Tyshe Priority Area for Action

Desk Study

(AFA0175)

Tyshe Bridge, looking west, February 2020.

Disclaimer:

Although every effort has been made to ensure the accuracy of the material contained in this publication, complete accuracy cannot be guaranteed. The Local Authority Waters Programme (LAWPRO) nor the author(s) accept any responsibility whatsoever for loss or damage occasioned, or claimed to have been occasioned, in part or in full as a consequence of any person acting or refraining from acting, as a result of a matter contained in this publication.

Table of Contents

List of Figures

List of Tables

Acknowledgements

The authors would like to acknowledge the contribution of Kerry County Council staff to this report and thank them for their support to the Local Authority Waters Programme. The Council has carried out a significant amount of work in the Tyshe catchment in recent years.

Data attribution

The following data sources were consulted in the preparation of this report:

Catchment boundaries, waterbodies and areas for action: EPA (2018)
Bedrock Unit: GSI (2008)
Aquifer Category: GSI (2015)
LandUse: Corine 2018
Soils & Subsoils Maps: Teagasc-EPA (2015)
IFS Soils: EPA (2006)
Susceptibility and Pollution Impact Potential Maps: EPA (2018)
WFD waterbody status: EPA (2018)
Pollution Impact Potential Maps: EPA (2016)
Flood Risk Management Plan for the Tralee Bay-Feale River Basin, 2018
Ardfert Waste Water Treatment Plant Site Visit Report - SV17563 - Irish Water, 10 December 2019
SANICOSE model 2018

Date of completion of this desk study

Document conclusions are based on data collated on or before **10th December 2019**

Summary

The Tyshe River rises in County Kerry near Rathkenny and flows north-westwards towards the coast before joining the Ballynoe_010 and flowing out to sea above Banna beach. There are two waterbodies in the Tyshe PAA – the Tyshe_10 and the Tyshe_20. The Tyshe PAA is mostly rural with the village of Ardfert located in Tyshe_10 and the village of Banna located in Tyshe_20. The Tyshe_10 is currently (WFD cycle 2) *At Risk* of not meeting the WFD objectives of Good status. There is one monitoring point which has Poor ecological status that is driven by Poor invertebrate status and Poor fish status. Nutrient conditions are also failing at this monitoring site – all three nutrients (nitrate (N), ammonium (NH_4-N) and ortho-phosphate (P)) are Moderate status. The Tyshe_20 (WFD cycle 2) is currently unassigned and at *Review* status. the Tyshe_020 has no biology monitoring but has chemistry data at two monitoring points. The chemistry data shows elevated concentrations for P (Poor status) and N (Moderate status) at both of these sites. Ammonia is also elevated at the upstream site (Moderate status) but improves to Good status at the outlet site.

The data available for this desk-study supports the pressures indicated in the WFD app for Tyshe 10 – agriculture and domestic wastewater. Delivery of P may be highest from the poorly drained soils to the south which have a high surface P pollution impact potential (PIP). The elevated ammonia concentrations could also indicate the presence of farmyard point sources, which could be on the well-drained soils too. There are a few (six) domestic wastewater systems with high – very high P impact potential along the north and south tributaries of the Tyshe_10. These could also be delivering ammonia into the stream and should be factored into the local catchment assessment sampling. Delivery of nitrate is likely to be highest from the well-drained agricultural fields overlying the karstified aquifer, particularly where rock is at the surface and subsoil permeability is high. The Local catchment assessment should therefore focus on disentangling the sources of elevated P and NH_3 from the sources of elevated N, particularly trying to isolate any point sources responsible for elevated P and NH_4-N.

Tyshe_20 is unassigned and an IA3 is specified in the WFD app. Therefore, the local catchment assessment will be limited in this waterbody. However, the chemistry data available for this waterbody indicates that it is *At Risk* based on elevated P, N and NH_4-N. If possible, a kick sample will be taken to assess the biological status of the waterbody however, it is likely to be tidal/saline for much of its length so this may not be possible. Agriculture and urban wastewater are listed as the significant pressures in the WFD app. However, a new treatment plant for Ardfert was installed in 2017 therefore chemistry samples (and biology if possible) will also be taken above and below the discharge from this new plant to ascertain if it could be removed as a significant pressure. Similar to the Tyshe_10, delivery of P and NH_4-N may be highest from the poorly drained and peaty soils which have a high surface P PIP. The elevated NH_4-N concentrations could also indicate the presence of farmyard point sources, which could be on the well-drained soils too. Delivery of N is likely to be highest from the well-drained agricultural fields overlying the karstified aquifer, particularly where rock is at the surface and subsoil permeability is high.

1 Background

Table 1-1: Background information on the Tyshe PAA

Priority Area for Action	Catchment Number	Catchment Name	Sub catchment	Region	Local Authority
Tyshe	23	Tralee Bay-Feale	23_7 Ardfert_Oughter_SC_010	Southwest	Kerry

Priority Area for Action	No. of *At Risk* WBs	No. of *Review* WBs	No. of dRBMP Prioritised WBs	No of WBs for Status Improvement:		
				2021	2027	Beyond 2027
Tyshe	2	0	0	0	2	0

Reason for selection	• Discharges into designated bathing waters (Banna strand). • Building on improvements from upgrade to Ardfert WWTP. • Headwaters to High Ecological Status objective coastal water body.

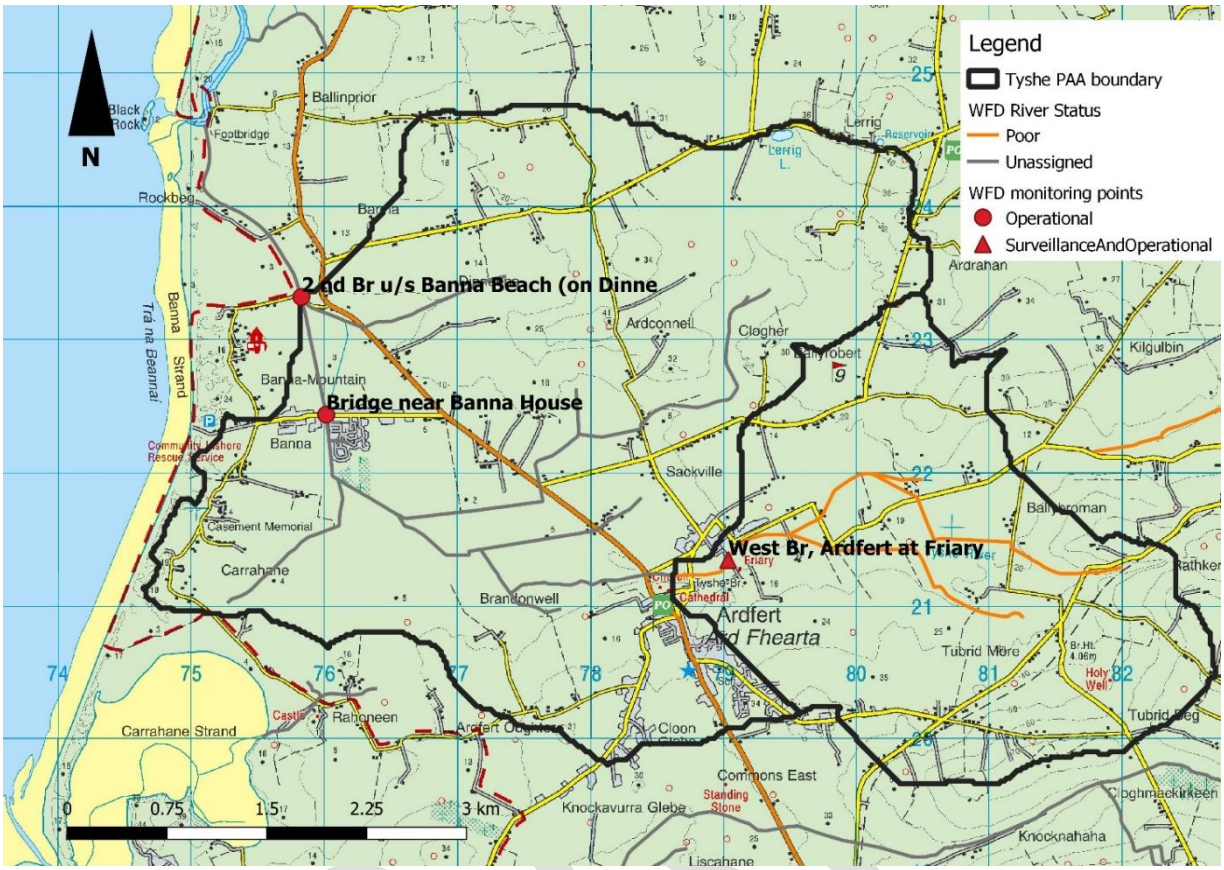


Figure 1-1: Tyshe River Priority Area for Action Ecological Status (2010-2015).

1.1 Protected Areas

The Tyshe River discharges into the High-Status objective Outer Tralee Bay coastal waterbody. The coastline at the outflow is part of the Akeragh, Banna and Barrow Harbour SAC and pNHA and is also part of the Tralee Bay Complex SPA. Banna Strand Bathing Waters are located approximately 2 km south of the outflow at Blackrock. These bathing waters are Blue Flag status and were compliant with EU Guide and Mandatory values for Bathing water quality in 2013 and were classified as Good Water Quality.

1.1.1 Drinking water

The Ardfert South drinking water supply is abstracted from groundwater at two boreholes on the Tyshe_20. The following information in blue has been extracted from an EPA report in 2012 by "Kelly, Coran, et al. Establishment of Groundwater Source Protection Zones Ardfert Water Supply Scheme Ardfert South Borehole" These boreholes are located 0.7 km northwest of Ardfert village as shown in Figure 1 below and deliver water to Ardfert and Fenit. These boreholes draw from a sand and gravel deposit that overlies a karstified aquifer, at a variable rate of 1200 to 1900 m3/day at 24 hours per day depending on which borehole is pumping and what the demand is. The Zone of Contribution as currently delineated meets 100% of the demand. The groundwater vulnerability in the Inner Source Protection Area is 'extreme' as the water table is within 3m of the ground surface and the sand and gravel aquifer is the target at risk. Over the majority of the remainder of the area, the vulnerability

varies from ‘extreme’ to ‘moderate’. Nitrate concentrations are consistently high (but were compliant with standards for nitrate in 2015). Chloride concentrations are consistently high but are likely to reflect the location close to the coast. According to the Local Authority the current pumping regime comes under strain in dry summers, which appears evidenced by increasing drawdown probably due to a combination of demand and possibly indicating the limited extent of sand and gravel and also possibly an influence of dewatering at the quarry.

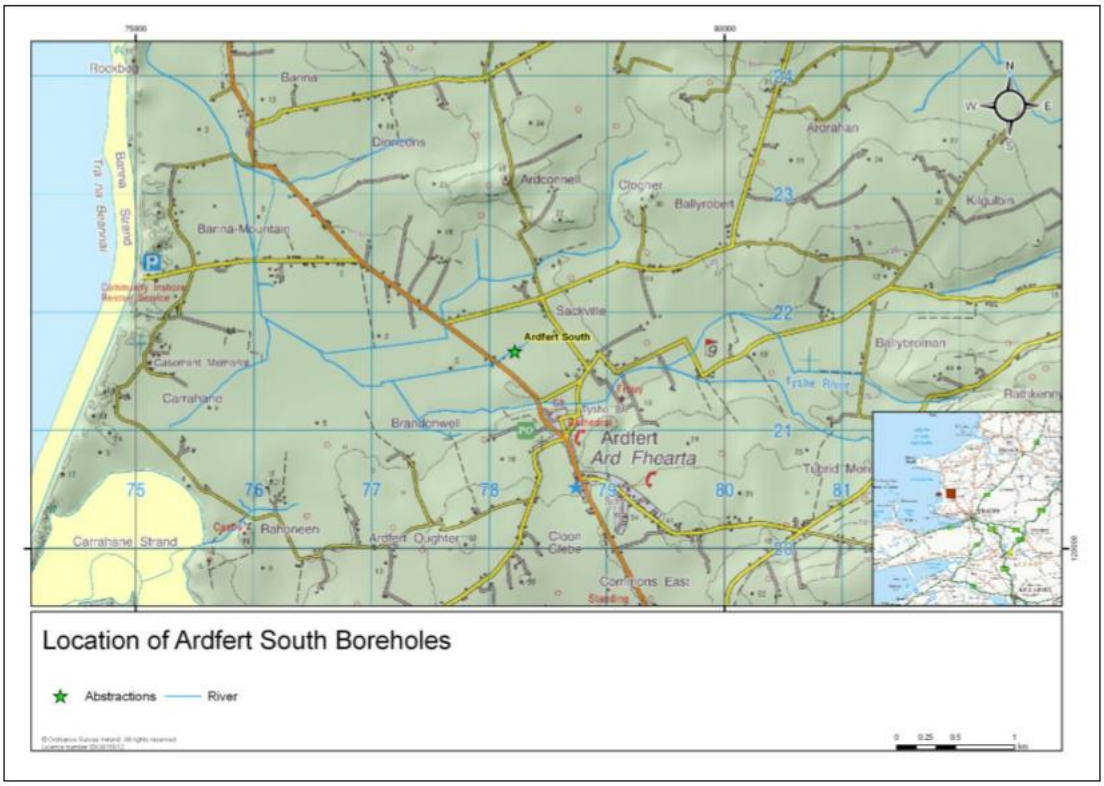


Figure 1-2. Location Map for Ardfert South Boreholes - *taken from Kelly, Coran, et al. "Establishment of Groundwater Source Protection Zones Ardfert Water Supply Scheme Ardfert South Borehole".*

Table 1-2: Summary table of individual waterbodies within the Tyshe System PAA

Waterbody Code	Waterbody Name	Risk *Use colour codes*	Obj.	Ecological Status			Pressures		
				2007-2009	2010-2012	2010-2015	Category	Subcategory	Sig? (Y/N)
IE_SH_23T020400	Tyshe_10	*At risk*	Good	Poor	Poor	Poor	Agriculture	Agriculture	Y
							Domestic Waste Water	Single House Discharges	Y
IE_SH_23T020500	Tyshe_20	*Review*	Good	Unassigned	Unassigned	Unassigned	Urban Waste Water	Agglomeration PE of 1,001 to 2,000	Y
							Agriculture	Agriculture	Y
							Hydromorphology	Channelisation	N

Source: Summary information from WFD App

2 Receptor information

2.1 Overview table

Table 2-1: Receptor information for Tyshe PAA

		Figures Tables	Tyshe_010	Tyshe _020	
WFD station			West Br Ardfert at Friary	Bridge near Banna House	2nd Bridge upstream Banna Beach
Risk Category	**2010-2015**		*At Risk*	*Review*	
Biological Status (inverts)	**2010-2015**	Y	Poor	Unassigned	
Biological status (fish)	**2010-2015**		Poor	Unassigned	
Supporting Chemistry	**2010-2015**		Moderate	Moderate	
Nutrient Conditions	**2010-2015**		Fail	Fail	
Ortho-P (mg/l P)	**Baseline**	Y	0.087	0.075	0.070
	indicative quality		Poor	Poor	Poor
	Trends - significant?		Upwards	Downwards	Downwards
	Dist to threshold		Has exceeded EQS	Has exceeded EQS	Has exceeded EQS
NH4-N (mg/l N)	**Baseline**	Y	0.130	0.125	0.057
	indicative quality		Poor	Moderate	Good
	Trends - significant?		Upwards	Upwards	Upwards
	Dist to threshold		Has exceeded the EQS	Has exceeded the EQS	Far
TON (mg/l N)	**Baseline**	Y	3.826	3.589	3.527
	indicative quality		Poor	Moderate	Moderate
	Trends - significant?		Downwards	Downwards	Downwards
	Dist to threshold		Far	Far	Far
Supporting Conditions	**Oxygenation Conditions**		Pass	No data	No data
	Acidification Conditions		Pass	No data	No data
	Specific pollutants		Pass	No data	No data
	Chemical status		Good	No data	No data

		Figures Tables	Tyshe_010	Tyshe _020	
Other water quality data			BOD levels also exceeded the 95%ile 18 times from 2007 – 2019 (n = 247) 19 samples <80% saturation (n = 142).	BOD levels also exceeded the 95%ile 10 times from 2007 – 2019 (n = 86) 7 samples <80% saturation (n = 21). 3 samples >120%, (n=21)	BOD levels also exceeded the 95%ile 5 times from 2007 – 2019 (n = 53) 8 samples <80% saturation (n = 21). 2 samples >120%, (n=21)
Hydromorphology					
RHAT score			Moderate	No data	No data
Evidence of Arterial drainage		Y	No	Yes	Yes
Ecological Status (2010–2015)		Y	Poor since 1989 (moderate 2007)	Unassigned	Unassigned
Elements driving status			Invertebrates and fish	No data	No data
Protected Areas			No	No	No
WFD Objective			Good	Good	Good
EPA biologist notes (if any)			2014 survey: Moderate RHAT score. Moderate siltation. 2017 survey: substrate siltation heavy		N/A
Significant issue/impact for receptor (e.g. PO_4)			Orthophosphate, nitrate, ammonium and sediment	Orthophosphate, nitrate, ammonium	Orthophosphate, nitrate

Source: Summary information from WFD App

2.2 Q values

There are no biological monitoring data for Tyshe_020, which is unassigned.

Tyshe_010 is monitored for biology at one site 'West Br Ardfert at Friary'. Other than one moderate result in 2007, biology here has been consistently poor since 1989 (see table 2.2)

Table 2.2: Table of Q values for Tyshe_10

	1987	1989	1993	1996	1998	2001	2005	2007	2011	2014	2017
West Br, Ardfert at Friary	Bad	Poor	Poor	Poor	Poor	Poor	Poor	Moderate	Poor	Poor	Poor

Source: Summary information from WFD App

2.3 Hydrochemistry

Tyshe_10

Ortho-phosphate, Nitrate and Ammonium levels for West Bridge, Ardfert at Friary from 2010 to 2019 are graphed below in Figures 2-3-1 to 2-3-3 respectively. Also shown on the graphs are the mean and 95%ile EQS's for each parameter.

As can be seen from the graphs, annual average nutrient concentrations nearly always exceed the mean EQS for all three nutrients and sometimes even exceed the 95%ile EQS for ortho-phosphate and ammonium. The individual grab samples frequently exceed the 95%ile EQS for ortho-phosphate and ammonium with peaks in excess of 0.4mg/L recorded for ortho-phosphate and in excess of 1mg/L recorded for ammonium. Nitrate concentrations are mostly within the 3.5mg/L (mean EQS) – 5.4mg/L range (95%ile EQS).

Tyshe_20

Orthophosphate, Nitrate and Ammonium levels are graphed below for two monitoring stations on Tyshe_20; 'Bridge near Banna House' (Fig. 2-3-4 – 2-3-6) and '2nd bridge u/s near Banna House' (Fig. 2-3-7 – 2-3-8). Also shown on the graphs are the mean and 95%ile EQS's for each parameter.

Orthophosphate concentrations at the two monitoring stations on Tyshe_20 are similar to those in Tyshe_10 - annual average concentrations have always exceeded the mean EQS and have frequently exceeded the 95%ile EQS. Nitrate concentrations were slightly lower at the two monitoring stations on Tyshe_20 (in comparison to Tyshe_10). Whilst individual grab samples frequently exceeded the mean EQS of 3.5mg/l, annual averages tended to hover around this threshold (sometimes slightly higher/lower) in recent years. Ammonia concentrations were also slightly lower at the two monitoring stations on Tyshe_20 (in comparison to Tyshe_10) and decreased downstream, from the upper station (bridge near Banna House) to the lower station (2nd Br u/s near Banna House). At the upper station (bridge near Banna House), annual average concentrations nearly always exceeded the mean EQS (except in 2010) and exceeded the 95%ile EQS twice. Further downstream at 2nd Br u/s near Banna House, annual average concentrations of ammonium exceeded the mean EQS three times and never exceeded the 95%ile EQS.

Tyshe_10

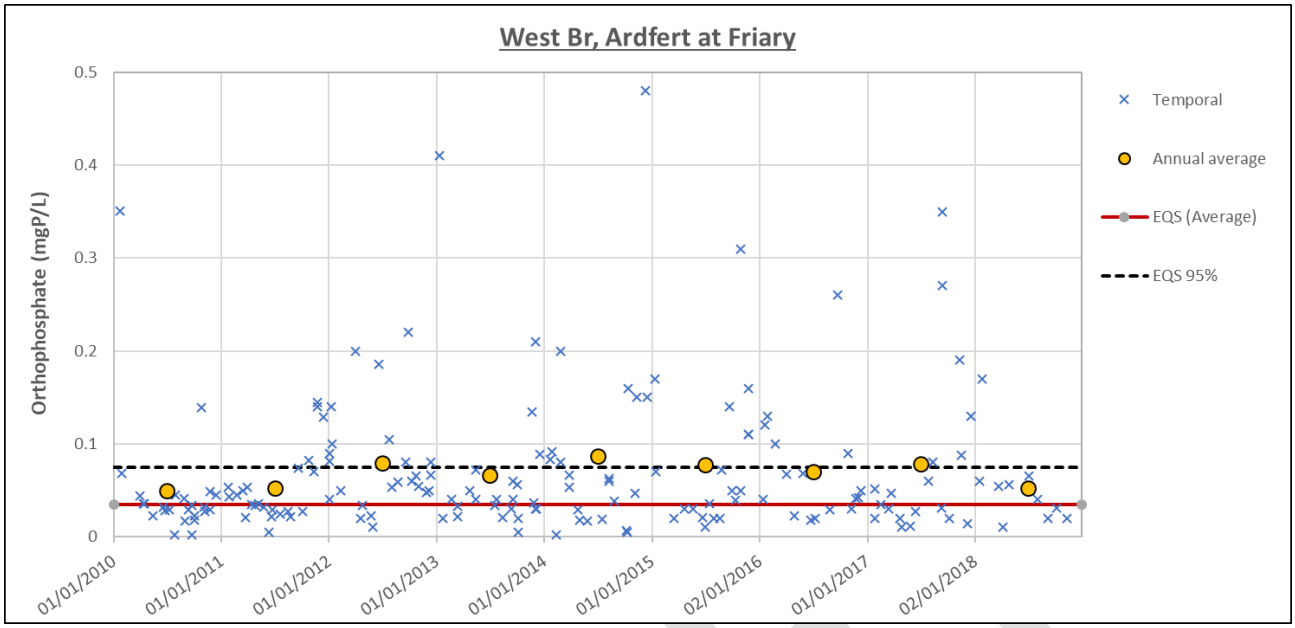


Figure 2-3-1 Orthophosphate concentrations at West Br, Ardfert at Friary.

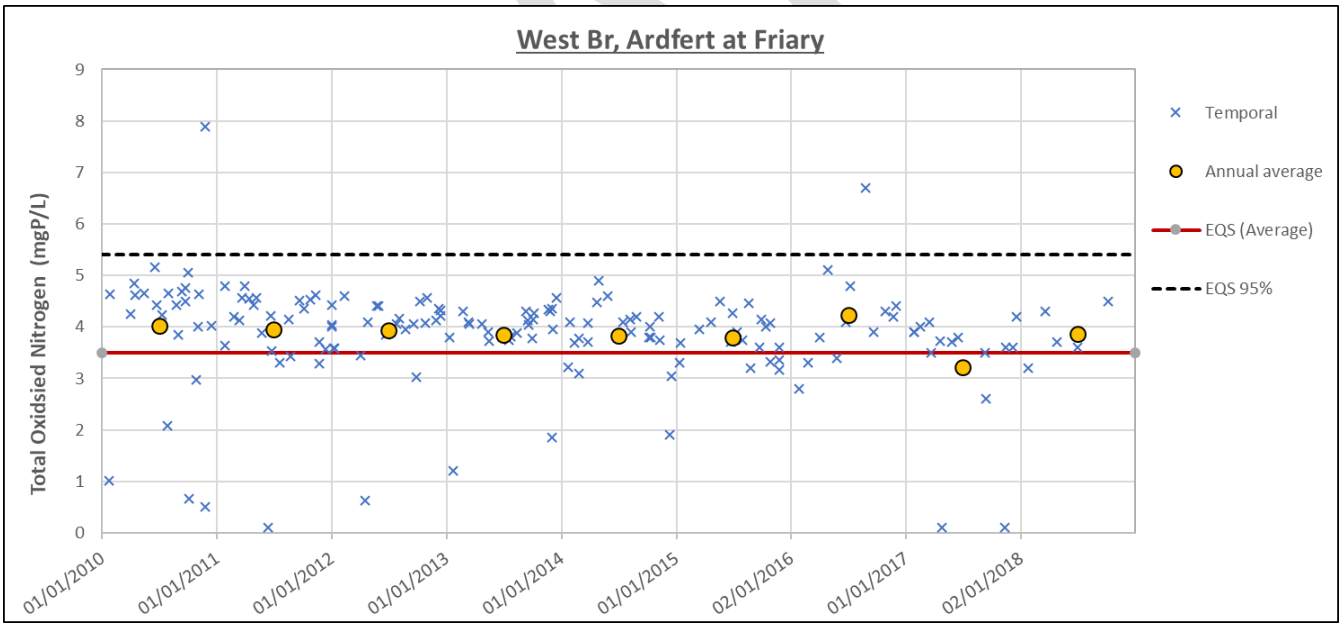


Figure 2-3-2 Total Oxidised Nitrogen concentrations at West Br, Ardfert at Friary.

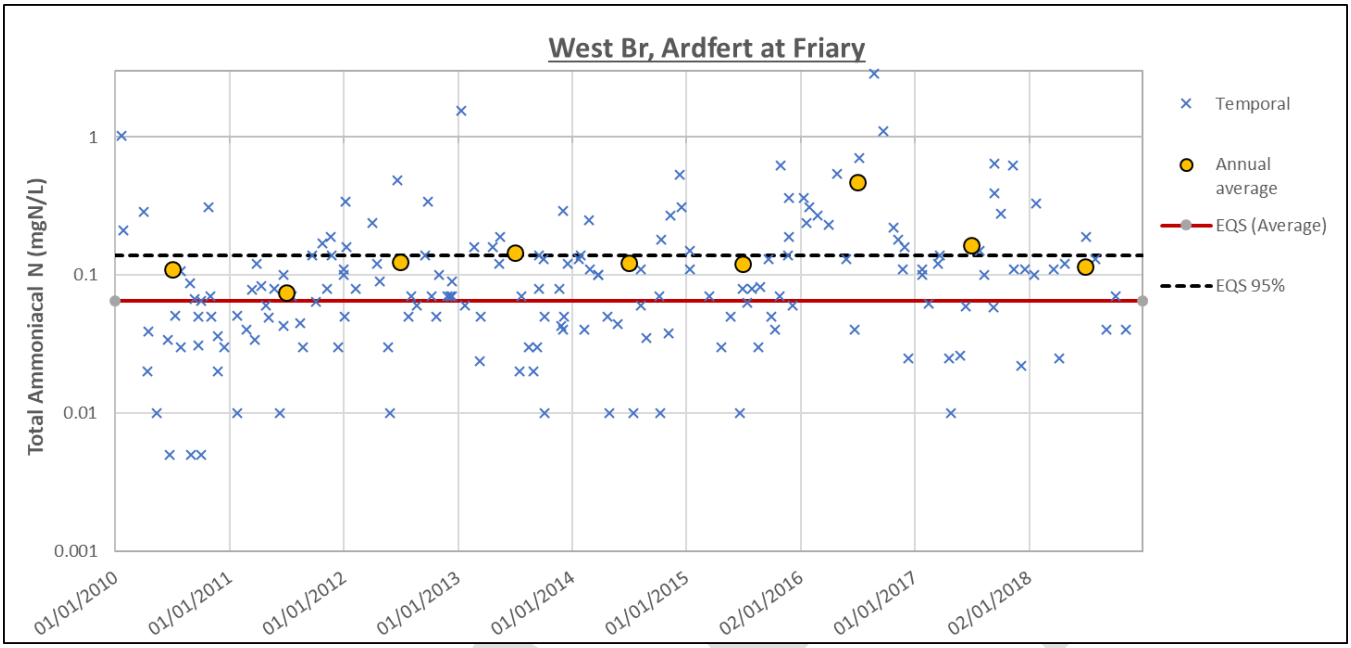


Figure 2-3-3 Total Ammoniacal N concentrations at West Br, Ardfert at Friary. Log scale is used here to accommodate the full range of values.

Tyshe_20

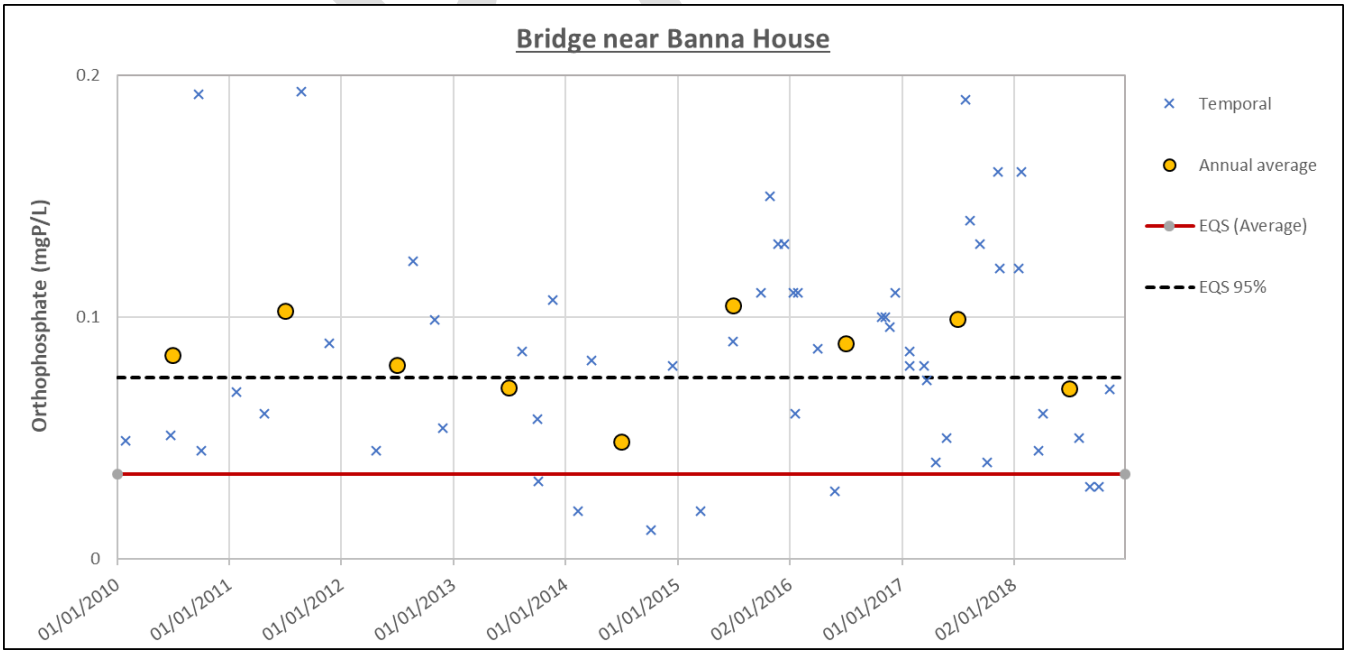


Figure 2-3-4 Orthophosphate concentrations at Bridge near Banna House.

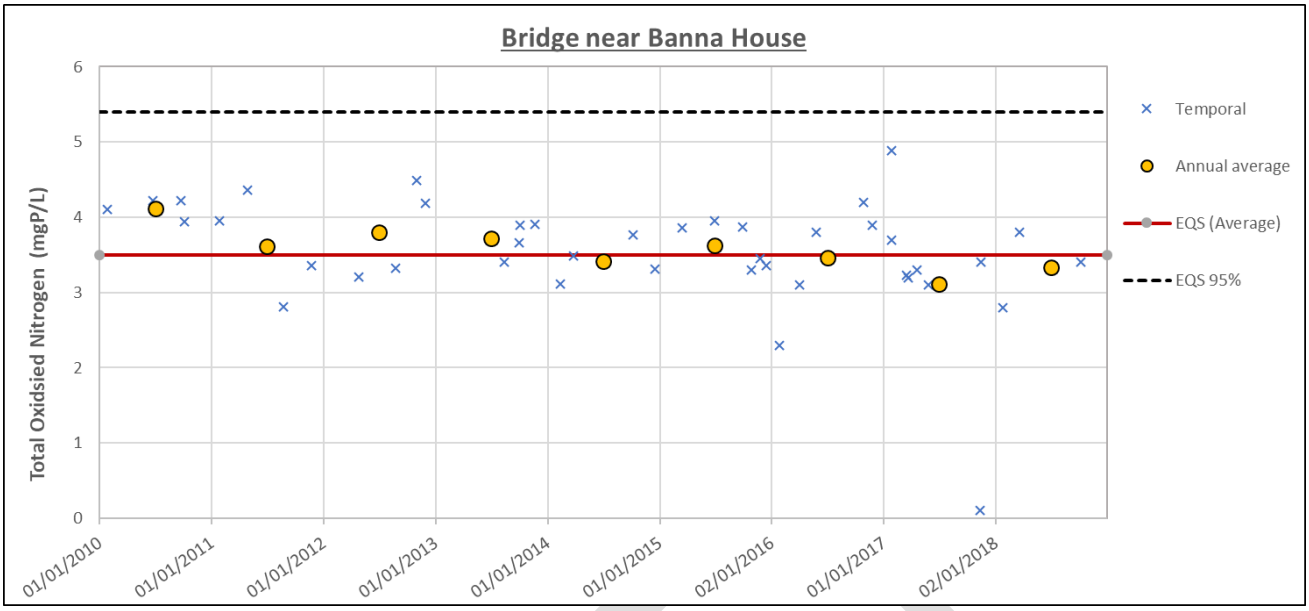


Figure 2-3-5 Total Oxidised Nitrogen concentrations at Bridge near Banna House.

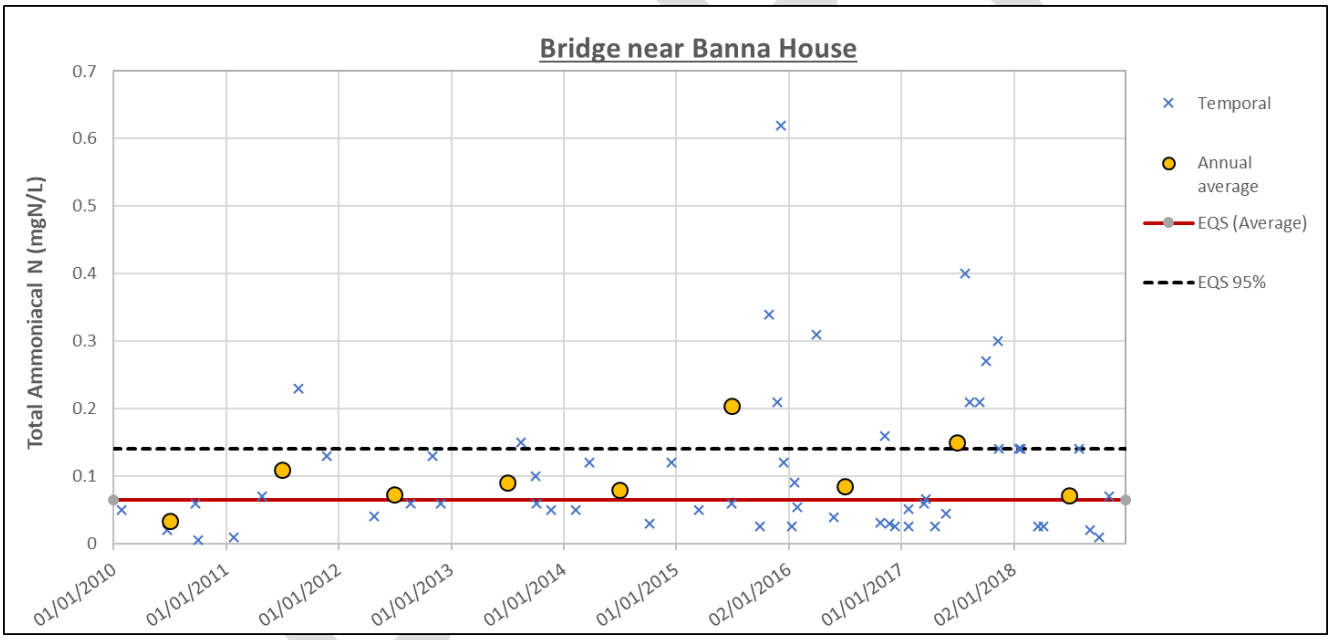


Figure 2-3-6 Total Ammoniacal N concentrations at Bridge near Banna House.

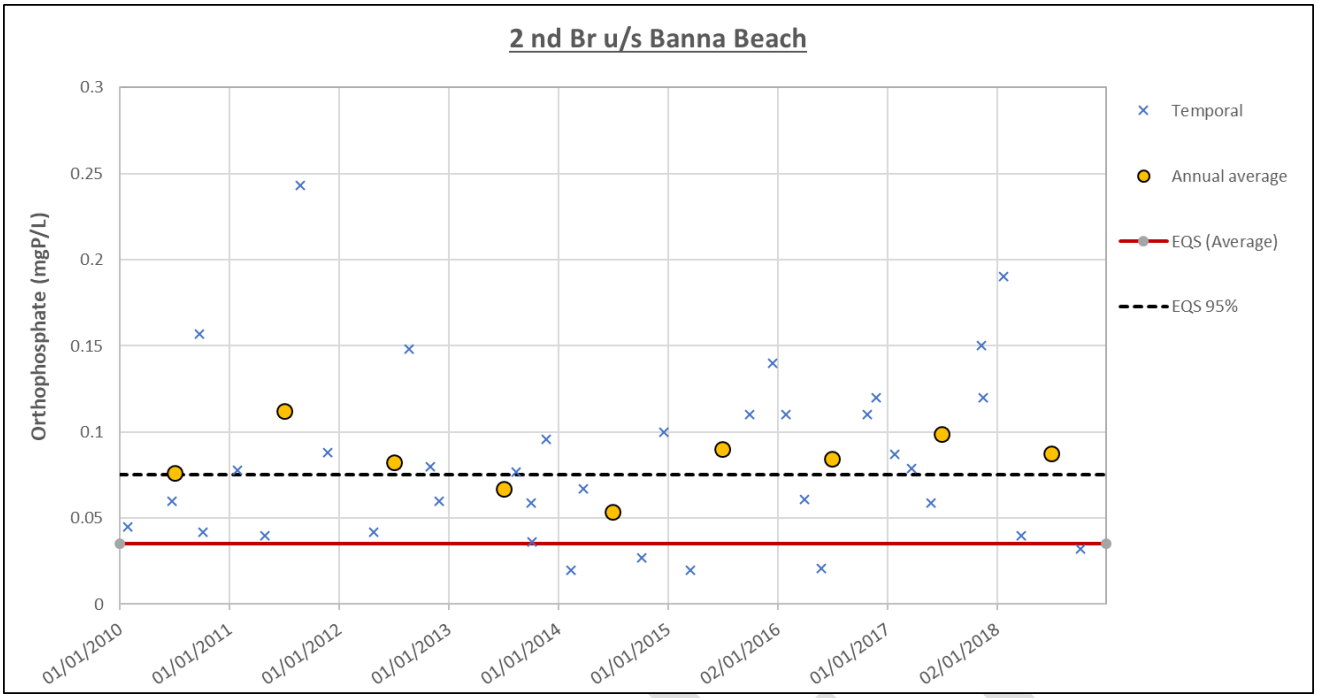


Figure 2-3-7 Orthophosphate concentrations at 2nd Bridge u/s Banna Beach.

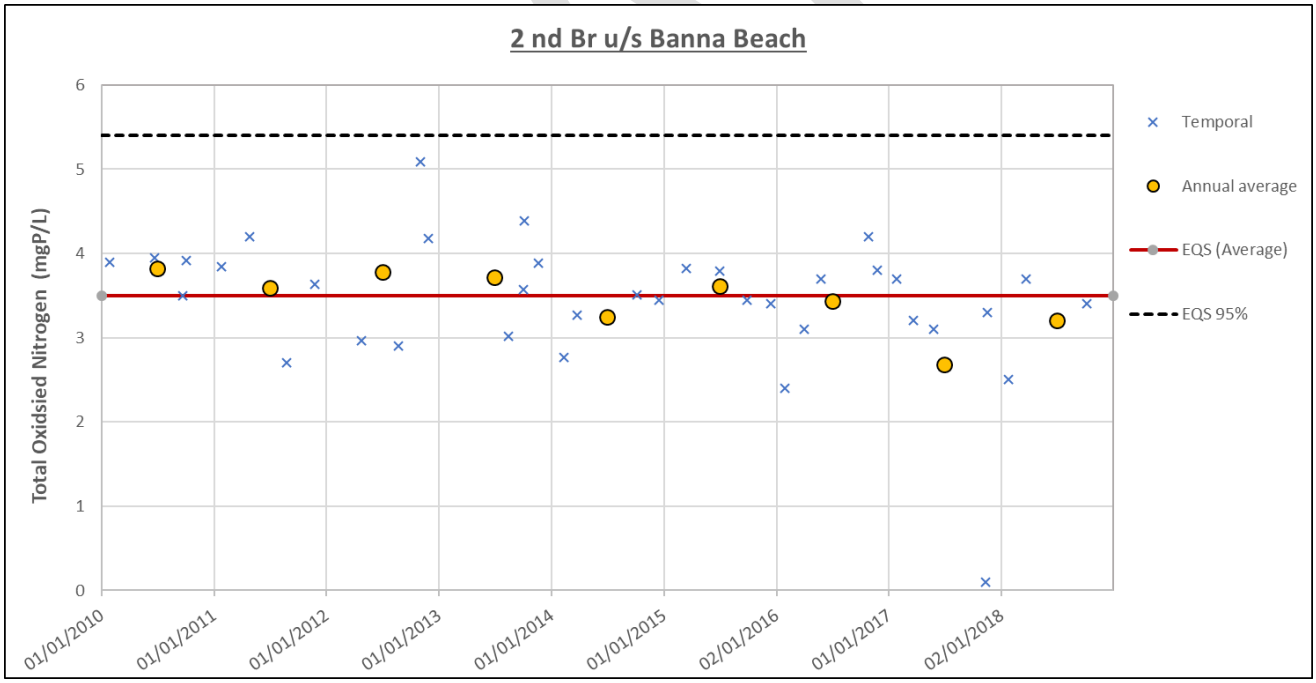


Figure 2-3-8 Total Oxidised Nitrogen concentrations at 2nd Bridge u/s Banna Beach.

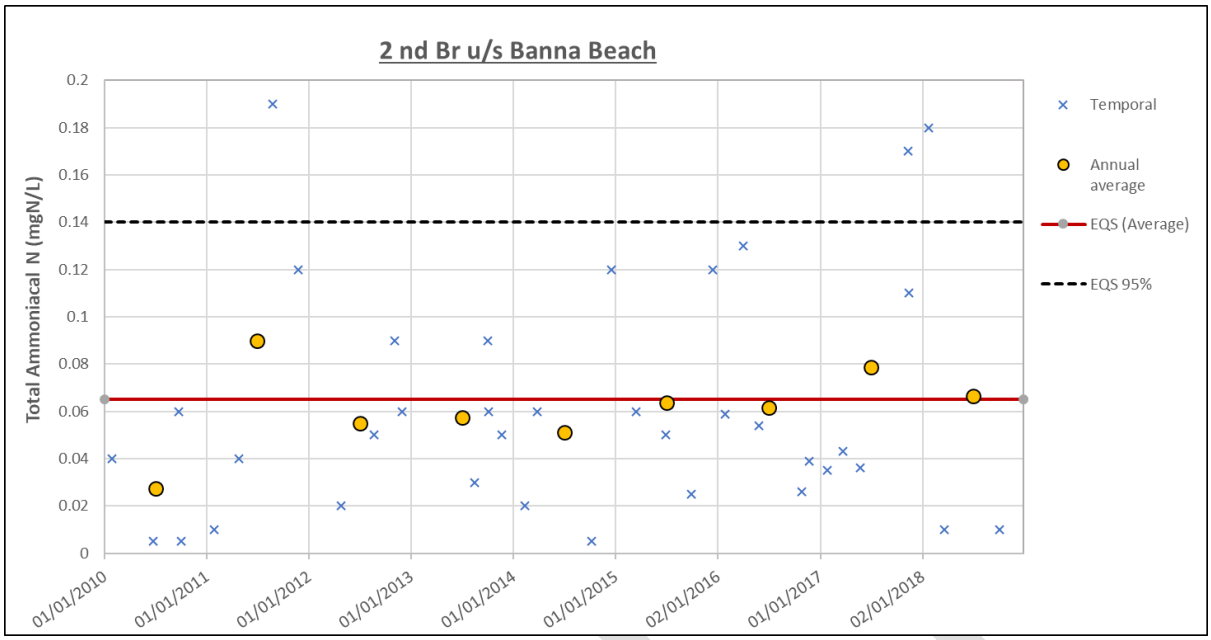


Figure 2-3-9 Total Ammoniacal Nitrogen concentrations at 2nd Bridge u/s Banna Beach.

2.4 Summary of Issues

Tyshe_10

Tyshe_10 has been at Poor ecological status since 1989, with the exception of 2007 when it was at Moderate status. The Poor status is mainly driven by macroinvertebrate and fish status. However nutrient conditions are also consistently failing for all three parameters (orthophosphate, ammonia, nitrate). The biologists noted that siltation was Moderate in 2014 and Heavy in 2017. Therefore, elevated nutrients, **including orthophosphate, ammonium and nitrate, as well as sediment, are the significant issues in this waterbody.**

Tyshe_20

Tyshe_20 is unassigned, however hydrochemistry data are routinely collected at two WFD monitoring sites. These sites are failing on nutrient conditions, specifically ortho-phosphate and nitrate, however ammonium concentrations are also elevated with frequent spikes. Therefore, elevated nutrients, **including orthophosphate, ammonium and nitrate are the significant issue in this waterbody.**

3 Significant pressures

3.1 Initial EPA characterisation

Table 3-1: Initial EPA characterisation

Water body Name	Id	Category	Sub Category	Name	Significant?	Pressure & Impact details
Tyshe_10	WBP0005554	Agriculture	Agriculture	n/a	Yes	Nutrient Pollution Organic Pollution
	WBP0005555	Domestic wastewater	Single House discharges	n/a	Yes	Nutrient Pollution Organic Pollution
Tyshe_20	WBP0005557	Urban wastewater	Agglomeration PE 1,001 – 2,000	Ardfert	Yes	Nutrient Pollution Organic Pollution
	WBP0005558	Agriculture	Agriculture	n/a	Yes	Nutrient
	WBP0005559	Hydromorphology	Channelisation	n/a	No	

Source: Summary information from WFD App

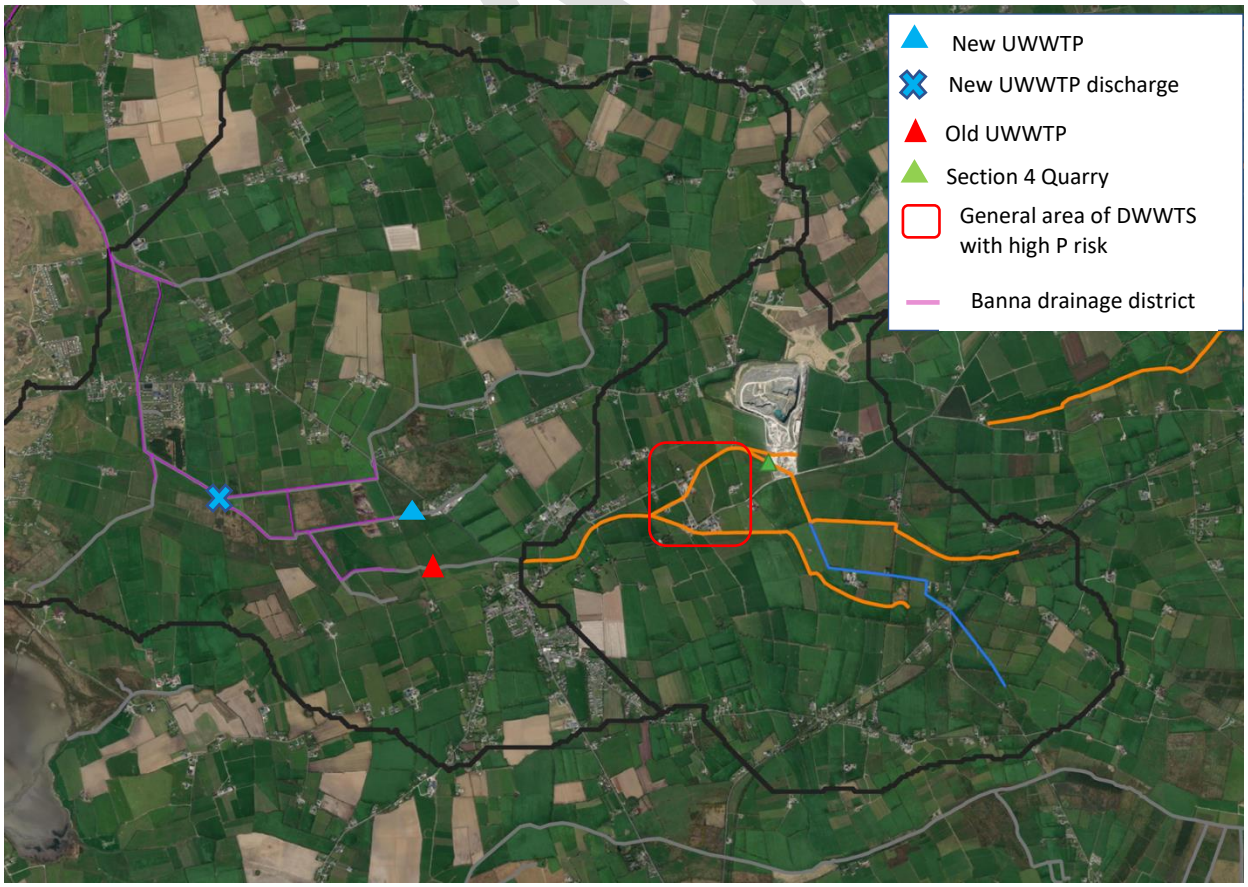


Figure 3-1. Location of pressures within the Tyshe PAA

3.2 Diffuse pollution pressures

Table 3-2: Surface water and near surface phosphorus source load apportionment modelling (SLAM V2.04, April 2016)

Waterbody	Pasture	UWW	Septic tanks
Tyshe_10	87%		6%
Tyshe_20	65%	20%	

Source: WFD Characterisation Workshop Kerry County Council, Storyboards & Sub-catchment Overview maps

3.3 Urban wastewater Treatment Plant

Urban wastewater is listed as a significant pressure on Tyshe_20 for cycle 2 of the WFD in the WFD app. However, since this pressure assessment was done, a new urban wastewater treatment plant with a design p.e. of 1200 has been installed for the Ardfert agglomeration (2017) in a different location on Tyshe_20 (see Figure 3-1 above). The tributary adjacent to the new plant location has low flows and can dry up, therefore the discharge has been piped to a downstream location as indicated in Figure 3-1 above. The older plant (see location Figure 3-1 above) appears to have been overloaded and had primary treatment only. The new plant consists of tertiary treatment (with phosphorus removal and Rapid Gravity Filtration). The new plant is now fully compliant with the emission limit values in the wastewater discharge licence for the Ardfert agglomeration. (Site Visit Report - SV17563 - Irish Water, 10 December 2019, accessed from www.epa.ie/licensing/ in April 2020).

An investigation of the River Tyshe was undertaken on 20/08/2015 by the EPA Office of Evidence and Assessment. Based on the results of that investigation and following internal EPA consultation it was determined that the River Tyshe should be considered transitional waters from the vicinity of Ardfert WWTP downstream to the confluence with Outer Tralee Bay (EPA Inspector's report, 2015).

3.4 Domestic wastewater

Domestic wastewater is listed as a significant pressure on Tyse_10 for cycle 2 of the WFD in the WFD app. Figure 3-1 above shows the location of domestic wastewater treatment systems (DWWTS) on the Tyshe_10 which are considered to have a high or very high phosphorus pollution impact potential (SANICOSE model, 2018). Four of these also have a very high nitrogen pollution impact potential. These DWWTS should be factored into the local catchment assessment for this waterbody.

3.5 Hydromorphology

The Tyshe River, specifically Tyshe_20, falls within the Banna Drainage District (see Figure 3-1 above). Kerry County Council has a statutory duty to maintain this Drainage District. The River Tyshe flows to the sea at Blackrock. The outfall at Blackrock is vulnerable to blockage from build-up of sand (Flood Risk Management Plan for the Tralee Bay-Feale River Basin, 2018). Sand and seaweed are excavated out of the channel opening. These works currently take place at least every two weeks, but this can be daily in the winter months. The annual cost of these works is estimated at approximately €150,000. The drainage systems back up when this outfall at Blackrock is not clear. Maintenance work is also carried out to keep tidal flaps, approx. 600m upstream of the outfall, functioning. Sluice gates are manually operated to close on high tides to prevent tide backing up on Tyshe River, typically closed

once every few weeks (Flood Risk Management Plan for the Tralee Bay-Feale River Basin, 2018). As part of a national Preliminary Flood Risk Assessment, discontinuing the existing regime of removing silt and debris from the outfall at Blackrock is being explored.

3.6 Quarry

An active limestone quarry, with its base at -25 mOD, is located in the Tyshe_10 catchment as shown in Figure 3-1 above. The quarry has a section 4 license and is being dewatered – approximately 2500 m3/d on average. The quarry may be delivering elevated sediment loads to the Tyshe_10 and could account for the Moderate to Heavy siltation recorded by the biologists in 2014 and 2017.

4 Pathway information (diffuse pollution)

4.1 Conceptual Model Development

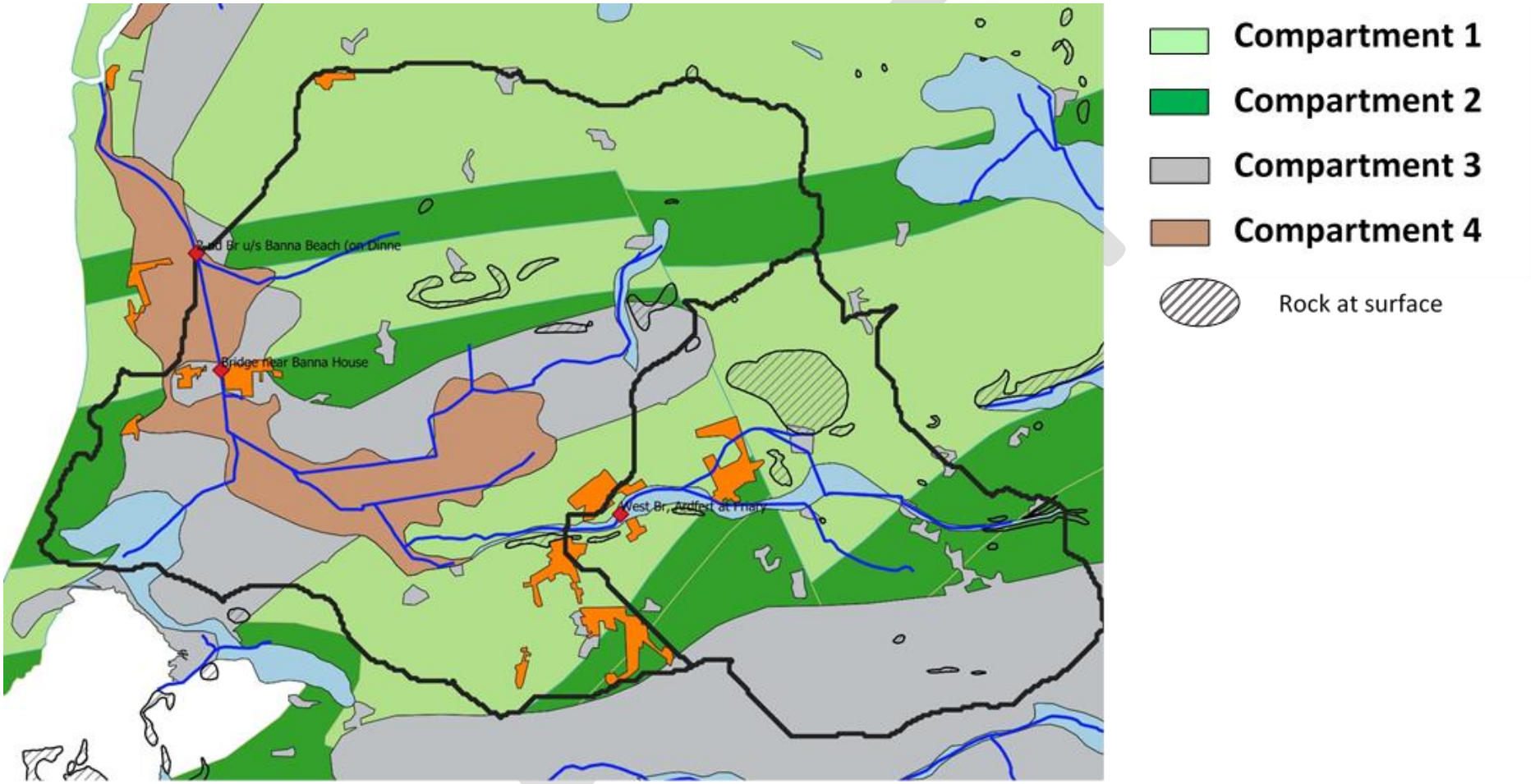


Figure 4.1: Conceptual model compartments for Tyshe PAA.

Table 4.1: Conceptual model compartments for Tyshe PAA.

	Compartment 1	Compartment 2	Compartment 4	Compartment 5
Soil Drainage	Well drained	Well drained	Poorly drained	Peat
Subsoil permeability	Low-Moderate	Low-Moderate	Moderate	Peat
Aquifer Type	Unproductive	Productive	Mostly productive	Productive and Unproductive
P susceptibility	Mostly Low	Very Low - Low	High	High
Near surface N susceptibility	Low	Low-Moderate	Low	Low
Subsurface N susceptibility	Very Low-Low	Tyshe_10 - areas of Very-Low, Moderate and Very-High (where rock is at the surface) Tyshe_20 - mostly Moderate but very high near borehole.	Very Low	Very Low
P PIP	Very Low - Low	Very Low - Low	High-Very High	High-Very High
Surface water receptor N PIP	Mixture of Very Low to Very High.	Mixture of Very Low to Very High.	Very Low	Very Low
Groundwater receptor N PIP	Very Low	Mixture of Low-Moderate. Very High near Borehole and around quarry	Very Low	Very Low

4.2 Pathways description

Tyshe_10 and Tyshe_20 are failing for all three nutrients: ortho-phosphate, ammonium and nitrate, therefore the conceptual model has focused on both surface and subsurface pathways for nutrient loss in this PAA.

Tyshe_10

As can be seen in Figure 4-1, the Tyshe_10 has predominantly well-drained soils with some poorly drained soils in the uplands to the South. The poorly drained soils are prone to losses of phosphorus in overland and shallow subsurface pathways and also to sediment losses in overland flow. The surface P pollution impact potential (PIP) is mostly very high on these poorly drained soils (Appendix 6) indicating the presence of high P source pressures from agriculture on these vulnerable soils. The well-drained soils overlay a locally important aquifer to the south and a regionally karstified aquifer further up the catchment (Appendix 2). Nitrate delivery to the stream is likely to be highest from the karstified aquifer however low subsoil permeabilities mean recharge is low and overall nitrate susceptibility (Appendix 4 & 5) and PIP (Appendix 7 & 8) are low except in local zones where rock is at the surface (e.g. the quarry) or where subsoils are more freely draining.

Tyshe_20

As can be seen in Figure 4-1, the Tyshe_20 has predominantly well-drained soils with central zones of poorly drained and peaty soils. These poorly drained and peaty soils are prone to phosphorus and ammonium losses in overland and shallow subsurface flows, and also to sediment losses in overland flow. The surface P PIP (Appendix 6) is very high in these zones indicating a high source availability of phosphorus. The well-drained soils overlay a regionally karstified aquifer and also bands of a locally important aquifer (Appendix 2). Nitrate delivery to the stream is likely to be highest from the karstified aquifer however low subsoil permeabilities mean overall nitrate susceptibility (Appendix 4 & 5) and PIP (Appendix 7 & 8) are low except in local zones where rock is at the surface or where subsoils are more freely draining (e.g. near the borehole).

4.3 Conclusions on the Significant Pressures

Tyshe_10

Excess nitrate, phosphate, ammonium and sediment, are the significant issues at this site which could be symptomatic of agricultural pressures and domestic wastewater as listed in the WFD app. There is an extended area of poorly-drained high P PIP to the South, away from the main river channel, which is risky for P and sediment losses from agriculture in overland/near surface flows. The sediment may also be associated with activities in the quarry and will need to be assessed as part of the local catchment assessment. The well-drained soils overlying the karstified aquifer are the riskiest for nitrate loss from agriculture, particularly where rock is at the surface (near quarry). Continuously elevated ammonium concentrations are indicative of persistent point sources (e.g. leaky tanks, dairy washings) which cannot be narrowed down to any particular part of the catchment at this point.

- Agriculture (diffuse and point)
- Domestic wastewater

Tyshe_20

Excess nitrate, phosphate and ammonia are the significant issues at this site which could be symptomatic of agricultural pressures and urban wastewater as listed in the WFD app. However, a new treatment plant for Ardfert was installed in 2017 therefore urban wastewater may no longer be a significant pressure here and will be assessed in the local catchment assessment. There are extended areas of high P PIP in the middle of the catchment around the river channel which are risky for P and sediment losses from agriculture in overland/near surface flows. The well-drained soils overlying the karstified aquifer are the riskiest for nitrate loss from agriculture, particularly where subsoil permeability is high (near borehole). Continuously elevated ammonium concentrations are indicative of persistent point sources (e.g. leaky tanks, dairy washings) which cannot be narrowed down to any particular part of the catchment at this point.

- Agriculture (diffuse and point)
- Urban wastewater (unlikely to still be significant but needs some upstream/downstream data)

5 Interim Conclusions on the PAA based on the desk study

The Tyshe River (Tyshe_010 and Tyshe_020) rises in County Kerry near Rathkenny and flows north-west towards the coast and out to sea above Banna beach. The Tyshe_10 is currently (WFD cycle 2) *At Risk* and the Tyshe_20 is under *Review*.

Tyshe_10

- WFD cycle 2 – **At Risk,** Poor WFD status (driven by macro-invertebrates and fish)
- Supporting chemistry data – Yes (Moderate status)
- Significant issue - nutrients; nitrate, ortho-phosphate and ammonium (all moderate status) and sediment (moderate/heavy siltation).
- The main significant pressures are likely agriculture and domestic wastewater.
- As this waterbody is At Risk, additional fieldwork is needed. This field work should focus on rapid assessments or SSIS and chemistry samples to determine where the elevated nutrients are arising and should include an assessment upstream and downstream of the quarry.

Tyshe_20

- WFD cycle 2 – **Review**, Unassigned.
- Supporting chemistry data – Yes (Poor-Moderate status)
- Significant issue – nutrients; nitrate (Moderate), ortho-phosphate (Poor) and ammonium (Moderate).
- The main significant pressures are likely to be agriculture and urban wastewater.
- This waterbody is Unassigned, however, the chemistry data available for this waterbody indicates that it is At Risk based on elevated P, N and NH_4-N.
- If possible, a kick sample will be taken to assess the biological status of the waterbody however, it is likely to be tidal/saline for much of its length so this may not be possible. Urban wastewater is listed as a significant pressure in the WFD app. However a new treatment plant for Ardfert was installed in 2017 therefore chemistry samples (and biology if possible) will also be taken above and below the discharge from this plant to ascertain whether it can be removed as a significant pressure.

6 Workplan

6.1 EPA further characterisation actions

Table 6-1. EPA further characterisation actions

WB Name	Id	Action	Responsible Organisation	Further Characterisation Action details
Tyshe_010	FC003284	IA7 Multiple Sources in Multiple Areas	LAWPRO	IA7, full assessment. Start on the poorly drained soils. Source of ammonia and phosphate not likely from well drained soils or groundwater source; likely to be agriculture and septic tanks in areas of wet soils.
			Inland Fisheries Ireland	IFI to liaise with EPA on whether information available on the driver(s) of Poor fish status.
Tyshe_020	FC002678	IA3 Determination of Water Quality (unassigned waterbody)	LAWPRO	IA3 to determine biological conditions. If issues present, proceed to IA7, with a focus on agriculture and wastewater issues

6.2 Field (Local Catchment Assessment)

Catchment investigations to be undertaken at locations outlined below and as shown in figure 6-2-1. The objective is to identify tributary streams with biological impacts and that may be contributing significant nutrient and/or sediment loadings to the WFD monitoring sites in this PAA.

Tyshe_10 (1 – 6)

Undertake SSIS at sites 1 – 6 shown in Figure 6-2-1 below to identify tributaries that are impacted and causing a significant pressure at the waterbody outlet. Sites 1 and 2 are upstream and downstream of the quarry respectively and may detect any pressures from that facility. Nutrient sampling for ortho-phosphate, ammonium and nitrate should also be done at each of these sites as well as sediment assessments, conductivity, pH, temperature and DO, to determine (i) which tributaries are delivering the highest nutrients loads downstream (ii) where the elevated sediment is arising from and (iii) to help detect any point source pressures for example from farmyards or septic tanks. If impacts are detected on a tributary, continue the assessments along these tributaries.

Tyshe_20 (sites 7-11)

Undertake SSIS at sites 7 – 12 shown in Figure 6-2-1 below where possible, to identify tributaries that are impacted and causing a significant pressure at the WFD monitoring sites. Some of these sites may be too saline to do a reliable SSIS assessment and this should be noted to help determine the extent of saline intrusion in this waterbody. Assess the level of sedimentation and test for conductivity, pH, temperature and DO at each site. Nutrient sampling should also be done at these sites to detect which tributaries are contributing elevated nutrients to the WFD monitoring sites in this PAA. Sites 8 and 9 are upstream and downstream of the discharge pipe from the new wastewater treatment plant respectively. Sites 10 and 11 are upstream and downstream of a holiday home development and may help to determine if this development is discharging nutrients to the waterbody. Visit the water abstraction site (at the WFD monitoring station) and observe any potential impacts it may be having on hydro-morphology.

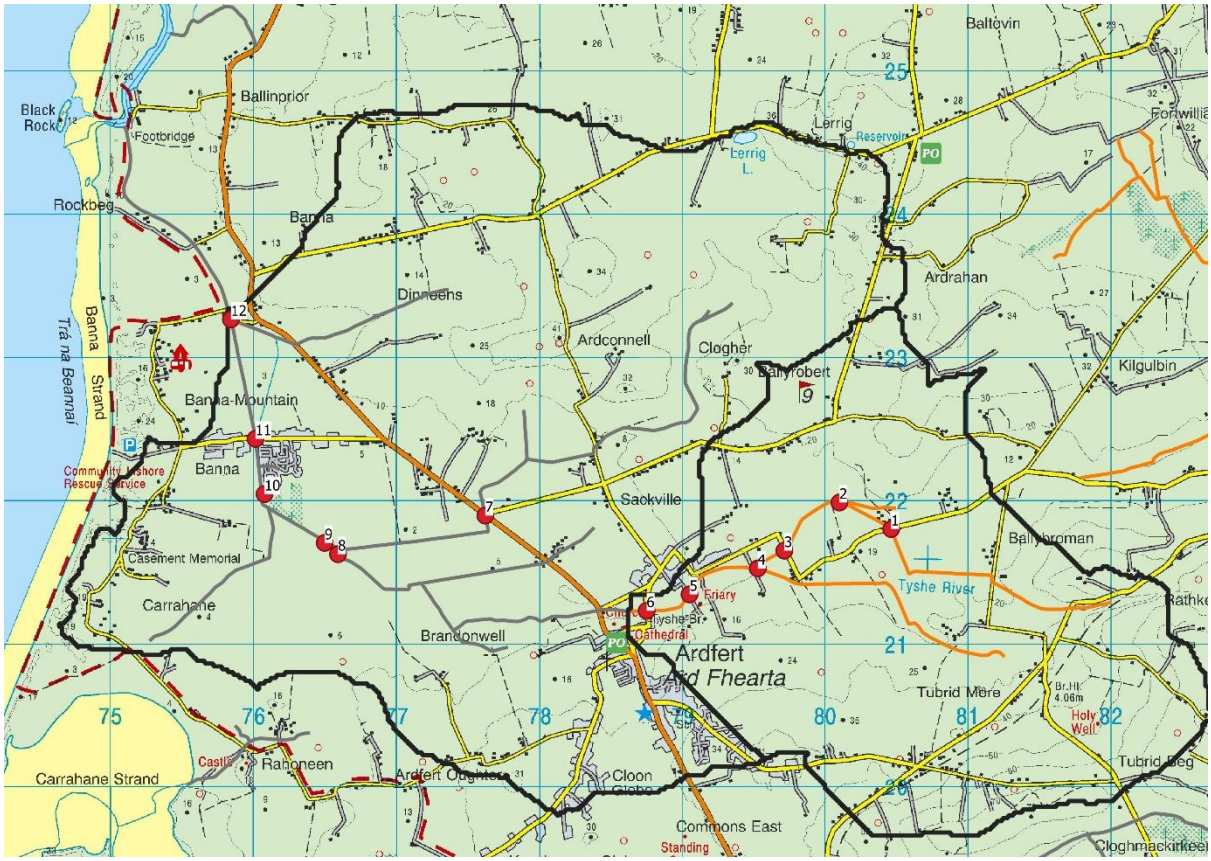


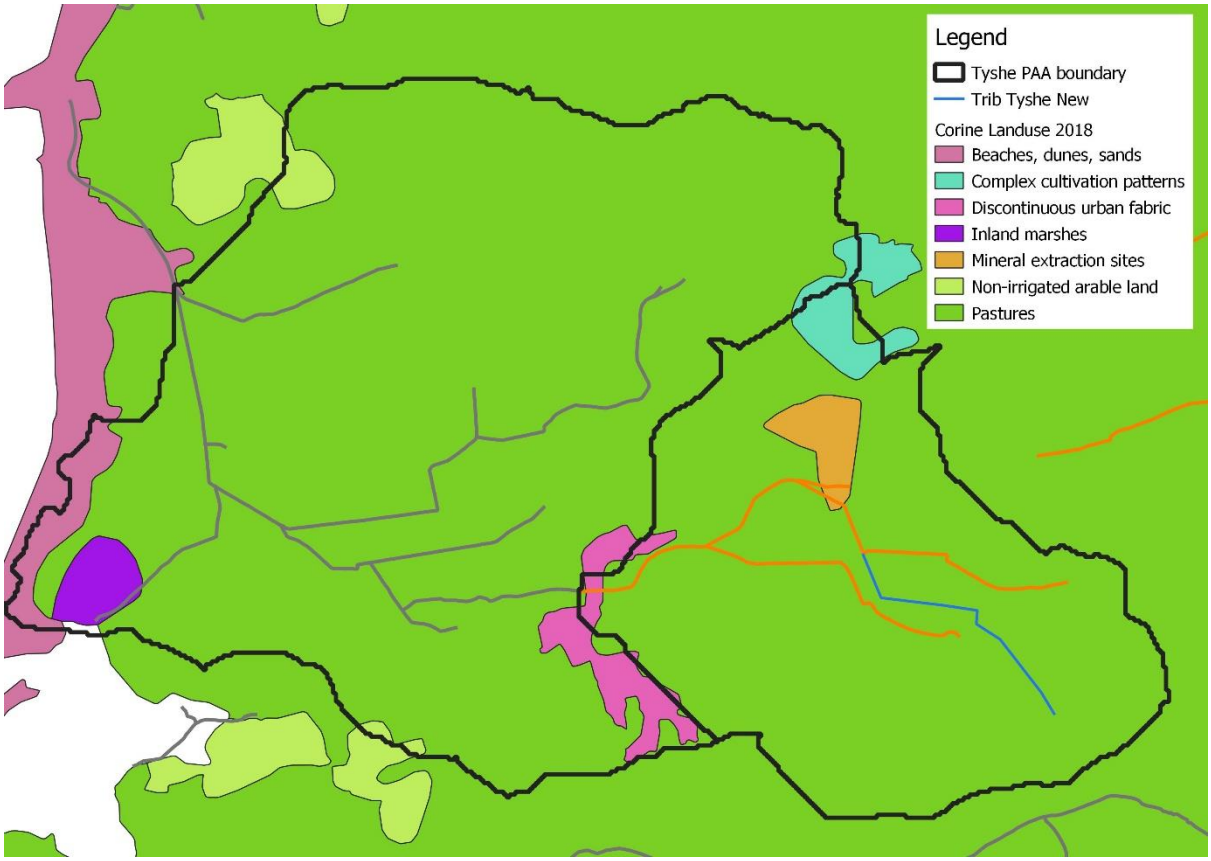
Figure 6-2-1: Local catchment assessment sites on Tyshe_10 and Tyshe_20

7 Communications

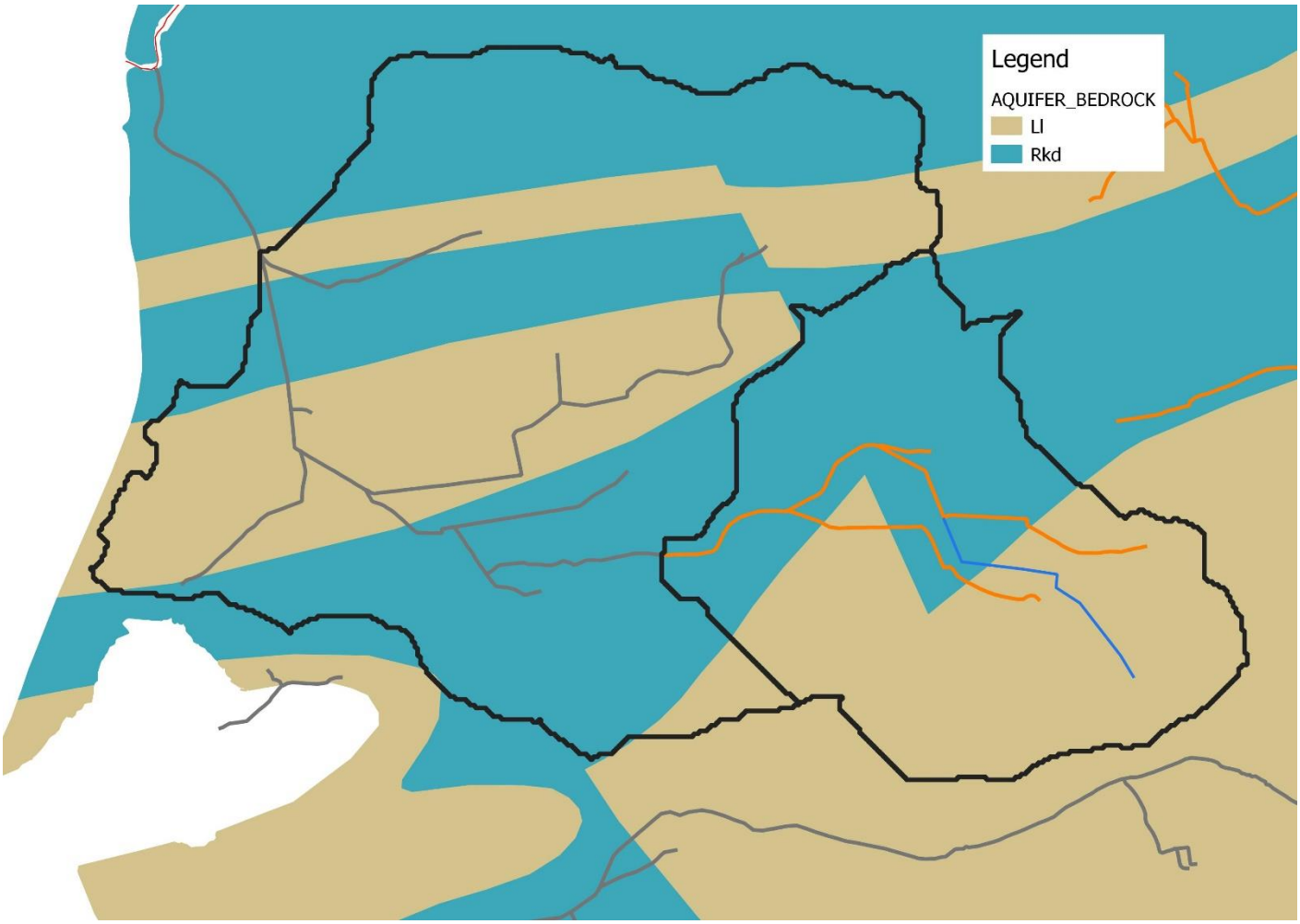
A public information meeting was held on the 14th February 2019 in Ardfert Community Centre, Ardfert in County Kerry. There was a good attendance, *ca.* 20 people in addition to LAWPRO and ASSAP staff. There was a high level of engagement at the meeting with many issues arising. The main concerns at the meeting included: the source protection zone around the abstraction point – were people aware of this? The effects of the quarry on groundwater levels, if invasive species are part of the programme and the implications for farmers if they don't resolve any issues in the allotted timeframe.

8 Appendix

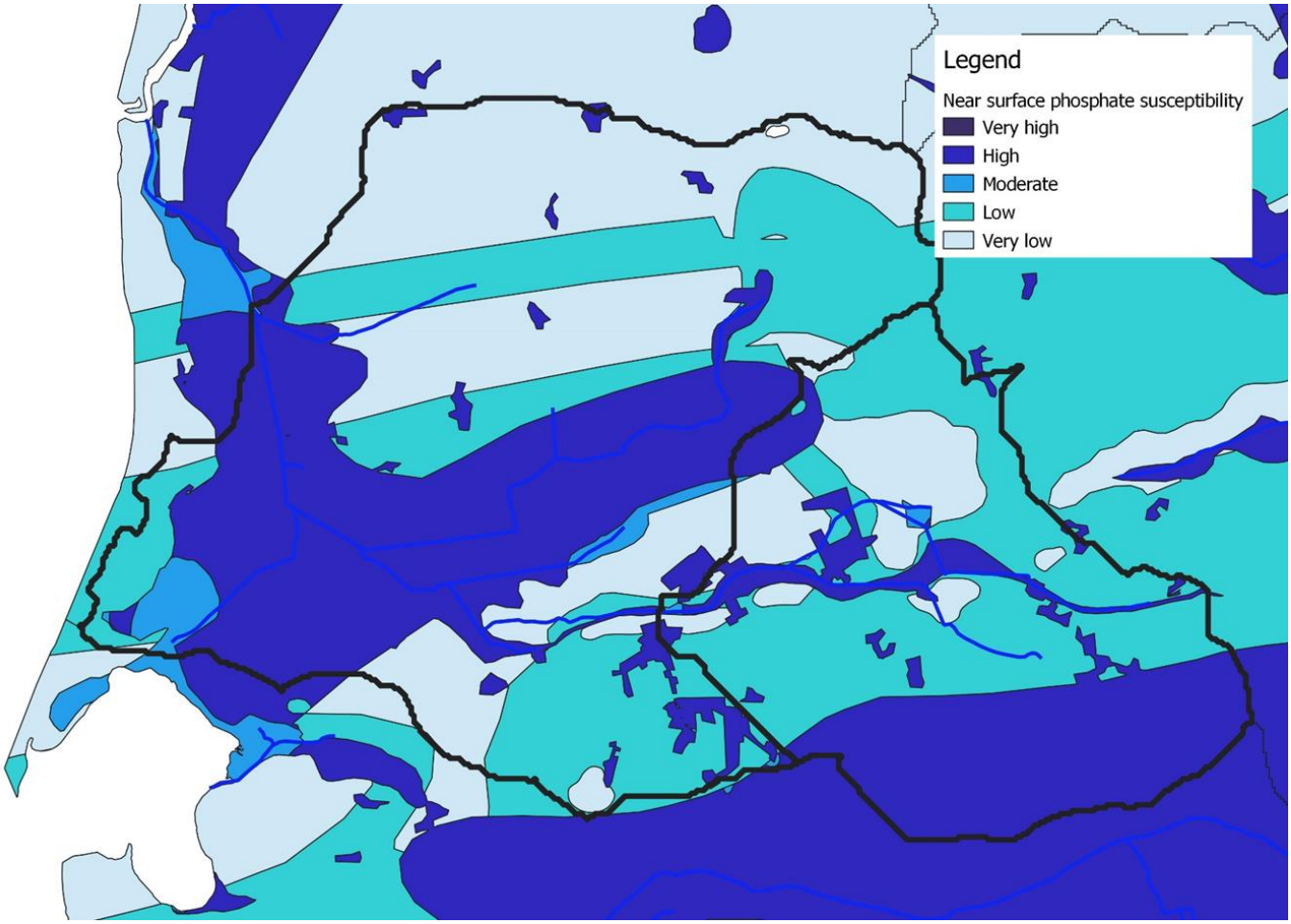
Appendix 1: Corine Landuse in the Tyshe PAA



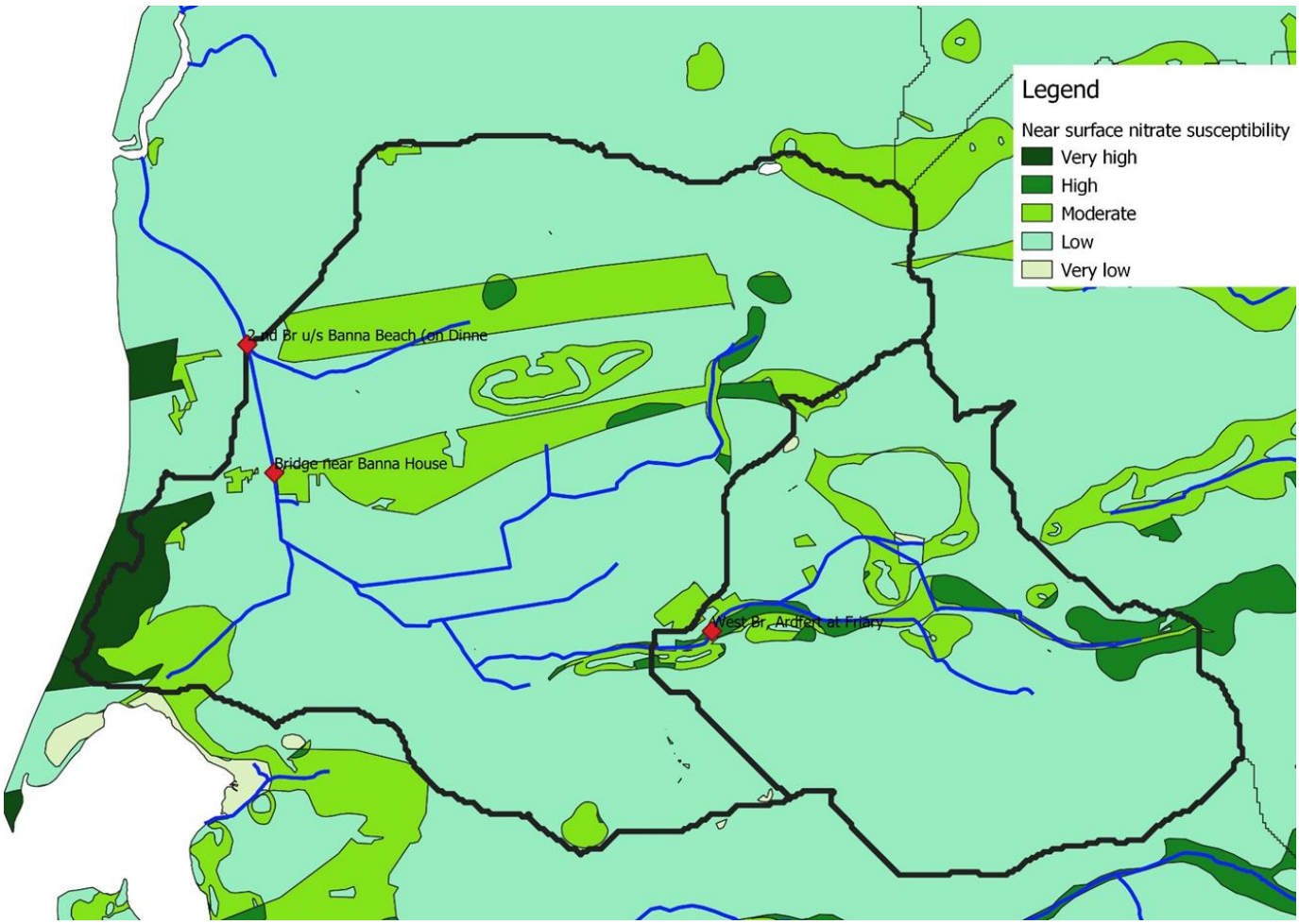
Appendix 2: Bedrock Aquifer type in the Tyshe PAA



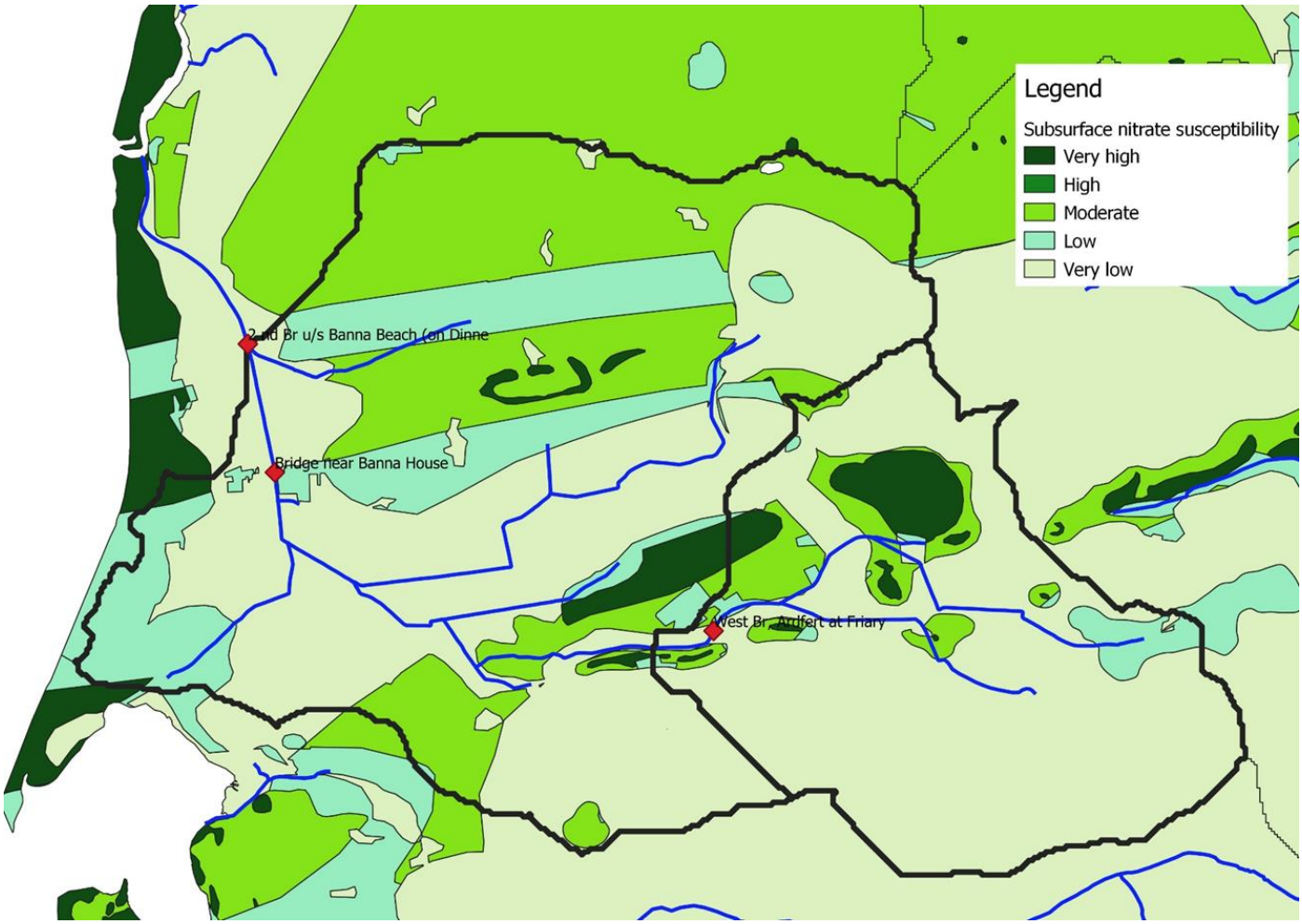
Appendix 3: Near surface phosphate susceptibility map for the Tyshe PAA



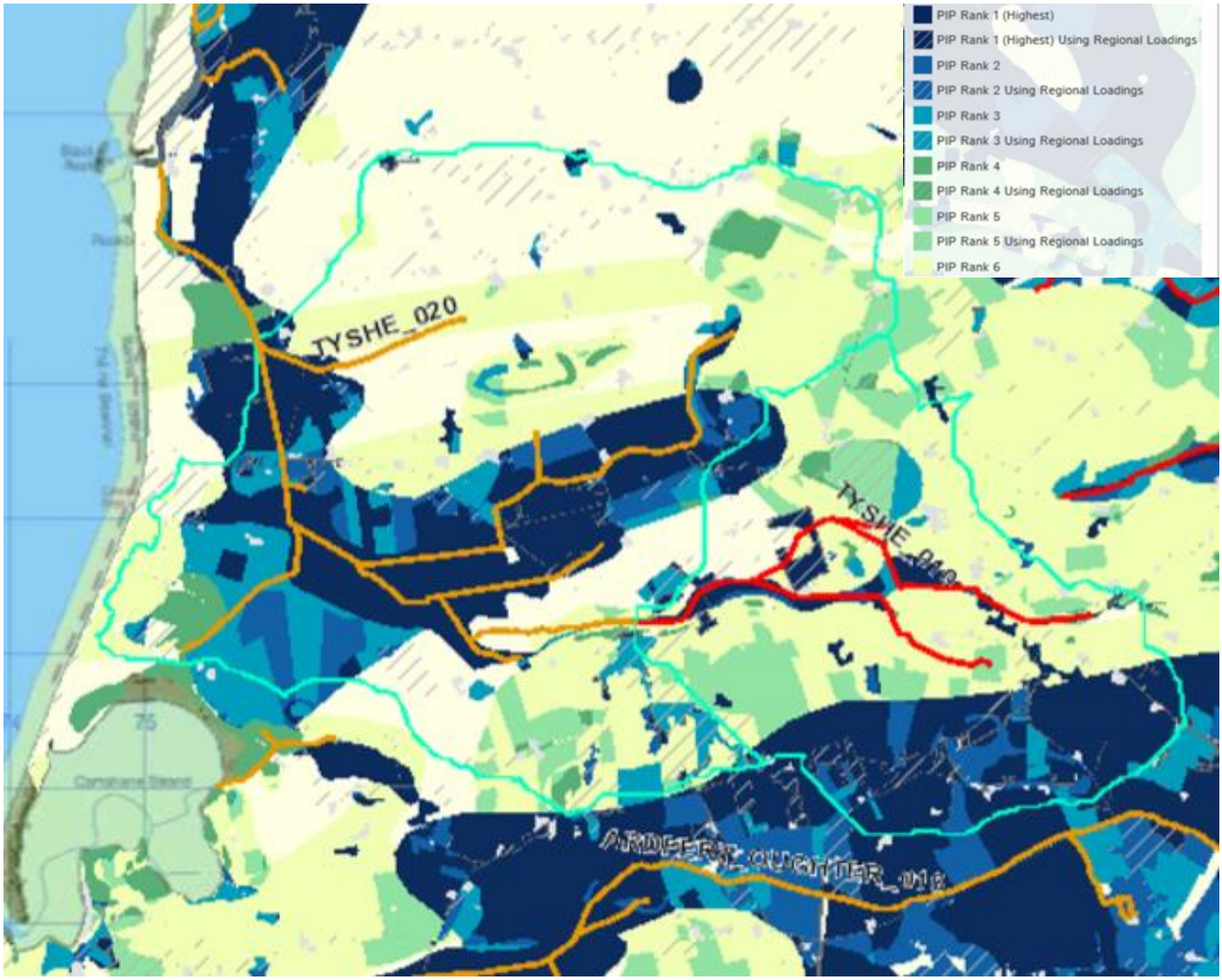
Appendix 4: Near surface nitrate susceptibility map for the Tyshe PAA



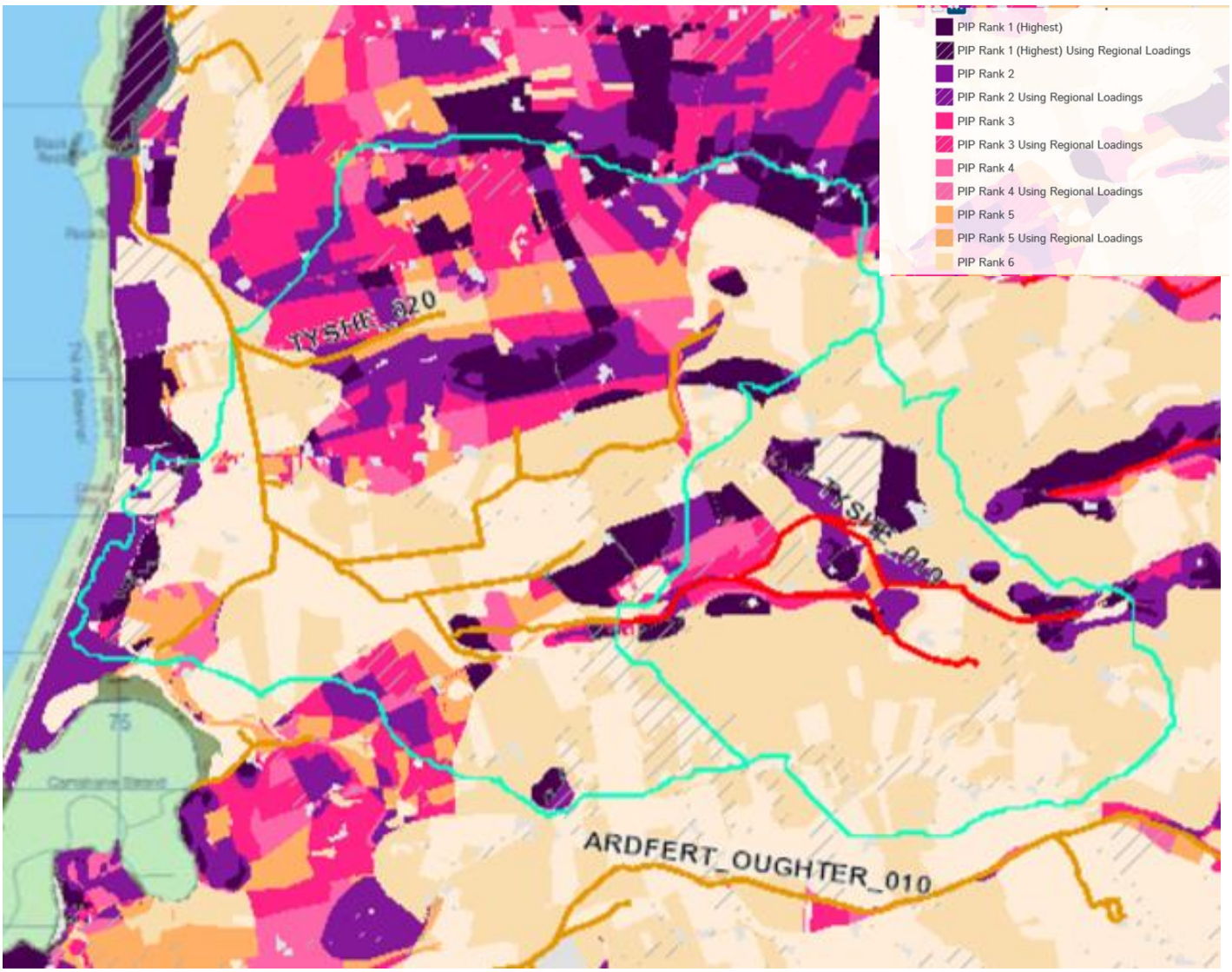
Appendix 5: Subsurface nitrate susceptibility map for the Tyshe PAA



Appendix 6: Pollution impact potential map for phosphate to surface waters.



Appendix 7: Pollution impact potential map for nitrate to surface waters.



Appendix 8: Pollution impact potential map for nitrate to groundwater.