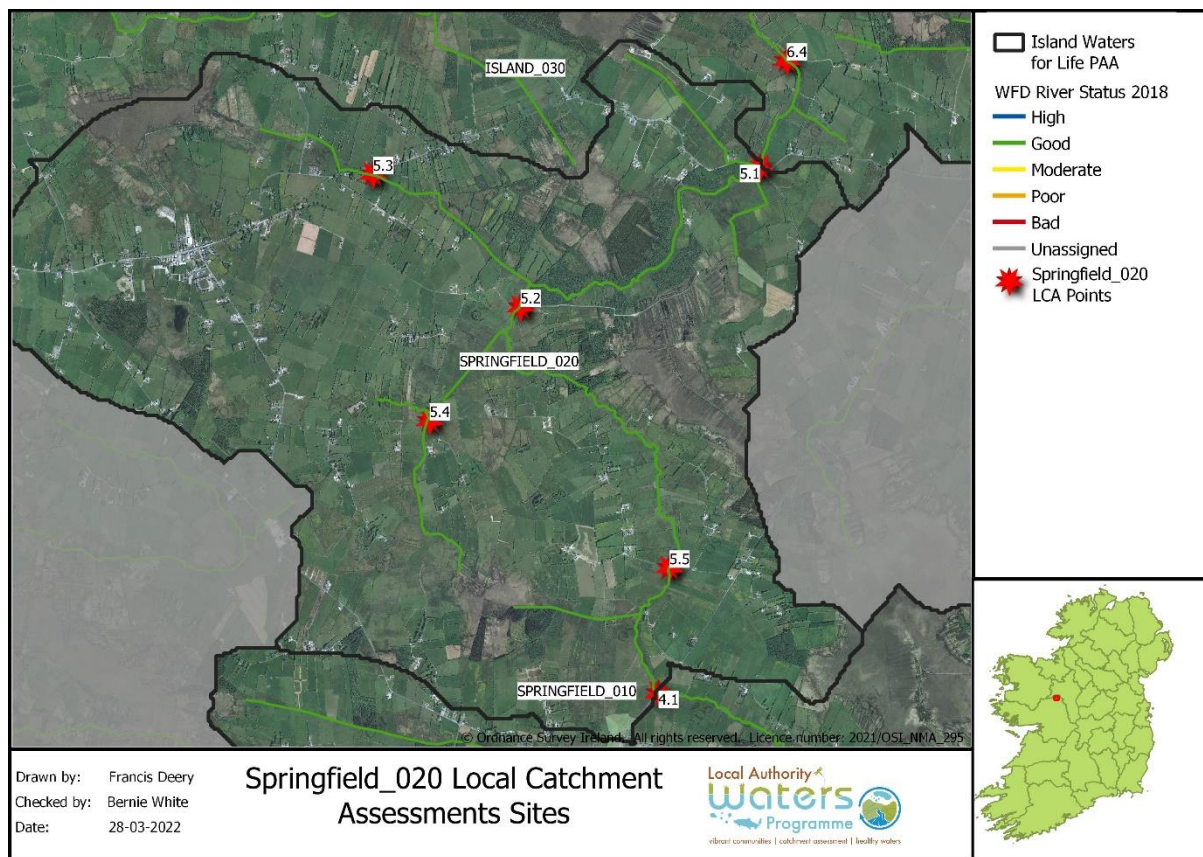


Figure 24: Location of LCA sites in Springfield_020

Table 9: LCA sites in Springfield_020, parameters and reasons for selection

Station	Station Name	SSIS/RA	Chemistry	Reason
LCA 5.1	EPA Operational Monitoring point at Ballaghaugaug Bridge.	Yes	Yes	Confirm if site is impacted or not. Collect chemistry to confirm if nutrients are a significant issue. Shuffle test if siltation is suspected as a significant pressure.
LCA 5.2	LCA Site 5.2 in the townland of Monasterowen	Yes	Yes	Confirm if site is impacted or not. Collect chemistry to confirm if nutrients are a significant issue. Shuffle test if siltation is suspected as a significant pressure. Downstream of forestry plantation.
LCA 5.3	LCA Site 5.3 in the townland of Springfield at the bridge on the R360	Yes	Yes	Confirm if site is impacted or not. Collect chemistry to confirm if nutrients are a significant issue. Shuffle test if siltation is suspected as a significant pressure.

Station	Station Name	SSIS/RA	Chemistry	Reason
				Downstream of peat extraction and high P PIP area.
LCA 5.4	LCA 5.4 in the townland of Templetogether	Yes	Yes	Confirm if site is impacted or not. Collect chemistry to confirm if nutrients are a significant issue. Shuffle test if siltation is suspected as a significant pressure. Downstream of peat extraction, forestry plantations and high P PIP area.
LCA 5.5	LCA Site 5.5 in the townland of Gorteen	Yes	Yes	Confirm if site is impacted or not. Collect chemistry to confirm if nutrients are a significant issue. Shuffle test if siltation is suspected as a significant pressure. Downstream of peat extraction area.

6.6 Island_030

- Take an SSIS and chemistry samples at the two EPA monitoring stations to confirm if EPA station RS26I010300 continues to be not impacted, and that station RS26I010400 continues to not achieve high status and is therefore impacted. Compare macroinvertebrate populations found with the EPA species list that was captured during the most recent EPA biological assessment of both stations (2018 & 2020).
- Take SSIS and chemistry samples immediately upstream of the WWTP and compare results with downstream samples.
- As this is a high-status objective waterbody, additional SSIS samples and further assessments will be carried out between the two EPA monitoring points as explained in **Figure 25** and **Table 10**. The purpose of this monitoring is to identify additional pressures.

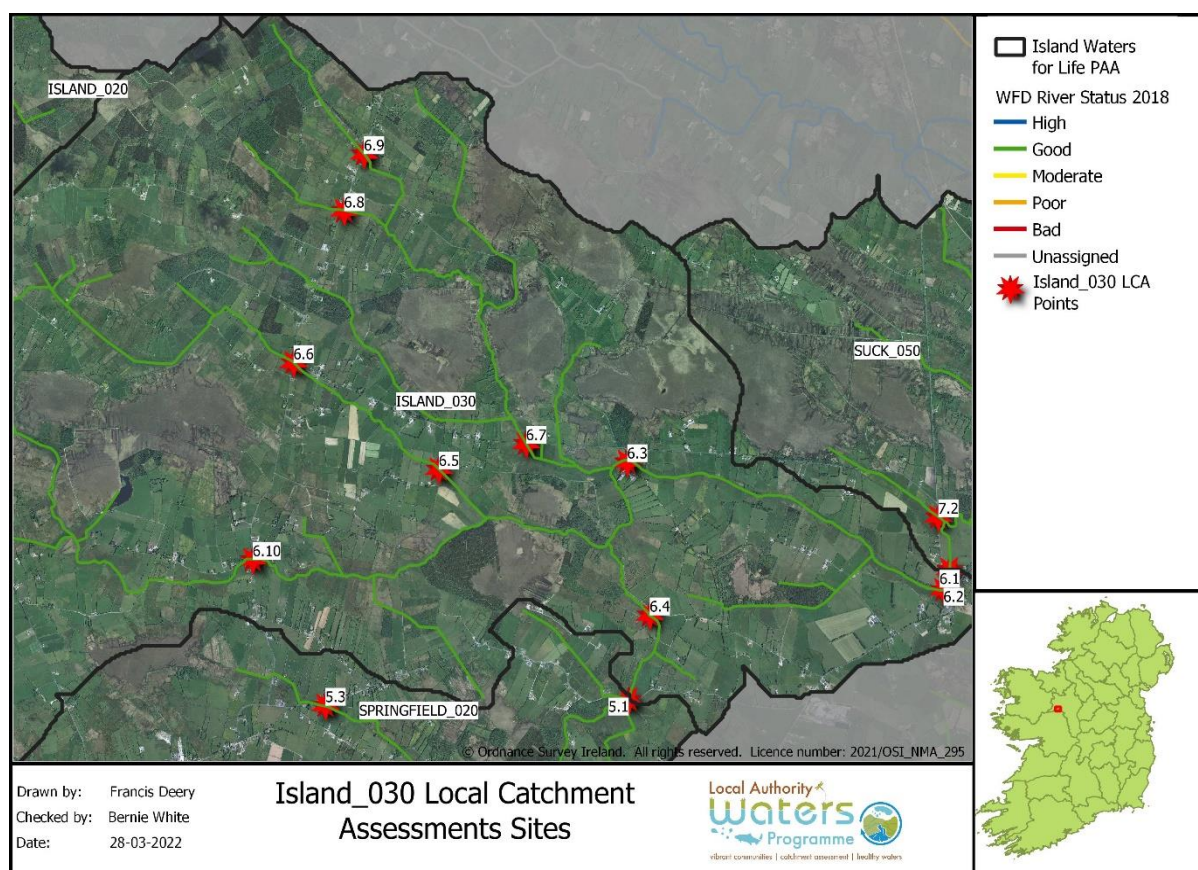


Figure 25: Location of LCA sites in Island_030

Table 10: LCA sites in Island_030, parameters and reasons for selection

Station	Station Name	SSIS/RA	Chemistry	Reason
LCA 6.1	EPA Monitoring Site – Ballymoe: Castlerea Bridge – N60 road site (RS26I030400)	Yes	Yes	Confirm condition at EPA monitoring station using an SSIS. Collect chemistry to confirm if nutrients are a significant issue. Shuffle test if siltation is suspected as a significant pressure.
LCA 6.2	LCA Site 6.2 Upstream of Ballymoe WWTP	Yes	Yes	Carry out SSIS/RA and collect chemistry at this point. The samples at this LCA site will be compared to the samples downstream of the Ballymoe WWTP. This site will capture any issues that are immediately upstream of the Ballymoe WWTP
LCA 6.3	EPA Operational	Yes	Yes	Confirm condition at EPA monitoring station using an SSIS.

Station	Station Name	SSIS/RA	Chemistry	Reason
	Monitoring point – Fjord at Bookalagh (RS26I030300)			Collect chemistry to confirm if nutrients are a significant issue. Shuffle test if siltation is suspected as a significant pressure.
LCA 6.4	LCA Site 6.4 in the townland of Tobinstown	Yes	Yes	Carry out SSIS/RA and collect chemistry at this point. Downstream of forestry plantation Shuffle test also, to check levels of silt. Downstream of Springfield_020 outflow.
LCA 6.5	LCA Site in the townland of Moneenally	Yes	Yes	Carry out SSIS/RA and collect chemistry at this point. Downstream of area of land drainage. Shuffle test if siltation is suspected as a significant pressure.
LCA 6.6	LCA Site 6.6 in the townland of Castlefield	Yes	Yes	Carry out SSIS/RA and collect chemistry at this point. In an area of Rank 1, 2, 3 Phosphorus PIP Shuffle test if siltation is suspected as a significant pressure.
LCA 6.7	LCA Site 6.7 in the townland of Farm	Yes	Yes	Carry out SSIS/RA and collect chemistry at this point. Investigate any impacts coming from the land use upstream. In an area of Rank 1, 2, 3 Phosphorus PIP Shuffle test if siltation is suspected as a significant pressure.
LCA 6.8	LCA Site 6.8 in the townland of Creggameen	Yes	Yes	Carry out SSIS/RA and collect chemistry at this point. Shuffle test if siltation is suspected as a significant pressure.
LCA Site 6.9	LCA Site 6.9 in the townland of Trien	Yes	Yes	Carry out SSIS/RA and collect chemistry at this point. Shuffle test if siltation is suspected as a significant pressure.
LCA Site 6.10	LCA Site 6.10 at Clough Bridge on the R361	Yes	Yes	Carry out SSIS/RA and collect chemistry at this point. Shuffle test if siltation is suspected as a significant pressure.

7 Review of mitigation options

Where agriculture on poorly draining soils is a pressure in the catchment, the following are suggested mitigation actions:

- Education and awareness for farmers on agricultural pressures from farm yards, effluent management and control including nutrients pathways in high PIP areas and impacts to high status sites in particular.
- Awareness raising in relation to the EPA phosphate PIP maps, showing risk areas for phosphate loss.
- Source control particularly for organic soils
- Pathway interception measures to reduce phosphate (and sediment) loss to waters
- Advice on land drainage following best practice guidance from advisory bodies
- Awareness to landowners and farmers on impacts of land reclamation. Advice on good practice and measures to prevent sediment losses to water, impact of riparian removal etc

Urban wastewater and other point sources

An urban wastewater pressure in the catchment has already been referred to Irish Water. Where other point sources are identified as pressures in the demonstration catchment, liaise with licensing/permitting authorities to address.

Appendix I: Protected area map, Islands Demonstration Catchment

