

Mulkear

Priority Area for Action Desk Study

AFA 0136

South-West Region



Photograph of WFD operational monitoring point at Brittas Bridge, taken on 28th of August 2019

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

Summary

The Mulkear River rises in the Slievefelim and Silvermines mountains in County Tipperary, before joining the Shannon River below Annacotty in County Limerick. The Mulkear PAA consists of two waterbodies Mulkear (Limerick)_020 and Dooglasha (Cappamore)_010. The Mulkear (Limerick)_020 is 37.37km in length. Currently this is at moderate ecological status with the biology (invertebrates) driving status. More recent Q data indicates a return to good status here. Assessment needs to be undertaken to determine the cause of the 2015 deterioration in biological quality. Land use, soils and phosphate PIP maps indicate that the significant issue could be phosphate, nitrate, ammonia and/or sediment. Dooglasha (Cappamore)_010 is 17.02km in length. Currently this is unassigned and at review. No chemistry data are available for the waterbodies in the PAA. Available results for two waterbodies outside the PAA (Mulkear_010 and Mulkear_030) were used to determine the potential significant issue on Mulkear_020. Increasing orthophosphate levels are identified on Mulkear (Limerick)_010 and Mulkear (Limerick)_030.

The sub catchment mostly consists of locally important (LI), poorly productive (Pu) aquifers, with some Lm and a band of regionally important (Rkd) across the middle. It contains important habitats for species such as salmon and it has important trout spawning streams. The Mulkear was selected as a PAA to build on completed and ongoing work by the Mulkear LIFE project and on improvements from in-stream works. Phosphate via overland flow is the main risk to surface waters on poorly drained soils. There are also numerous rock outcrops across the entire sub catchment with potential for nitrate (and phosphate) to infiltrate groundwater although this pathway is likely to be insignificant in comparison to the overall loadings on the catchment.

Initial assessments have identified significant pressures from industry and anthropogenic pressures on the Mulkear (Limerick)_020. Consideration must be given to agriculture for overland phosphate transport over poorly draining soils. Anthropogenic pressures have been identified as significant pressures on the Dooglasha (Cappamore)_010.

Recommended Actions:

- Undertake SSIS at Brittas Br on the Mulkear (Limerick)_020. Also take samples for ammonia, ortho-Phosphate and total oxidised nitrogen at this monitoring point.
- Undertake SSIS assessments in Mulkear (Limerick)_020 from tributaries upstream of Brittas Br on the Mulkear as well as on the Dooglasha (Cappamore)_010.
- Undertake SSIS assessments and take water samples for ammonia, ortho-Phosphate and total oxidised nitrogen to establish the status for Dooglasha (Cappamore)_010 (currently unassigned). This is a review waterbody and SSIS assessments and/or 3 water samples will be undertaken on three separate occasions over a twelve month period, according to the agreed protocol.

Information from this first LCA will inform the extent of additional assessment and stream walks needed.

1 Background

1.1 Location of Mulkear Priority Area for Action and Reasons for Selection

Table 1-1: Background information on the Mulkear (Limerick) Priority Area for Action

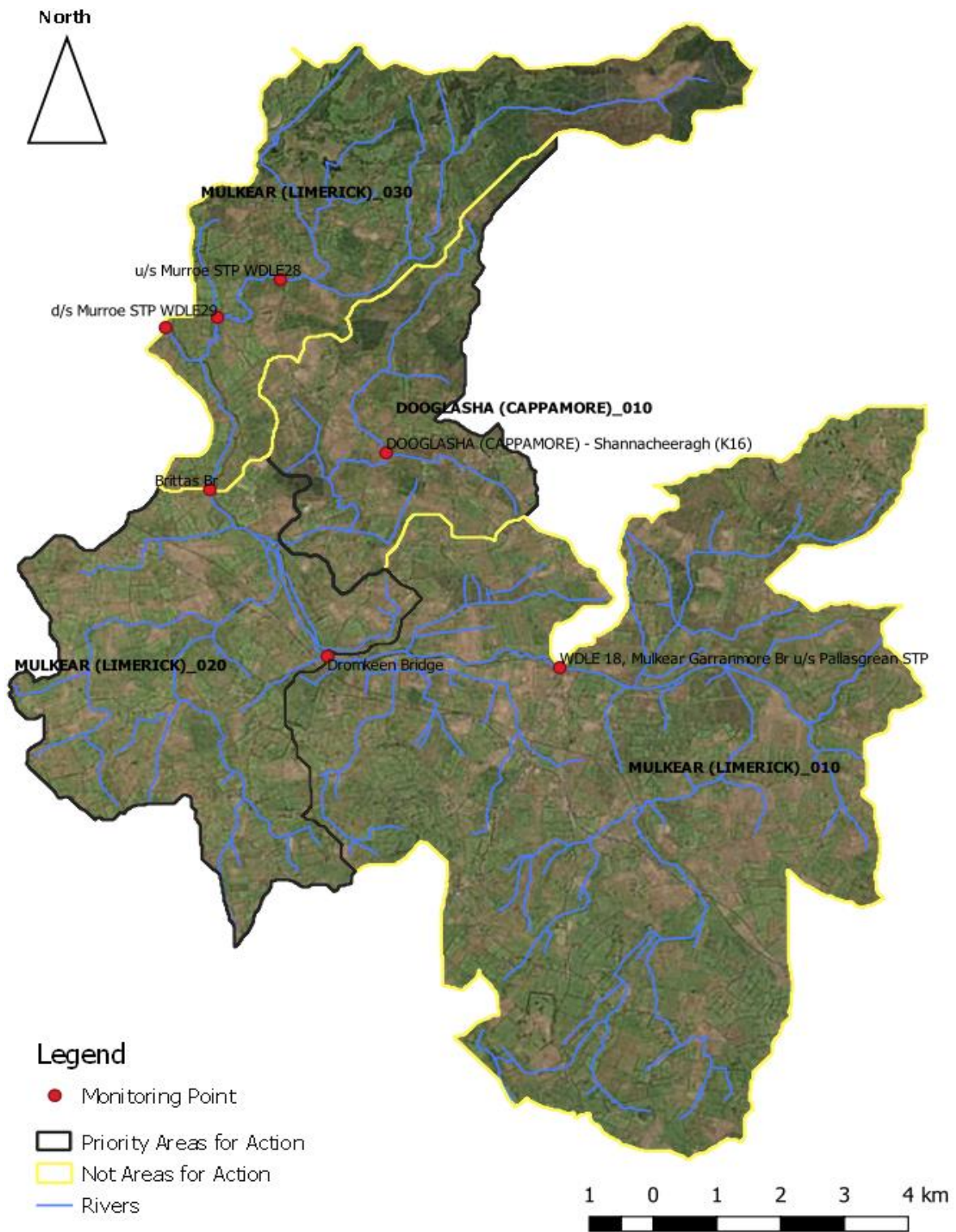
Priority Area for Action	Catchment Number	Catchment Name	Sub catchment	Region	Local Authority
Mulkear (Limerick)	25D	Lower Shannon	25d_8 Mulkear_SC_020	Southwest	Limerick

Priority Area for Action	No of <i>At Risk</i> WBs	No of <i>Review</i> WBs	No of dRBMP Prioritised WBs	No of WBs for Status Improvement:		
				2021	2027	Beyond 2027
Mulkear (Limerick)	1	1	1	0	2	0

Reason for selection	<ul style="list-style-type: none"> • Building on completed and ongoing work by the MulkearLIFE project. • Building on improvements from in-stream works. • Important trout spawning streams. • Failing to meet protected area objective for salmon. • One deteriorated water body.
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Mulkear Priority Area for Action Desk Study

A map of the Mulkear waterbodies is presented in figure 1.1 below:

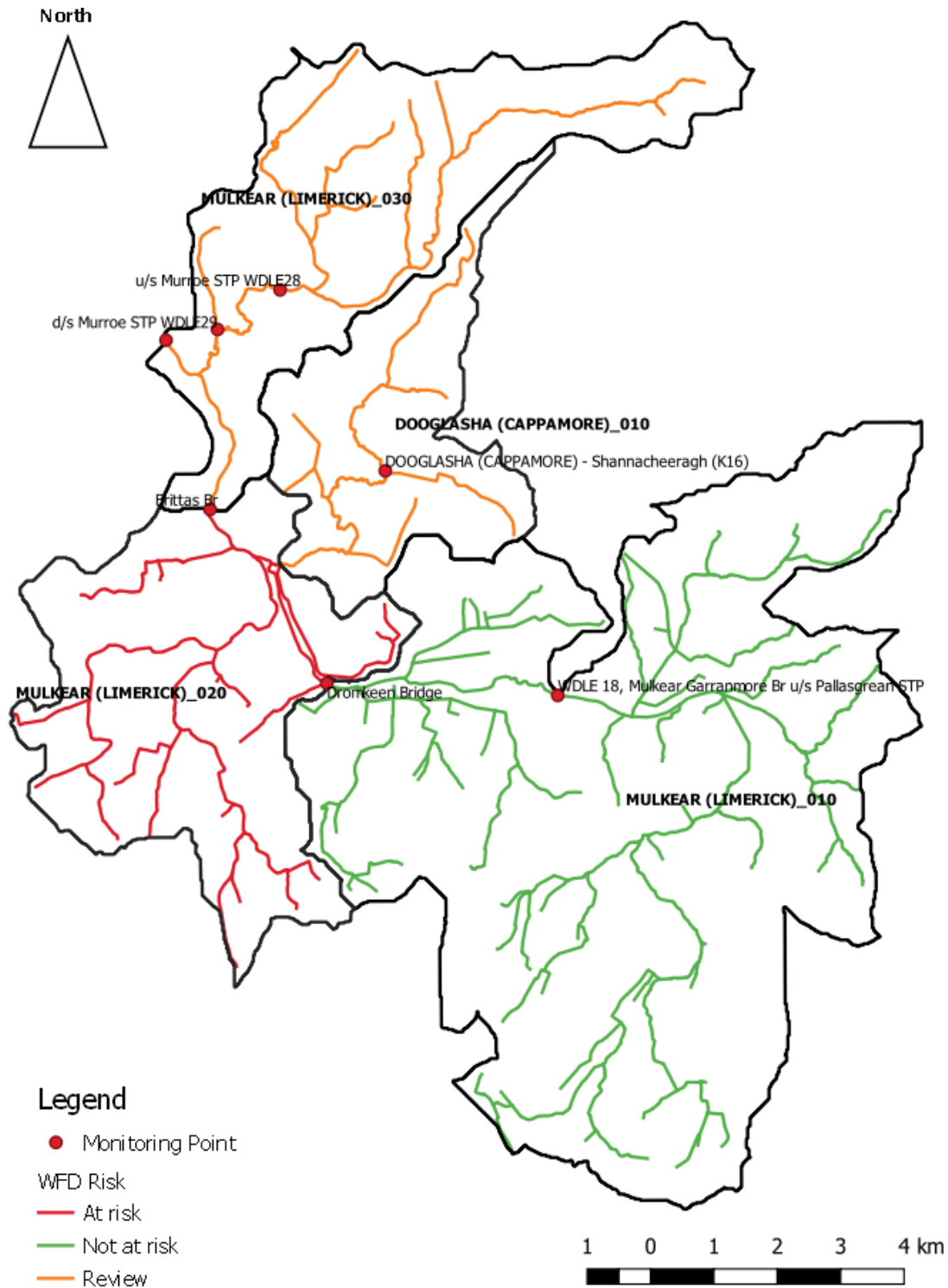


Source: EPA

Figure 1-1: Mulkear Waterbodies

Mulkear Priority Area for Action Desk Study

The Mulkear River waterbody risk and status maps are shown on figures 1.2 and 1.3 respectively, with monitoring point locations.



Source: EPA 2018

Figure 1-2: Mulkear Priority Area for Action WFD Risk Map

Mulkear Priority Area for Action Desk Study

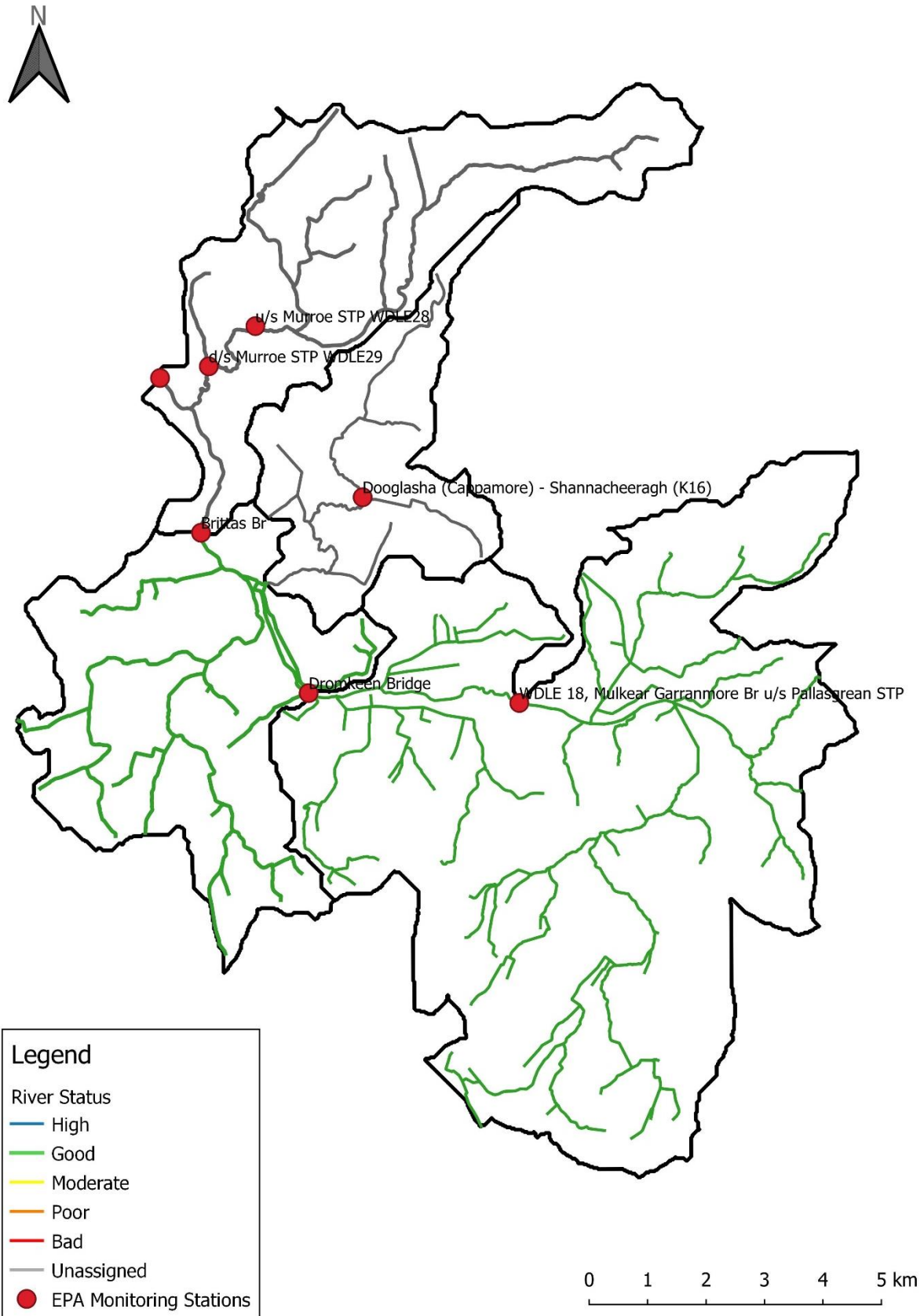


Figure 1-3: Mulkear Priority Area for Action Ecological Status

Mulkear Priority Area for Action Desk Study

1.2 Waterbody information

Table 1.2 outlines summary status and pressure information on each waterbody (WB). Details of monitoring points on each waterbody are provided in table 1.3 and shown on the map in figure 1.1.

Table 1-2: Summary table of individual waterbodies within the Mulkear Priority Area for Action

Water body Code	Water body Name	Water body Type	Date to meet Environmental Objective	Risk	Status Objective	Ecological Status			Biological status	Pressures		
						2007-2009	2010-2012	2010-2015		2018	Category	Sub Category
IE_SH_25M040100	Mulkear (limerick)_010	River	-	Not at risk	Good	Unassigned	Unassigned	Good	Q4	-	-	-
IE_SH_25M040200	Mulkear (limerick)_020	River	2027	At risk	Good	Good	Good	Moderate	Q4	Industry	IPC	No
										Anthropogenic Pressures	Unknown	Yes
										Industry	Section 4	Yes
IE_SH_25M040300	Mulkear (limerick)_030	River	-	Review	Good	Unassigned	Unassigned	Unassigned	Not monitored	Urban Waste Water	Agglomeration PE of 1,001 to 2,000	Yes
										Agriculture	Farmyard	No
IE_SH_25D020400	Dooglasa (Cappamore)_010	River	2027	Review	Good	Unassigned	Unassigned	Unassigned		Anthropogenic Pressures	Unknown	Yes

Source: EPA 2018

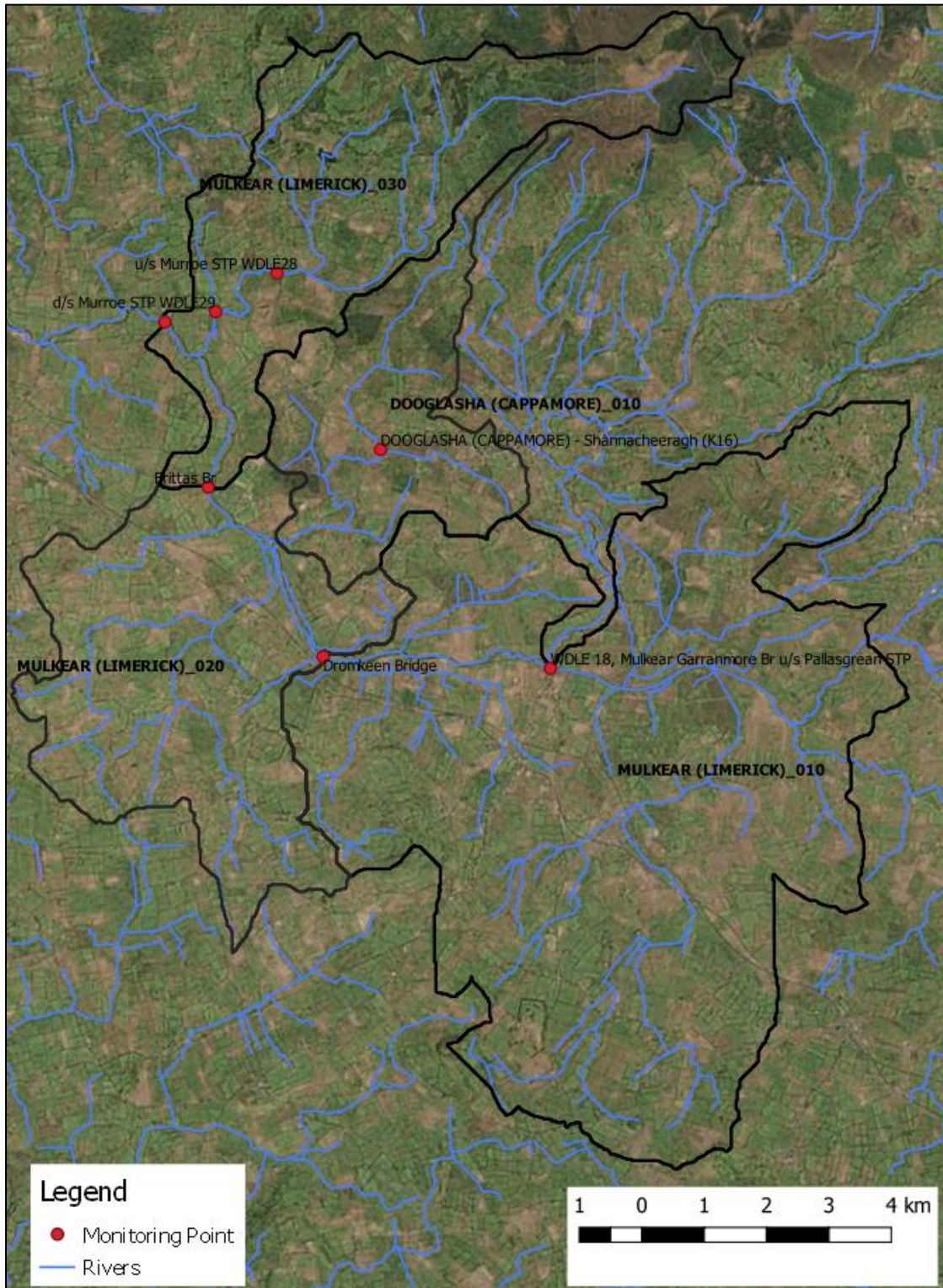
Table 1-3: Monitoring Point Locations

Waterbody	Monitoring Point Code	Name	Type	Comments
Mulkear (limerick)_010	RS25M040100	Dromkeen Bridge	Operational	Includes Q and chemistry data
	RS25M040010	WDLE 18, Mulkear Garranmore Br u/s Pallasgreen STP	Investigative	chemistry data for nitrogen and BOD only
	TPEFF1900D0503SW001	Pallasgreen EFF SW001	UWW	Includes chemistry data only
	TPINF1900D0503SW001	Pallasgreen INF SW001	UWW	Includes chemistry data only
Mulkear (limerick)_020	RS25M040200	Brittas Br	Operational	Includes Q data only
Mulkear (limerick)_030	RS25M040300	Br nr Abingdon Ho (K5)	Operational	Includes Q and chemistry data
	RS25K420760	u/s Murroe STP WDLE28	Investigative	chemistry data for suspended solids and BOD only
	RS25K420930	d/s Murroe STP WDLE29	Investigative	chemistry data for suspended solids and BOD only
	TPEFF1900D0306SW001	Murroe EFF SW001	UWW	Includes chemistry data only
	TPINF1900D0306SW001	Murroe INF SW001	UWW	Includes chemistry data only
Dooglasa (Cappamore)_010	RS25D020400	DOOGLASHA (CAPPAMORE) - Shannacheeragh (K16)	PreWfd	No data

Source: EPA 2018

2 Receptor Assessment

Monitoring stations are shown on the map below:



Source: EPA

Figure 2-1: WFD monitoring stations

Mulkear Priority Area for Action Desk Study

2.1 Overview table

Information on the receptor, including summary results for each operational monitoring point, is provided in table 2.1:

Table 2-1: Receptor Information

Factor		Figures Tables	Mulkear (Limerick)_010	Mulkear (limerick)_020	Mulkear (Limerick)_030	Dooglasla (Cappamore)_010
Risk Category		y	<i>Not at risk</i>	<i>At risk</i>	<i>Review</i>	<i>Review</i>
Monitoring station		y	25M040100	25M040200	25M040300	25D020400
Biological status (inverts)	2009-2015 Status	y	<i>Good</i>	<i>Moderate</i>	Unassigned	Unassigned
	Trends in Q value since 2009	y	Yes drop. High status in 2006.	Yes 2015 drop. Good status in 2012 and 2018.	No data	No data
	2018 Q data		<i>Q4</i>	<i>Q4</i>	Unassigned	Unassigned
Biological status (Fish)			No data	No data	No data	No data
Hydrochemistry Data						
Ortho-P (mg/l P)	Baseline	Y	0.048ppm 2015 (baseline 0.029)	No data	0.048ppm 2015 (baseline 0.031)	No data
	Indicative quality		Good	No data	Good	No data
	Trends - significant?		No, upwards	No data	No, upwards	No data
	Distance to threshold		Far	No data	Far	No data
NH4-N (mg/l N)	Baseline	Y	0.033ppm 2015 (baseline 0.032)	No data	0.036ppm 2015 (baseline 0.033)	No data
	Indicative quality		High	No data	High	No data
	Trends - significant?		No, downwards	No data	No, downwards	No data
	Distance to threshold		Near	No data	Near	No data
TON (mg/l N)	Baseline	Y	1.181ppm 2015 (baseline 1.196)	No data	1.179ppm 2015 (baseline 1.188)	No data
	Indicative quality		Good	No data	Good	No data
	Trends - significant?		No, upwards	No data	No, upwards	No data
	Distance to threshold		Far	No data	Far	No data
Supporting Conditions	Chemical conditions?		Pass	No data	No data	No data
	Oxygenation Conditions		Pass	No data	No data	No data
	Acidification Conditions		Pass	No data	No data	No data
Hydromorphology						
RHAT score			No data	No data	No data	No data
Evidence of Arterial drainage			No	No	No	No
Ecological Status (2010–2015)			<i>Good</i>	<i>Moderate</i>	Unassigned	Unassigned
Trends (2010-2015)			High status in 2006.	Good status in 2012.	No data	No data
Protected Areas			Lower River Shannon SAC			
WFD Objective			<i>Good</i>	<i>Good</i>	<i>Good</i>	<i>Good</i>
EPA biologist notes (if any)			Not available	Not available	Not available	Not available
Significant issue/impact for receptor			Increasing ortho-p	None identified	Increasing ortho-p	None identified

Source: EPA 2018

Mulkear Priority Area for Action Desk Study

2.2 Q values

Mulkear (Limerick)_010 (*Not at risk*)

There are no chemistry data available for Brittas Br.

There is one investigative station on Mulkear (Limerick)_010 at Garranmore Bridge upstream of Pallasgreen wastewater treatment plant. There is an operational station downstream at Dromkeen Bridge (RS25M040100).

Dromkeen Bridge is located close to the boundary between Mulkear (Limerick)_010 and Mulkear (Limerick)_020. Q results for the monitoring point on the Dromkeen Bridge monitoring station have been consistently Good (Q4) since 1993 (High (Q4/5) in 2006).

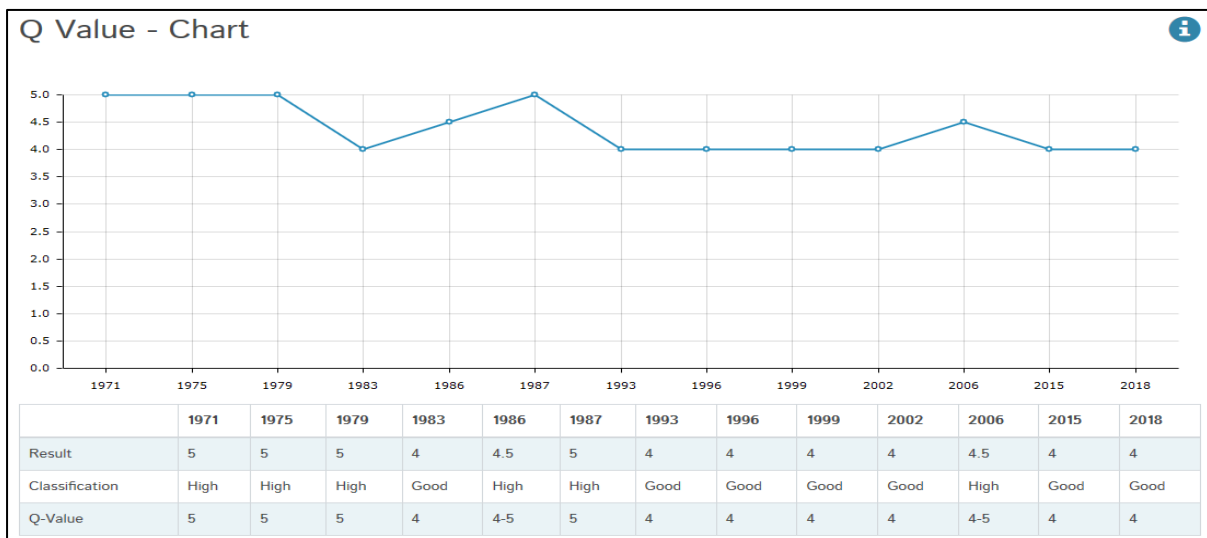


Figure 2-2: Q value, at Dromkeen Bridge, Mulkear (Limerick)_010

Mulkear (Limerick)_020 (*At risk*)

There is one operational station on Mulkear (Limerick)_020 the Brittas Br, RS25M040200. There are no chemistry data available for Brittas Br. Biological monitoring results at this location deteriorated from Good (Q4) in 2012 to Moderate (Q3/4) in 2015. 2018 Q data indicates a return to Good status. Q values are graphed in figure 2.3.

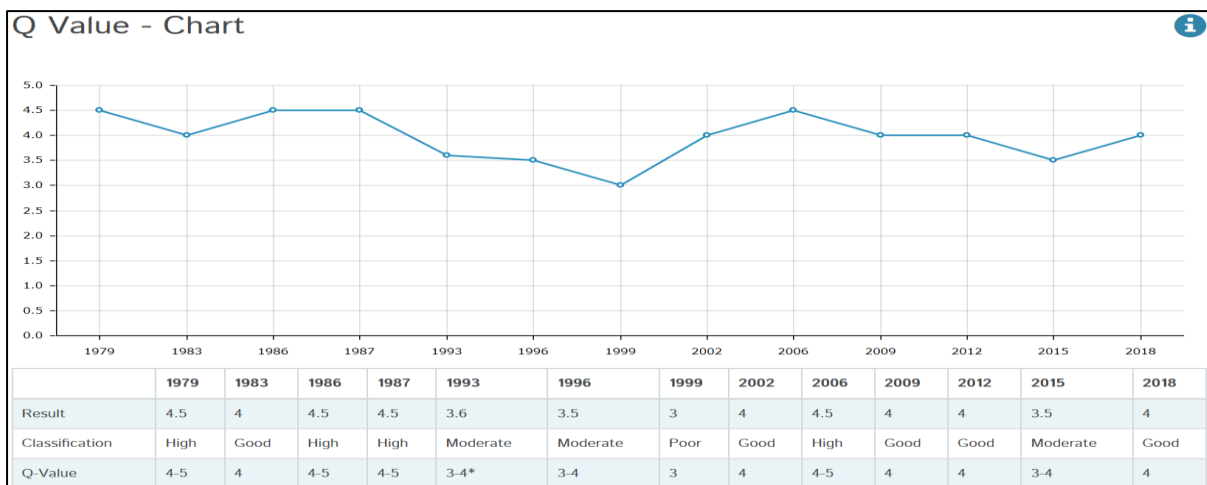


Figure 2-3: Q value, at Brittas Br, Mulkear (Limerick)_020

Mulkear (Limerick)_030 (*Review*)

Q results for the operational monitoring point (Br nr Abingdon Ho (K5), RS25M040300) were Poor (Q3) when monitored last in 1993. Q values are graphed in figure 2.4.

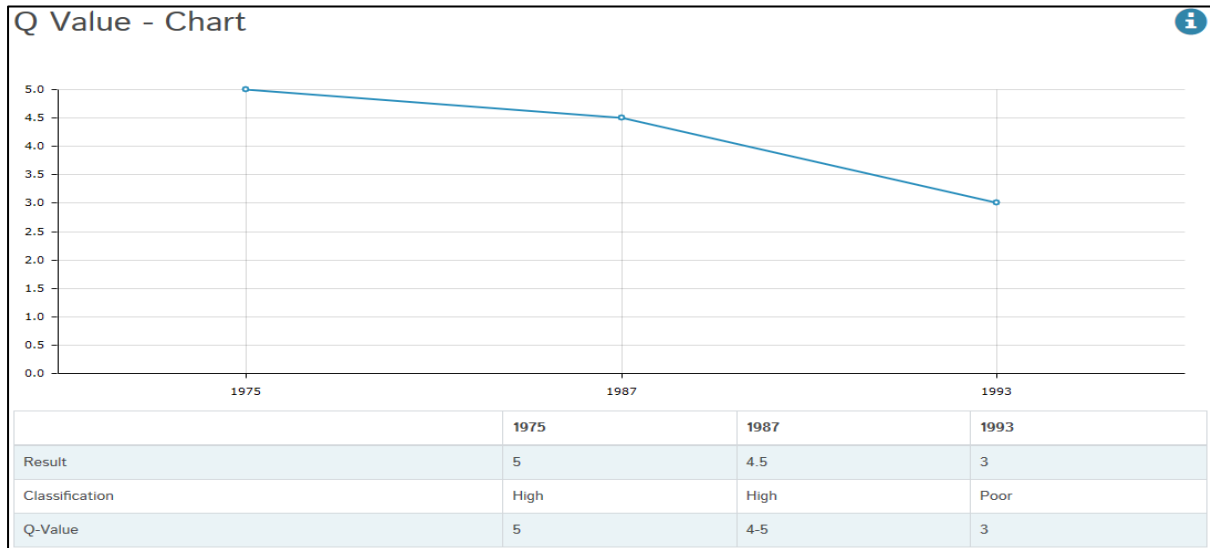


Figure 2-4: Q value, at Br nr Abingdon Ho (K5), Mulkear (Limerick)_030

Dooglasha (Cappamore)_010 (*Review*)

There are no biological data available for the Shannacheeragh (K16), RS25D020400 station on Dooglasha (Cappamore)_010. This river is unassigned and at *Review*.

Mulkear Priority Area for Action Desk Study

Table 2-2: Table of Q Values

Water body Name	Monitoring Point	1971	1975	1979	1983	1986	1987	1993	1996	1999	2002	2006	2009	2012	2015	2018
Mulkear (Limerick)_010	Dromkeen Bridge	High	High	High	Good	High	High	Good	Good	Good	Good	High	-	-	Good	Good
Mulkear (Limerick)_020	Brittas Br	-	-	High	Good	High	High	Moderate	Moderate	Poor	Good	High	Good	Good	Moderate	Good
Mulkear (Limerick)_030	Br nr Abingdon Ho (K5)	-	High	-	-	-	High	Poor	-	-	-	-	-	-	-	-
Dooglasha (Cappamore)_010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Source: EPA 2018

2.3 Hydrochemistry

Mulkear (Limerick)_010 (*Not at risk*)

Orthophosphate levels have frequently been elevated and the annual average results exceeded the mean EQS for good status waters in 2015. Individual orthophosphate results at Garranmore Bridge (upstream of the Pallasgreen wastewater treatment plant) and at Dromkeen Bridge are graphed below in Figure 2.5:

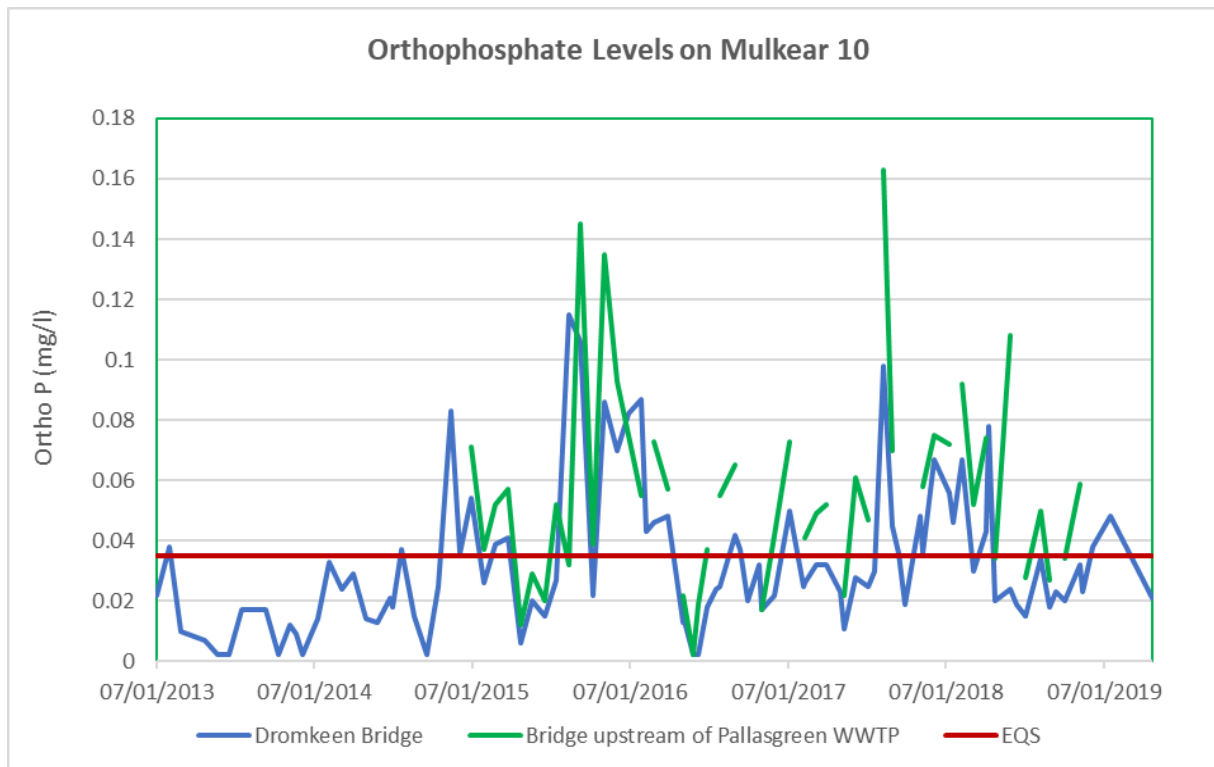


Figure 2-5: Orthophosphate levels at Garranmore Bridge and Dromkeen bridge on Mulkear (Limerick)_010

As Figure 2.5 shows, the orthophosphate peaks generally coincide at Dromkeen Bridge and at Garranmore bridge. Given that Garranmore bridge is upstream of the Pallasgreen wastewater treatment plant, this would indicate that the peaks are not related to the WWTP discharge. The high surface P PIP maps indicate that the significant pressure here is likely to be agriculture (figure 9.1).

Periodic spikes have been observed in ammonia levels on both monitoring points on Mulkear (Limerick)_ 10. Annual average ammonia results were below the mean EQS for Good status waters (0.065mg/l) up to 2017 but tentative results indicate that the EQS was exceeded in 2018 at Dromkeen Bridge. Individual results from 2013 to 2019 are graphed in figure 2.6 below. The mean EQS is also shown in the graph.

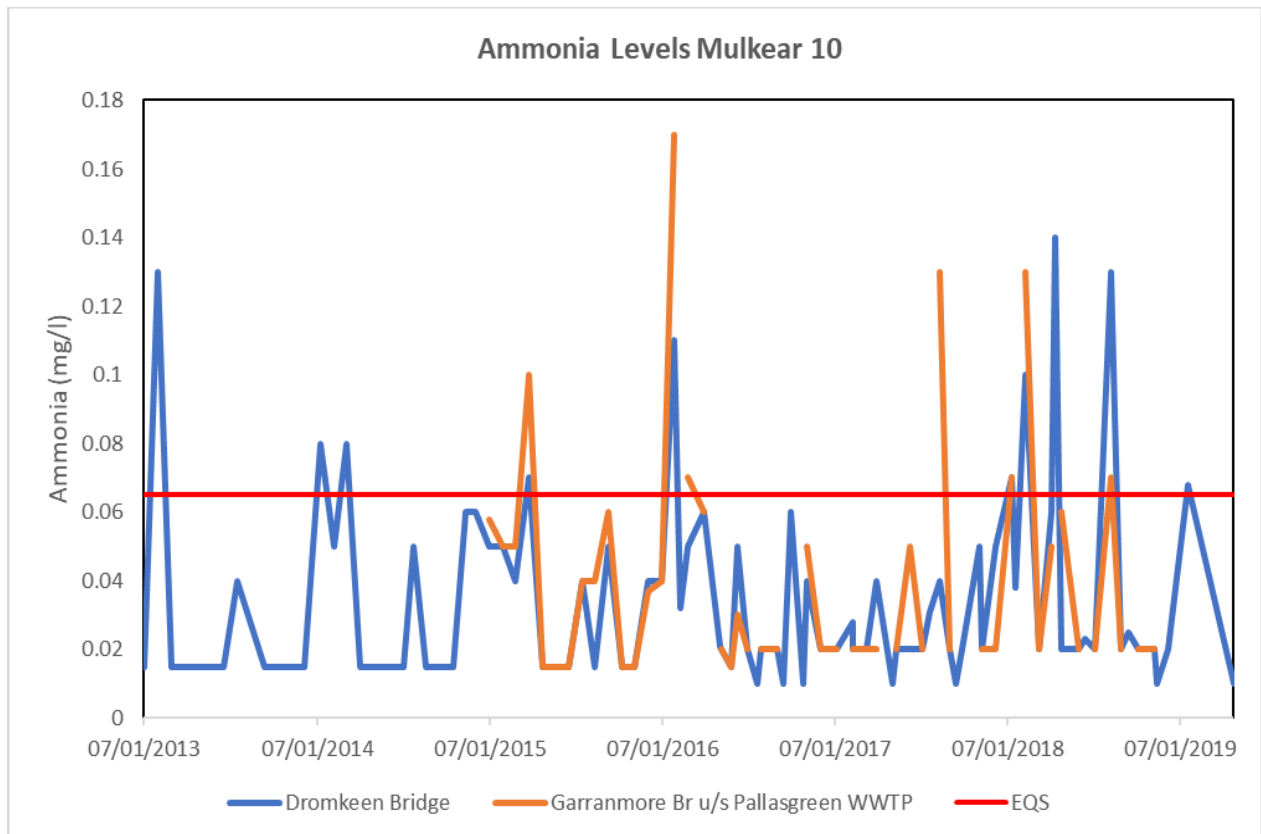


Figure 2-6: Ammonia levels at Garranmore Bridge and Dromkeen bridge on Mulkear (Limerick)_010

BOD results for the Dromkeen Bridge site have been generally satisfactory although occasional spikes have been observed, with the highest result recorded in August 2017 (3.78ppm). BOD results at Garranmore bridge upstream of Pallasgreen wastewater treatment plant are also generally satisfactory but a spike in results was observed on the same date in 2017 (5.3ppm).

In summary, Mulkear (Limerick)_010 is at good status and is *Not At Risk*. However, results indicate that orthophosphate and to a lesser extent ammonia levels have frequently been elevated on Mulkear (Limerick)_10, both at Dromkeen bridge and upstream at Garranmore Bridge. The PIP maps support these results, showing that the upstream area is high risk for surface phosphate (see figure 9.1).

Mulkear (Limerick)_020 (*At risk*)

There are no chemistry data available for Brittas Br.

Mulkear (Limerick)_030 (not part of PAA)

Mulkear (Limerick)_030 is at unassigned status and is at review. There is one WFD operational station on this waterbody, the Bridge near Abingdon House (K5), RS25M040300. This site is currently monitored for chemistry only. Annual average orthophosphate levels exceeded the 0.035mg/l mean EQS at this site in 2015 (result of 0.048mg/l, see figure 2.7 below).

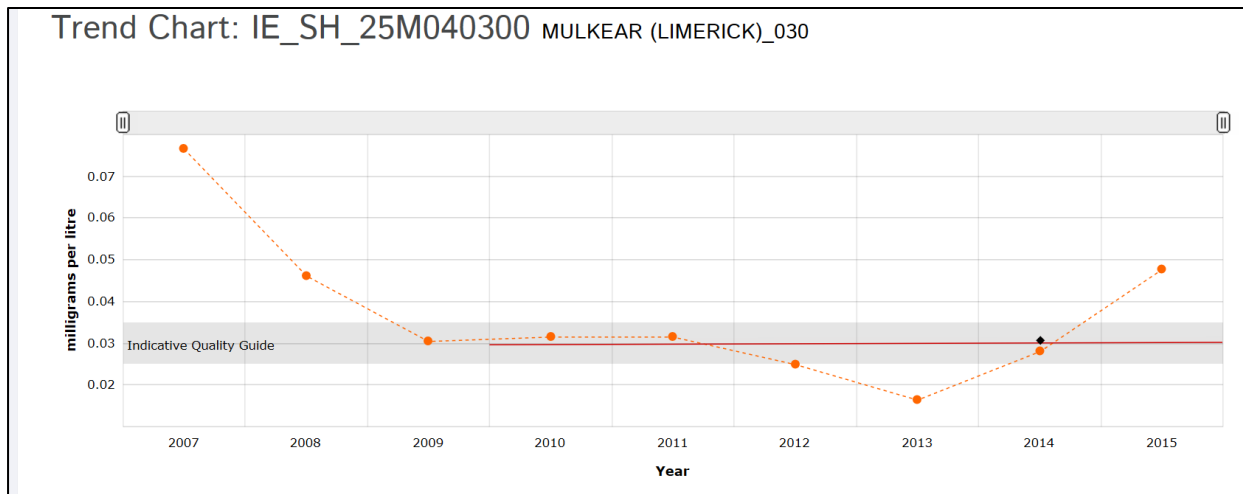


Figure 2-7: Annual average orthophosphate levels (as P), at Br nr Abingdon Ho (K5), Mulkear (Limerick)_030

Annual average ammonia and nitrate levels at this monitoring station have been consistently low and stable/decreasing.

Dooglasa (Cappamore)_010 (Review)

There are no chemistry data available for the Shannacheeragh (K16), RS25D020400 station on Dooglasa (Cappamore)_010.

2.4 Summary of Issues

Mulkear (Limerick)_020 (At risk)

There are no chemistry data available for this waterbody. Results for the two waterbodies outside the PAA (Mulkear_010 and Mulkear_030) and the surface phosphate PIP maps indicate that orthophosphate is likely to be the significant issue on Mulkear (Limerick)_20. Annual average orthophosphate results are above the mean EQS for these two waterbodies. There have also been periodic spikes observed in orthophosphate levels (and to a lesser extent, ammonia) on Mulkear_010. Land use and the surface phosphate PIP map indicate very high/high areas for risk of phosphate and/or sediment from agriculture in these areas and this will be considered in the field assessments.

Dooglasa (Cappamore)_010 (Review)

There are no chemistry data available for this waterbody but the surface phosphate PIP maps indicate very high/high areas for risk of diffuse sources of phosphate. Corine land usage maps show pastures/forestry on peat soils, indicating that ammonia may also be a potential issue in this waterbody. There is also potential for sediment loss from the poorly draining soils (including peat). Pathways for orthophosphate, ammonia and sediment are surface flowpaths (overland flow and land drains). Felling records would be useful for this waterbody to assist in determining whether forestry is a significant pressure here. Nutrient monitoring will also be required to identify whether orthophosphate and/or ammonia are a significant issue here.

3 Significant pressures

3.1 Initial EPA Characterisation

Table 3-1: Initial EPA Characterisation

Waterbody Name	Id	Category	Sub Category	Name	Significant	Pressure & Impact details
MULKEAR (LIMERICK)_020	WBP0004247	Industry	IPC	Marrow Meats Limited	No	
	WBP0006235	Anthropogenic Pressures	Unknown	n/a	Yes	Other Significant Impacts
	WBP0006398	Industry	Section 4	n/a	Yes	Other Significant Impacts
MULKEAR (LIMERICK)_030	WBP0004249	Urban Waste Water	Agglomeration PE of 1,001 to 2,000	Murroe	Yes	Nutrient Pollution
	WBP0004250	Agriculture	Farmyards	n/a	No	
DOOGLASHA (CAPPAMORE)_010	WBP0006234	Anthropogenic Pressures	Unknown	n/a	Yes	Other Significant Impacts

Source: EPA 2018

Note that Marrow Meats Limited has closed since. Therefore, this will not be considered for further assessment.

3.2 Conclusions on the Significant Pressures

Biological status at an operational monitoring point on Mulkear (Limerick) _020 deteriorated to moderate in 2015 but has recovered back to Q4 (Good) in 2018. The reason for the deterioration needs to be established in order to ensure that the waterbody is not at risk of further deterioration. The WFD initial characterisation identified industry and anthropogenic pressures as the significant pressure/s on Mulkear (Limerick) _020. As there are no water chemistry data available, it is difficult to know which pollutant is impacting the invertebrates here. However elevated orthophosphate and ammonia levels have been reported upstream on Mulkear (Limerick)_010. Also, there were increasing orthophosphate levels reported for Mulkear (Limerick) _030 measured at Br nr Abingdon Ho (K5). The surface phosphate PIP map indicates very high/high areas for risk of diffuse sources of phosphate. Land use and soil type indicate that the issue on this waterbody may be phosphate and possibly sediment.

The WFD initial characterisation identified anthropogenic pressure as the significant pressure on Dooglasha (Cappamore)_010, which is unassigned and at review. SSIS assessments and 3 water samples will be undertaken on three separate occasions over a twelve month period on the Dooglasha (Cappamore)_010. The surface phosphate PIP map indicates very high/high areas for risk of diffuse sources of phosphate, however there is no chemistry data available for this waterbody. Forestry and agriculture must be considered as the Corine land Usage map indicates pastures/forestry on peat soils, so land drains and surface pathways may be contributing. Felling records would be useful for this waterbody to assist in determining whether forestry is a significant pressure here. Land use, soil type and phosphate PIP maps indicates that the possible significant issue may be orthophosphate, ammonia and/or sediment.

Field assessment will be needed to assess potential significant pressure/s on the ground.

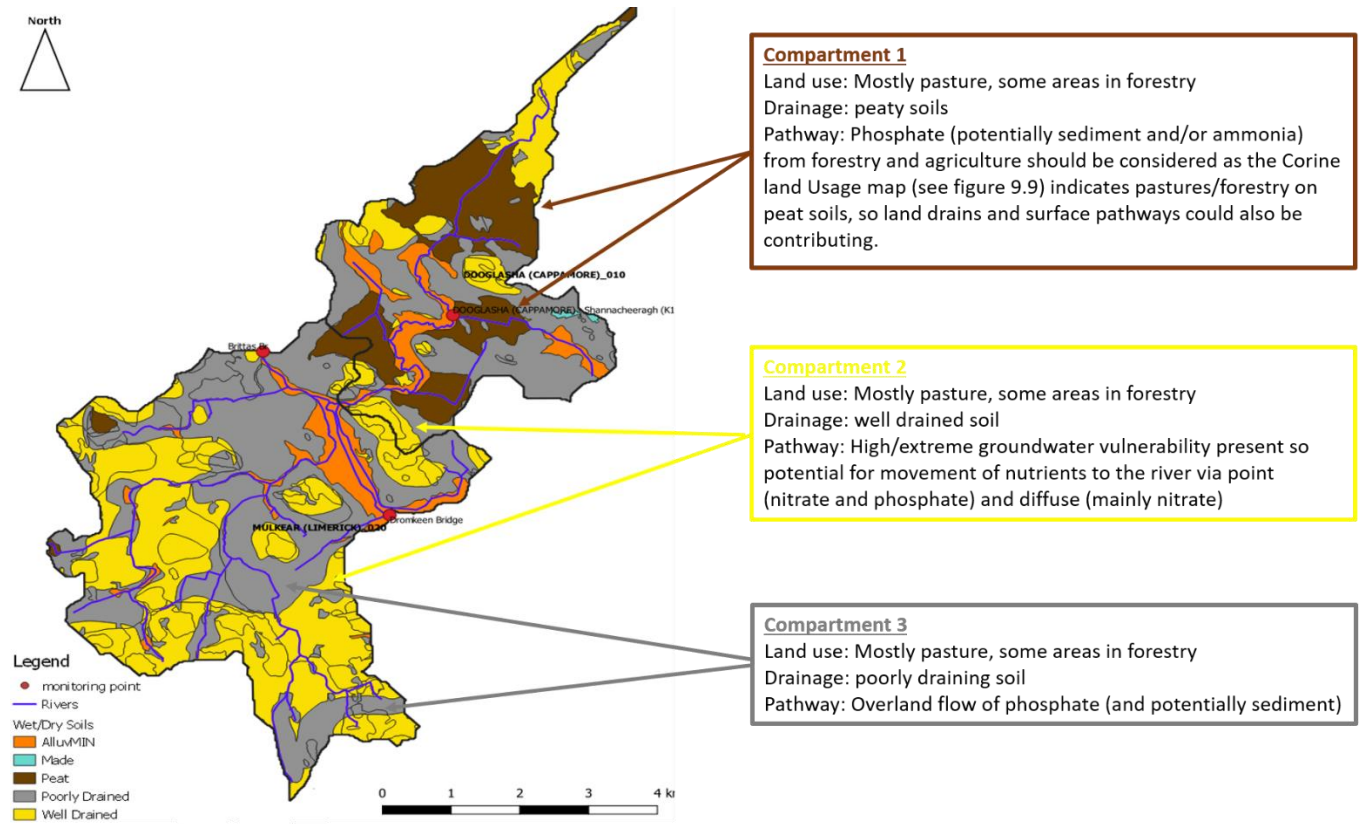
4 Pathways Information (diffuse pollution)

4.1 Conceptual Model Development

The conceptual model is based largely on a combination of aquifer type, bedrock type, soil type, PIP maps (and susceptibility maps), similarity in annual P trend for Mulkear (limerick) 010 and Mulkear (limerick) 030. The inputs from larger point sources also need to be assessed in the LCA process. Available results indicate that phosphorus (potentially ammonia and/or sediment) are the significant issue in the PAA. Land use and management must be investigated. This should include agriculture, land drainage and forestry activities. Flow paths for pollutant transfer are likely to be via diffuse overland flow and land drains with possible contribution from small point sources (eg farmyards and DWWTSs).

Mulkear Priority Area for Action Desk Study

Conceptual Model Map



Source: Teagasc-EPA

Figure 3-1: Conceptual Model

Compartment 1 corresponds to the peaty soils (Cut, BktPt, FenPt). Orthophosphate (potentially sediment and/or ammonia) from forestry and agriculture should be considered as the Corine land Usage map (see figure 9.12) indicates pastures/forestry on peat soils, so land drains and surface pathways could also be contributing. Felling records would be useful for this waterbody to assist in determining whether forestry is a significant pressure here. Orthophosphate and ammonia could be a significant issue(s) and should be investigated by taking a water sample. This indicates possibly significant issues from orthophosphate, ammonia and/or sediment. The surface Phosphate PIP map (See Figure 9.1) has areas of high PIP Rank in this compartment and these areas should be the focus for stream walks in assessing phosphate loadings upstream.

Compartment 2 corresponds to the well-drained soil (AminDW, AminSW, BminDW, BminSW) and this corresponds with the surface nitrate PIP map. This area has high/extreme groundwater vulnerability and the main flow paths are near surface and some groundwater recharge via outcrops. There may be limited subsurface flow across the top of the bedrock but the phosphate contribution via this pathway is likely to be insignificant in comparison to the overall loadings on the catchment. Therefore, this compartment will not be considered a focus area for this assessment.

Compartment 3 corresponds to the poorly draining soil (AminPD, AminPDPT, AminSP, BminPD, BminSP, Lac) and there are areas of alluvium soil as can be seen in figure 3.1. These areas correspond with the areas of areas of high surface Phosphate PIP map. The main flow paths including drains are diffuse overland flow for surface phosphate (and potentially sediment). The surface phosphate susceptibility of high ranking in this PAA and these areas should be the focus for stream walks in assessing phosphate (and potentially sediment) loadings upstream of the Brittas Br station.

In summary, considering that phosphate (potentially sediment and/or ammonia) are the significant issue in this PAA compartments 1 and 3 are of most significance in terms of pollutant pathways, with overland flow and land drains being the most likely pathway for phosphate and sediment.

Table 4-1: Conceptual Model

	Compartment 1	Compartment 2	Compartment 3
Location	This compartment corresponds to peat	This compartment corresponds to well drained soil	This compartment corresponds to poorly drained soil and Alluvium
Aquifer type	LI (Locally important bedrock aquifers that are productive in local zones), Lm (Locally important aquifers which are generally moderately productive), PI (Generally unproductive bedrock except for local zones), Rkd (Regionally important karstified aquifer)	LI (Locally important bedrock aquifers that are productive in local zones), Lm (Locally important aquifers which are generally moderately productive)	LI (Locally important bedrock aquifers that are productive in local zones), Lm (Locally important aquifers which are generally moderately productive), PI (Generally unproductive bedrock except for local zones), Rkd (Regionally important karstified aquifer)
Topography	Low ground	Low ground	Low ground
Bedrock unit	Basalts & other Volcanic rocks, Devonian Old Red Sandstones, Dinantian Lower Impure Limestones, Dinantian (early) Sandstones, Shales and Limestones, Dinantian Pure Unbedded Limestones	Basalts & other Volcanic rocks, Devonian Old Red Sandstones, Dinantian Lower Impure Limestones, Dinantian Pure Unbedded Limestones, Namurian Shales, Silurian Metasediments and volcanics	Basalts & other Volcanic rocks, Devonian Old Red Sandstones, Dinantian Lower Impure Limestones, Dinantian (early) Sandstones, Shales and Limestones, Dinantian Pure Unbedded Limestones, Namurian Sandstones, Namurian Shales
Gwb	Pallas Grean, Knockroe East, Ballyneety, Slieve Phelim	Knockseefin-Longstone East, Pallas Grean, Knockroe East, Ballyneety, Slieve Phelim	Knockseefin-Longstone East, Pallas Grean, Knockroe East, Ballyneety, Slieve Phelim
Subsoil type	Cut (Cutover peat), BktPt (Blanket Peats), FenPt (Fen peat)	TNSSs (Namurian Shales and sandstones till), TBi (Basic igneous till), TLs (Carboniferous Limestone till), TDSs (Devonian Sandstone till), GLs (Carboniferous Limestone sands and gravels), GDSs (Devonian Sandstone sands and gravels), TLPsS (Lower Palaeozoic Sandstone and shale till)	TNSSs (Namurian Shales and sandstones till), TBi (Basic igneous till), TLs (Carboniferous Limestone till), TDSs (Devonian Sandstone till), L (Lake sediments undifferentiated), Rck (Bedrock at surface), A (Alluvium undifferentiated), GLs (Carboniferous Limestone sands and gravels), GDSs (Devonian Sandstone sands and gravels), TLPsS (Lower Palaeozoic Sandstone and shale till)

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	Compartment 1	Compartment 2	Compartment 3
Subsoil permeability	Mostly Low	Mostly subsoil less than 3 metres; high and some areas moderate	Mostly Low; some areas moderate and high
Soil type	Cut (Cutaway/cutover peat), BktPt (Blanket Peats), FenPt (Fen peat)	AminDW, BminDW (deep well drained soils), BminSW, AminSW (shallow well drained soils),	AlluvMIN (Mineral alluvium), Lac (Lacustrine type soils), AminPD, BminPD (deep poorly drained soils), AminPDPT (Poorly drained soils with peaty topsoil), AminSP, BminSP (shallow poorly drained soils), made
Soil drainage	Poorly drained	Well drained	Poorly drained
Groundwater vulnerability	Mostly low	high and extreme, localised areas of X (bedrock outcrop)	low, moderate, localised areas of high and extreme
Po4 susceptibility	High	Low/moderate	High
No3 susceptibility	Low	High	Mainly low. Locally high on outcrops and along alluvial river channels
Po4 pip sw	High/very high if in agriculture use	Mainly Low/Moderate.	High/very high if in agriculture use
No3 pip sw	Low	Mostly high.	Mainly low. Locally high on outcrops and along alluvial river channels
Flowpaths	Overland flow and drains where poorly draining soils and subsoils.	Near surface and shallow groundwater flow. Some recharge via outcrops.	Overland flow and drains where poorly draining soils and subsoils

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

5 Interim conclusions on the PAA

Mulkear (Limerick) _020

- Mulkear (Limerick) _020 is at Moderate ecological status with the biology (invertebrates) driving status. However, 2018 Q data indicates a return to good status here.
- Biological status deteriorated to moderate in 2015 and therefore it is categorised as *At Risk*.
- The reason for the 2015 deterioration needs to be established.
- The WFD App gives the significant pressures for Mulkear (Limerick) _020 as industry and anthropogenic pressures.
- As there are no water chemistry data available, it is difficult to know which pollutant is impacting the invertebrates here.
- Results for the two waterbodies outside the PAA (Mulkear (Limerick)_010 and Mulkear (Limerick)_030) and the surface phosphate PIP maps indicate that orthophosphate is likely to be the significant issue on Mulkear (Limerick)_20.
- The surface phosphate PIP map indicates very high/high areas for risk of diffuse sources of phosphate.
- Land drains and surface pathways could also be contributing.
- Annual average orthophosphate results are above the mean EQS for these two waterbodies. There have also been periodic spikes observed in orthophosphate levels (and to a lesser extent, ammonia) on Mulkear (Limerick)_010.
- EPA biologist noted that substrate/siltation is slight.
- Land use, soil type and phosphate PIP maps indicates that the possible significant issues on this waterbody may be orthophosphate, nitrate, ammonia and/or sediment and these areas will be the focus for the local catchment assessments.

Dooglasha (Cappamore) _010

- Dooglasha (Cappamore) _010 is currently unassigned and *At Review*.
- The WFD App characterises the significant pressures for Dooglasha (Cappamore) _010 as anthropogenic pressures.
- As there are no water chemistry or biological data available, it is difficult to know which pollutant is impacting the invertebrates here.
- However results for the two waterbodies outside the PAA (Mulkear (Limerick)_010 and Mulkear (Limerick)_030) and the surface phosphate PIP maps indicate that orthophosphate is likely to be the significant issue on Dooglasha (Cappamore) _010.
- SSIS assessments and 3 water samples will be undertaken on three separate occasions over a twelve month period on the Dooglasha (Cappamore) _010.
- The surface phosphate PIP map indicates very high/high areas for risk of diffuse sources of phosphate.
- Forestry and agriculture must be considered as the Corine land Usage map indicates pastures/forestry on peat soils; land drains and surface pathways may be contributing.
- Felling records would be useful for this waterbody to assist in determining whether forestry is a significant pressure here.
- Land use, soil type and phosphate PIP maps indicates that the possible significant issues on this waterbody may be orthophosphate, ammonia and/or sediment and these areas will be the focus for the local catchment assessments.

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
MULKEAR (LIMERICK)_010				
MULKEAR (LIMERICK)_020	FC001 590	IA7 Multiple Sources in Multiple Areas	Limerick City & County Council	Aim: determine what pressure(s) cause the drop from consistently Good ecological status to Moderate ecological status in 2015. IA7 is required, specifically for the lower reaches of this river to determine the significant pressure(s). Consideration to be given to agriculture (potential for overland phosphate transport over gley soils). Note that there are also drill rigs moving in the area (zinc and lead prospecting) and discharging (with licence) but result in increased sediment loads.
MULKEAR (LIMERICK)_030	FC001 591	IA1 Provision of Information	Limerick City & County Council	Watching brief: Suspect there is an impact coming from Mulkear (Limerick)_020. IA1/watching brief to see if there is improvement following IA7 in Mulkear (Limerick)_020, as there were spikes in orthophosphate in 2015.
DOOGLASHA (CAPPAMORE)_010	FC001 588	IA3 Determination of Water Quality (unassigned waterbody)	Limerick City & County Council	There is no data available for this river, however due to potential pressures across the subcatchment it is advised that water quality samples should be taken to determine risk status.

Source: EPA 2018

The estimated resource for this local catchment assessment is 46 days.

6.2 Additional Information Requirements

- Talk to Limerick County Council for information on potential significant pressures including agriculture, forestry, section 4 licence and other anthropogenic pressures
- Talk to representatives of Mulkear LIFE project for information

6.3 Local Catchment Assessment

Field investigations to be undertaken at the following locations as outlined below and as shown on figures 6.1 and 6.2. The focus is on phosphate loadings in Mulkear (Limerick)_020 and elevated phosphate, ammonia and/or sediment loadings in Dooglasa (Cappamore)_010. Identification of tributary streams contributing possible phosphate, ammonia and/or sediment loadings will help to focus the work of ASSAP in this PAA.

Mulkear (Limerick)_020 (Moderate but 2018 Q results indicate a return to Good status)

- Start at monitoring point for the waterbody, Brittas Br on the Mulkear (Limerick)_020. Carry out SSIS assessment and take samples for ammonia, orthophosphate and total oxidised nitrogen at this monitoring point.
- If biological status at point 1 is less than good, follow up with SSIS assessments at points 2-6 to assess individual inflow tributaries. There is pasture directly along the main river channel and this is a high/very high phosphate PIP area due to the poorly draining alluvial soils. Agriculture, forestry and a section 4 licensed facility occur along the tributary streams. Carrying out SSIS assessments will rule them in and out. SSIS assessments will be required at the following points on map indicated, moving upstream until good status is evident.
- Therefore, if the condition of point 3 is less than good, undertake SSIS assessments at points 7 and 8.
- If the condition of point 8 is less than good, undertake SSIS assessment at point 9.
- If SSIS assessment at Point 9 isn't good, follow up with SSIS assessment at Point 10.
- If the condition of point 7 is less than good, undertake SSIS at point 11 and 12.
- If the biological status of point 12 is less than good upstream, undertake SSIS assessments at points 13 and 14.

Dooglasha (Cappamore)_010 (currently unassigned)

- Start at point 15 for the waterbody on Dooglasha (Cappamore)_010. Carry out a SSIS assessment and take water samples for ammonia, ortho-Phosphate and total oxidised nitrogen to establish the status for the unassigned waterbody. Take note of point sources of sediment from agriculture and/or forestry. The results of this will inform if agriculture and/or forestry is causing a sediment problem here. This is a review waterbody and the SSIS assessments and 3 water samples will be done on three separate occasions over a twelve month period, according to the agreed protocol.
- If biological status at point 15 is less than good, follow up with SSIS assessments at points 16 and 17 to assess individual inflow tributaries. There is pasture directly along the main river channel and this is a high/very high phosphate PIP area due to areas of peat and poorly draining alluvial soils. Agriculture and forestry occur along the tributary streams. Again, carrying out SSIS assessments along the main channel and inflow streams to narrow the focus. SSIS assessments will be required at the following points on map indicated, moving upstream until good status is evident.
- If the condition of point 17 is less than good, undertake SSIS assessment at points 18 and 19.
- If the biological status of point 19 is less than good upstream, undertake SSIS assessments at points 20 and 21.

The initial information gathered by the local catchment assessment team will inform more targeted assessments in the PAA. Where significant issue(s) are identified, appropriate mitigation measures will be discussed and referred to the relevant agency.

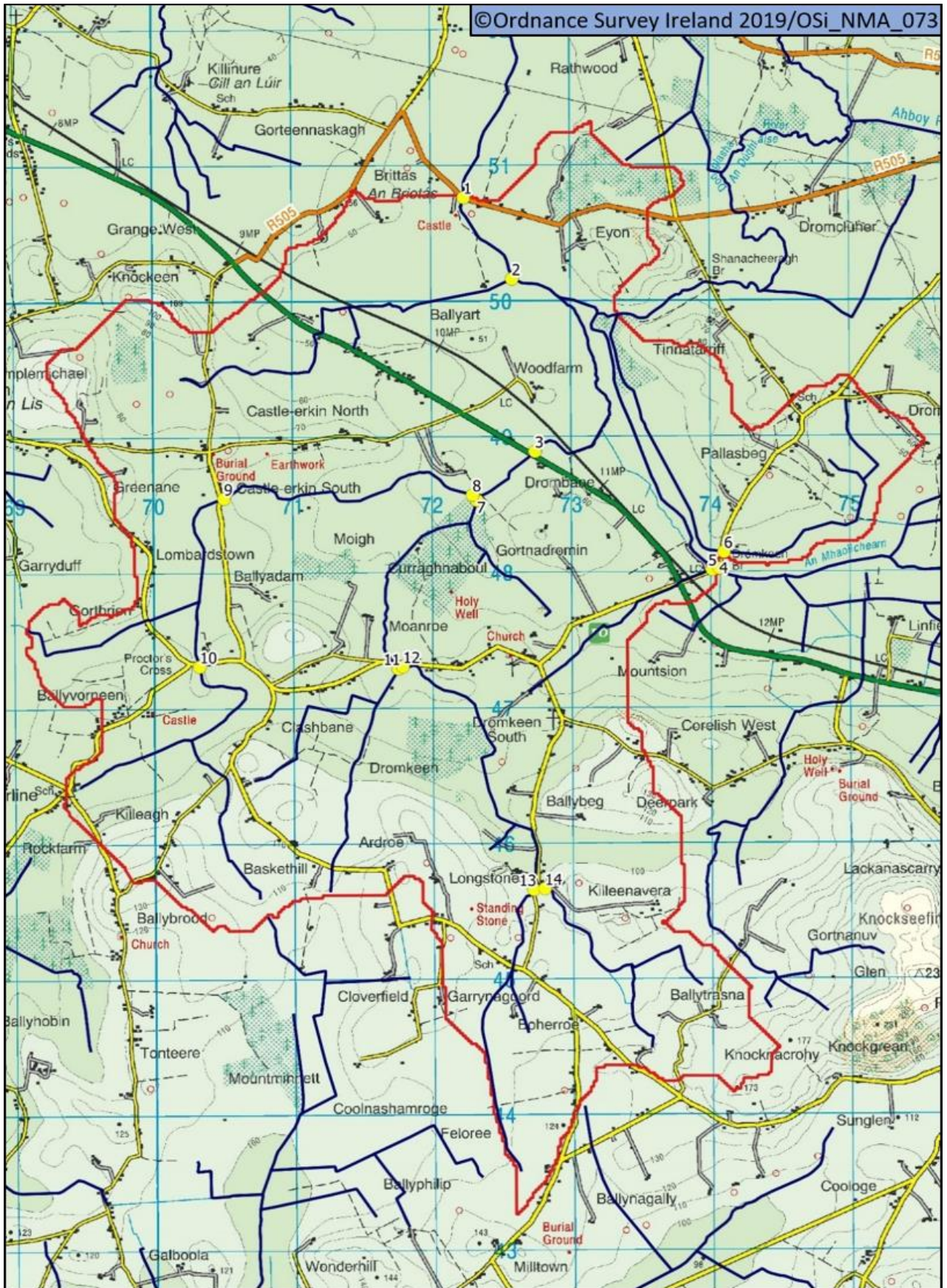


Figure 6-1: Sample locations for Mulkear (Limerick)_020

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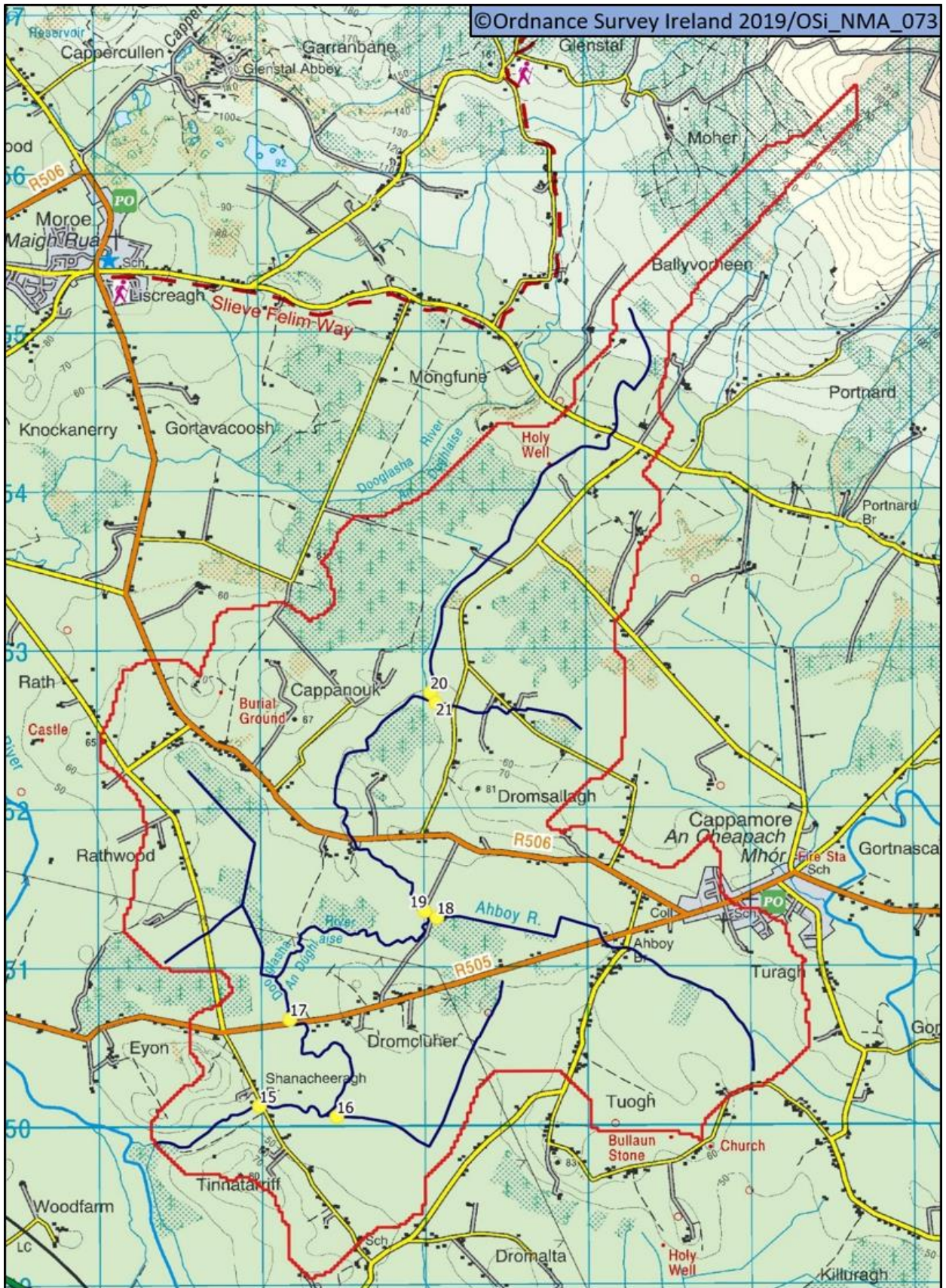


Figure 6-2: Sample locations for Dooglasla (Cappamore)_010

7 Review of Possible Mitigation Options

According to the initial characterisation, pressures include industry, anthropogenic pressures, possibly agriculture and/or forestry. Appropriate mitigation measures will be identified based on the nature of the significant pressure/s. If agriculture is identified as a significant pressure in this catchment, LA Waters staff will work with the relevant ASSAP advisors to identify appropriate mitigation measures.

8 Communications

- Public meetings will be required for this PAA.
- According to the initial characterisation pressures include industry, anthropogenic pressures and possibly agriculture and/forestry. As agriculture may be a significant pressure for this catchment farm engagement will be needed. ASSAP will contact local farming community to attend public meeting.

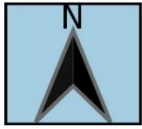
Key messages for this PAA

- The Local Authority Waters Catchment Assessment Team is to identify areas in the catchment where significant pressures are occurring and to recommend measures to address these.
- This will be done by reviewing all the available information and walking the key areas in the catchment. Initial assessments have identified pressures from industry and human activities.
- Consideration must be given to agriculture for overland phosphate and/or sediment transport over poorly draining soils. Phosphate via overland flow is the main risk to surface waters on poorly drained soils. There are also numerous rock outcrops across the entire sub catchment with potential for nitrate (and phosphate) to infiltrate groundwater. Although this pathway is likely to be insignificant in comparison to the overall loadings on the catchment.
- Next steps in the catchment assessment will be to undertake SSIS and water quality samples assessments on the Dooglasha (Cappamore)_010 (IA3). Catchment walks in the other sub catchment will most likely involve identifying the significant pressures.
- If agriculture is confirmed as a significant pressure in the catchment, the ASSAP advisor will work with local landowners to identify suitable mitigation measures.

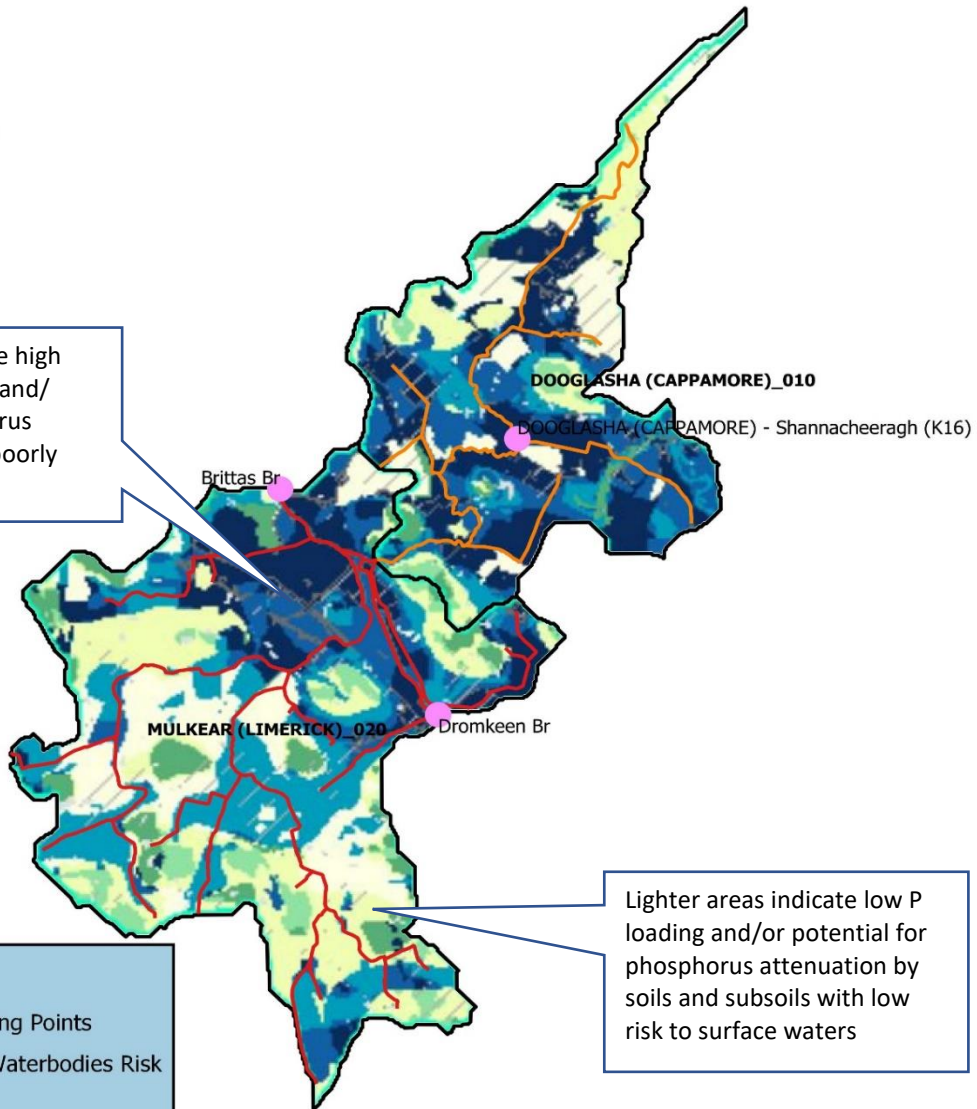
Date of completion of desk study:

21st January 2020

9 Appendices



Darker areas indicate high phosphorus loading and/ high risk of phosphorus runoff overland on poorly draining soils.



Lighter areas indicate low P loading and/or potential for phosphorus attenuation by soils and subsoils with low risk to surface waters

Legend

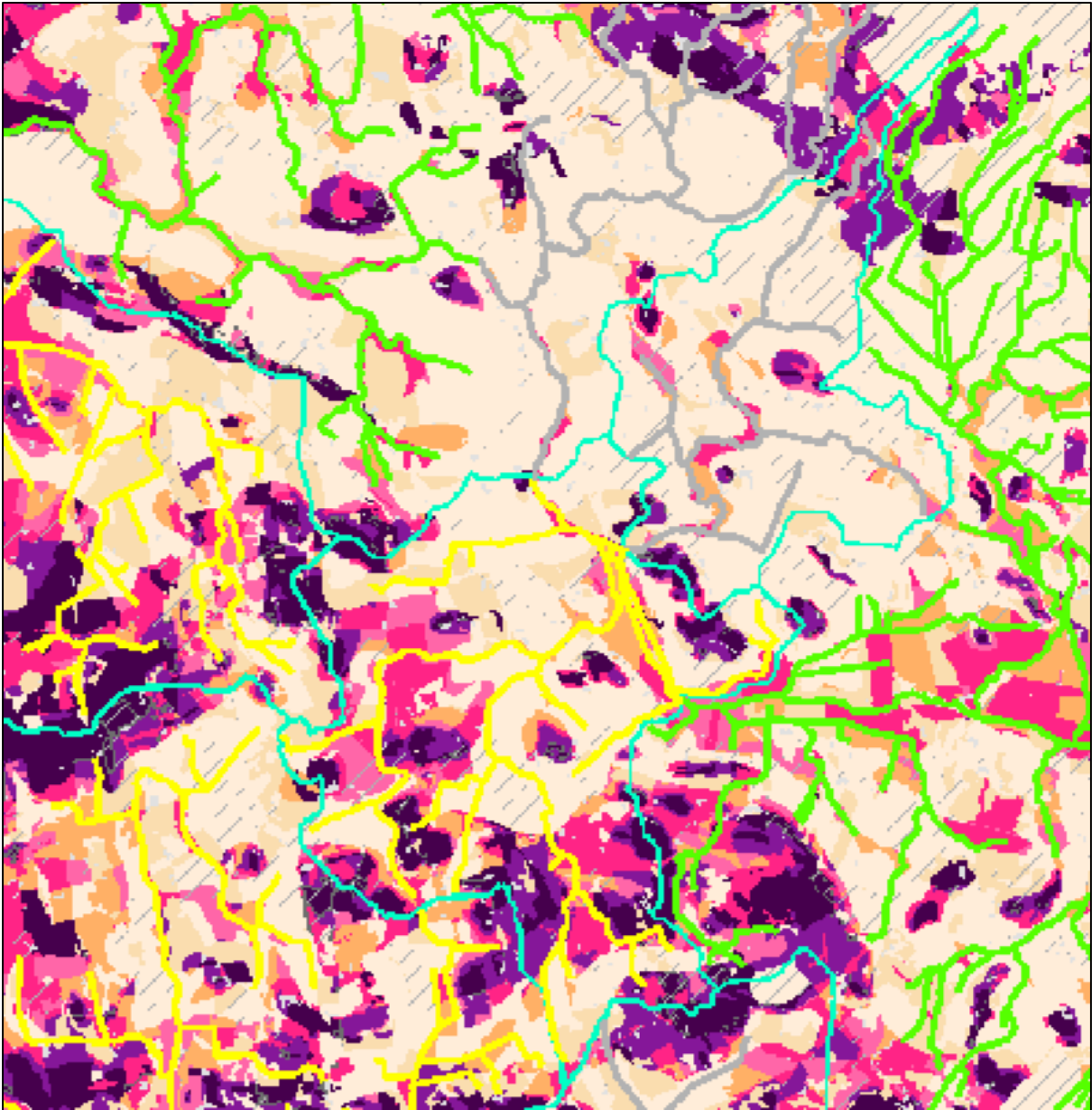
- Monitoring Points
- WFD_River Waterbodies Risk
- At risk
- Not at risk
- Review

- PIP Rank 1 (Highest)
- PIP Rank 1 (Highest) Using Regional Loadings
- PIP Rank 2
- PIP Rank 2 Using Regional Loadings
- PIP Rank 3
- PIP Rank 3 Using Regional Loadings
- PIP Rank 4
- PIP Rank 4 Using Regional Loadings
- PIP Rank 5
- PIP Rank 5 Using Regional Loadings
- PIP Rank 6



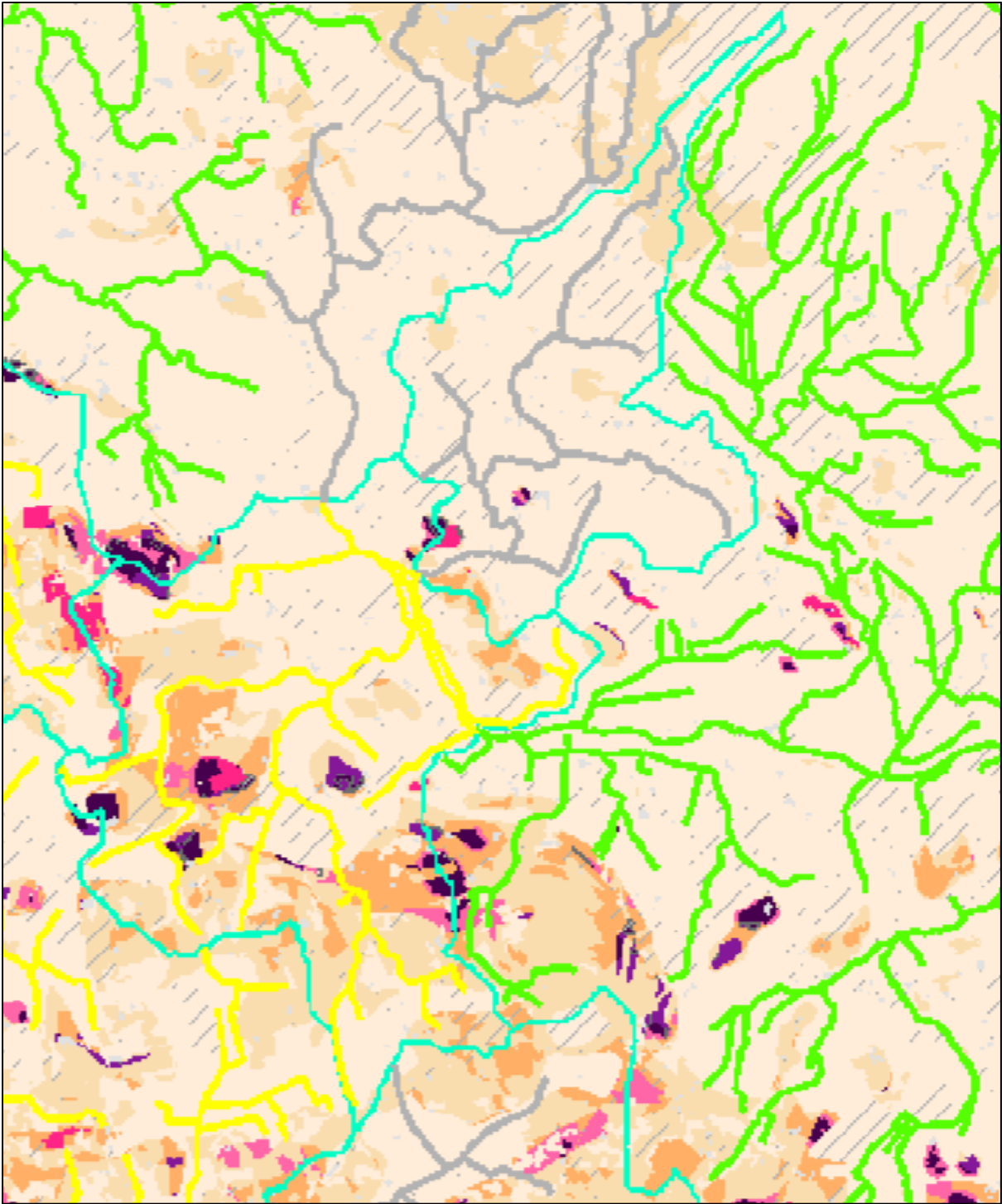
Source: EPA (2016)

Figure 9-1: Pollution impact potential: surface water receptor phosphate PIP Map



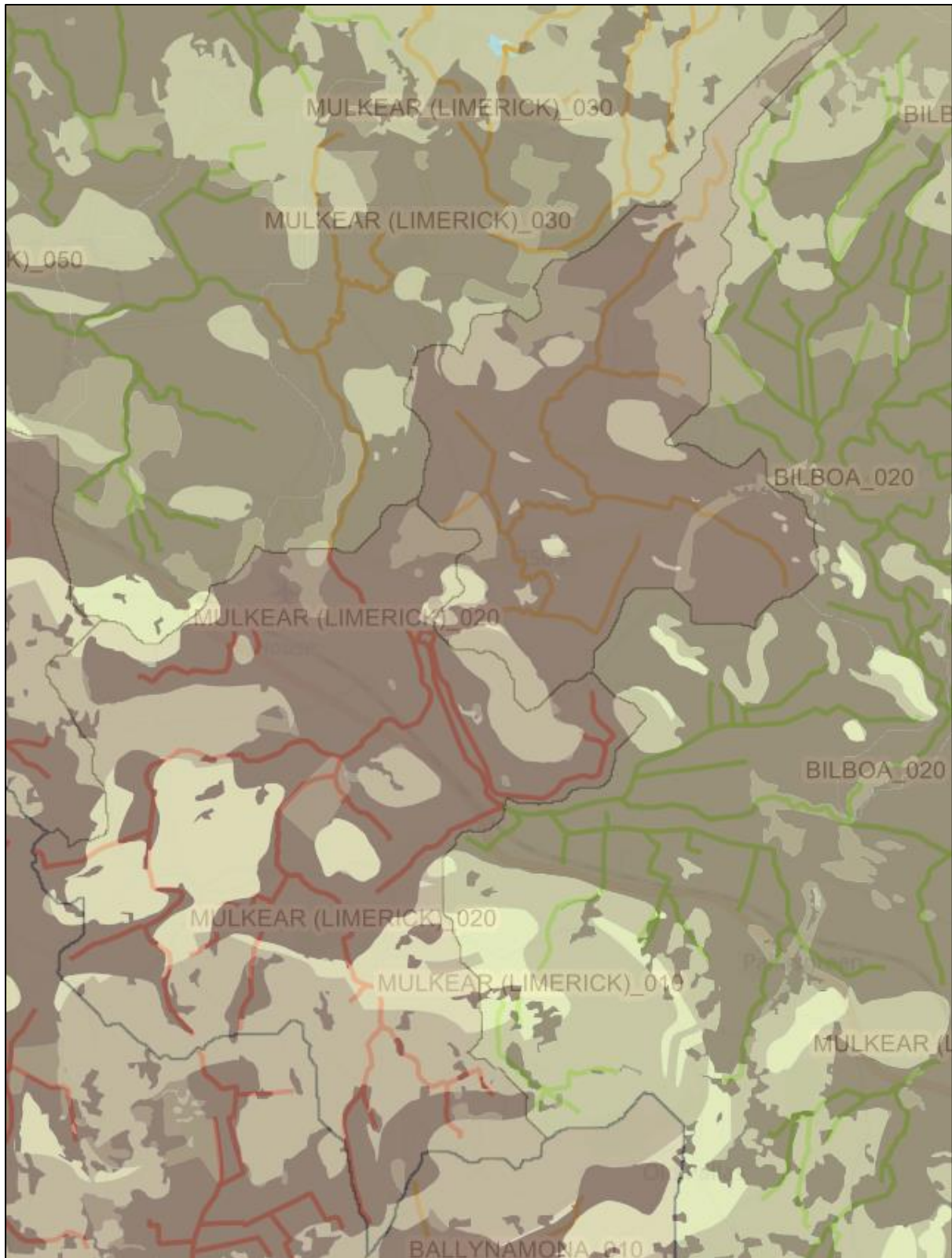
Source: EPA (2016)

Figure 9-2: Pollution impact potential: surface water receptor nitrate PIP Map



Source: EPA (2016)

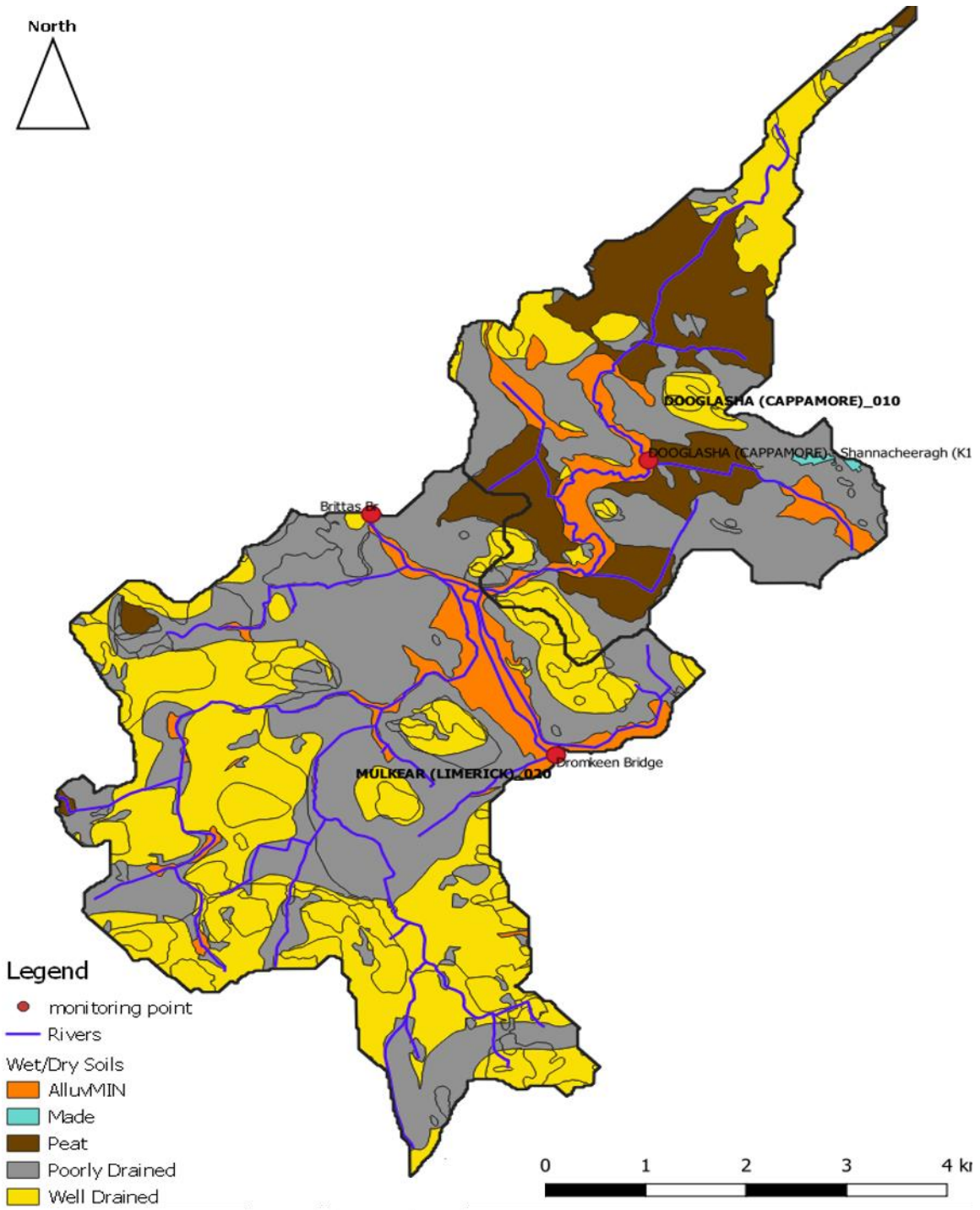
Figure 9-3: Pollution impact potential: ground water receptor nitrate PIP Map



Source: EPA (2016)

Figure 9-4: Near Surface Phosphate Susceptibility Map

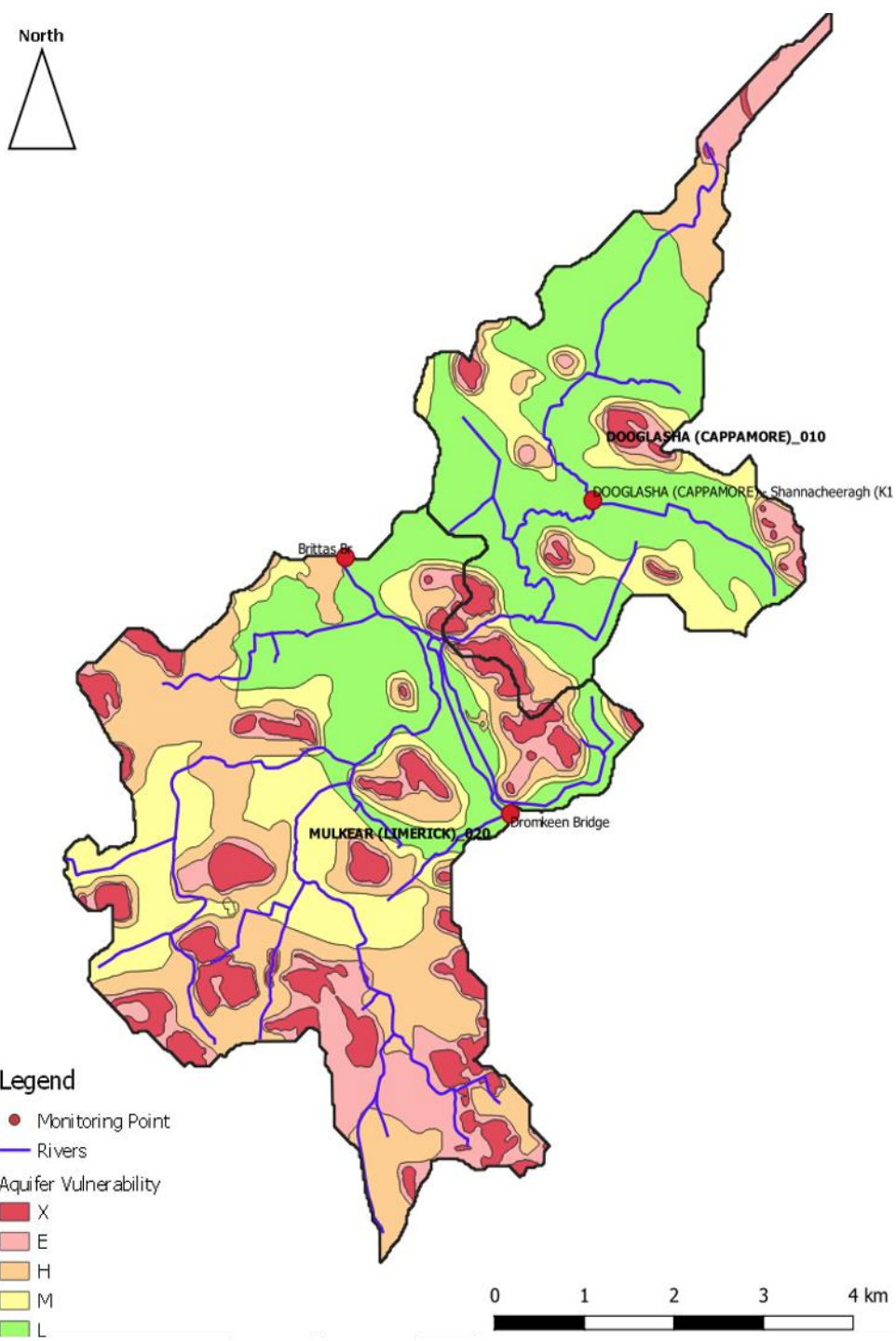
Mulkear Priority Area for Action Desk Study



Source: Teagasc-EPA

Figure 9-5: Soils Wet/Dry

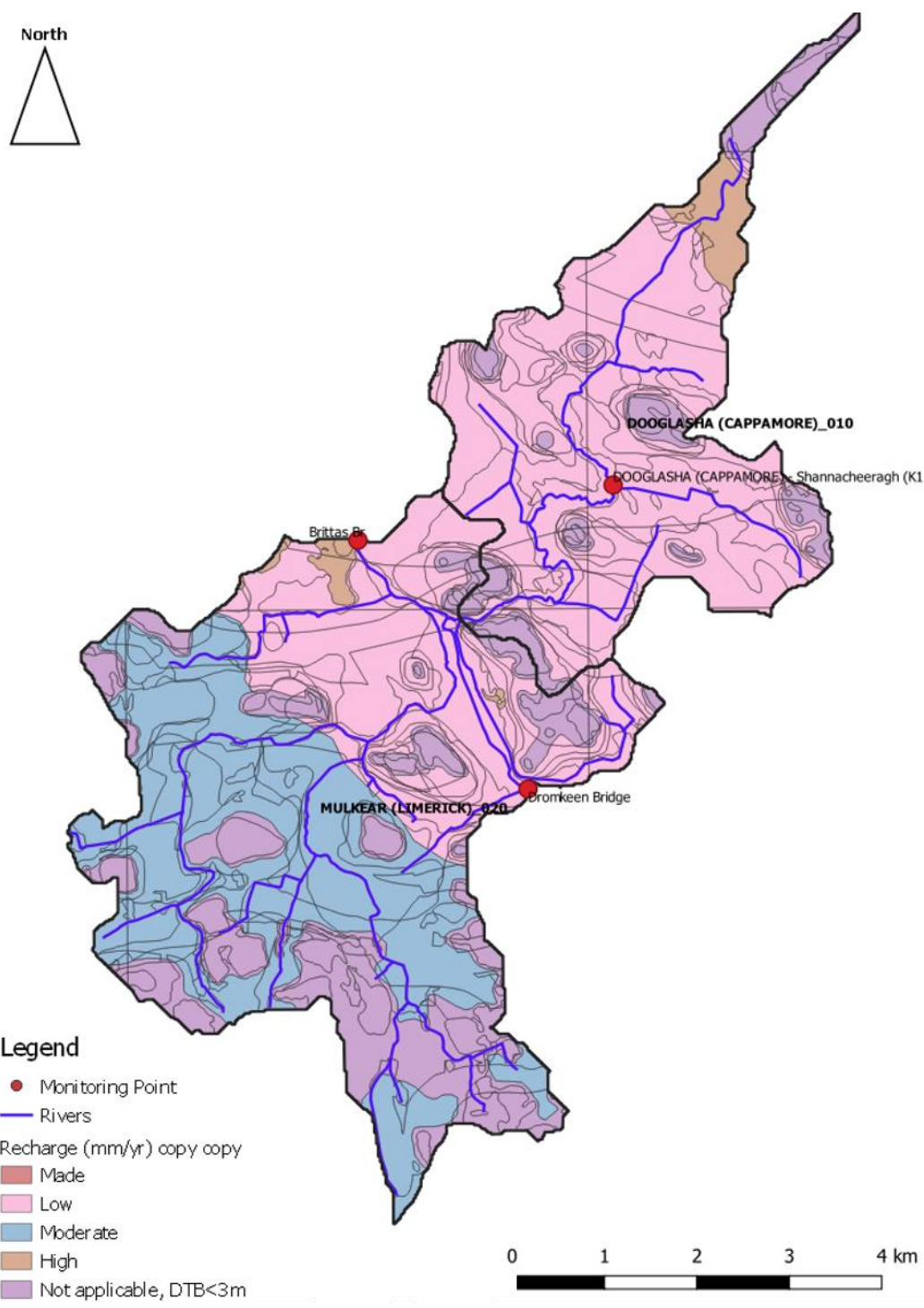
Mulkear Priority Area for Action Desk Study



Source: GSI (2015)

Figure 9-6: Aquifer Vulnerability

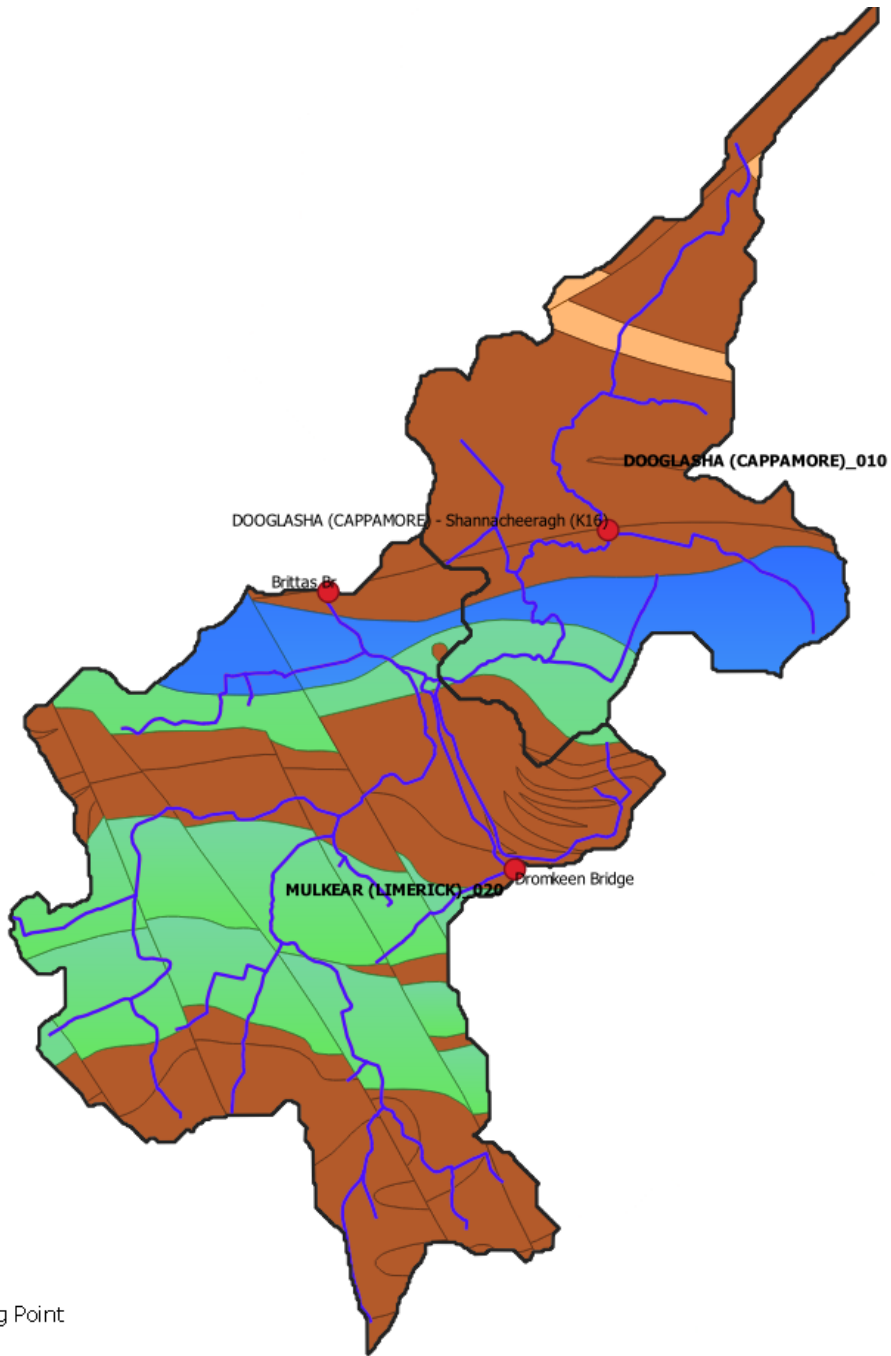
Mulkear Priority Area for Action Desk Study



Source: GSI (2015)

Figure 9-7: Subsoil Permeability

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Legend

● Monitoring Point

— Rivers

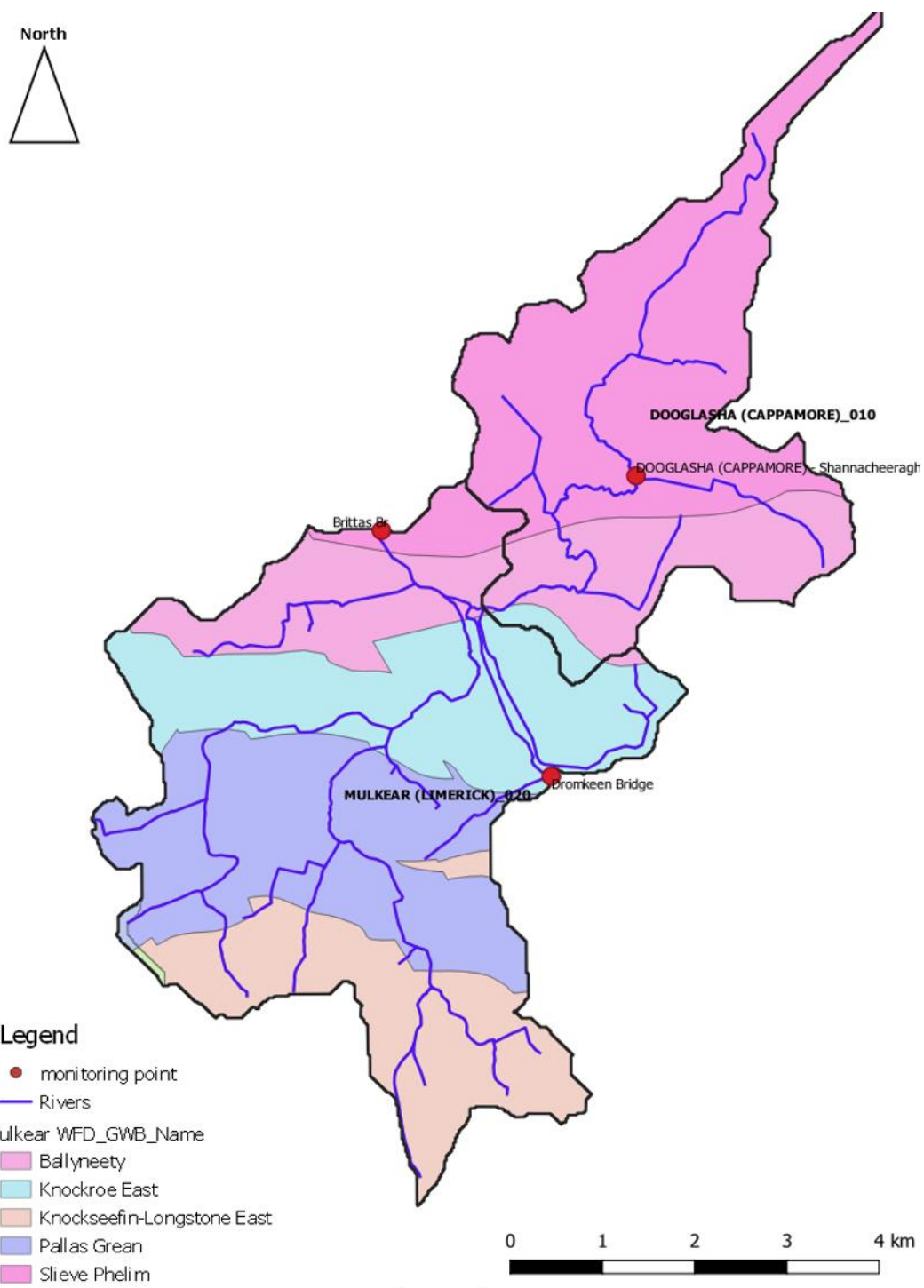
Aquifer Type

- Locally Important Aquifer - Bedrock which is Generally Moderately Productive
- Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
- Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones
- Regionally Important Aquifer - Karstified (diffuse)

Source: GSI (2015)

Figure 9-8: Aquifer Type

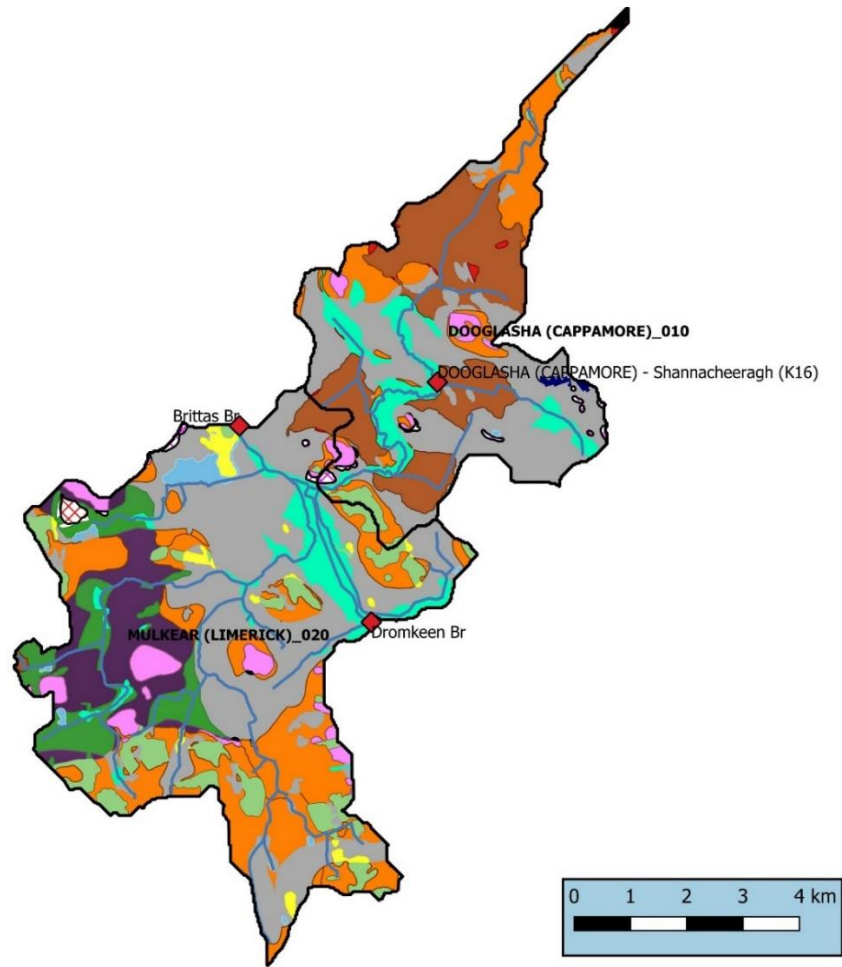
Mulkear Priority Area for Action Desk Study



Source: EPA (2016)

Figure 9-9: Ground Waterbodies

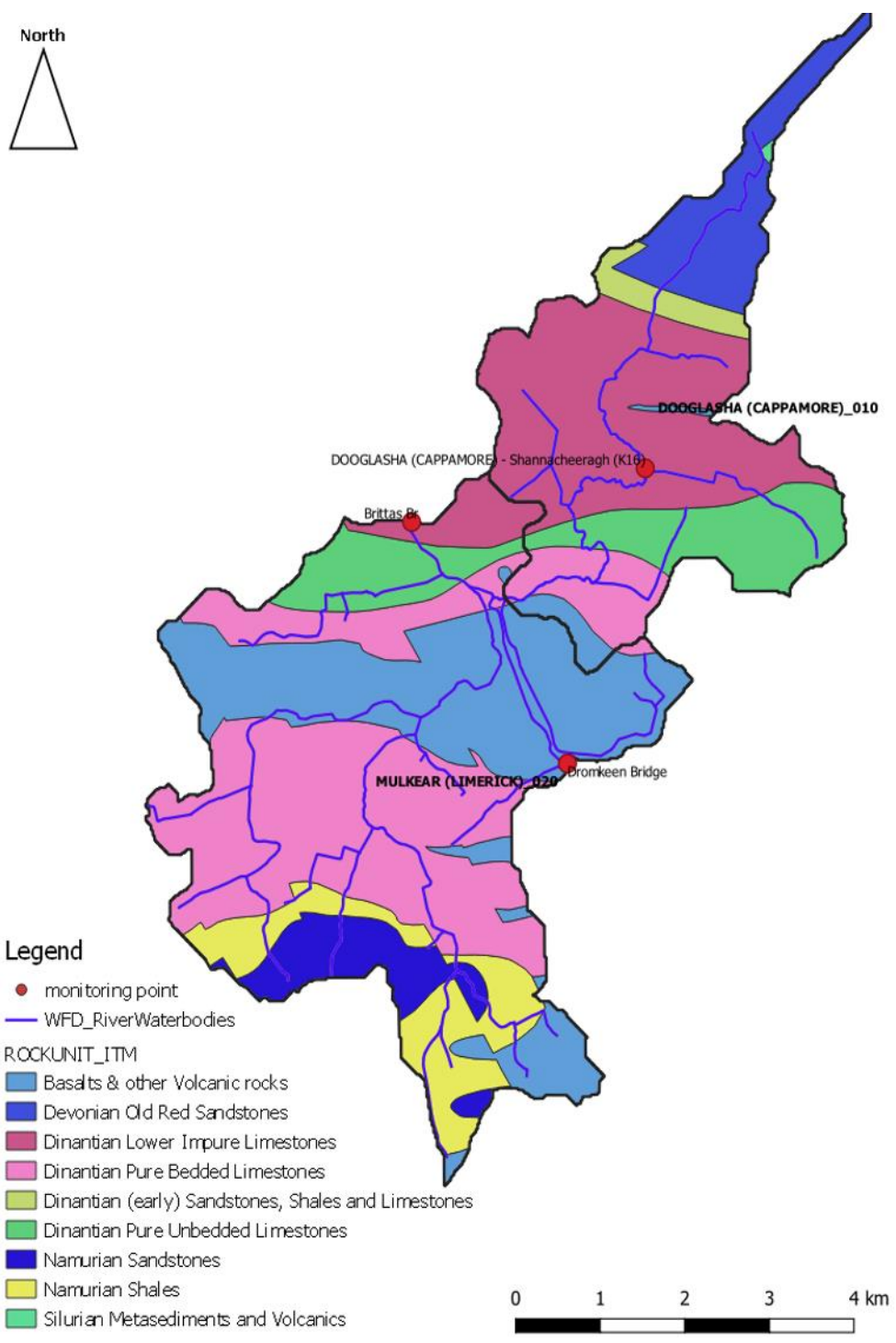
Mulkear Priority Area for Action Desk Study



Source: EPA

Figure 9-10: Soil Type

Mulkear Priority Area for Action Desk Study



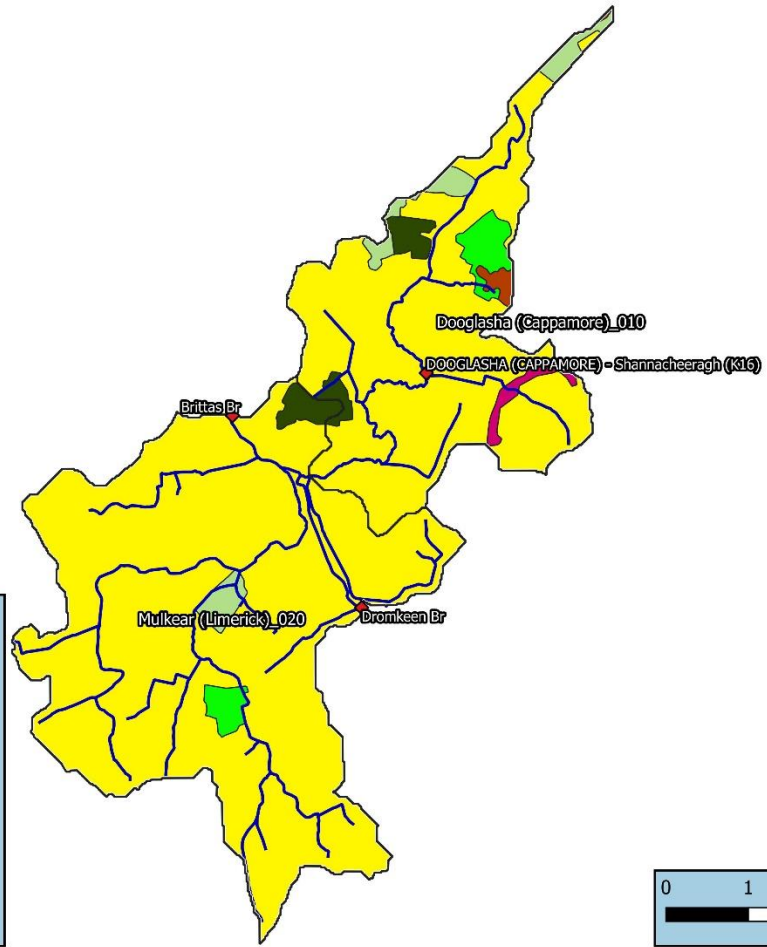
Source: GSI (2008)

Figure 9-11: Bedrock Aquifer



Legend

-  Mulkear PAA
-  Monitoring Stations
-  WFD_River Waterbodies
- Corine Land Use 2018**
-  Coniferous forest
-  Discontinuous urban fabric
-  Mixed forest
-  Pastures
-  Peat bogs
-  Transitional woodland-shrub



Source: EPA 2018

Figure 9-12: Land Use