Big (Louth) _20 Priority Area for Action

AFA_0021 Desk Study Report Version F01

23th July 2019

(Border Region)

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1. Background

This subcatchment covers the Cooley Peninsula. The main river channel comprises the Big (Louth) River, comprised of two water bodies (Big (Louth)_010 IE_NB_06B010100 and Big (Louth)_020) IE_NB_06B010300. The Big River rises on Slievetrasna (near the Windy Gap) in the Cooley Mountains at a height of 409 m. It flows in a south-easterly direction to enter Dundalk Bay some 1.5 km east of Gyle's Quay. The total length of the river is 10.5 km, and it drains a catchment of some 28.16 km. The geology of the catchment consists mainly of acid intrusive rocks near the source of the river with some outcrops of limestone in the lowlands. Ecological status of Big (Louth)_010 is Good for 2010-2015; nutrient concentrations are low. Ecological status of Big (Louth)_020 is Moderate for 2010-2015, driven by invertebrate status. The only chemistry data available for this water body is just upstream of Big (Louth)_20.

The biologist's comments from the 2015 biological monitoring on the Big (Louth) River says: '*An unwelcome deterioration in ecological condition was noted at both sites on the Big (Louth) in June 2015. The previous high status recorded in 2011 has been lost, with the upper site (0100) now of good ecological quality while the lower site is moderately polluted'*

The following reasons for selection were listed in the Border Regional Operational Committees prioritisation report

- Desk study into abstraction regime.
- Was at High status in the recent past.
- Engagement possibilities with interested farmers in the area
- The BIG (LOUTH)_010 IE_NB_06B010100 is currently at 'Good' Ecological Status for the period 2010-2015 and the WFD risk is 'Not at risk' The Big (LOUTH)_20 IE_NB_06B010300 is at 'Moderate' Ecological status and 'At risk'

Sources of Information

- EPA Characterisation data
- Louth Co Council
- EPA Regional Laboratory Sampling results
- EPA IPPC licence file

EPA Characterisation data

IA7 Take repeated samples of conductivity/dissolved oxygen profile up the stream. Look at the pipes and discharges. Local authority to liaise with IFI due to their local knowledge. A desk study of the abstraction regime associated with the IPC licence required.

Figure 1 Water-framework Directive Risk map of the Big (Louth)_20 near Carlingford in County Louth.

2. Receptor Information and Assessment

There is one waterbody in the Big (Louth)_20 River catchment that has been identified as at risk based on the reporting 2012-2015. The biological status is based on the Q-value assessment *2015*, which categorises the Big (Louth)_20 as Moderate status. Water quality results for the chemical status are presented for an operational monitoring station RS06B010300 Riverstown Br at the lower end of the Big (Louth)_20 catchment located on the R175 road for the monitoring periods up to 2015.

Table 1 Summary of waterbodies status and risk

Sub-Catchment	WB	Status Objective	WB Code	Risk	Eco. Status[1.] 07/09 10/12 10/15			WQ data	Sig. Pressure	AA	IA	
BIG (LOUTH)_010	BIG (Louth)	Good	IE_NB_06B010100	Not at risk	GES	GES	GES	Yes		N		
BIG (LOUTH)_020	BIG (Louth)	Good	IE_NB_06B010300	At risk	PES	HES	MES	No	Industry-IPC facility and Section 4	Y	IA7	

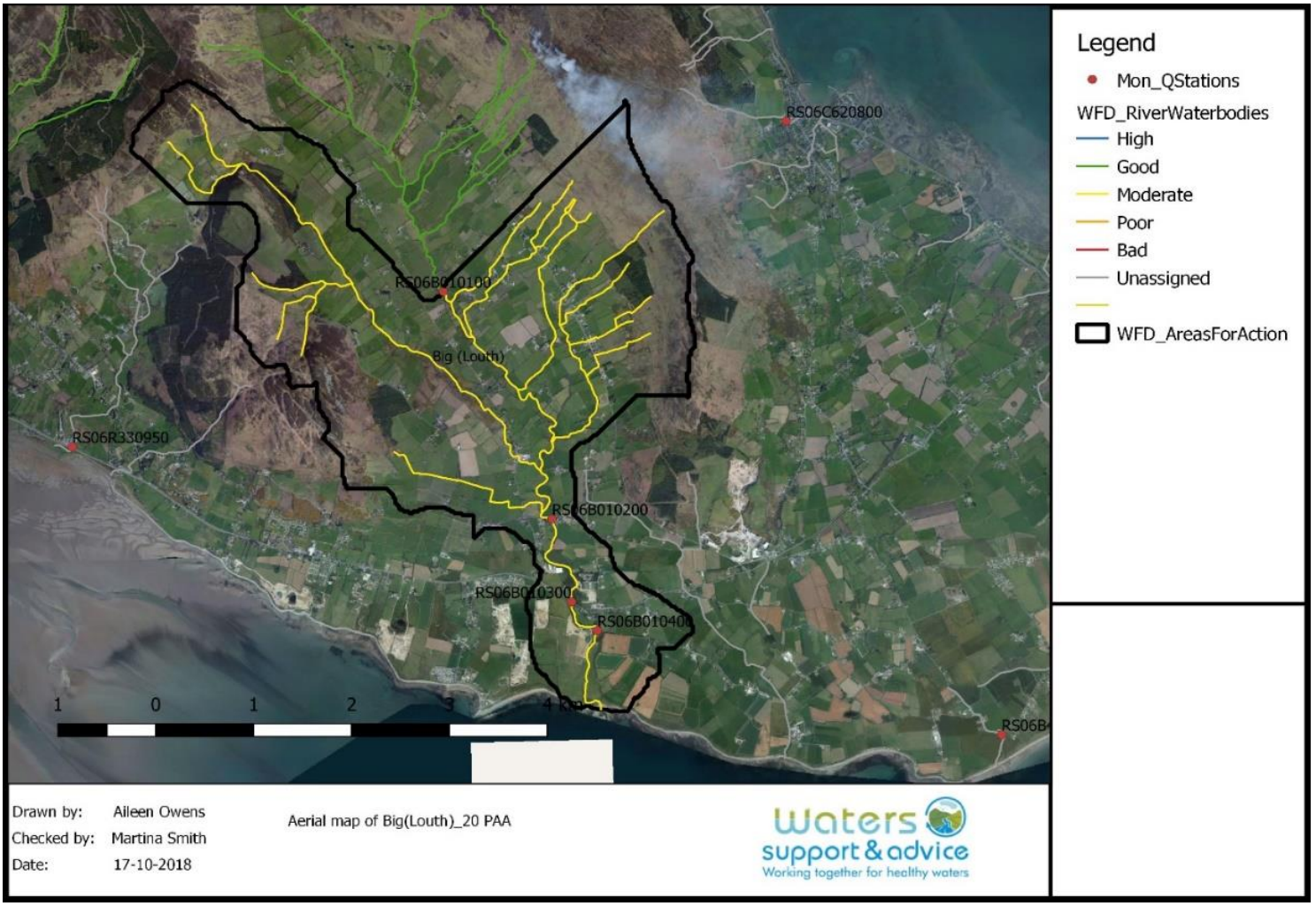
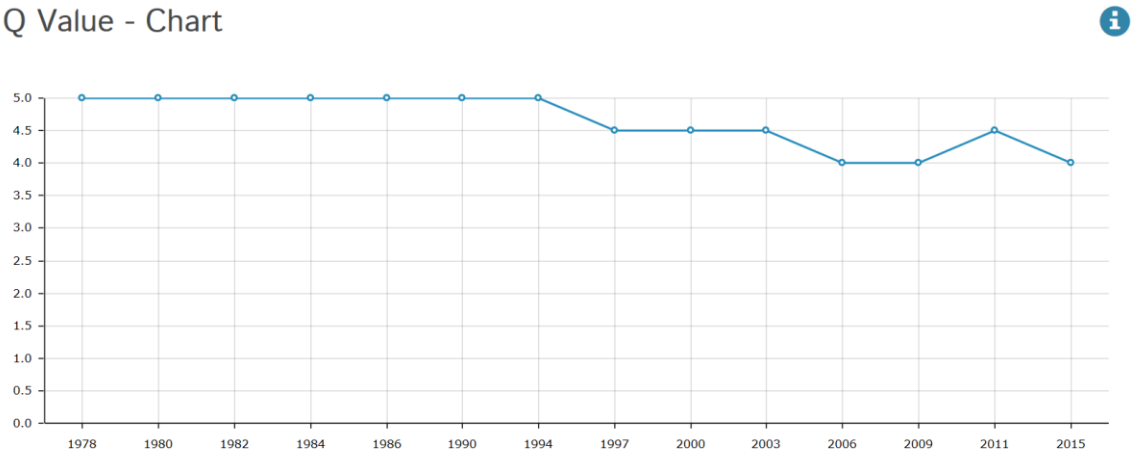


Figure 2 Location of the investigative monitoring stations at the Lower end of the Big (Louth)_20 near Carlingford in County Louth.

2.1 Big Louth_10

- The 2015 biological data characterises the river in the Big(Louth)_10 as Good ecological status (Q4)
- The ecological status rose to high status in 2011 from Good status in 2009 and returned down to Good in 2015.



	1978	1980	1982	1984	1986	1990	1994	1997	2000	2003	2006	2009	2011	2015
Result	5	5	5	5	5	5	5	4.5	4.5	4.5	4	4	4.5	4
Classification	High	High	High	High	High	High	High	High	High	High	Good	Good	High	Good
Q-Value	5	5	5	5	5	5	5	4-5	4-5	4-5	4	4	4-5	4

Figure 3 The biological trend and data for the Surveillance RS06B010100 Ballygoly Br monitoring station for the years 1978 to 2015.

Total Oxidised Nitrogen concentrations are well within the assumed EQS of 1.8mg/l, Even though TON is trending slightly downwards the general concentrations and baseline concentrations are well below the EQS of 1.8 mg/l for TON

Table 2 The associated aggregation table for Ammonia (Total N) trend the ortho-Phosphorus (as P) trend for Surveillance IE_NB_06B010100 monitoring station for the years [2007-2017].

		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
NH_3	n	2	4	0	2	1	3	5	2	12	2	2
	mg N L^{-1}	0.06	0.019		0.035	0.06	0.033	0.02	0.028	0.01	0.044	0.025
PO_4	n	2	1	2	2	1	1	6	2	12	6	7
	mg P L^{-1}	0.04	0.02	0.04	0.02	0.03	0.05	0.05	0.017	0.005	0.012	0.018
TON		8	12	12	12	8	12	12	12	12	12	12
	mg T L^{-1}	0.83	0.59	0.60	0.73	0.53	0.62	0.60	0.77	0.75	0.50	0.587

- Ortho-phosphate levels at Ballygoly bridge monitoring point RS06B010100 showed a steady decline during 2016 well below the EQS of 0.035mg/l for 'Good' ecological status but the last monitoring of 2017 shows a jump to 0.031mg/l quite close to the EQS. Results for 2018 were not available at the time of the deskstudy. Assuming the ortho-phosphate levels remain a 2017 levels Ortho-phosphorus is not an issue in the Big (Louth)_10

- Ammonia levels at Ballgoly Br monitoring point show consistent readings below the EQ for the past number of years. There is not a Nitrate problem in Big (Louth)_10.
- Total Oxidised Nitrogen measured at Ballygoly bridge in 2016 and 2017 were below 1mg/l well below the EQS of 1.8mg/l.

From these results we can say that there is not a risk of not reaching 'Good' Ecological status for the Big (Louth)_10 and therefore we must concentrate on the river between Ballygoly Bridge RS06B010100 and Riverstown Bridge RS06B010300 where the biological quality drops to Q4 in Big (Louth)_20.

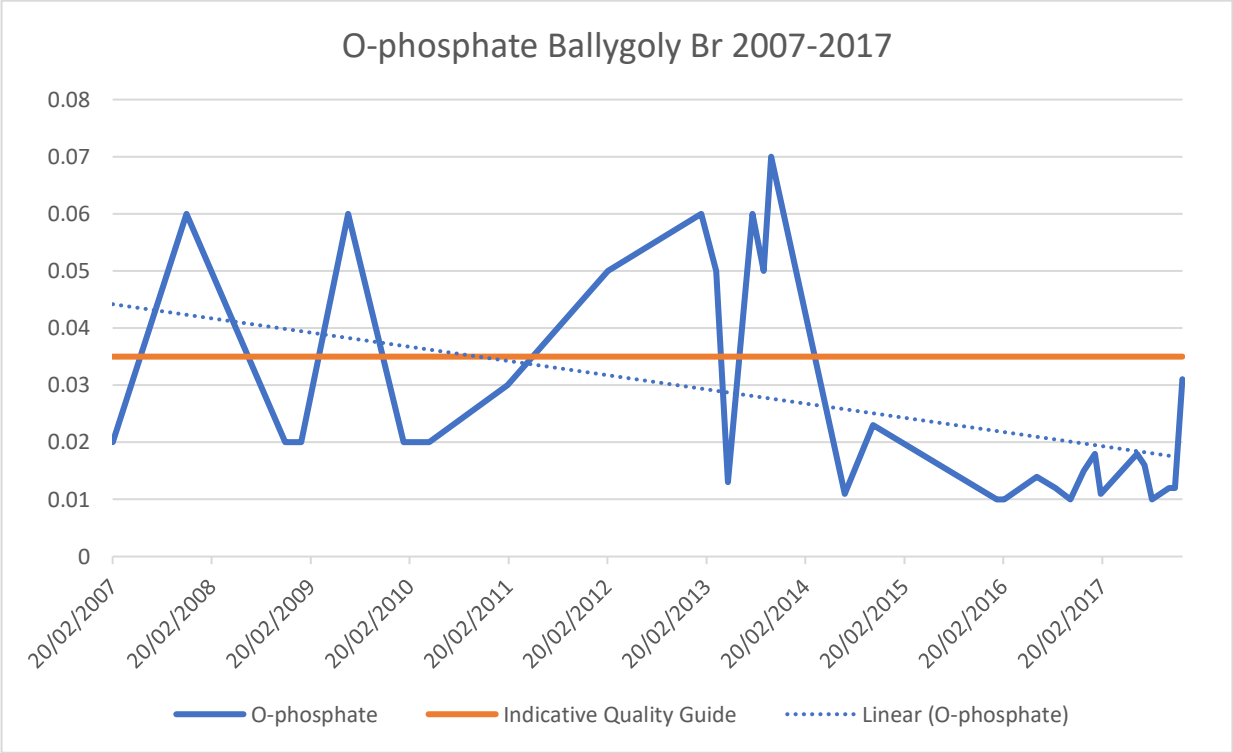


Figure 4 Ortho-phosphate levels at Ballygoly Br IE_NB_06B010100 2007-2017

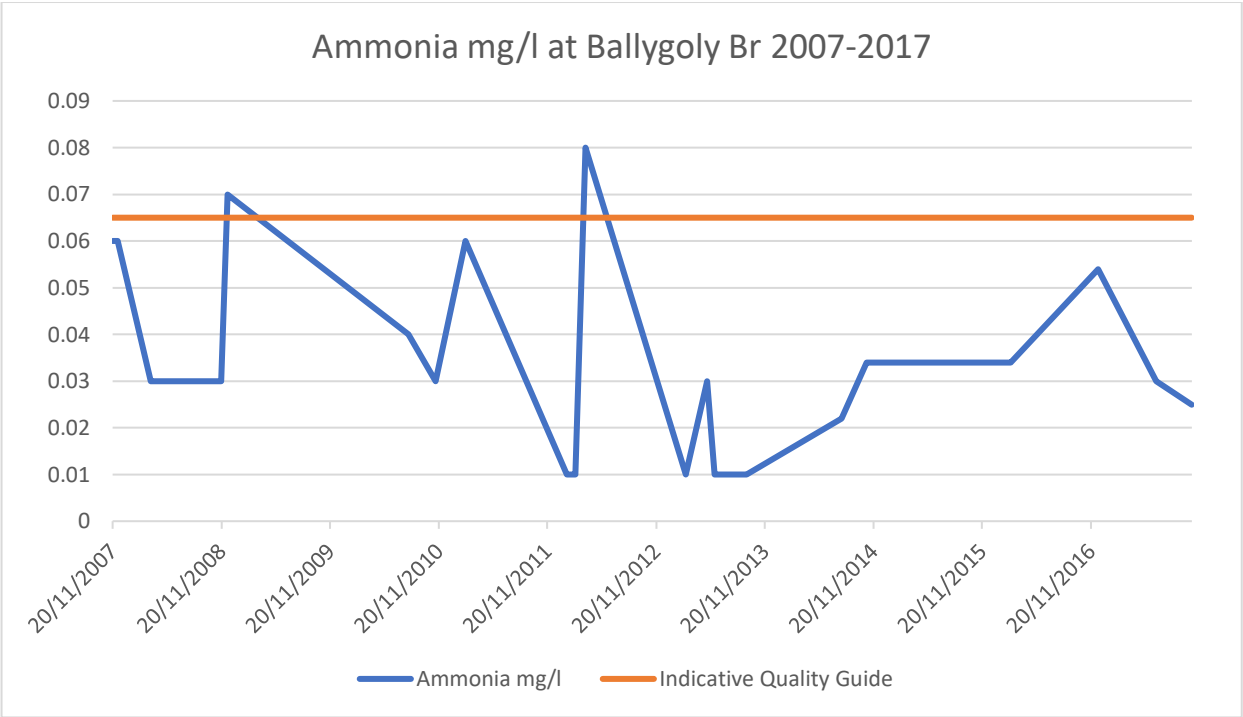


Figure 5 Ammonia levels at Ballygoly Br IE_NB_06B010100 2007-2017

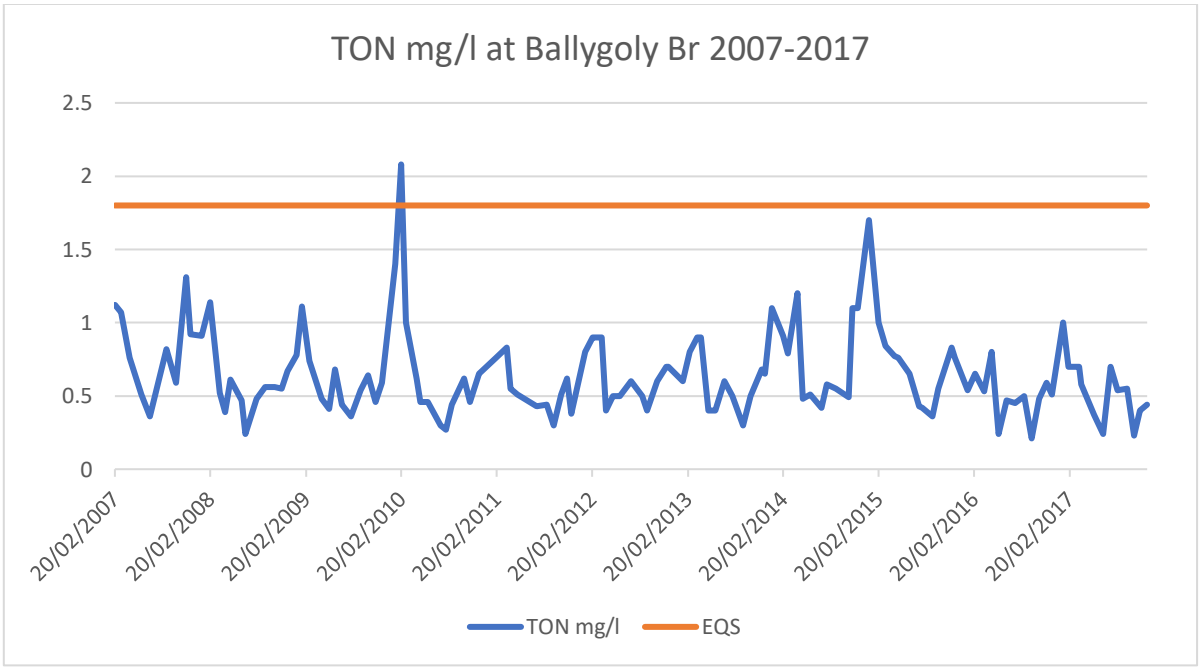
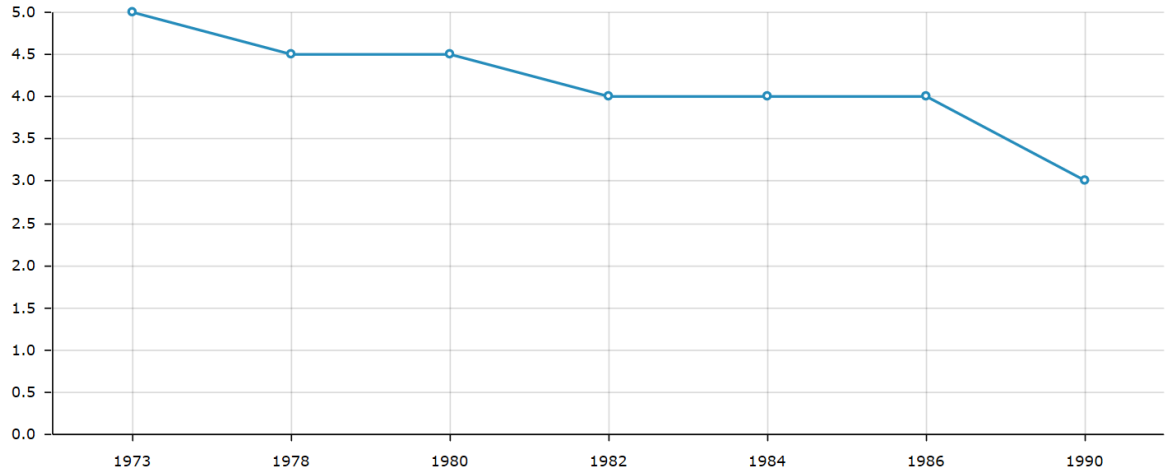


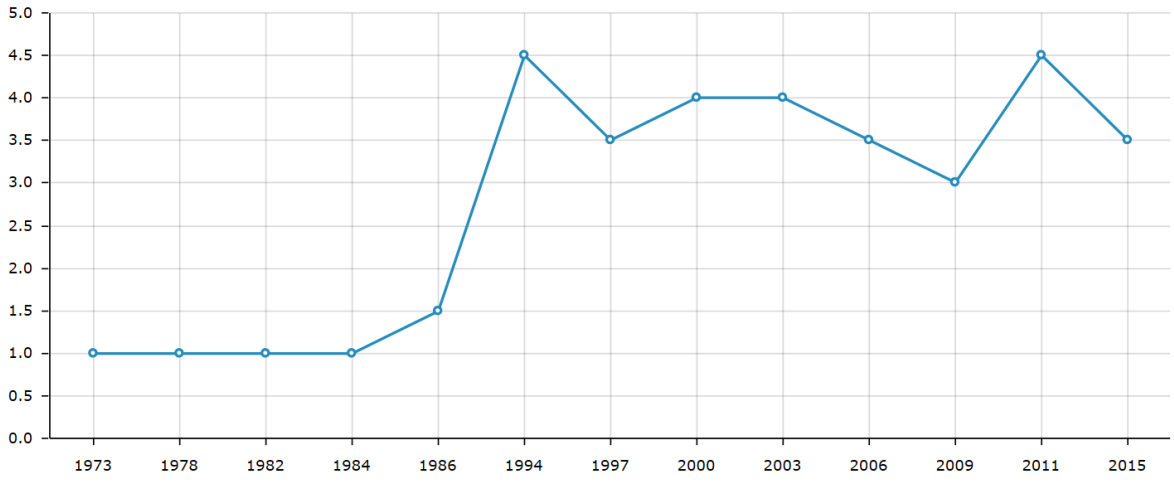
Figure 6 TON mg/l levels at Ballygoly Br IE_NB_06B010100 2007-2017

2.1. Big (Louth) _20



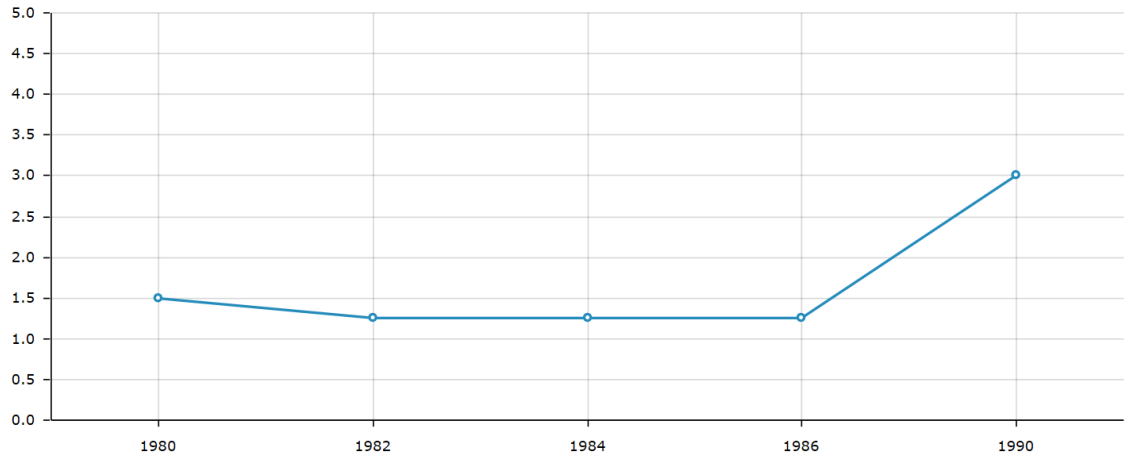
	1973	1978	1980	1982	1984	1986	1990
Result	5	4.5	4.5	4	4	4	3
Classification	High	High	High	Good	Good	Good	Poor
Q-Value	5	4-5	4-5	4	4	4	3

Figure 7 The biological trend and data for the Surveillance RS06B010200 Br u/s Riverstown Br monitoring station for the years 1973 to 1990.



	1973	1978	1982	1984	1986	1994	1997	2000	2003	2006	2009	2011	2015
Result	1	1	1	1	1.5	4.5	3.5	4	4	3.5	3	4.5	3.5
Classification	Bad	Bad	Bad	Bad	Bad	High	Moderate	Good	Good	Moderate	Poor	High	Moderate
Q-Value	1	1	1	1	1-2	4-5	3-4	4	4	3-4	3	4-5	3-4

Figure 8 **The biological trend and data for the Surveillance RS06B010300 Riverstown Br monitoring station for the years *1978 to 2015.***



	1980	1982	1984	1986	1990
Result	1.5	1.25	1.25	1.25	3
Classification	Bad	Bad	Bad	Bad	Poor
Q-Value	1-2	1/0	1/0	1/0	3

Figure 9 The biological trend and data for the RS06B010400 0.5km d/s Riverstown Br monitoring station for the years 1980 to 1990.

Table 3 Receptor information for the waterbody Big (Louth)_10 and Big (Louth)_20

Factor	Data available (Y/N)	Comment/Description Big (Louth)_10 Ballygoly Br	Comment/Description Big (Louth)_20 Riverstown Br
Risk category*	Y	Not At Risk	At Risk
Biological status • **2009-2015*** • **Variation/trends in Q values*** • **2016-2018 Q value data were available**	 Y Y 	 Station 100 Good 2009 Q4, 2011 Q4-5, 2015 Q4 N/a	 Station 400 Moderate 2009 Q3, 2011 Q4-5, 2015 Q3-4 N/a
Hydrochemistry* • **Existing** • **New**	 Y Y	 Fig 7,8 & 9 Fig 7,8 & 9	 N/a N/a
Trends in PO4, NH3 and NO3, if data are available • **In app** • **From all available data (i.e. plot actual data)** • **Baseline Concentration (mg/l)** • **Other water quality data** • **Distance to threshold**	 Y Y Y N	 PO_4 Down, NH_3 Down, $N0_3$ Up PO_4 Down, NH_3 Down, NO_3 Down PO_4 0.015, NH_3 0.032, TON 0.612 PO_4 Far, NH_3 Far, NO_3 Far	 N/a N/a N/a n/a n/a
Supporting Conditions: **Chemical Conditions** **Oxygenation conditions** **Acidification conditions**	 Y N N	 Good Good Good	 n/a n/a n/a
Hydromorphology • **RHAT score** • **Evidence of arterial drainage**	 N Y	 No RHAT carried out High density of drainage in the headlands	 Moderate density of drainage
Ecological status* **Trends (2010-2015)**	Y	2009 Good 2012 Good 2015 Good	2009 Poor 2012 High 2015 Moderate
Protected areas			Dundalk Bay SPA adjacent to mouth of the Big River, pNHA & SAC 1km NW of the mouth of Big river. Drinking water source.
WFD objectives		Good ecological status by 2027	Good ecological status by 2027
Relevant info. from notes of EPA biologists		An unwelcome deterioration in ecological condition was noted at both sites on the Big (Louth) in June 2015. The previous high status recorded in 2011 has been lost, with the upper site (0100) now of good ecological quality while the lower site is moderately polluted.	An unwelcome deterioration in ecological condition was noted at both sites on the Big (Louth) in June 2015. The previous high status recorded in 2011 has been lost, with the upper site (0100) now of good ecological quality while the lower site is moderately polluted.
Significant issue/impact for receptor (e.g. PO^4)*			Likely to be Nitrate based on the PIP maps

*Available in WFD app.

3. Significant Pressure Information

Table 4 Summary of waterbodies status and risk

Sub-Catchment	WB	WB Code	Risk	Eco. Status[1.]			WQ data	Issue	Sig. Pressure	AA	IA
BIG (LOUTH)_010	BIG (Louth)	IE_NB_06B010100	Not at risk	GES	GES	GES	Yes			N	
BIG (LOUTH)_020	BIG (Louth)	IE_NB_06B010300	At risk	PES	HES	MES	No	Inverts	Industry IPC & Section 4	Y	IA7

The significant pressure was identified in the EPA's Characterisation as Industry.

3.1.1 IPPC Licensed facility

One IPPC Industry is abstracting large volumes of water from the river for its cooling towers and cooling water is discharged to the Big (Louth) _20 river via a cascade, which both aerates and reduces the temperature prior to its discharge. The cooling water discharges at a weir in the river. The current licensed max flow per day discharged is 1,920m3/day, and 81m3/hour. The rate of water abstraction from the River Big (Louth) shall not exceed 90m3/hr or one third (%) of the mean hourly flow rate at any time. The combined treated process effluent and cooling water is discharged to the Irish Sea. The cooling water is discharged to the sea outfall to maintain sufficient flow velocity in the pipeline to prevent seawater ingress. The process effluent on site receives biological treatment and tertiary treatment (reedbed) prior to mixing with the cooling water. The current licensed max flow per day is 600m3/day, and 27m3/hour. Treated effluent from the licensed site is discharged to ground (percolation area) from the Bord na Mona packaged treatment system which treats the sites sanitary effluent. IE_NB_06B010300 monitoring point at Riverstown Br is 500m downstream of the discharge from Cooley Distillery. The latest visit from the EPA staff in February 2018 was in enforcement of their emissions to air and does not mention the discharges to waters.

3.1.2 Section 4 licensed facility

There's also a Section 4 Discharge Licence in Riverstown that is also characterised by the EPA as a significant pressure. Having looked at the coordinates of the licence the discharge point is approximately within 100m of the monitoring point. Any non-compliance from the Section 4 licence would be likely to have a significant impact on the monitoring point especially during low flow conditions where there is reduced assimilative capacity. The Section 4 licence in 2019 is generally in compliance.

Further Characterisation Actions in the WFD App suggest:

- Take samples (conductivity/DO profile up the stream), repeated.
- Look at the pipes.
- Louth Co Council to liaise with IFI due to their local knowledge.
- Desk study of abstraction regime associated with IPC licence required.

3.2 Pollution Potential Impact Maps

Higher ranking of NO_3 is experienced towards the lowlands of the catchment near the coast of Dundalk Bay where the shallow well drains soils lie over granite gravels allowing a vertical pathway to surface waters and groundwaters.

Figure 10 The surface water receptor NO_3 pollution impact potential for the Big (Louth)_20 catchment in County Louth.

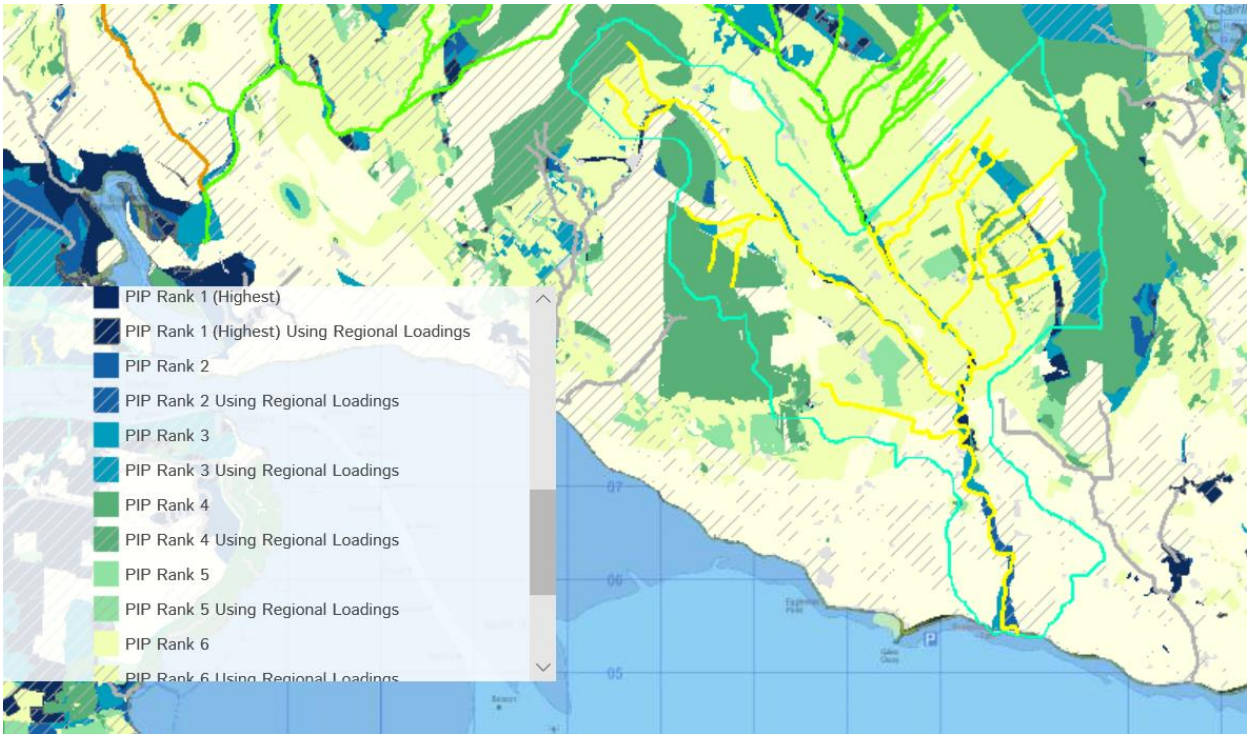


Figure 11 Surface water PO_4 pollution impact potential map for the Big (Louth)_20 catchment in County Louth

Susceptible areas close to the coast provide a pathway for NO_3 to Groundwater. This is the area to concentrate in during fieldwork.

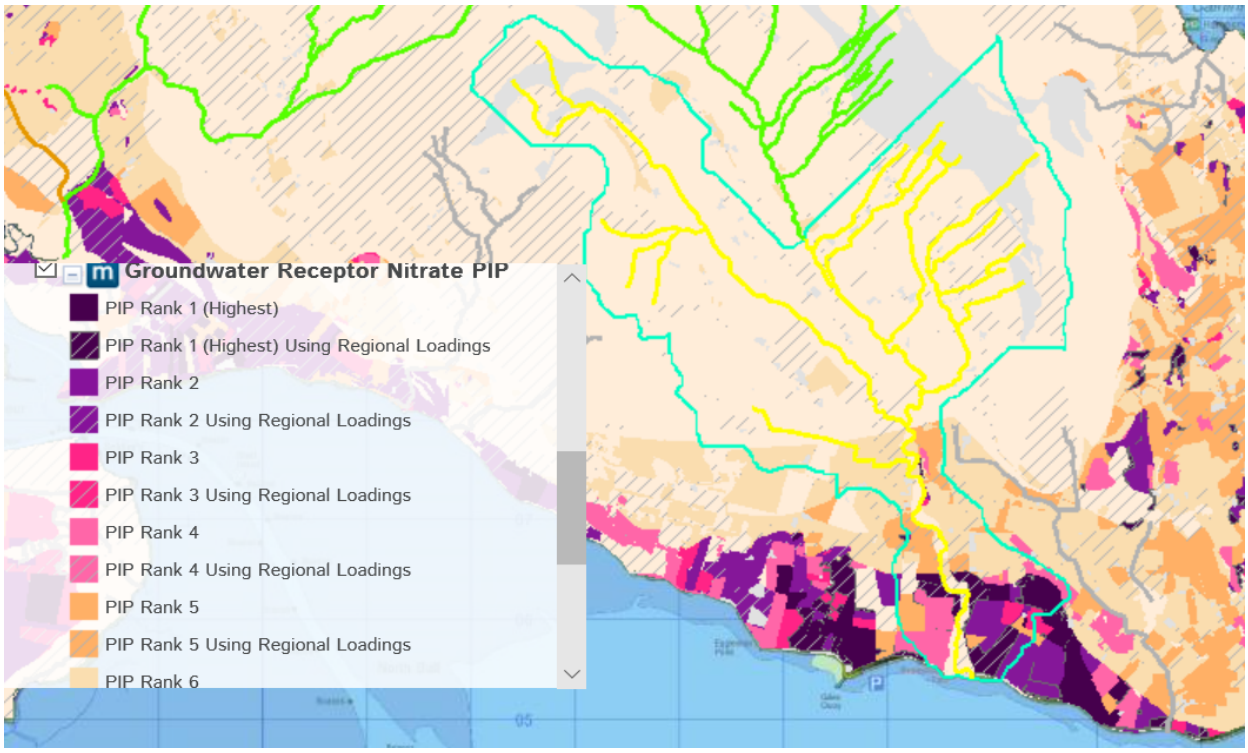


Figure 12 The groundwater NO_3 pollution impact for the Big (Louth)_20 catchment in County Louth

4. Pathway Information and Analysis

There are 2 main aquifers in the Big (Louth)_20 the first is in the upper part of the river and is generally unproductive except in local zones. The second aquifer is closer to the coast and is generally Moderately Productive.

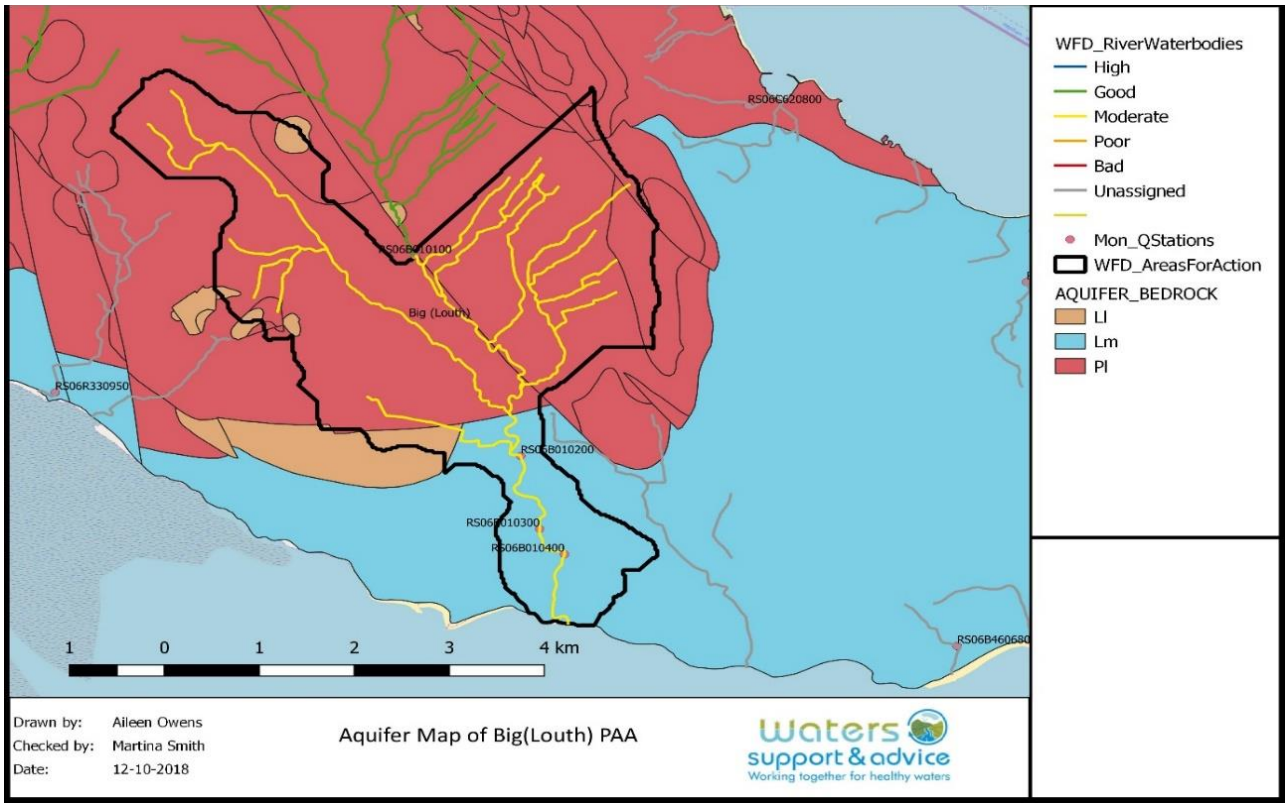


Figure 13 The aquifer bedrock for the Big (Louth)_20 catchment in County Louth.

Soils in the catchment are well drained overall.

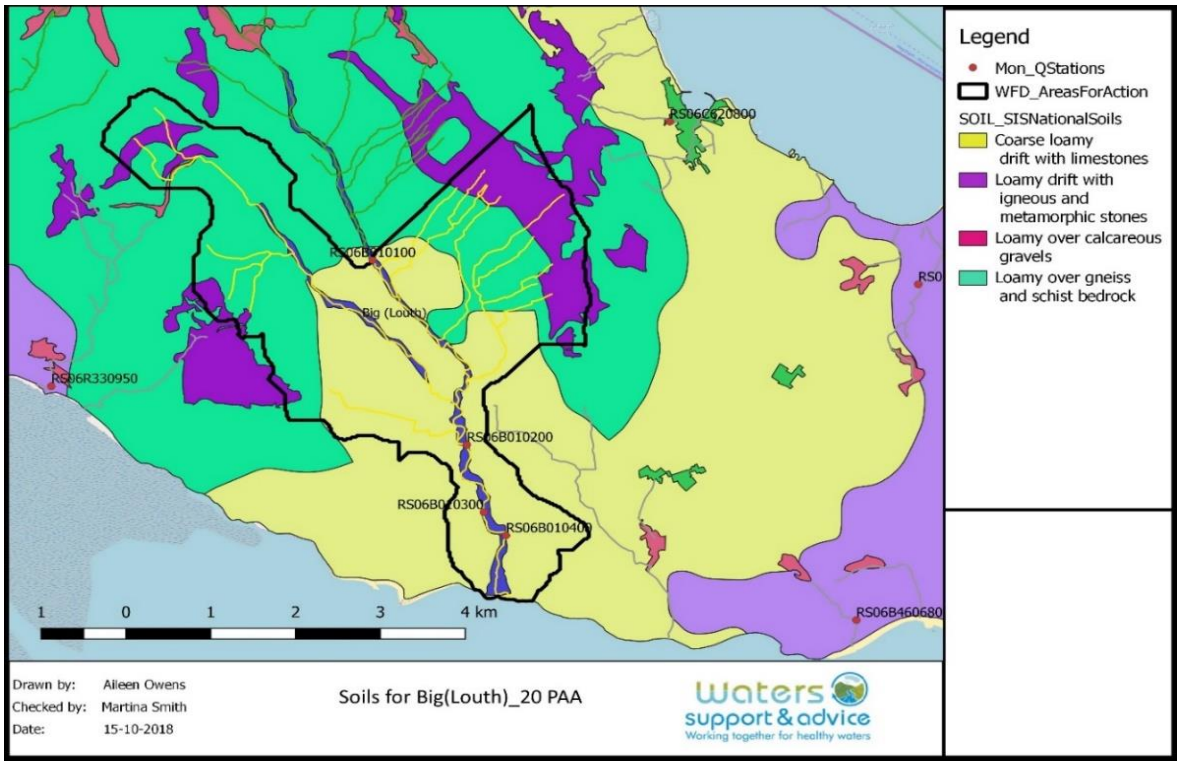


Figure 14 The soil type for the Big(Louth)_20 catchment in County Louth.

The map shows areas that overall are well drained and dry and differ only in the depth of the soils.

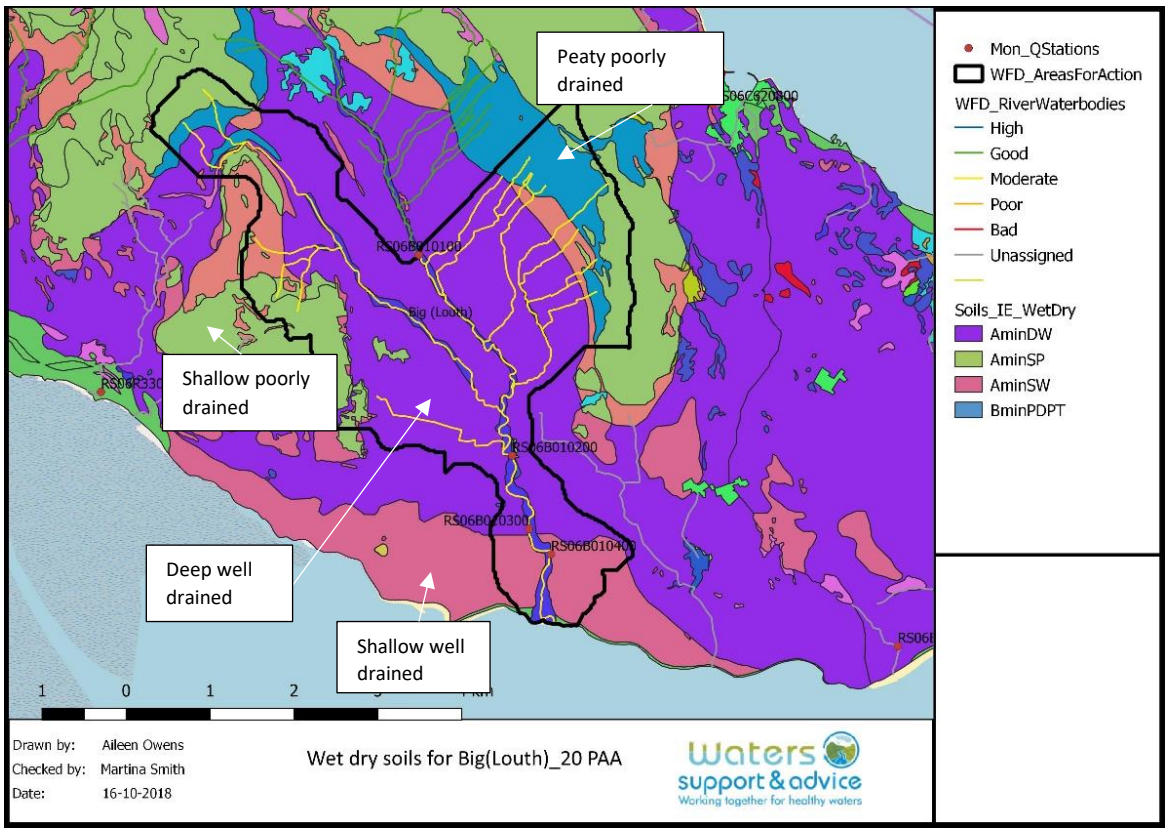


Figure 15 The wet and dry soils for the Big (Louth)_20 catchment in County Louth.

Compartment 1 is the upper areas of the river in pink, green and blue and Compartment 2 is the coastal are where the Granite Gravels are found in red providing a pathway for Nitrate down through the subsoil.

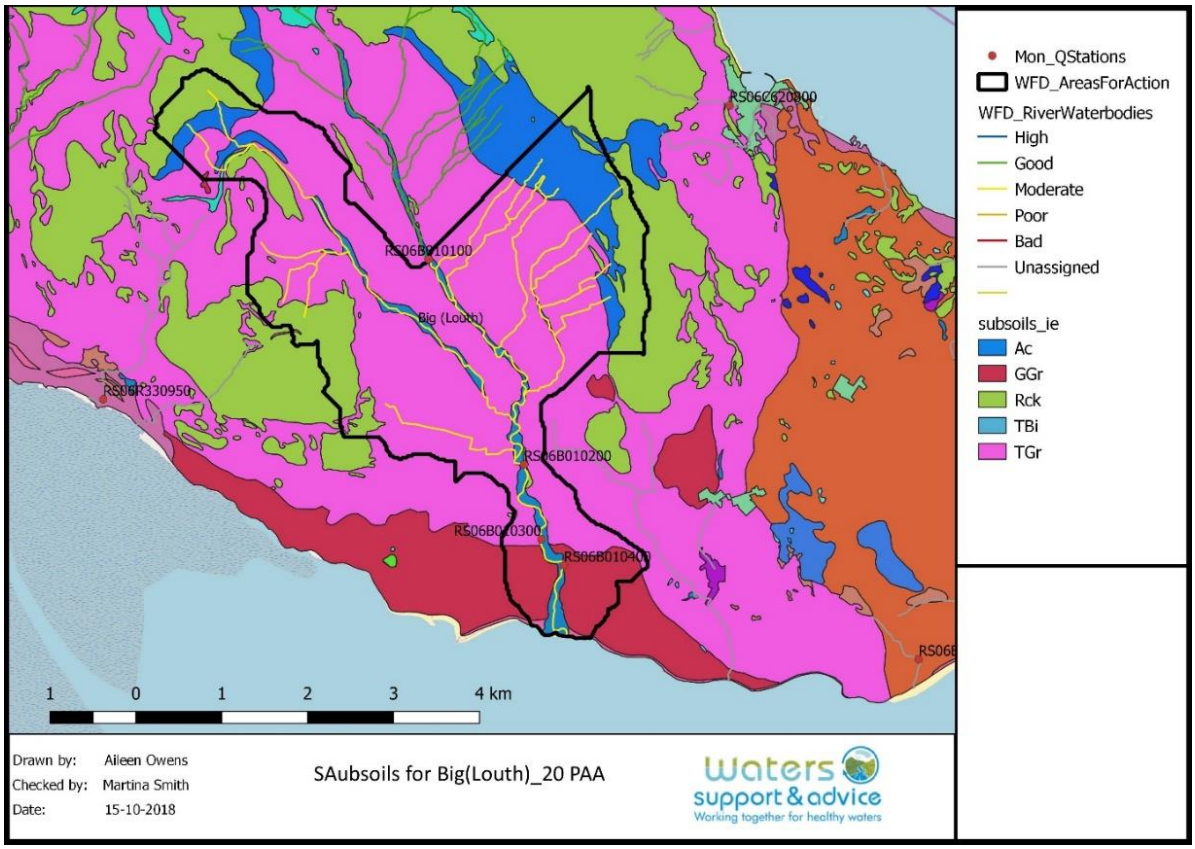


Figure 16 The subsoil type for the Big (Louth)_20 catchment in County Louth.

The bedrock in the upper part of Big (Louth)_20 is Granite & other igneous intrusive rocks where the main flowpath is in a thin upper fractured zone or occasional fault zones and transitional zone. Landscape is poorly draining, and deep groundwater flow is limited. The lower areas towards the coast are Dinantian mixed sandstones, shales and limestones, the flowpath is through the upper fractured zones and fault zones. Permeability decreases with depth and small streams are frequent in the uplands

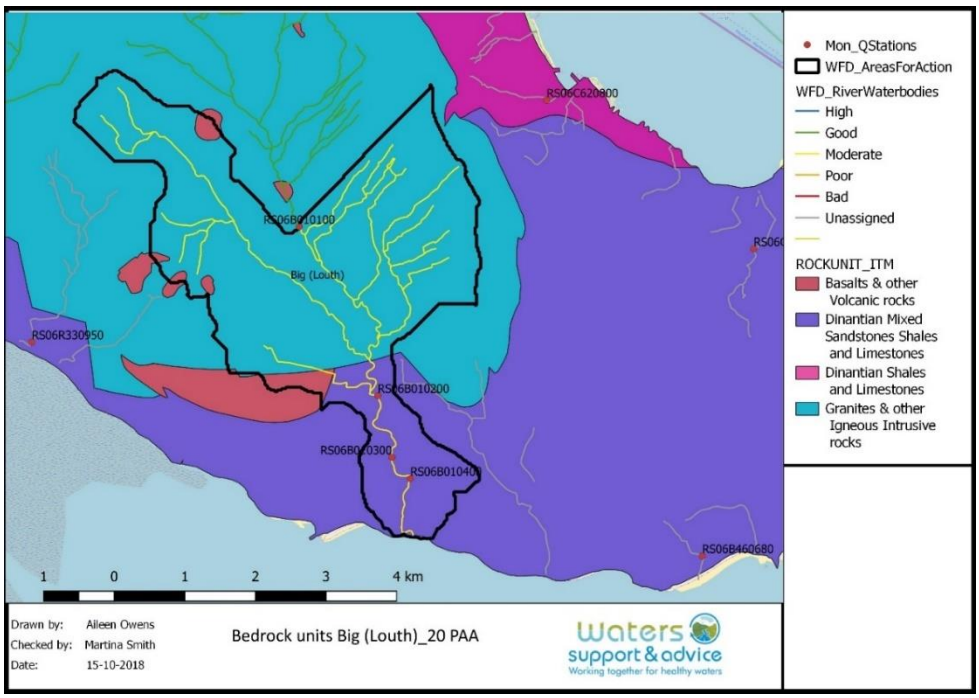


Figure 17 The bedrock units for the Big (Louth)_20 catchment in County Louth.

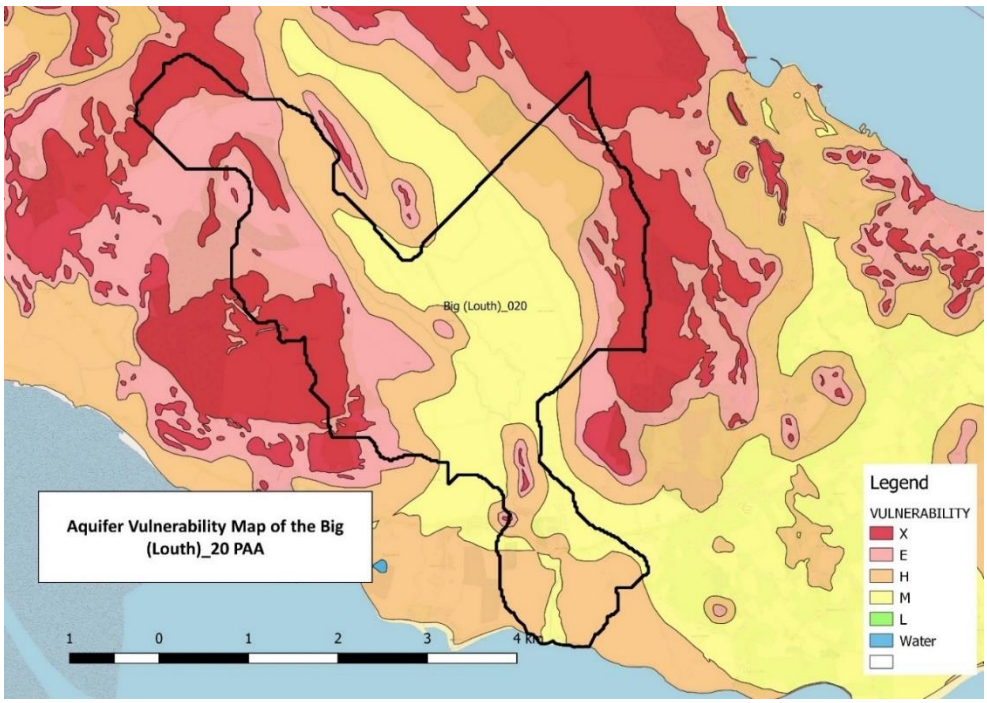


Figure 18 The Aquifer Vulnerability map for the Big (Louth)_20 catchment in County Louth.

Figure 19 The Sub Surface Nitrate Susceptibility for the Big (Louth)_20 catchment in County Louth

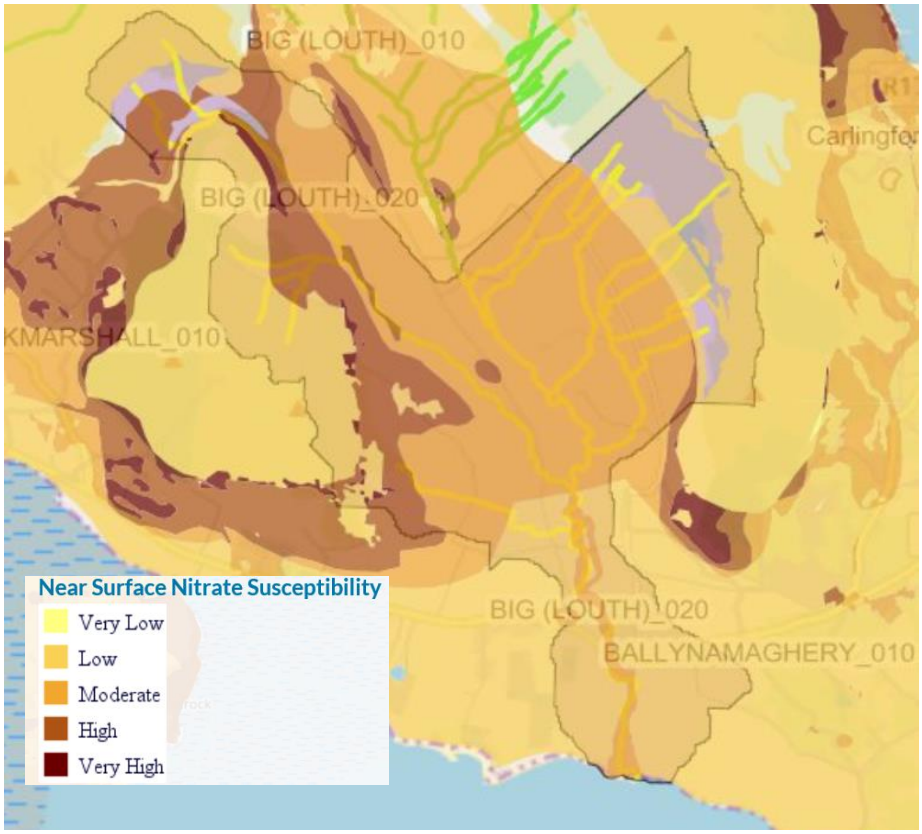


Figure 20 Near Surface Nitrate Susceptibility for the Big (Louth)_20 catchment in County Louth

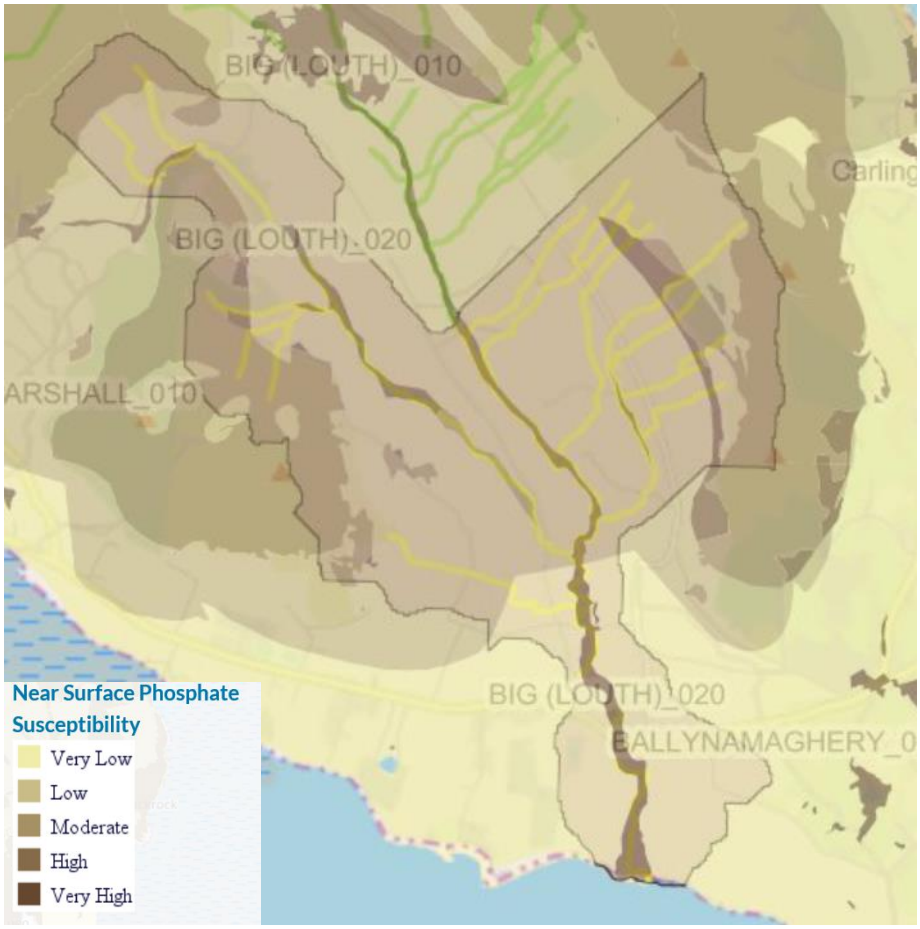


Figure 21 Near Surface Phosphate Susceptibility **for the Big (Louth)_20 catchment in County Louth**

Table 5 Conceptual model information for the pathways

Monitoring Station	Compartment 1	Compartment 2
Aquifer	Pl Bedrock is generally unproductive except in local zones	LM Bedrock is moderately productive
Topography	Upper reaches of smaller tributaries start in mountainous areas and flow into the main channel at lower levels.	Moderate to Low
Soil type	Loamy drift with igneous & metamorphic stones in upper areas Loamy over gneiss & schist bedrock in upper areas Coarse loamy drift with limestone in lower areas	Coarse loamy drift with limestone
Soil wet/dry	Small areas of and AminPDPT but mainly AminSW and Amin	AminSW
Subsoil type	Ac (Clayey) & Rck(Rock) in uplands. Mainly TGr (Granite till) in main river areas.	Some GGr (granite sand & gravels)
Subsoil permeability	Non permeable	Permeable.
Rock units	>90% Granite & other igneous intrusive rocks. Small areas of Basalts and other volcanic rocks	Dinantian mixed sandstone shales & limestones.
Groundwater vulnerability	E-H on higher ground M-H below the mountain areas	High
$P0_4$ susceptibility	Low to Moderate	Low
NO_3 susceptibility	Nearsurface-Low to Moderate. High on upper ground Subsurface- Low to Moderate	Nearsurface-Low Subsurface- High
$P0_4$ pollution impact potential (PIP)	Rank 6&7 in lower ground Rank 4 in upper regions	Low Rank 7
NO_3 pollution impact potential (PIP)	To SW Low Rank 7 To GW Low Rank 7,6,5	To SW Rank 4,3,2 &1 To GW Rank 4,3,2,1
Main flow paths	Near surface flow with nitrate the main nutrient of concern.	Vertical flow through well drained soils and subsoils and then some deep horizontal flow once bedrock is encountered with some flowpaths through upper fractured zones.

Table 6 Pathway information checklist

Factor	Map/Image available (Y/N)	Description/Relevance
Topography • **Map** • **Aerial imagery**	No Fig 2	
Soil	Fig 11	Well drained
Subsoil	Fig 13	Near the coast has well drained gravels
Subsoil permeability		The majority of the catchment has poorly drained subsoil apart from along the coast.
Bedrock	Fig 14	Deep GW flow is limited due to poor transmissivity of the bedrocks.
Aquifer	Fig 10	Moderately productive near the lower areas of the river.
Groundwater vulnerability	Fig 15	GW highly vulnerable over gravels.
Karst features (if present)		
Hydrology • **Drainage density**	No	High density of streams and drains due to the bedrock
Susceptibility • **PO_4 to SW** • **NO_3 to GW** • **NO_3 to SW**	Fig 19 Fig 17 Fig 18	Low susceptible Moderate susceptibility in uplands and low susceptibility in the lowlands Low in the uplands and increasing to high as you reach the coast and the lowlands
Pollution Impact Potential (PIP) • **PO_4 to SW** • **NO_3 to GW** • **NO_3 to SW**	Fig 8 Fig 9 Fig 7	Not impacted Not impacted in upper reaches but impacted towards the coast. Significant subsurface nitrate pollution impact potential near the coast

5. The Interim 'story' of the Area for Action

5.1 Big (Louth)-010

Risk category: Not at risk

Status: Good

Hydrochemistry summary: NO_3, PO_4 and TON below EQS and trending downwards

Baseline Concentration: NO_3 0.032mg/l, PO_4 0.015mg/l, TON 0.612mg/l

Significant issue: n/a

Significant pressure: n/a

Other pressures: n/a

Relevant pathways: n/a

5.2 Big (Louth)_20

Risk category: At risk

Status: Moderate

Hydrochemistry summary: None available

Baseline Concentration: None available

Significant issue: NO_3

Significant pressure: Industry, 1 IPPC licensed facility

Other pressures: Section 4 licence

Relevant pathways: Compartment 2: Vertical flow through well drained soils and subsoils and then some deep horizontal flow once bedrock is encountered with some flow paths through upper fractured zones

Phosphorus, TON and Nitrate is currently trending downwards for Big_10 thus suggesting that they are not an issue for the Big (Louth)_010. There are no hydrochemistry results for Big (Louth)_20, however, the pollution impact potential and susceptibility maps would indicate that NO_3 is an issue and the pathway in the lower end of this waterbody would allow pollutants to the river. It is important to note that the Big (Louth)_020 has declined in status from High to Moderate in the latest cycle (2010 – 2015) and is failing on the Invertebrates. Point sources are most likely with the Significant pressure being industry.

6. Work Plan

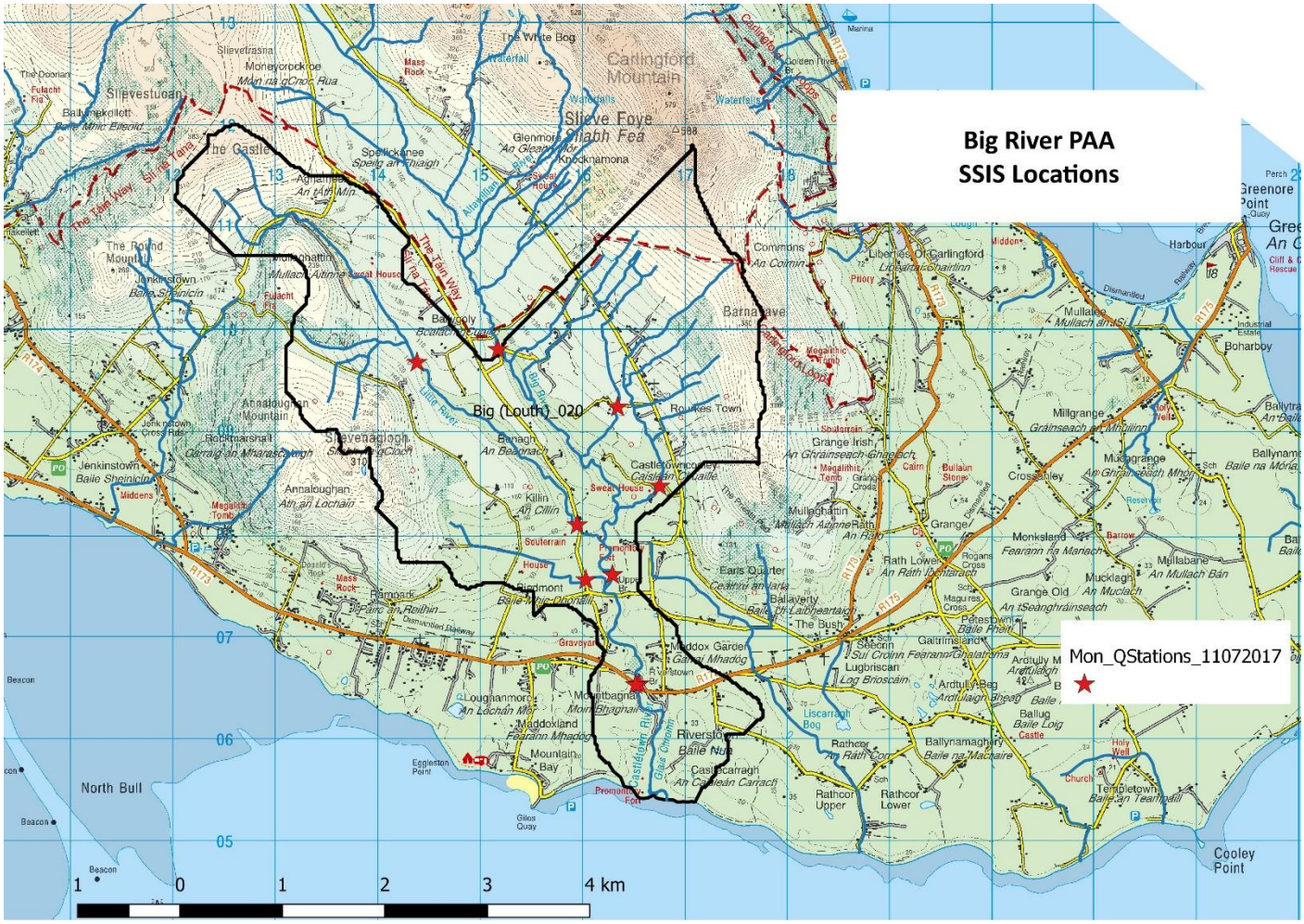


Figure 22 Planned SSIS in Big (Louth)_020

- Consultation on the desk studies LA, IFI etc
- Talk to EPA IPC licence inspectors about IPC licensed facility and request monitoring results
- Public meeting Feb 2019.
- Take 3 Water chemistry samples at the Q monitoring station in 2019
- SSIS/RA upstream and downstream of identified significant pressures
  Walk 1km upstream of the monitoring point station 400
- Concentrate field work in Compartment 2 assuming the tributaries are satisfactory. Take repeated samples of conductivity/dissolved oxygen profile up the stream. Look at the pipes and discharges.
  Stream walks should be designed based on sampling tributary streams prior to them meeting the main channel.
- A desk study of the abstraction regime associated with the IPC licence required

Communications

- Public Community meeting to be held in the catchment prior to any Local Catchment Work being carried out to let the community know of the planned work.
- Farmers meeting to be held in conjunction with ASSAP to let the farmers in the area know about the project and what's expected for them.
- Consult with EPA OEE staff regarding the IPPC licenced site
- Consult with Louth Co Council regarding the Section 4 licence.

Date of report completion: 23/07/19