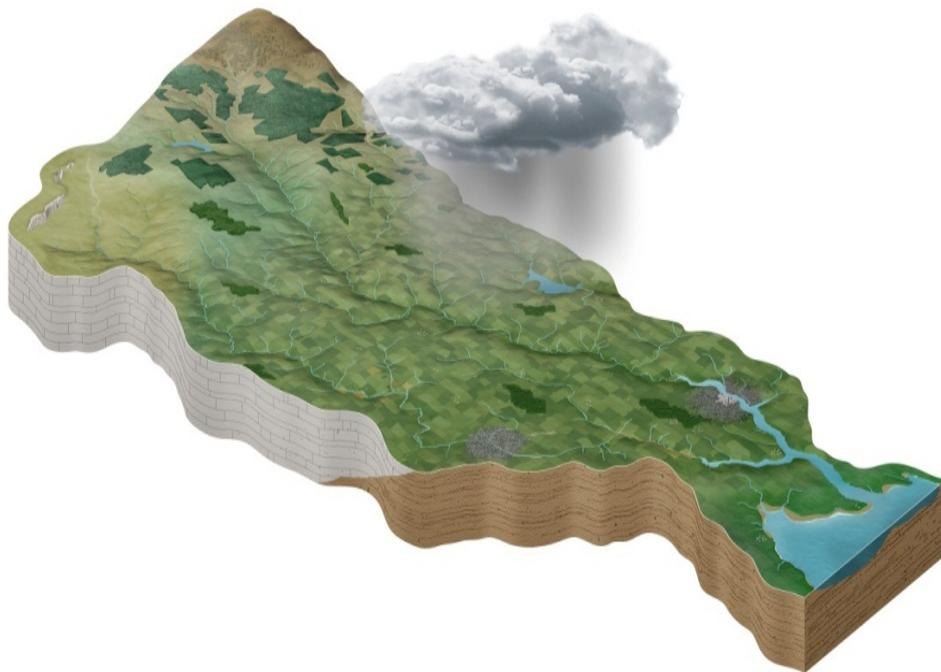


Avoca Vartry Catchment Assessment 2010-2015 (HA 10)



Catchment Science & Management Unit

Environmental Protection Agency

September 2018

Version no. 3

Preface

This document provides a summary of the characterisation outcomes for the water resources of the Avoca Vartry Catchment, which have been compiled and assessed by the EPA, with the assistance of local authorities and RPS consultants. The information presented includes status and risk categories of all water bodies, details on protected areas, significant issues, significant pressures, load reduction assessments, recommendations on future investigative assessments, areas for actions and environmental objectives. The characterisation assessments are based on information available to the end of 2015. Additional, more detailed characterisation information is available to public bodies on the EPA WFD Application via the EDEN portal, and more widely on the catchments.ie website. The purpose of this document is to provide an overview of the situation in the catchment and help inform further action and analysis of appropriate measures and management strategies.

This document is supported by, and can be read in conjunction with, a series of other documents which provide explanations of the elements it contains:

1. An explanatory document setting out the full characterisation process, including water body, subcatchment and catchment characterisation.
2. The Final River Basin Management Plan, which can be accessed on: www.catchments.ie.
3. A published paper on Source Load Apportionment Modelling, which can be accessed at: <http://www.jstor.org/stable/10.3318/bioe.2016.22>
4. A published paper on the role of pathways in transferring nutrients to streams and the relevance to water quality management strategies, which can be accessed at: <http://www.jstor.org/stable/pdf/10.3318/bioe.2016.19.pdf>
5. An article on Investigative Assessments which can be accessed at: <https://www.catchments.ie/download/catchments-newsletter-sharing-science-stories-june-2016/>

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1 Introduction

This catchment includes the area drained by the Rivers Avoca and Vartry and by all streams entering tidal water between Sorrento Point, Co. Dublin and Kilmichael Point, Co. Wexford, draining a total area of 1,247km². The largest urban centre in the catchment is Bray. The other main urban centres in this catchment are Dun Laoghaire-Rathdown, Arklow, Wicklow Town, Rathnew, Newtown Mount Kennedy, Greystones, Delgany and Kilcoole. The total population of the catchment is approximately 179,100 with a population density of 144 people per km². The higher areas of the Wicklow Mountains are underlain by granite bedrock while metamorphic slates and quartzites underlie the eastern coastal part of the catchment.

The Shanganagh River drains the eastern slopes of the Dublin Mountains, flowing east through South Dublin and into the sea at Killiney Bay. The River Dargle rises on the northern side of Djouce Mountain, flowing east, over Powerscourt Waterfall and meets the Glencree River from the west. It then continues east, before being joined by the Glencullen River and flowing into the sea at Bray Harbour.

The Vartry River rises on the eastern slopes of Djouce Mountain, flowing south and through the Upper and Lower Vartry Reservoirs. The river then enters the steep-sided Devil's Glen, through the eastern Wicklow Hills and into the northern end of Broad Lough, from where it flows into the sea via Wicklow Harbour. The hilly coastal area of Wicklow between Wicklow town and Arklow is drained by a series of south easterly flowing rivers including the Three Mile water, Potter's and Redcross Rivers.

The Avoca River system drains most of the Wicklow Mountain area. The Avonmore River rises to the south of the Sally Gap, flowing through Lough Tay and then Lough Dan, continuing south where it is met at Laragh by the Glenmacnass, Glendasan and Glenealo Rivers. The Turlough Hill pumped storage hydroelectric generating station is situated on the headwaters of the Glendassan River. The Avonmore continues south through Rathdrum to the Meeting of the Waters where the Avonbeg River joins. Now called the Avoca River, it continues past its namesake town to Woodenbridge where the Aughrim River flows in. This tributary is the combined outflow from the Ow River and the Darry Water. Downstream of Woodenbridge, the Avoca River flows through a flat-floored, steeply-sided valley before becoming tidal just upstream of Arklow Town, through which it flows before it makes its way to the sea via Arklow Harbour.

The Avoca Vartry catchment comprises 10 subcatchments with 71 river water bodies, 11 lakes, four transitional and three coastal water bodies, and 10 groundwater bodies (Table 1, Figure1).

Table 1. List of subcatchments in the Avoca Vartry catchment

Subcatchment ID	Subcatchment Name
10_1	Newcastle [Wicklow]_SC_010
10_2	DerryWater_SC_010
10_3	Avoca_SC_010
10_4	Vartry_SC_010
10_5	Dargle_SC_010
10_6	Avonmore_SC_010
10_7	Avonmore_SC_020
10_8	Redcross_SC_010
10_9	Avoca_SC_020
10_10	Avonbeg_SC_010

Overview

Avoca-Vartry Catchment (10)

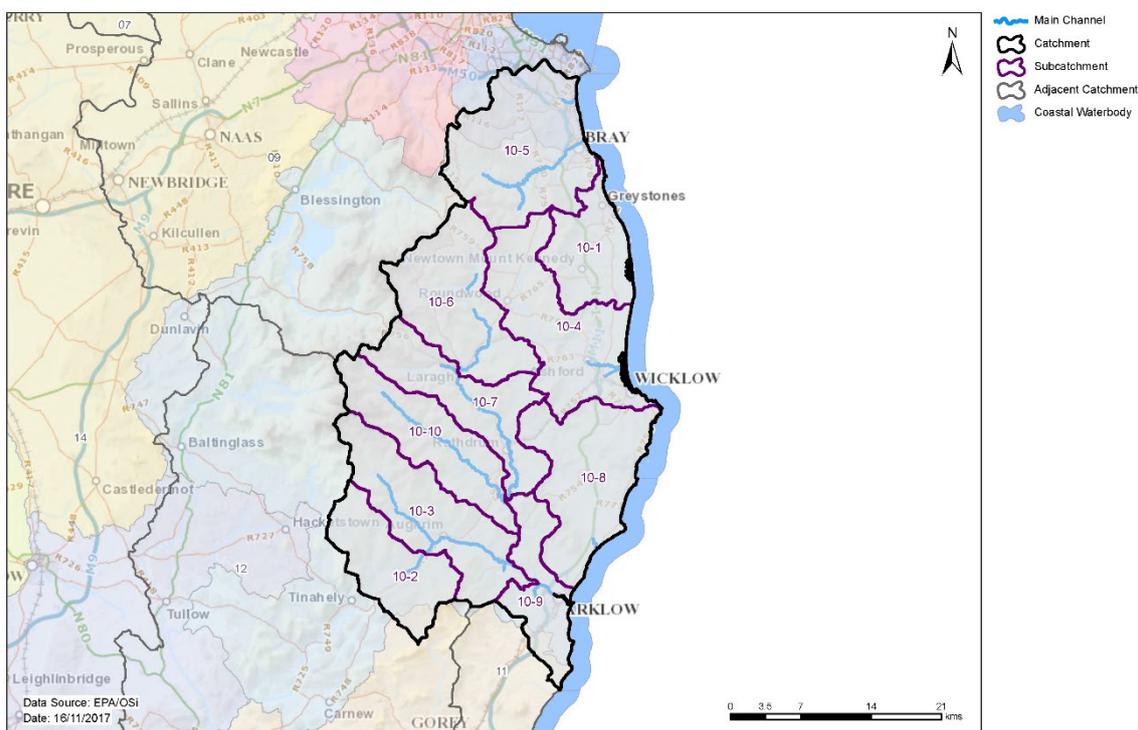


Figure 1. Subcatchments in the Avoca Vartry catchment

2 Water body status and risk of not meeting environmental objectives

2.1 Surface water ecological status

2.1.1 Rivers and lakes

- ◆ There were 41 (50%) river and lake water bodies at Good or High status, and 26 (32%) at less than Good status in 2015 (Table 2, Figure 2). Fifteen (18%) river and lakes water bodies are unassigned.
- ◆ Seven river water bodies and sites have a high ecological status objective. In 2015, three of these water bodies were at High status (Askanagap Stream_010, Ballycreen Brook_010 and Varty_010), three were at Good (Dargle_010, Glencullen_010 and Avonmore_020), and one (Avonmore_010) was at Moderate status (Figure 3, Appendix 1).
- ◆ The numbers of water bodies at each status class in 2007-09 and 2010-15 are shown in Figures 4 (rivers) and 5 (lakes).
- ◆ Fifteen water bodies have improved and 11 have deteriorated since 2007-09 (Figure 6a).
- ◆ The variations in nutrient concentrations and loads in the Avonmore and Avoca main channels are illustrated in Appendix 2.

2.1.2 Transitional and Coastal (TraC)

- ◆ Of the seven TraC water bodies, one was at High status (Southwestern Irish Sea - Killiney Bay (HA10)), one was at Good (Southwestern Irish Sea (HAs 11;12)) 29 % and two were at Moderate status (Broad Lough and Avoca Estuary) 29% in 2015 (Table 2, Figure 2). Three TraC water bodies 42% were unassigned.

- ◆ One TraC water body has a high ecological status objective, Southwestern Irish Sea - Killiney Bay (HA10), and this was at High status in 2015.
- ◆ The numbers of TraC water bodies in each status class in 2007-09 and 2010-15 is shown in Figure 6.
- ◆ Note the TraC water bodies Southwestern Irish Sea (HAs 11;12), Southwestern Irish Sea - Killiney Bay (HA10) and Southwestern Irish Sea - Brittas Bay (HA 10) are shared with other catchments.

Table 2. Summary of surface water body status and risk categories

	Number of water bodies	2010-15 Status						Risk Categories		
		High	Good	Mod	Poor	Bad	Unassigned	Not at Risk	Review	At Risk
Rivers	71	4	35	17	5	1	9	34	9	28
Lakes	11	0	2	3	0	0	6	4	6	1
TraC	7	1	1	2	0	0	3	3	2	2

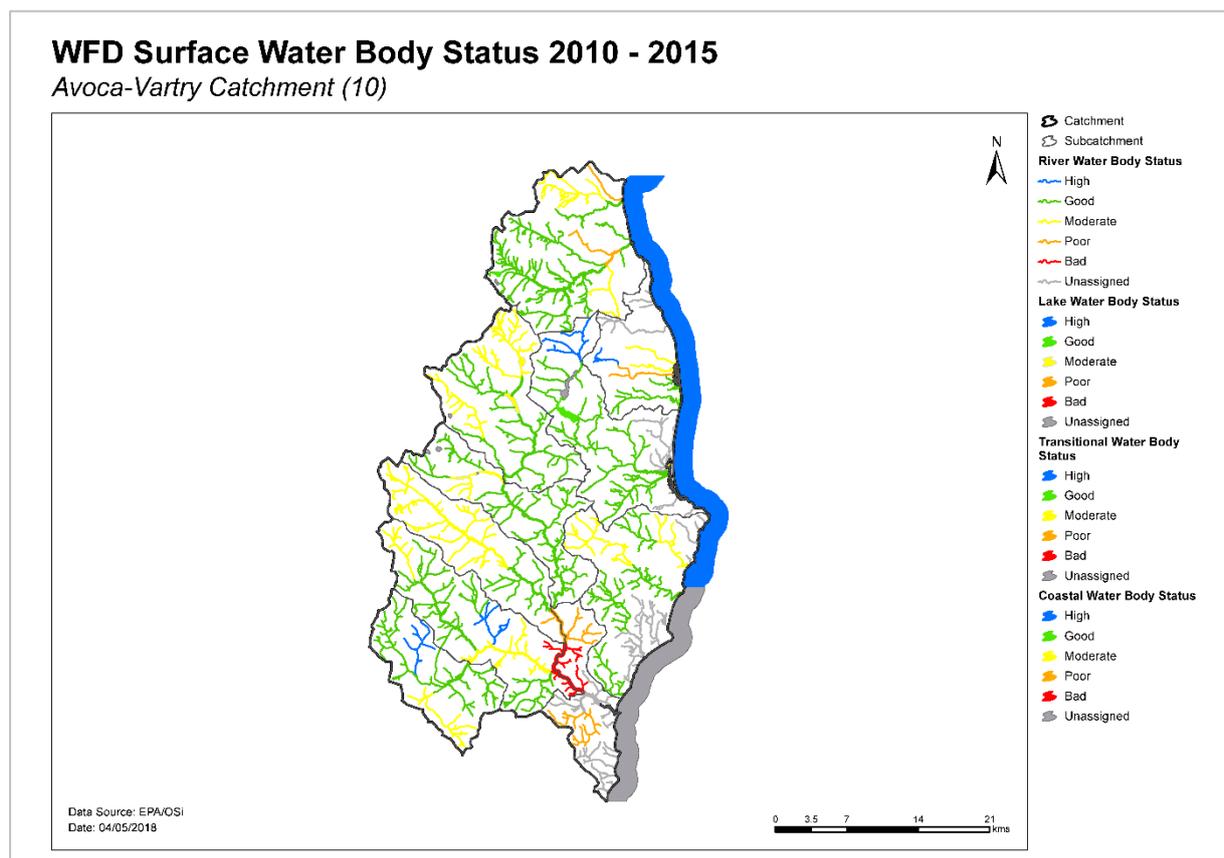


Figure 2. Surface water ecological status

High Status Objective Water Bodies and Sites

Avoca-Vartry Catchment (10)

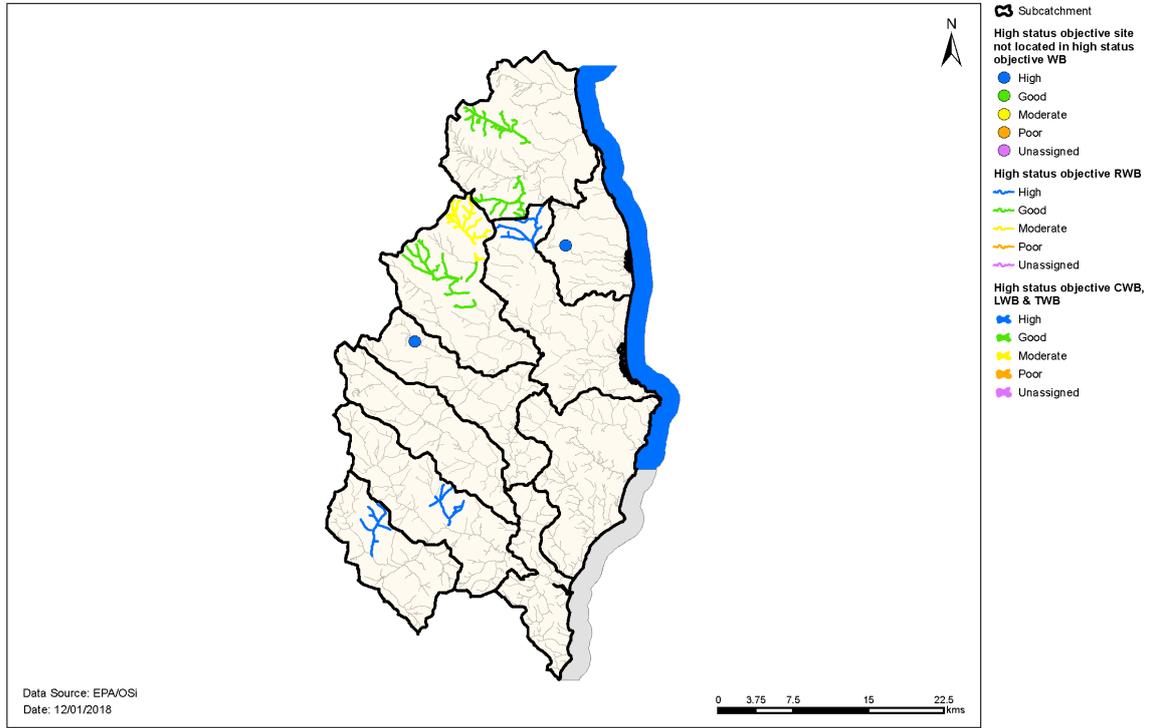


Figure 3. High ecological status objective water bodies and sites

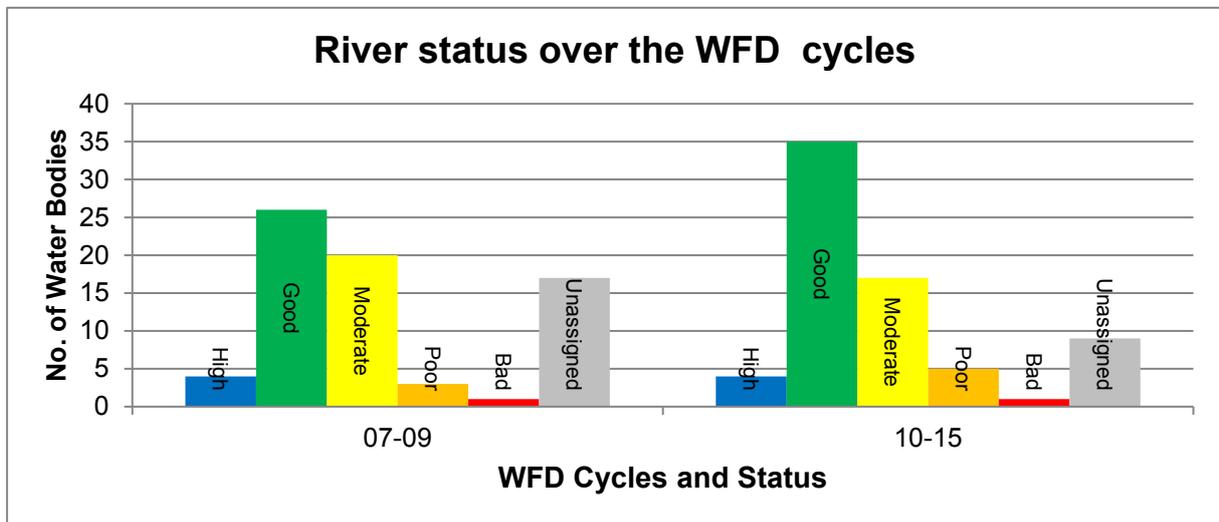


Figure 4. Number of rivers at each status class in 2007-09 and 2010-15

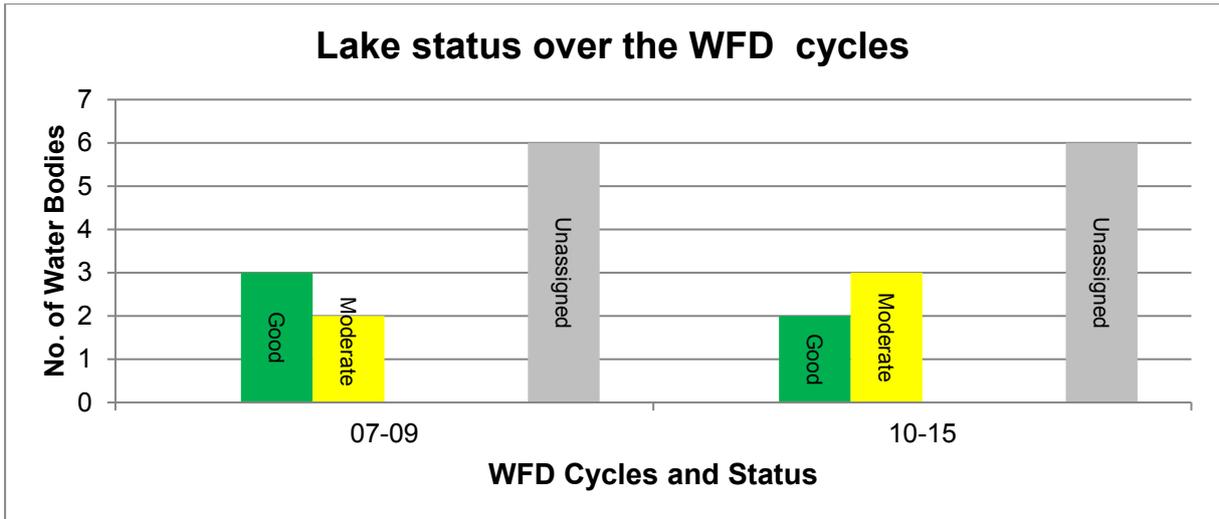


Figure 5. Number of lakes at each status class in 2007-09 and 2010-15

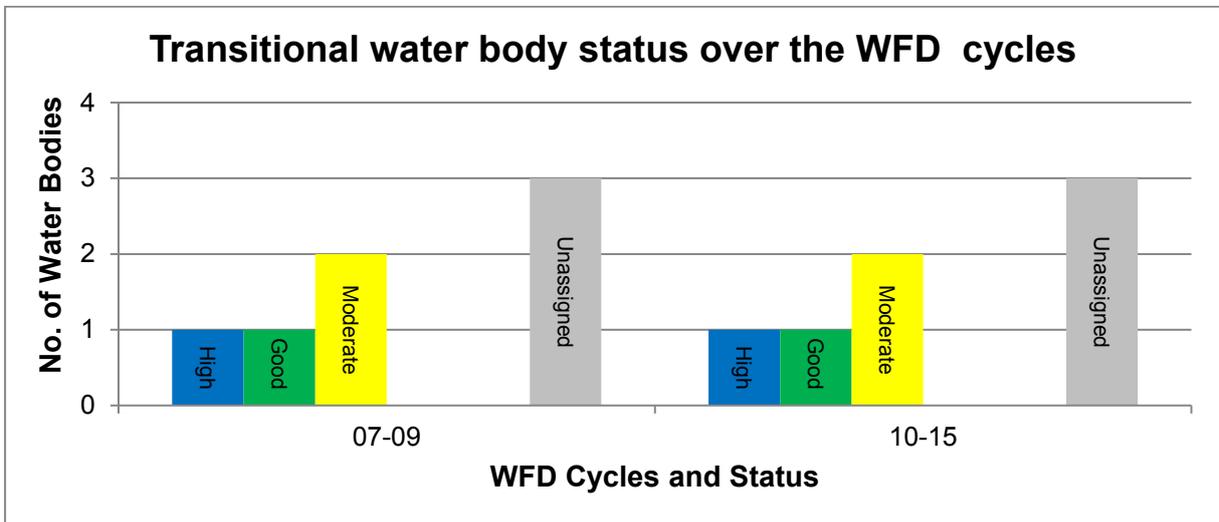


Figure 6. Number of transitional and coastal water bodies at each status class in 2007-09 and 2010-15

WFD Surface Water Body Status Change 2007 - 2009 to 2010 - 2015

Avoca-Vartry Catchment (10)

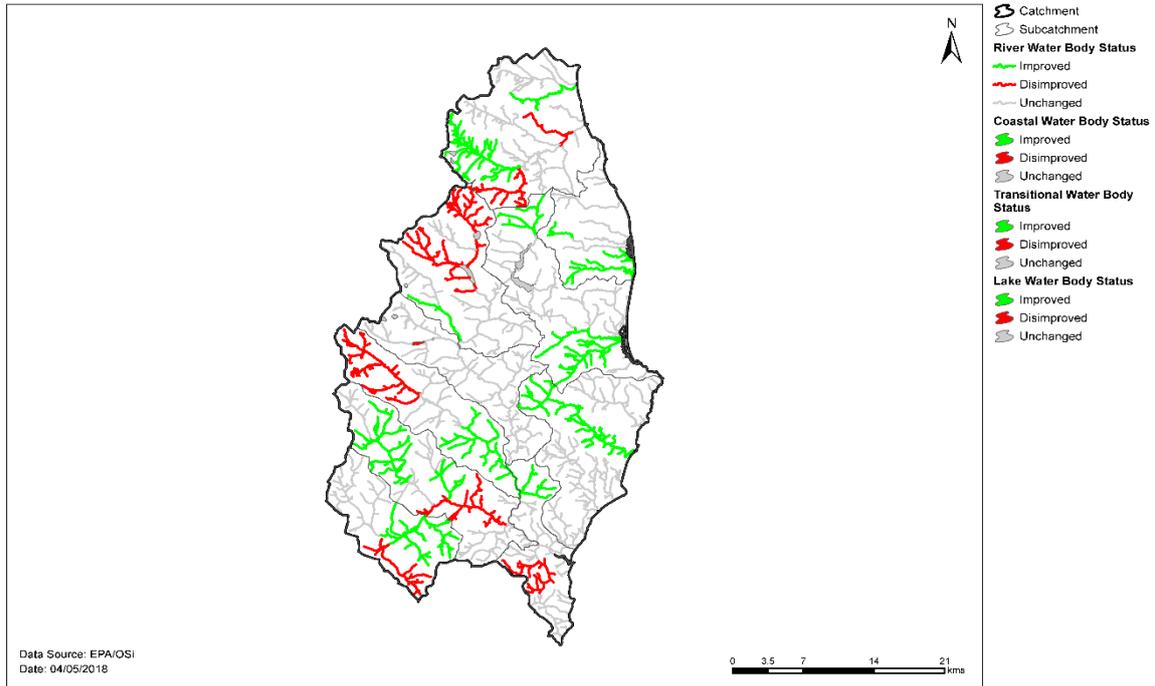


Figure 6a. Surface water body status changes from 2007-09 to 2010-15

2.2 Groundwater status

- ◆ Six groundwater bodies were at Good status in 2015, and four were at Poor status (Table 3, Figures 6b and 7).

Table 3. Summary of groundwater body status and risk categories

	Number of water bodies	2010-15 Status		Risk Categories		
		Good	Poor	Not at Risk	Review	At Risk
Groundwater	10	6	4	1	5	4

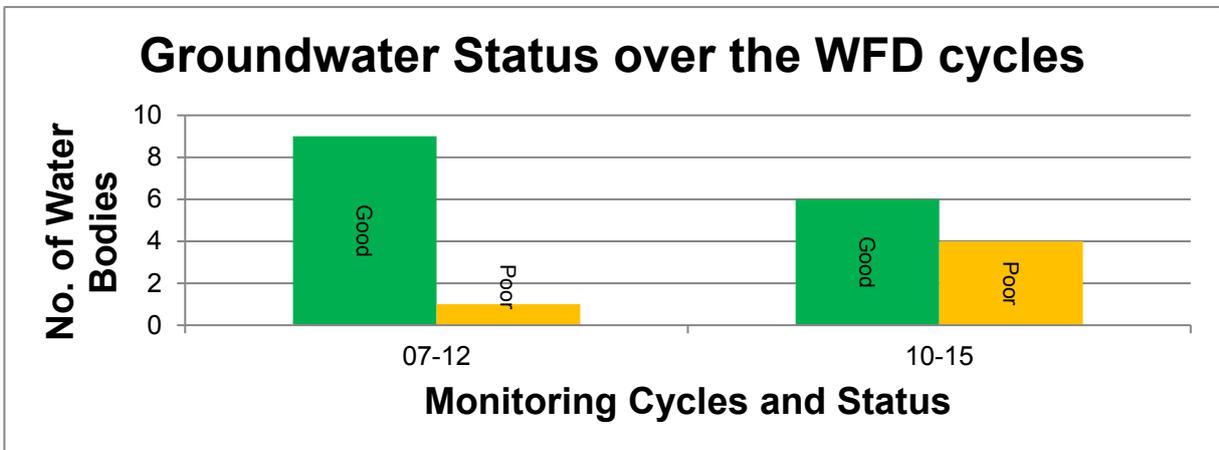


Figure 6b - Number of groundwater bodies at each status class in 2007-09 and 2010-15

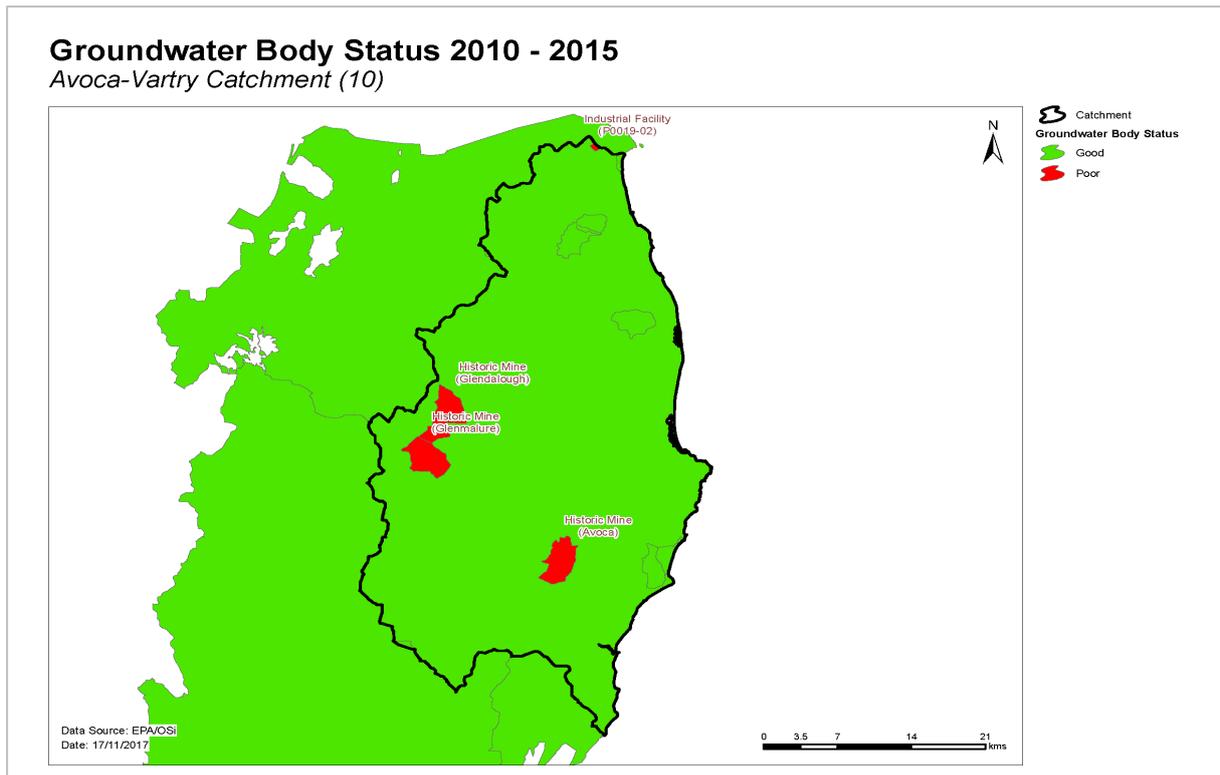


Figure 7. Groundwater body status

2.3 Risk of not meeting surface water environmental objectives

2.3.1 Rivers and lakes

- ◆ There are 34 river water bodies and four lake water bodies *Not at Risk* (Figure 8, Table 2) which require no additional investigative assessment or measures to be applied, other than those measures that are already in place.
- ◆ There are nine river water bodies and six lake water bodies in *Review*. This includes 10 water bodies where more information is required and 5 water bodies where measures have recently been implemented and improvements have not yet been realised.
- ◆ Twenty-eight river water bodies and one lake water body Upper Glendalough in the catchment are *At Risk* of not meeting their water quality objectives. Measures will be needed in these water bodies to improve the water quality outcomes. Summary information for the *At Risk* water bodies is given in Appendix 3.

2.3.2 Transitional and Coastal (TraC)

- ◆ Three coastal water bodies are *Not at Risk* – Southwestern Irish Sea - Killiney Bay (HA10), Southwestern Irish Sea (HAs 11;12) and Southwestern Irish Sea - Brittas Bay (HA 10) (Figure 8, Table 2) and require no additional investigative assessment or measures to be applied, other than those measures that are already in place.
- ◆ Two transitional water bodies, Dargle Estuary and Kilcoole Marsh are in *Review*.
- ◆ Two transitional water bodies, Broad Lough and Avoca Estuary are *At Risk* of not meeting their water quality objectives. Measures will be needed in these water bodies to improve the water quality outcomes.

Water Body Risk

Avoca-Vartry Catchment (10)

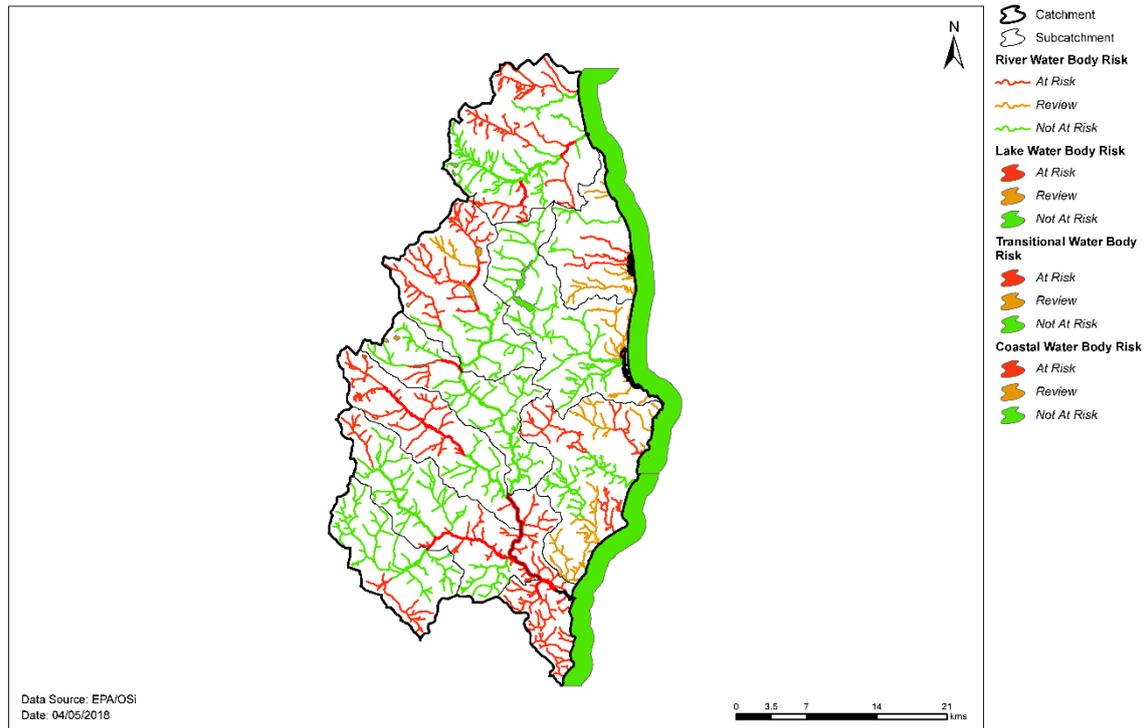


Figure 8. Surface water body risk

2.4 Risk of not meeting groundwater environmental objectives

- ◆ One groundwater body (Kilcullen) is *Not at Risk* (Figure 9, Table 3) and requires no additional investigative assessment or measures to be applied, other than those measures that are already in place.
- ◆ Five groundwater bodies (Kilcoole Gravels, Enniskerry Gravels, Wicklow, GWDTE-Buckronev-Brittis Fen (SAC000729) and GWDTE-Buckronev-Brittis Dunes (SAC000729)) are in *Review* (Figure 9). Enniskerry Gravels, Kilcoole Gravels and Wicklow are all in *Review* due to elevated nitrate concentrations. The issues in GWDTE-Buckronev-Brittis Fen (SAC000729) are related to water quantity/levels and excess nutrients, while in GWDTE-Buckronev-Brittis Dunes (SAC000729) it is also water quantity/levels.
- ◆ Four groundwater bodies are *At Risk*, Historic Mine (Glendalough), Historic Mine (Glenmalure), Historic Mine (Avoca) and Industrial Facility (P0019-02). Measures will be needed in these water bodies to improve the water quality outcomes. For the mine sites the issues are the elevated concentrations of heavy metals due to acid mine drainage from lead-zinc mines. The impact from the industrial site is due to trichloroethylene (TCE).

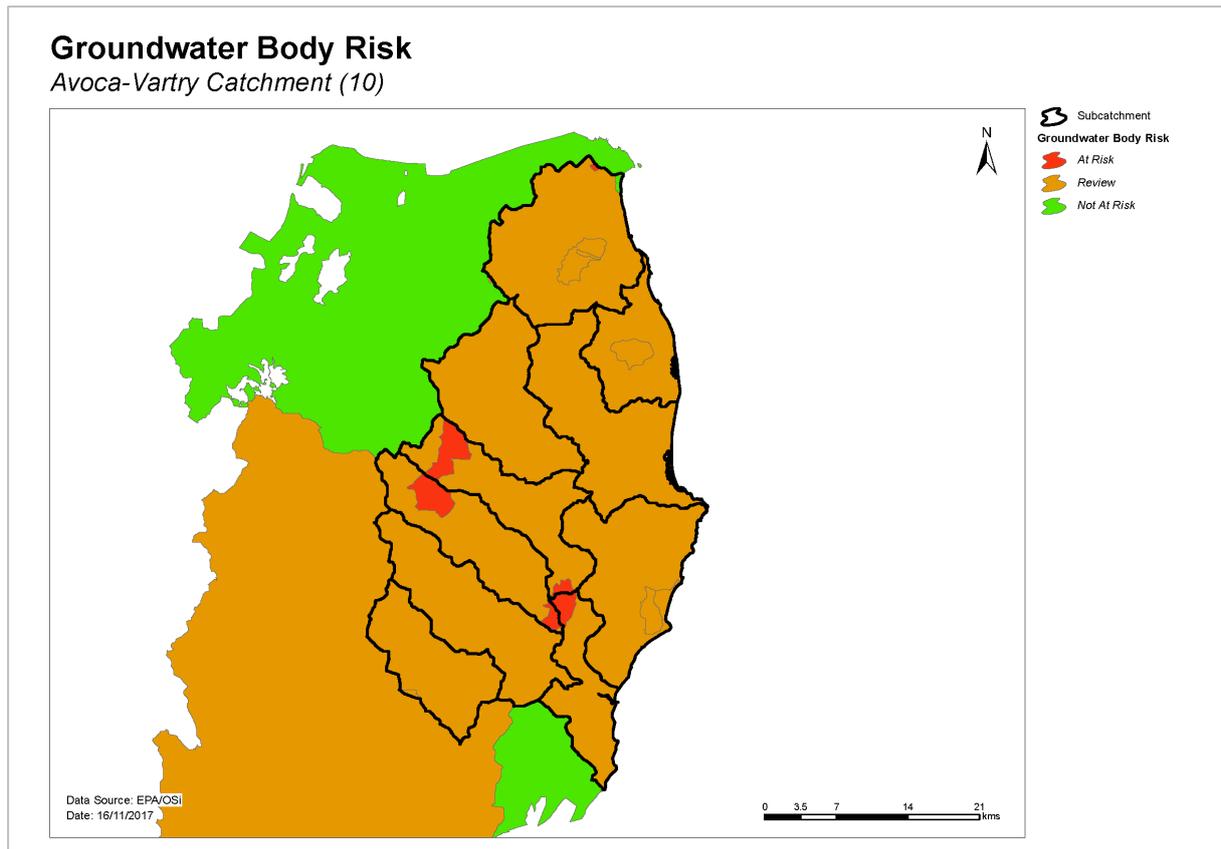


Figure 9. Groundwater body risk

2.5 Protected areas

2.5.1 Drinking water abstractions

- ◆ There are 42 abstractions in the Avoca Vartry Catchment comprising one regional supply (Wicklow Regional Supply), 25 public supplies and six private water supplies (Appendix 4).
- ◆ Twenty-nine of the abstractions are from two groundwater bodies Dunes (SAC000729) and the remaining 13 are from 11 river water bodies. The list of the public supplies and the associated water bodies is provided in Appendix 4.
- ◆ All sources were compliant with the standard for nitrate in 2015.
- ◆ All sources were compliant with the standard for pesticides in 2015. (Note that the Wicklow Regional Supply was non-compliant (MCPA, picloram) in 2014).

2.5.2 Bathing waters

- ◆ There are seven designated marine bathing waters in the catchment. All seven are in satisfactory condition.
- ◆ The list of the bathing waters and the associated water bodies is provided in Table 4.

Table 4. Designated bathing waters in the catchment

Bathing water		Water body intersection		Objective met?	
Name	Code	Name	Code	Yes	No
Killiney	IEEABWC100_0000_0400	Southwestern Irish Sea – Killiney Bay (HA 10)	IE_EA_100_0000	✓	
Bray South Promenade	IEEABWC100_0000_0300	Southwestern Irish Sea – Killiney Bay (HA 10)	IE_EA_100_0000	✓	
Greystones South	IEEABWC100_0000_0200	Southwestern Irish Sea – Killiney Bay (HA 10)	IE_EA_100_0000	✓	
Silver Strand	IEEABWC100_0000_0100	Southwestern Irish Sea – Killiney Bay (HA 10)	IE_EA_100_0000	✓	
Brittas Bay North	IEEABWC140_0000_0300	Southwestern Irish Sea – Brittas Bay (HA 10)	IE_EA_140_0000	✓	
Brittas Bay South	IEEABWC140_0000_0200	Southwestern Irish Sea – Brittas Bay (HA 10)	IE_EA_140_0000	✓	
Clogga	IEEABWC140_0000_0100	Southwestern Irish Sea – Brittas Bay (HA 10)	IE_EA_140_0000	✓	

2.5.3 Shellfish areas

- ◆ There are no designated shellfish areas in the catchment.

2.5.4 Nutrient Sensitive Areas

- ◆ There are no designated Nutrient Sensitive Areas (NSAs) in the catchment.

2.5.5 Natura 2000 Sites

- ◆ There are 12 Special Areas of Conservation (SACs) in the catchment (Appendix 5), not all of which have water quality and/or quantity conservation objectives for their qualifying interests.
- ◆ Three lake water bodies (Upper Glendalough, Tay and Dan) have been prioritised for action as the water conservation objectives for their habitats and/or species are not being supported by ecological status (Appendix 5).
- ◆ There are three Special Protected Areas (SPAs) in the catchment:
 - The Murrough SPA
 - Wicklow Head SPA
 - Wicklow Mountains SPA

As there are no specific water quality and quantity supporting conditions identified in the site-specific conservation objectives for these SPAs, the intersecting water bodies are not assigned for priority action for WFD protected area purposes in the second cycle.

- ◆ There are six river water bodies that are designated as salmonid rivers (under Salmonid Regulations (S.I. 293 / 1988)) that are not located within SACs. One of these water bodies (Dargle_030) has been prioritised for action as the water conservation objectives for this species are not being supported by ecological status (Appendix 5).

2.6 Heavily modified water bodies

- ◆ There are four designated heavily modified water bodies (HMWB) in the catchment: Vartry_020, Vartry Lower and Vartry Upper due to the presence of a drinking water abstraction; and Nahanagan due to power generation. Vartry_020 and Vartry Lower were classified as having Good Ecological Potential in 2013-15, while Vartry Upper and Nahanagan were unassigned.
- ◆ There are no artificially modified water bodies (AWBs) in the catchment.

3 Significant issues in *At Risk* water bodies

- ◆ Excess phosphorus leading to eutrophication is the dominant issue in the *At Risk* water bodies.
- ◆ Alteration of hydromorphological (or physical) conditions are a significant issue, including the input of excessive fine sediment. Such impacts have altered the morphology of water bodies and, in turn, have altered the habitat conditions.
- ◆ Broad Lough is being impacted by excess nutrients from agriculture, and suspected impacts from waste water (Wicklow). Avoca Estuary is impacted by elevated heavy metals from the historic Avoca Mines site and waste water from the Arklow agglomeration.
- ◆ There are four *At Risk* groundwater bodies; three are *At Risk* due to elevated heavy metal concentrations (historic mines) and one is due to trichloroethylene (TCE) from an industrial site.

4 Significant pressures

4.1 Water bodies

- ◆ Where water bodies have been classed as *At Risk*, significant pressures have been identified.
- ◆ Figure 10 shows a breakdown of the number of *At Risk* water bodies in each significant pressure category.

4.1.1 Rivers lakes, transitional and coastal (TraC)

- ◆ Significant pressures have been identified, through the initial characterisation process, in 31 surface water bodies, 15 of which have multiple pressures. The significant pressures will be refined as further characterisation is carried out.
- ◆ The significant pressures affecting the greatest number of water bodies are a miscellaneous group termed 'Other' in Figure 10 which includes historic mines, golf courses, aquaculture, atmospheric, tourism and illegal dumping. These pressures are typically relatively uncommon nationally which is why they are grouped. The next most common pressure is urban waste water, followed by forestry, agriculture, diffuse urban, hydromorphological pressures, domestic waste water, mines and quarries, and industry.
- ◆ There is only one lake that is *At Risk* (Upper Glendalough), with forestry and tourism currently noted as significant pressures.
- ◆ Agriculture has been identified as the significant pressure impacting Broad Lough, with likely urban waste water impacts from Wicklow town. For Avoca Estuary, heavy metals from the Avoca Mines and waste water from Arklow are the significant pressures.

4.1.2 Groundwater

There are four *At Risk* groundwater bodies – Historic Mine (Glendalough), Historic Mine (Glenmalure), Historic Mine (Avoca) and Industrial Facility (P0019-02). For the mine sites, the pressure is acid mine drainage as a result of historic mining activities. The pressure from the industrial site is due to trichloroethylene (TCE).

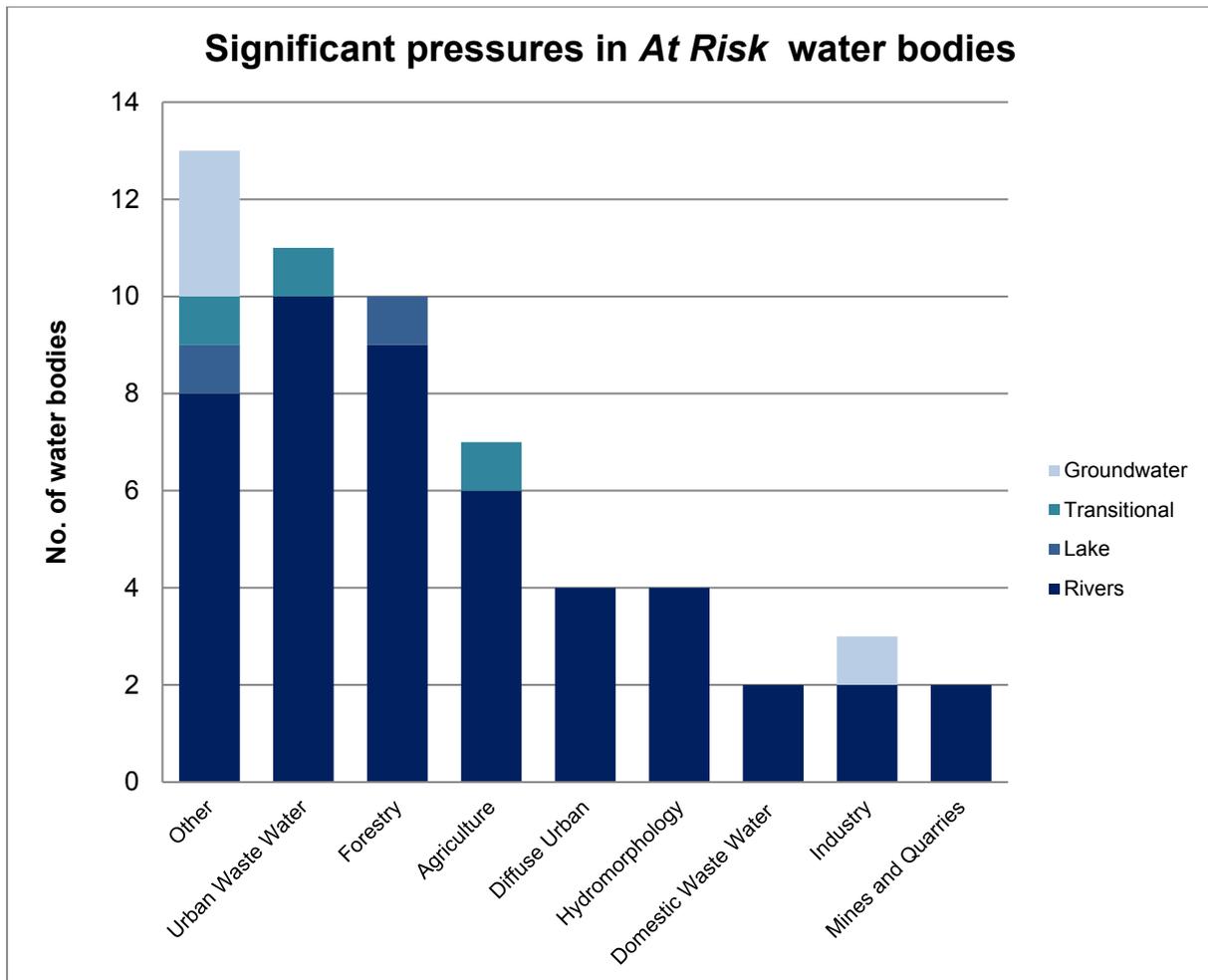


Figure 10. Significant pressures impacting on *At Risk* bodies

4.2 Pressure type

4.2.1 Urban waste water treatment plants

- ◆ Urban Waste Water Treatment Plants (WWTPs) and agglomeration networks have been highlighted as a significant pressure in 11 *At Risk* water bodies; details are given in Table 5 and Figure 15. Five of these *At Risk* water bodies are impacted by WWTPs and agglomeration networks that are scheduled to be upgraded, including two water bodies, Kilcoole Stream_010 and Aughrim (Wicklow)_020, which are impacted by WWTPs that were due to be upgraded in 2017.

4.2.2 Forestry

- ◆ Forestry has been identified as a significant pressure in nine river water bodies and one lake (Upper Glendalough) (Figure 16, Appendix 3). The significant issue affecting the greatest number of water bodies is acidification (includes Upper Glendalough). Increased siltation, often linked to clearfelling and associated activities such as road construction, is also significant.

At Risk Water Bodies where Urban Waste Water is a significant pressure
 Avoca-Vartry Catchment (10)

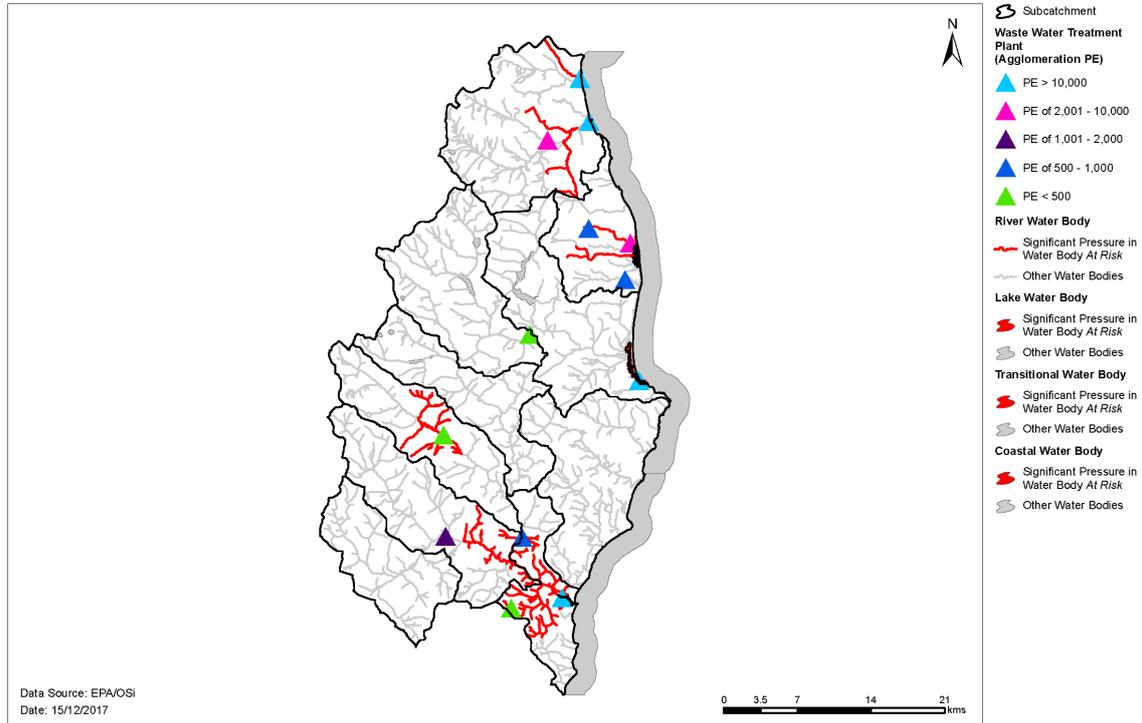


Figure 15. Water bodies that are *At Risk* and are impacted by urban waste water

At Risk Water Bodies where Forestry is a significant pressure
 Avoca-Vartry Catchment (10)

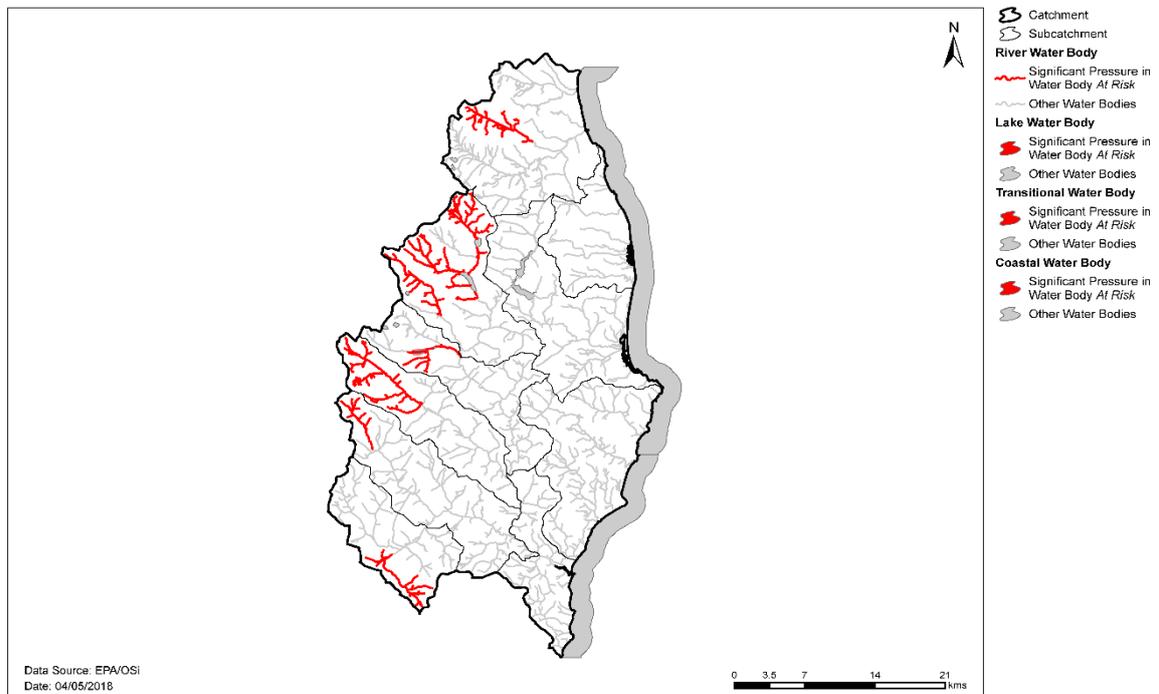


Figure 16. Water bodies that are *At Risk* and are impacted by forestry

Table 5. Waste Water Treatment Plants and agglomerations identified as Significant Pressures in *At Risk* water bodies and expected completion dates for associated upgrade works, where applicable.

Facility name	Facility Type	Water Body	2010-15 Ecological Status	Expected Completion Date
Kilcoole D0087	2,001 to 10,000 p.e.	Kilcoole Stream_010	Moderate	2017
Kilcoole D0087	2,001 to 10,000 p.e.	<i>Newtownmountkennedy_020</i> ¹	Poor	NA ²
Kilpedder D0416	500 to 1,000 p.e.	Kilcoole Stream_010	Moderate	Complete
Kirikee Lower A0039	< 500 p.e.	Avonbeg_030	Moderate	NA ²
Kirikee Upper A0045	< 500 p.e.	Avonbeg_030	Moderate	NA ²
Aughrim D0222	1,001 to 2,000 p.e.	Aughrim (Wicklow)_020	Moderate	2017
Shanganagh-Bray D0038	> 10,000 p.e.	<i>Kill of the Grange Stream_010</i> ¹	Poor	2018
Bray D0005	> 10,000 p.e.	Kilmacanoge_010	Moderate	NA ²
Thomastown A0030	< 500 p.e.	Ballyduff Stream (Wicklow)_010	Poor	NA ²
Avoca D0411	500 to 1,000 p.e.	Avoca_030	<i>Unassigned</i> ³	2025
Avoca D0411	500 to 1,000 p.e.	Avoca_020	Bad	2025
Arklow D0006	> 10,000 p.e.	<i>Ballyduff Stream (Wicklow)_010</i> ⁴	Poor	2022
Enniskerry D0088	2,001 to 10,000 p.e.	Dargle_030	Poor	2018
Wicklow D0012	> 10,000 p.e.	<i>Broad Lough</i> ¹	Moderate	NA ²

¹ The agglomeration network, rather than the WWTP, has been identified as a significant pressure impacting *Newtownmountkennedy_020*, *Broad Lough* and *Kill of the Grange Stream_010*.

² Currently not specified in improvement plans. The Kilpedder WWTP was upgraded in 2017, however, the agglomeration network, which been identified as a significant pressure impacting *Newtownmountkennedy_020*, is currently not specified in improvements.

³ Ecological Status is not available for *Avoca_030*, however, following discussions with Wicklow County Council, this water body was deemed to be *At Risk* of not meeting its environmental objectives.

⁴ *Ballyduff Stream (Wicklow)_010* is impacted by both the Arklow WWTP and the agglomeration network.

4.2.3 Agriculture

- ◆ Agriculture is a significant pressure in six river water bodies and one transitional water body, Broad Lough (Figure 17, Appendix 3). The issues related to farming in this catchment are varied, including diffuse loss of phosphorus and ammonia to surface waters from, for example, direct discharges; or runoff from yards, roadways or other compacted surfaces, or runoff from poorly draining soils. Sediment can also be a problem from land drainage works, bank erosion from animal access or stream crossings. The pollution impact potential map showing areas of relative risk for phosphorus loss from agriculture to surface water is given in Appendix 6.

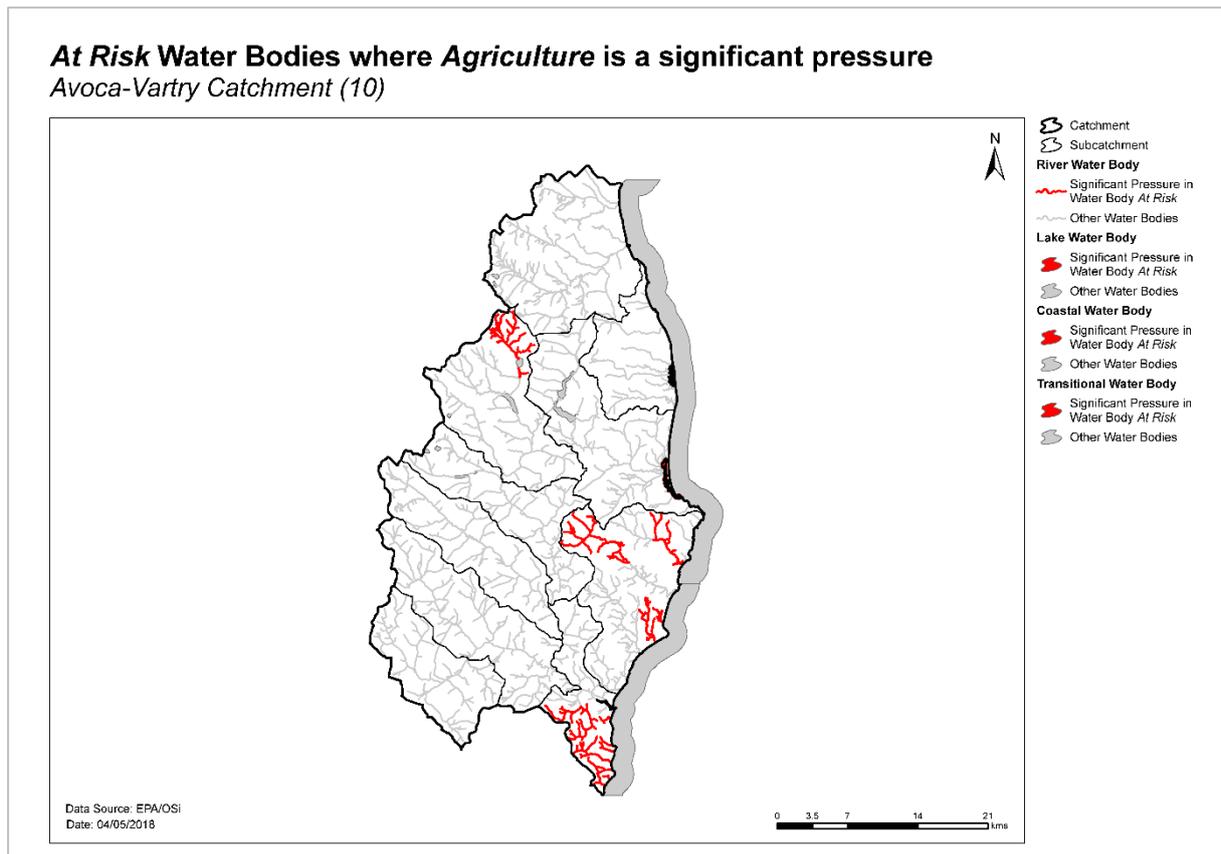


Figure 17. Water bodies that are At Risk and are impacted by agricultural activities

4.2.4 Other

- ◆ *Historic mines* have been identified as a significant pressure in four river water bodies – Glenealo_020, Avoca_010, Avoca_020 and Avoca_030. One transitional water body Avoca Estuary is also impacted by historic mines (Figure 11, Appendix 3), and three groundwater bodies (Historic Mine (Glendalough), Historic Mine (Glenmalure) and Historic Mine (Avoca)). The significant pressure arises because of the historic mines at Avoca which are discharging acid mine drainage. This gives rise to increased concentrations of heavy metals (above the Environmental Quality Standard).

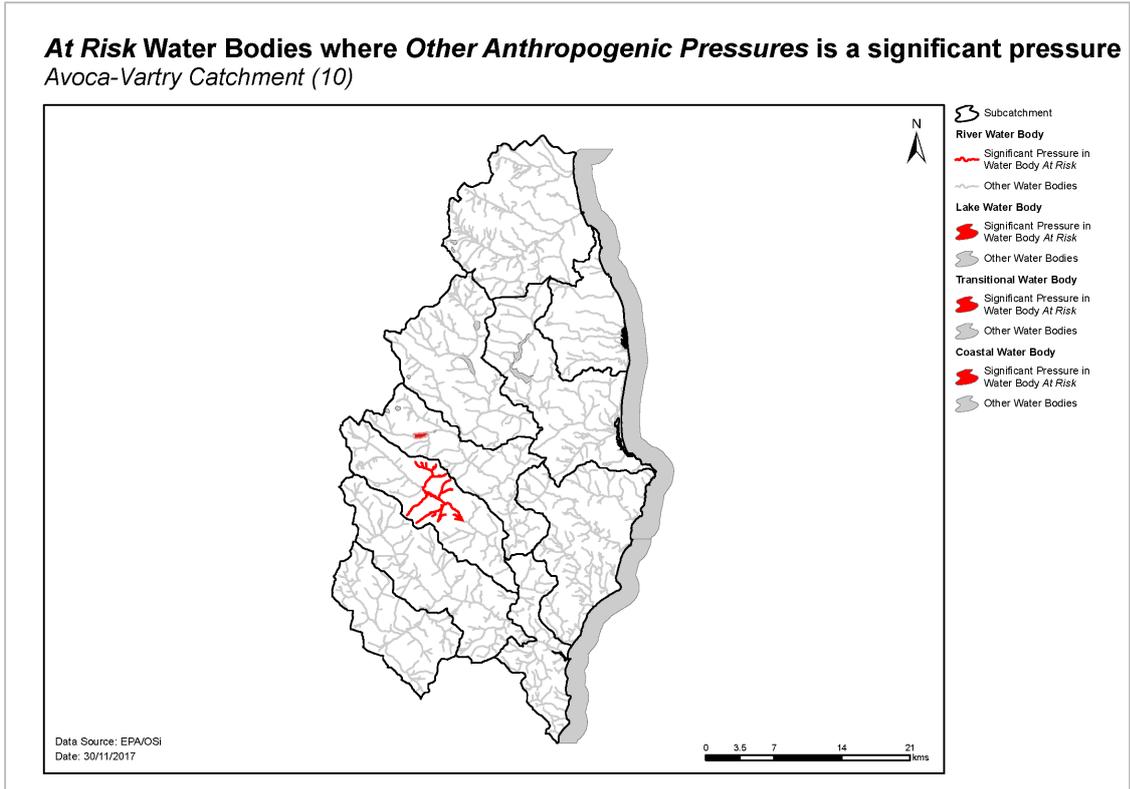


Figure 12. Surface water bodies that are *At Risk* and are impacted by other anthropogenic pressures. Note that groundwater bodies are indicated on Figure 9.

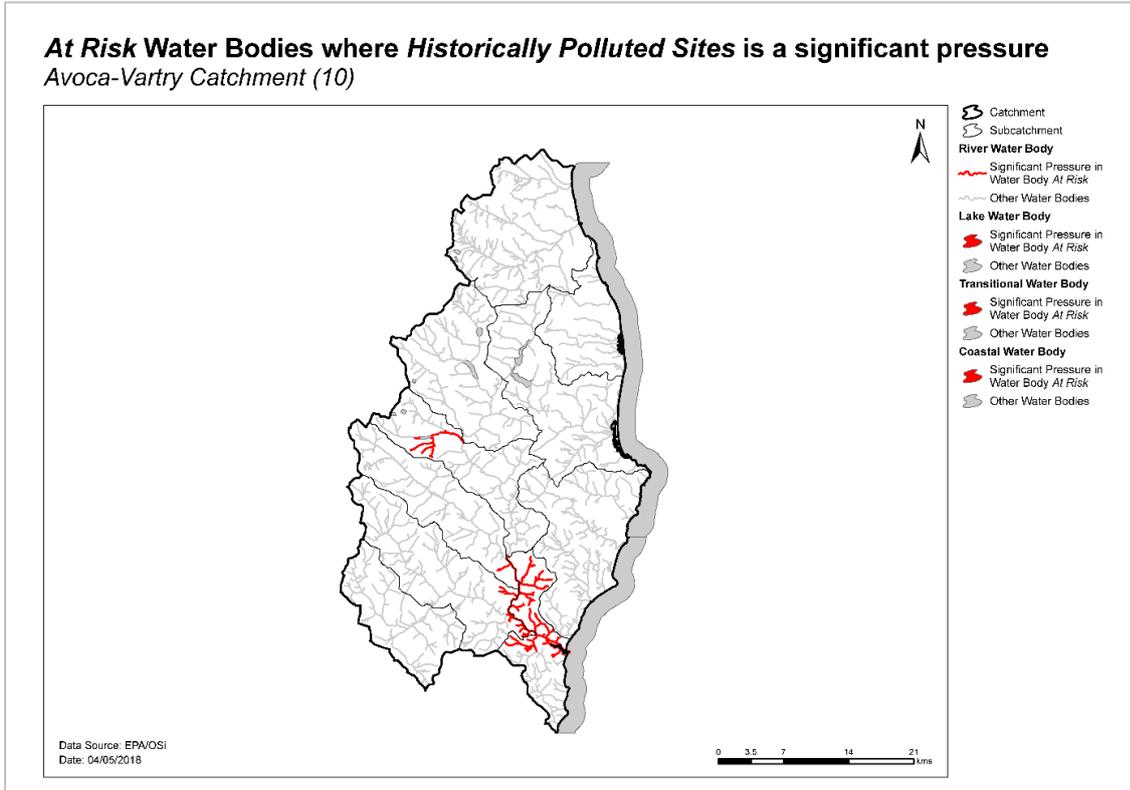


Figure 11. Water bodies that are *At Risk* and are impacted by historic mines. Note that groundwater bodies are indicated on Figure 9.

◆ *Tourism* has been identified as a significant pressure in one lake water body Upper Glendalough (Figure 12). The pressures are somewhat unclear but may relate to hiking, trekking and associated

activities in the Glendalough area causing erosion and excess sediment. These have also been identified in Lower Glendalough.

- ◆ A *golf course* has been identified as a significant pressure in one river Avonbeg_030 (Figure 12). The issues relate to elevated nutrients.
- ◆ *Aquaculture* has been identified as a significant pressure in one river Aughrim (Wicklow)_020 (Figure 13). There are three Section 4 discharges from fish farms on this river, causing elevated ammonia concentrations.
- ◆ *Illegal dumping* has been identified as a significant pressure in one river water, Three Mile Water_020 (Figure 14).
- ◆ Low pH is causing the downgrade to Moderate Ecological Status in one river water body Avonmore_010 but the significant pressure is unknown.

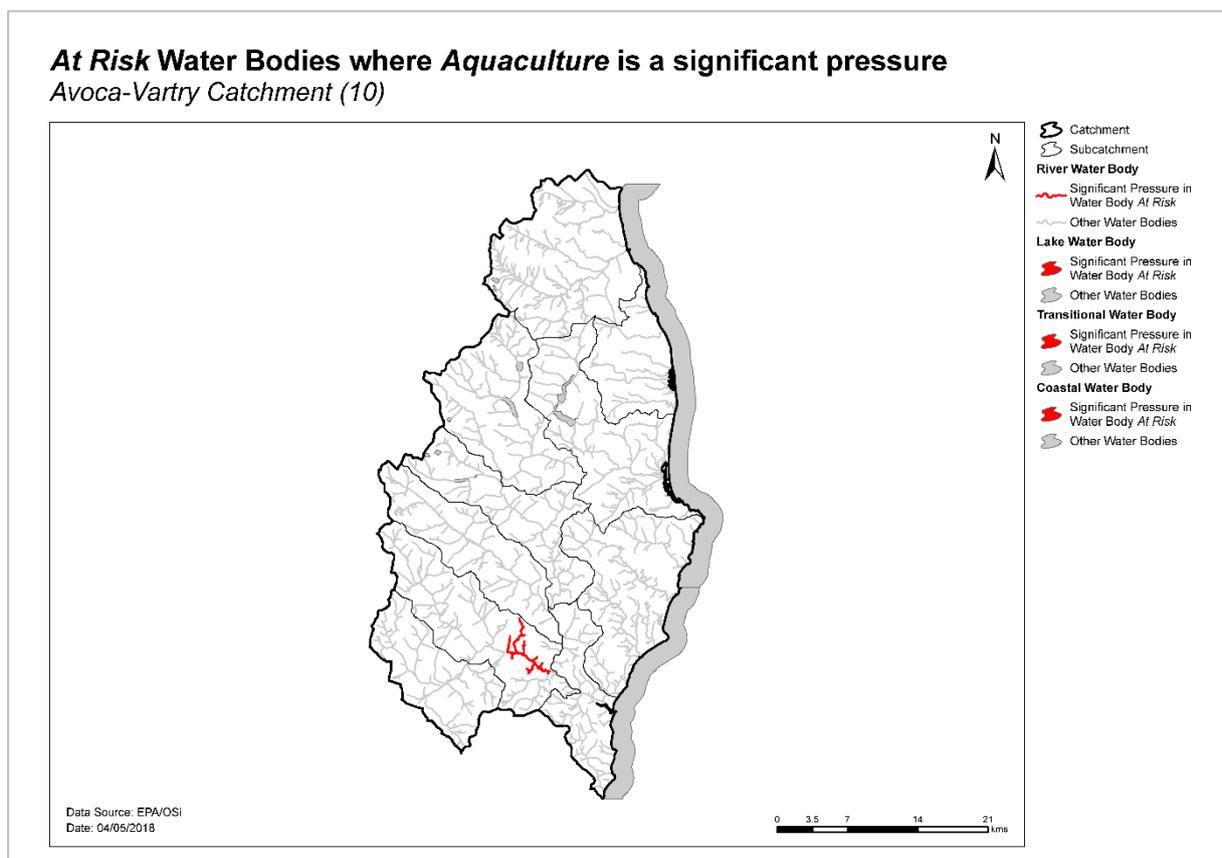


Figure 13. Water bodies that are *At Risk* and are impacted by aquaculture

At Risk Water Bodies where Waste is a significant pressure Avoca-Vartry Catchment (10)

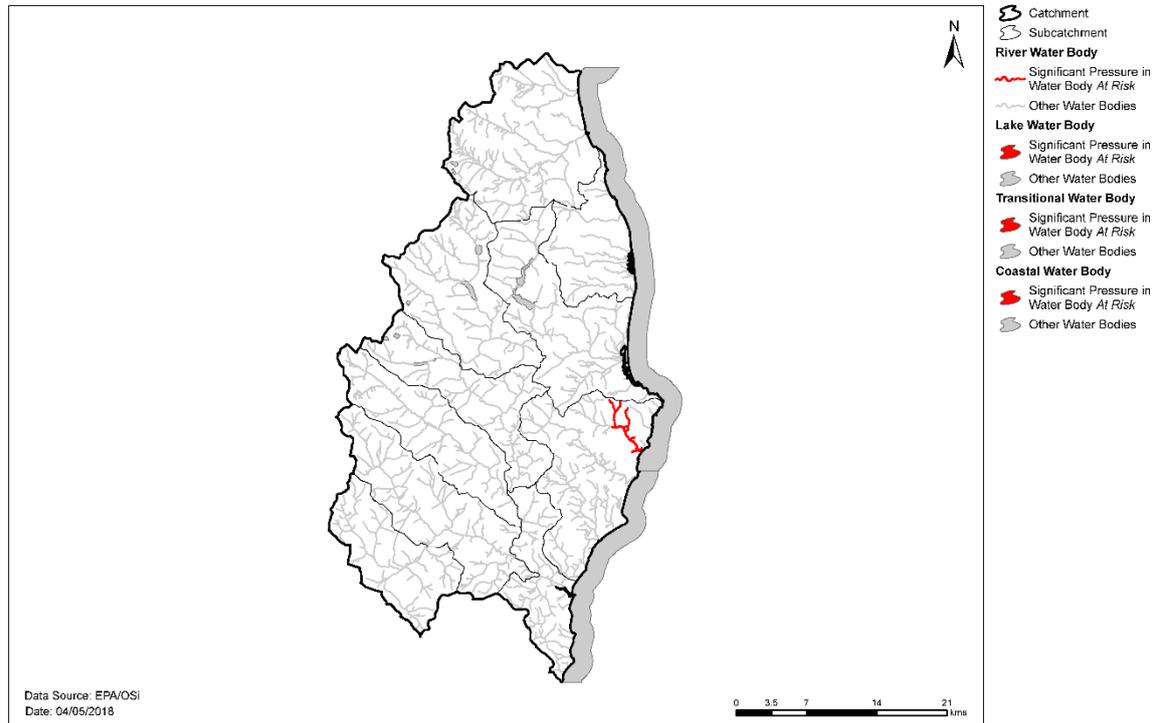


Figure 14. Water bodies that are *At Risk* and are impacted by waste related activity

4.2.5 Diffuse urban

- ◆ Diffuse urban pressures, caused by misconnections, leaking sewers and runoff from paved and unpaved areas, have been identified as a significant pressure in four river water bodies (Aughrim (Wicklow)_010, Kill of the Grange Stream_010, Kilmacanoge_010 and Carrickmines Stream_010). In the case of Aughrim (Wicklow)_010, it is likely there is a diffuse urban pressure from Aughrim town. Kill of the Grange stream is primarily impacted by misconnections and SWOs from both Sandford and Deansgrange. The diffuse pressure on Kilmacanogue_010 has been identified as the dual carriageway which passes through. Finally, Carrickmines is the source of the diffuse urban pressure on the Carrickmines Stream_010 (Figure 18, Appendix 3).

4.2.6 Hydromorphology

- ◆ One river water body within the Dargle (10_5) and one river water body within the Redcross (10_8) subcatchments are subject to extensive modification due to the presence of flood alleviation works and road works, respectively. In addition, one river water body within the Dargle (10_5) is mostly culverted leading to modified physical aquatic habitat. Excessive levels of siltation exist within one river water body of the same subcatchment due to bank erosion. This issue will need to be reviewed. Water bodies that are *At Risk* and impacted by hydromorphological pressures are shown in Figure 19 and listed in Appendix 3.

4.2.7 Domestic waste water

- ◆ Domestic waste water has been identified as a significant pressure in two river water bodies, Ballyronan Stream_010 and Potter's_010. In the case of Ballyronan Stream_010, there is a discharge from a private development (600p.e.) which has caused an impact due to a lack of assimilative capacity within the stream. In Potter's_010, the pressure is adjudged to be the cumulative effect of

many smaller sewage discharges resulting in enrichment and organic contamination (Figure 20, Appendix 3).

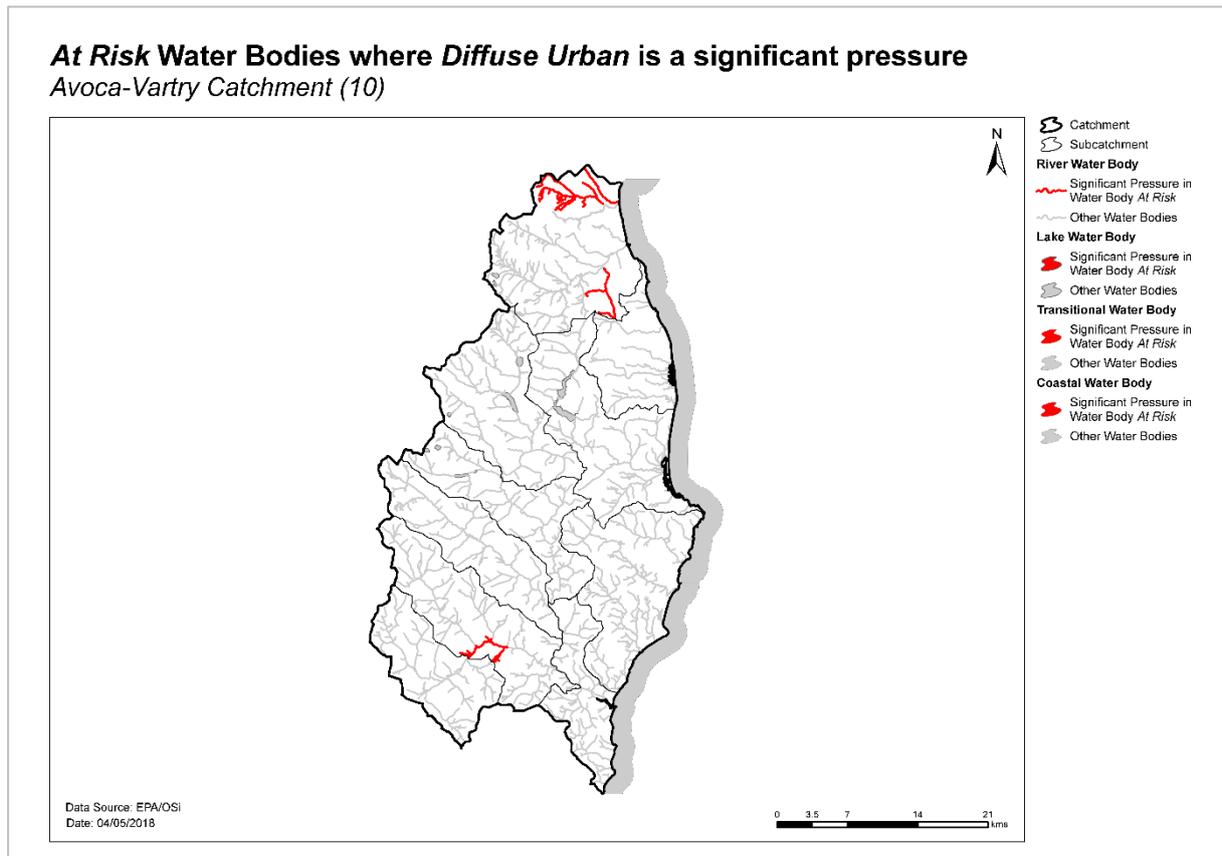


Figure 18. Water bodies that are *At Risk* and are impacted by diffuse urban pressures

At Risk Water Bodies where Hydromorphology is a significant pressure
 Avoca-Vartry Catchment (10)

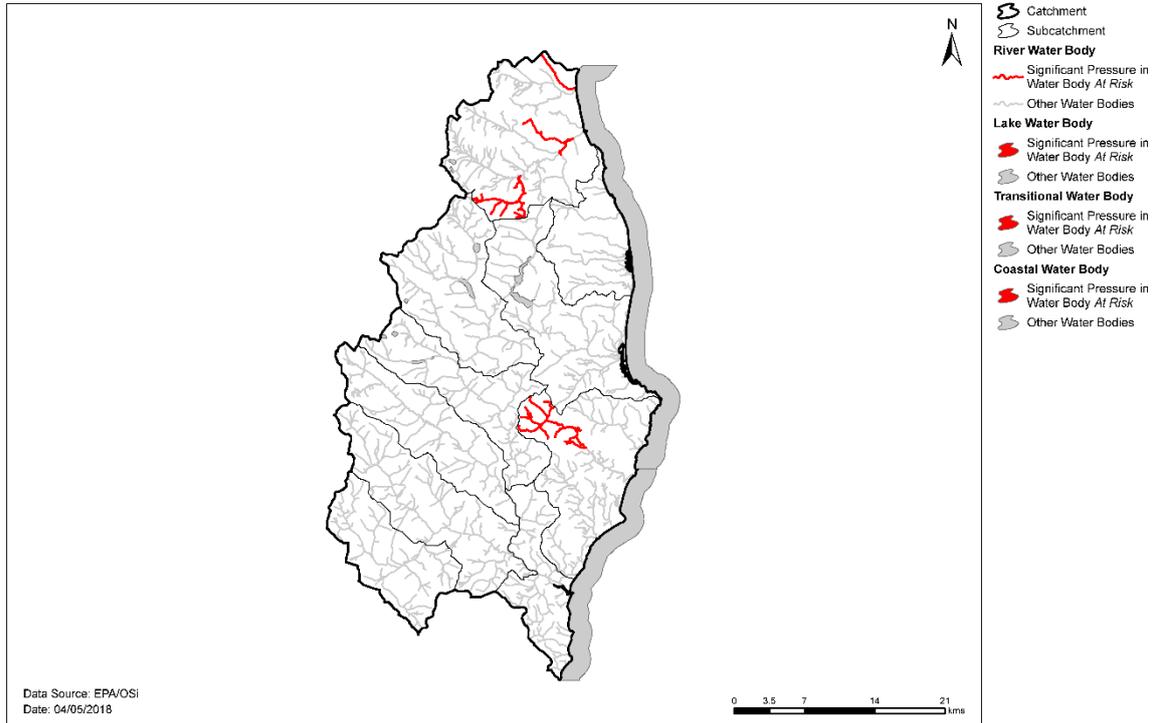


Figure 19. Water bodies that are *At Risk* and are impacted by hydromorphological pressures

At Risk Water Bodies where Domestic Waste Water is a significant pressure
 Avoca-Vartry Catchment (10)

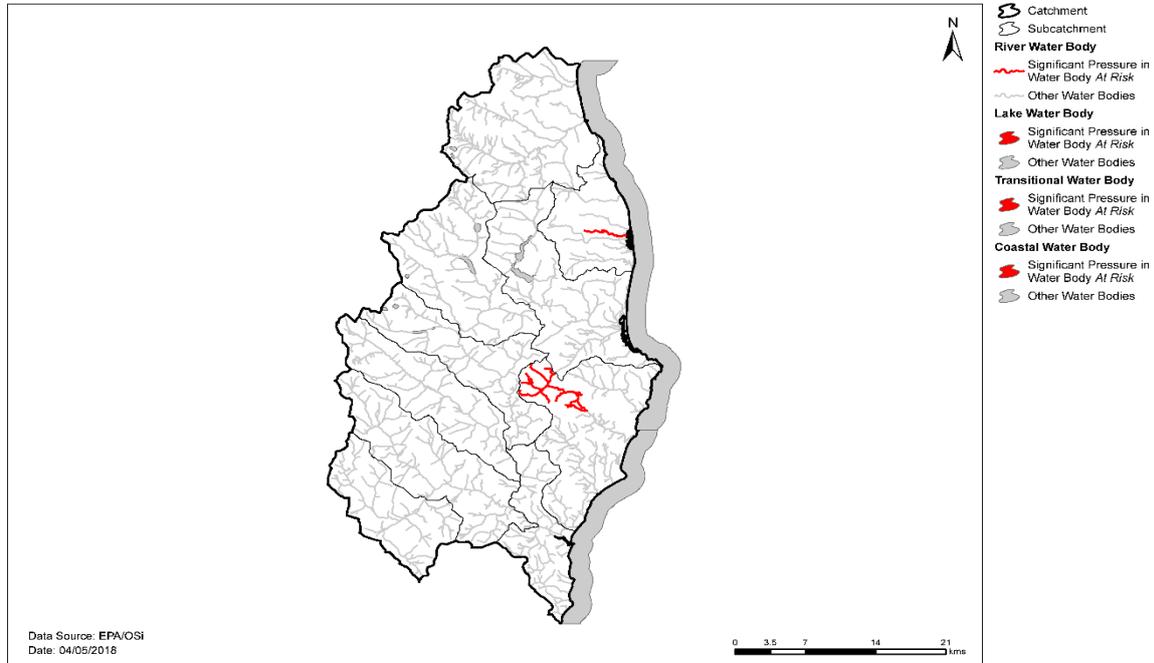


Figure 20. Water bodies that are *At Risk* and are impacted by domestic waste water

4.2.8 Industry

- ◆ An industrial site has been identified as a significant pressure impacting Ballyronan Stream_010, with elevated orthophosphate concentrations being the main issue of concern. Another site which has legacy issues related to total ammonia concentrations in groundwater, has been identified as a significant pressure impacting Avoca_030 (Figure 21). Industry also impacts on the groundwater body around the Industrial Facility (P0019-02).

4.2.9 Extractive industry

- ◆ *Quarries*
Quarries have been identified as a significant pressure in two water bodies – Potter’s_010 and Three Mile Water_020 (Figure 22, Appendix 3). For Potter’s_010, heavy siltation associated with a large quarry upstream in Ballinclare is a significant pressure, with heavy siltation noted in the 2015 survey. For Three Mile Water_020, the Eastern River Basin District Mobile Monitoring Unit identified two quarries upstream that may be causing a silt/sediment issue. Heavy siltation was also noted by EPA biologists here in 2015.

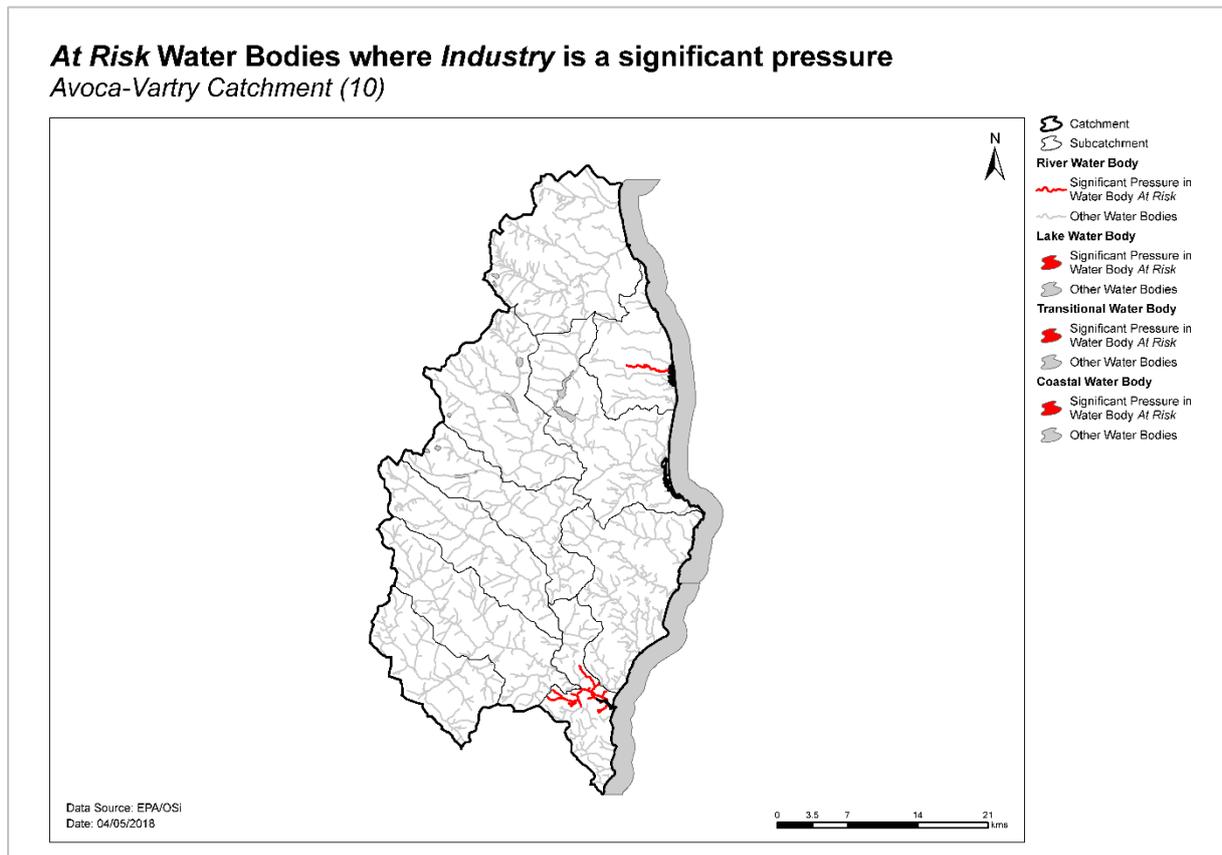


Figure 21. Water bodies that are *At Risk* and are impacted by industry

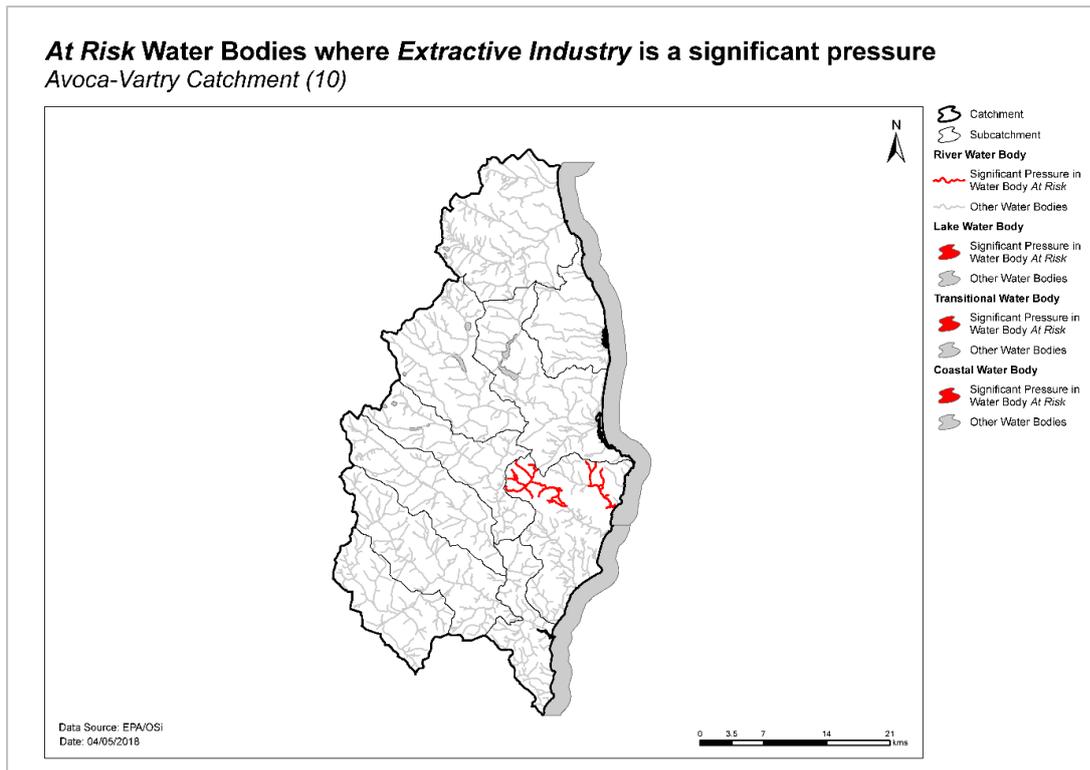


Figure 22. Water bodies that are *At Risk* and are impacted by extractive industries

5 Load reduction assessment

5.1 River water body load reductions

- ◆ Phosphate is the main parameter influencing water quality in rivers in the catchment.
- ◆ For water bodies where phosphorus monitoring data are available, the reduction in P load that would be required to bring the mean concentration back to the EQS of 0.035 mg/l as P, can be estimated using a simple method based on the average 2013 to 2015 concentration and the average flow, or the estimated 30th percentile flow (Q30) where flow data are not available. The relative load reductions are ranked on a national scale from Very High (>1 kg/Ha/y), to High (0.5-1 kg/Ha/y), to Medium (0.25-0.5 kg/Ha/y) to Low (<0.25 kg/Ha/y). Note that P load reductions may also be required in other water bodies, but without chemistry monitoring data, a quantitative estimate cannot be calculated.
- ◆ The available data for the Avoca Vartry catchment indicate that load reductions are required in three river water bodies (Table 6). The largest load reduction is required in the Ballyduff Stream (Wicklow)_010. This water body receives the primary discharge point for the Thomastown WWTP. The Kill of the Grange Stream_010 receives the stormwater overflow for the Shanganagh WWTP.

Table 6. Relative load reductions required in monitored water bodies that are *At Risk*.

Water Body	P Load Reduction Required
Ballyduff Stream (Wicklow)_010	Med
Kill of the Grange Stream_010	Low
Kilmacanoge_010	Low

5.2 TraC load reductions

Some 18 estuaries in Ireland have been monitored on a continual basis since 1990 as part of Ireland's commitment under the Convention for the Protection of the Marine Environment of the North-East Atlantic (the Oskar Convention). This has shown that generally over the long term, nutrients have decreased but further reduction will be required in many cases to support Good Ecological Status. However, many estuaries have not been monitored to the same degree, and where monitoring data is insufficient, an ongoing programme of modelling is being undertaken to estimate potential nutrient load removal required from contributing sub-catchments.

Different estuaries may require reductions in different nutrients. Further modelling work is required to determine precisely what load reductions are required, but in the interim, further monitoring will be carried out to assess the improvements resulting from various planned measures, and to confirm the nature of the issues.

In the Avoca-Varty catchment:

- ◆ As part of the Ireland's commitment to the Oskar Convention, nutrient flux or load monitoring has been carried out on the Avoca Estuary since 1990 (Figure 22a and 22b). Total N dropped sharply in 1995 following improvements at a large industrial facility, while P increased in the mid-90's, before declining to 1/3 of the load measured in 1990. Further analysis of these nutrient load trends is available at <http://dx.doi.org/10.3318/BIOE.2016.23>.
- ◆ The required nutrient load reduction for the Avoca estuary is unknown. However, achieving Good status in this water body is dependent on achieving a reduction in heavy metal concentrations from the historic mine.
- ◆ The nutrient load reduction required for the Broad Lough is unknown. There are currently no data for two of the three inflowing streams and there has been no estuarine modelling carried out.

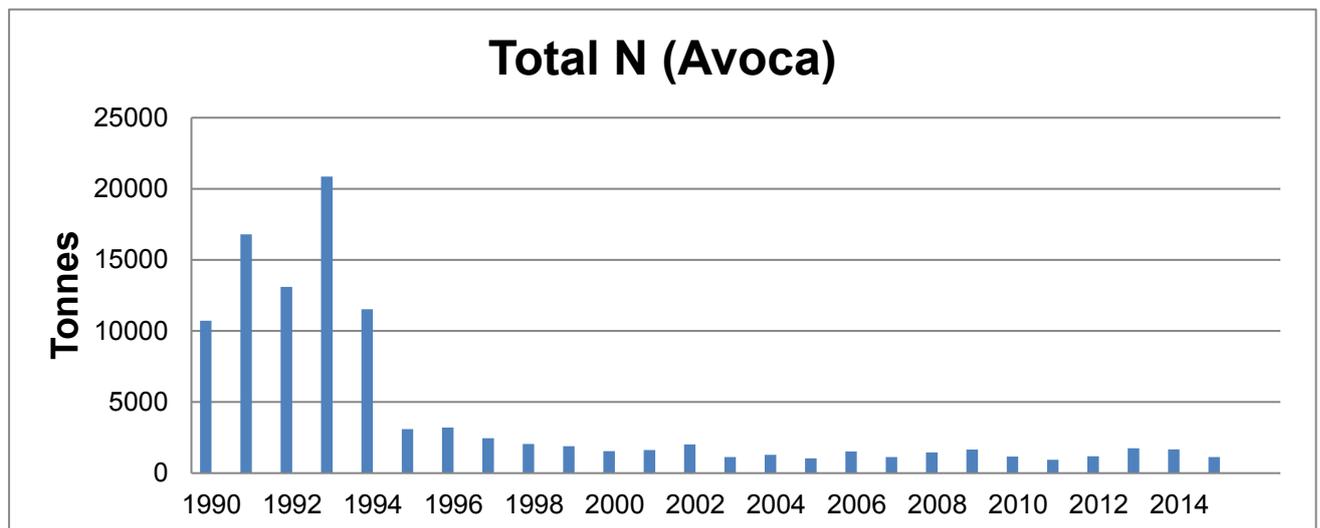


Figure 22a – Total Nitrogen Load (tonnes/year) 1990 to 2015

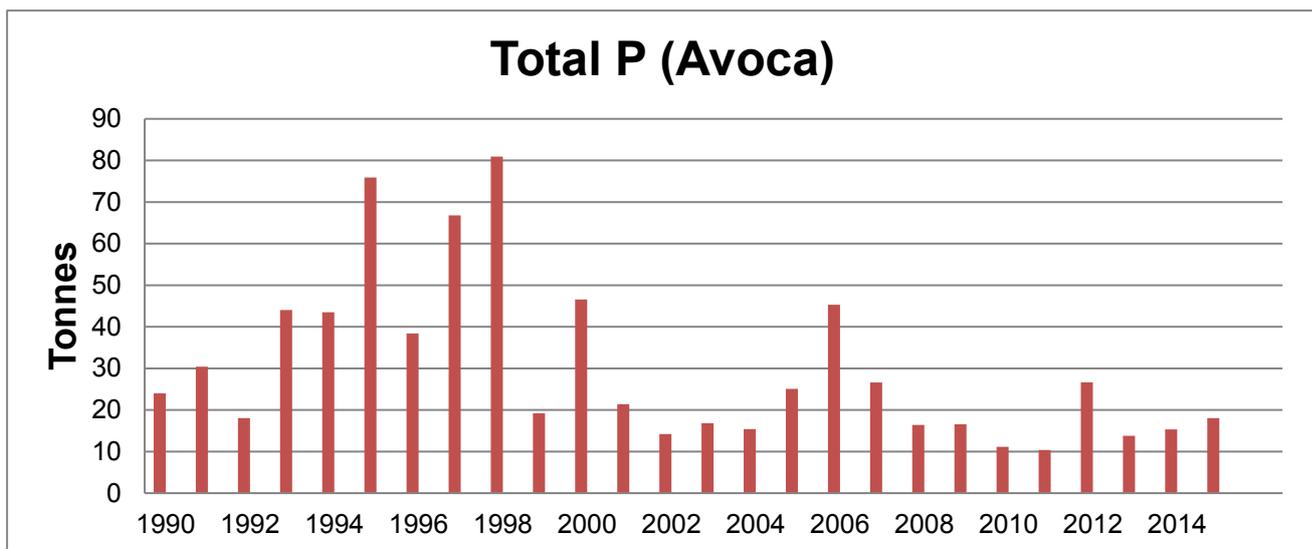


Figure 22b – Total Phosphorus Load (Tonnes/year) 1990-2015

6 Further Characterisation and Local Catchment Assessments

- ◆ Further characterisation through local catchment assessments is needed in 29 of the *At Risk* river and lake water bodies to refine the understanding of the significant pressures at the site/field scale so that specific and targeted measures can be identified.
- ◆ Further characterisation through local catchment assessments is needed in 15 *Review* river and lake water bodies to refine the understanding of the issues if any, and the significant pressures where relevant, at the site/field scale so that specific and targeted measures can be identified.
- ◆ Brief definitions on the 10 IA assessment scenarios are given in Appendix 7 and the number of IAs required for each scenario are given in Table 7.

Table 7. Investigative assessment allocation for *At Risk* and *Review* river and lake water bodies

Risk	IA 1	IA 2	IA 3	IA 4	IA 5	IA 6	IA 7	IA 8	IA 9	IA 10	Total
<i>At Risk</i>	30	1	3	1	2	4	7	4	0	0	52
<i>Review</i>	5	0	8	0	0	1	1	0	0	0	15

Note water bodies may have multiple categories of Local Catchment Assessments

7 Catchment summary

- ◆ Of the 71 river water bodies, 28 are *At Risk* of not meeting their WFD objectives.
- ◆ Out of the 11 lake water bodies, only one is *At Risk* of not meeting their WFD objectives.
- ◆ There are two of the TraCs water bodies, Broad Lough and Avoca Estuary are *At Risk* of not meeting their WFD objectives. The Avoca Estuary is *At Risk* and is impacted by heavy metal and waste water from Arklow agglomeration. Agriculture is the significant pressure on Broad Lough as well as suspected waste water discharges from Wicklow.
- ◆ Excess nutrient loss, mainly phosphate, leading to eutrophication is also a major issue for rivers and lakes in the catchment. The significant pressures relating to excess nutrients are primarily waste

water (urban and domestic), but also related to agriculture, forestry activity and diffuse urban pressures for the most part. Elevated ammonia from aquaculture is also a pressure.

- ◆ Hydromorphological (or physical) conditions (including the input of excessive fine sediment) and poor habitat quality are issues for several surface water bodies.
- ◆ There are four groundwater bodies *At Risk*, Historic Mine (Glendalough), Historic Mine (Glenmalure), Historic Mine (Avoca) and Industrial Facility (P0019-02). For the mine sites the pressure relates to the elevated concentrations of heavy metals due to acid mine drainage from lead-zinc mines. The pressure from the industrial site is due to trichloroethylene (TCE).

8 Areas for Action

The characterisation outcomes described above have highlighted that there is significant work to do in the catchment to protect and restore water quality, and meet the objectives of the WFD. During the development of the draft river basin management plan it became apparent that there would be a need to prioritise areas for collective action so that the best return on investment could be achieved. 190 Areas for action have been selected nationally in a process as described below. There are 4 areas for action in the Avoca/Vartry catchment

8.1 Process of Selection

Following the publication of the draft river basin management plan in early 2017, the EPA and the Local Authority Waters and Communities Office (LAWCO) jointly led a collaborative regional workshop process to determine where, from a technical and scientific perspective, actions should be prioritised in the second cycle. The prioritisation process was based on the priorities in the draft river basin management plan, the evidence from the characterisation process, and the expertise, data and knowledge of public body staff with responsibilities for water and the different pressure types. The recommended areas for action selected during the workshops were then agreed by the Water and Environmental Regional Committees. Since this selection, the Local Authorities Water and Communities Office (LAWCO) have undertaken public engagement and feedback sessions in each local authority.

The recommended areas for action are an initial list of areas where action will be carried out in the second cycle. All water bodies that are *At Risk* still however, need to be addressed. As issues are resolved, or when feedback from the public engagement process is assessed, areas for action may be removed from the list and new areas will be added. If additional monitoring shows that new issues have arisen, new areas may become a priority and may need to be added to the work programme.

The initial list of areas for action is not therefore considered as a closed or finite list; it simply represents the initial areas where work will be carried out during the second WFD planning cycle from 2018 to 2021.

8.2 Outcomes of process

The outcomes for the Avoca Vartry catchment are summarised below.

- ◆ Four recommended areas for actions (Table 89, Figure 23) were selected.
- ◆ These are the Ow Forestry, Potters and Three Mile Water, Dargle and Carrickmines, pH (Wicklow) 2.
- ◆ These include 11 *At Risk* river water bodies.
- ◆ There are no *At Risk* or *Review* water bodies where risk is driven by groundwater contribution of nutrients to surface water.

A remaining 37 *At Risk* and *Review* surface water bodies were not included in the recommended areas for action for the second cycle. The distribution of these is presented in Figure 23. These include:

- ◆ 33 river and lake water bodies – 18 *At Risk* and 15 *Review*, and
- ◆ four transitional and coastal water bodies – two *At Risk* and two *Review*.

Table 8. Recommended Areas for Action in the Avoca Vartry catchment

Recommended area for action	Number of water bodies	SCs	Local authority	Reason for Selection
Ow Forestry	1	10_3	Wicklow	<ul style="list-style-type: none"> • High Ecological Status ecological objective water body requiring improvement. • Building on work that is underway by Coillte. • Multi agency collaboration between Coillte, Wicklow County Council and the IFI.
Potters and Three Mile Water	2	10_8	Wicklow	<ul style="list-style-type: none"> • Building on improvements in Potters_010 – improved from Poor to Moderate between 2007-2009 and 2010-2015. • Building on existing knowledge in Wicklow County Council regarding farms and quarries in the area. • Building on improvements following completion of roadworks that were a pressure. • Good community engagement - there are 3 Group Water Schemes. • Discharges into Brittas Bay designated bathing waters. • A drinking water abstraction in Potters_010. • Potential for 'quick wins' in both water bodies.
Dargle and Carrickmines	4	10_5	Wicklow Dun Laoghaire Rathdown	<ul style="list-style-type: none"> • Multi agency cooperation between DLR, Irish Water, Inland Fisheries Ireland. • Building on completed and planned assessments on the Carrickmines Stream_010. • Building on Drainage Area Plan completed by Irish Water on Carrickmines Stream_010. • Carrickmines Stream_010 is a headwater stream to Shanganagh_010, which is at Good status. • Dargle_010 is the headwaters to the River Dargle. • Dargle_010 has a High Ecological Status objective and has deteriorated. • Dargle_030 is a deteriorated water body with protected area objectives for salmonids.
pH (Wicklow) 2	4	10_10 10_6	Wicklow	<ul style="list-style-type: none"> • 2nd pH project to link to the other Wicklow pH project. Four deteriorated water bodies. • Two High Ecological Status objective water bodies. Headwaters to the Avonbeg and Avonmore rivers.

Recommended Areas for Action Avoca-Vartry Catchment (10)

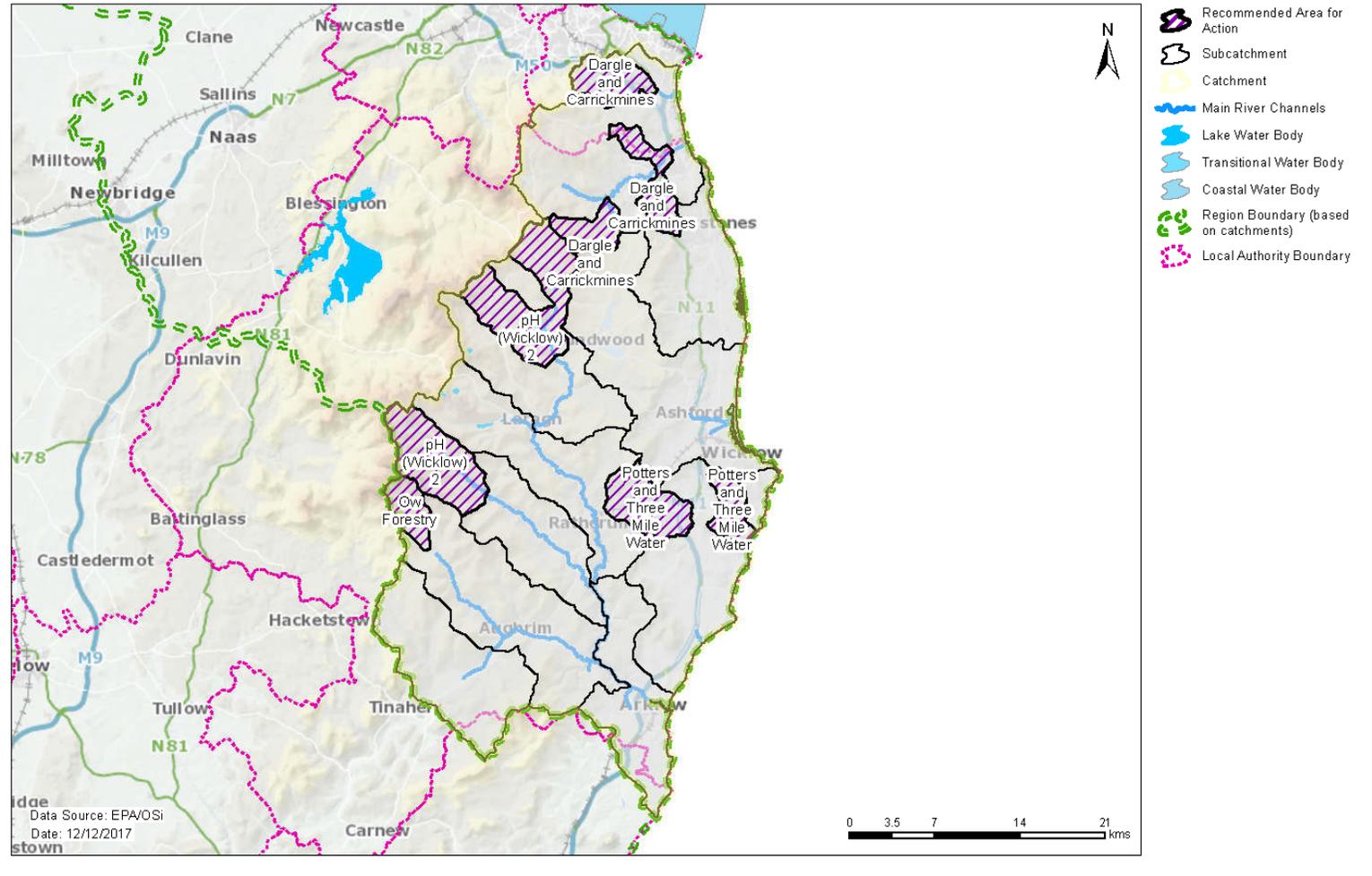


Figure 23. Location of Recommended Areas for Action in the Avoca Vartry Catchment. Note the waterbodies within an Areas for Action are not always contiguous.

Remaining *At Risk* and *Review* Water Bodies

Avoca-Vartry Catchment (10)

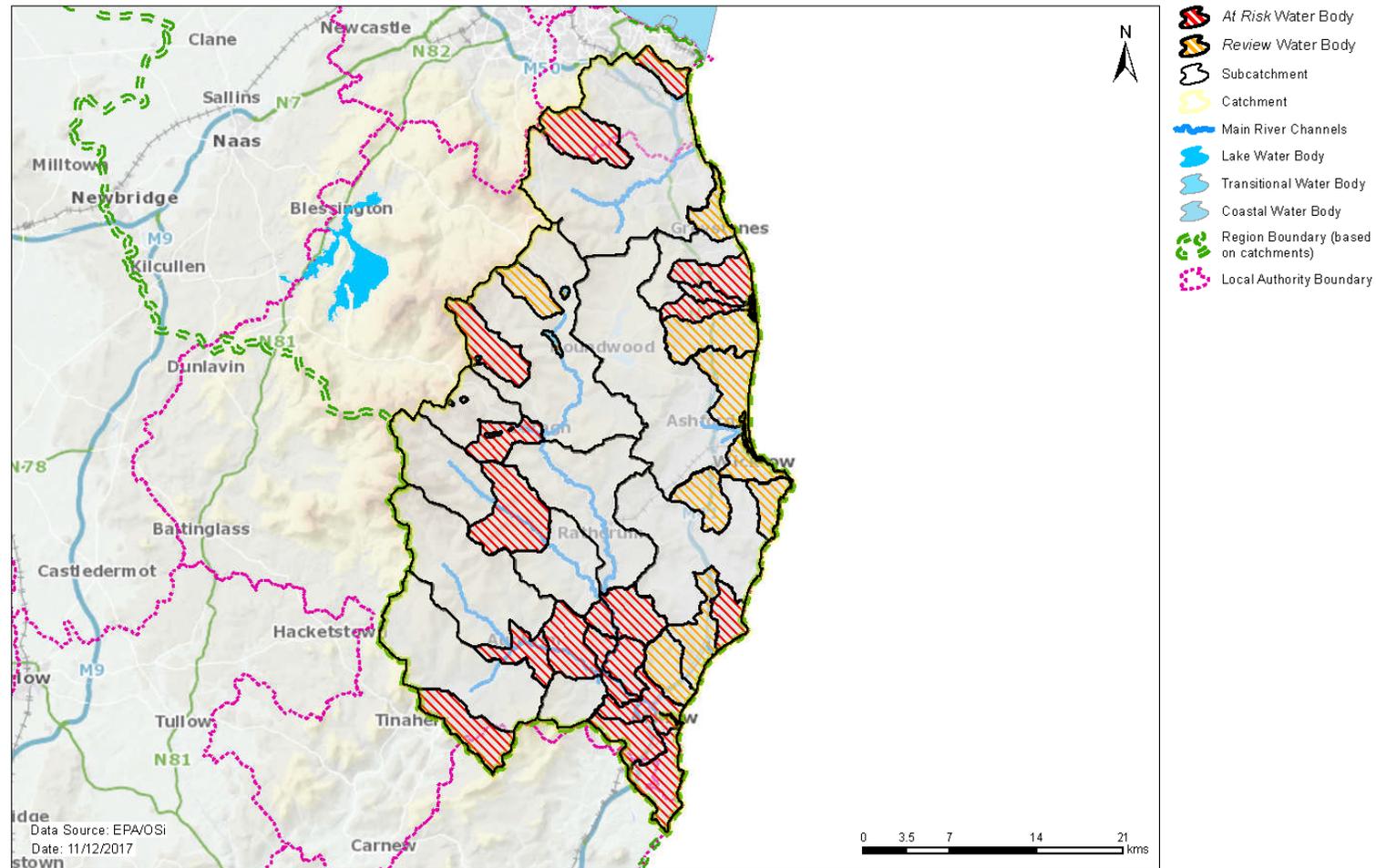


Figure 24. Location of *At Risk* and *Review* water bodies located outside Recommended Areas for Action in the Avoca Vartry Catchment

9 Environmental Objectives

9.1 Surface Water

- ◆ Assuming resources are available and actions are taken in the recommended areas for action, of the 11 *At Risk* surface water bodies, it is predicted that seven (64%) could improve by 2021 and four (36%) could achieve their objective by 2027, see Table 11.

Table 11: Environmental objective dates for water bodies in the Recommended Areas for Action

Risk Category	No. of Water Bodies	No. of WBs for 2021 Improvement	No. of WBs for 2027 Status Improvement
Rivers			
<i>At Risk</i>	11	7	4
<i>Review</i>	0	0	0
Total	11	7	4

- ◆ Forty-one surface water bodies have met their 2015 environmental objective.
- ◆ As action is not yet planned to be taken in the remaining 20 *At Risk* surface water bodies, a 2027 date is applied to 17 (85%) of the water bodies and a Less Stringent Objective classification is applied to the remaining 3 (15%). These are because of the long-term legacy issues with historic acid mine drainage.
- ◆ For the 17 *Review* surface water bodies, the absence of information on these water bodies means that there is no scientific basis to quantify an environmental objective date and therefore a 2027 date is applied, see Table 12.

Table 12: Environmental objectives dates in the *At Risk* and *Review* surface water bodies not included in Recommended Areas for Action

Risk Category	No. of Water Bodies	No. of WBs for 2021 Improvement	No. of WBs for 2027 Status Improvement	No. of WBs with Less Stringent Objective Designation
Rivers				
<i>At Risk</i>	17	0	14	3
<i>Review</i>	9	0	9	0
Lakes				
<i>At Risk</i>	1	0	1	0
<i>Review</i>	6	0	6	0
TraC				
<i>At Risk</i>	2	0	2	0
<i>Review</i>	2	0	2	0
Total	37	0	34	3

9.2 Groundwater

- ◆ Six of the ten groundwater bodies are currently at Good status and, therefore, have met their environmental objectives.
- ◆ The four groundwater bodies that are Poor status have a 2027 environmental objective, except Avoca which has a Less Stringent Objective designation.

Table 13 Environmental Objective dates of Poor status groundwater bodies in the Avoca catchment

Water body code	Water body name	Environmental Objective
IE_EA_G_077	Historic Mine (Glendalough)	2027
IE_EA_G_079	Historic Mine (Glenmalure)	2027
IE_EA_G_080	Historic Mine (Avoca)	Less Stringent Objective
IE_EA_G_091	Industrial Facility (P0019-02)	2027

10 Acknowledgements

This Avoca Vartry Catchment Assessment (Version 2) has been produced by the Catchment Science & Management Unit, EPA, with the assistance of the following:

- Wicklow County Council
- Dun Laoghaire Rathdown County Council.
- Inland Fisheries Ireland.
- Local Authorities Waters & Communities Office.
- Irish Water.
- RPS Group.
- Ecological Monitoring & Assessment Unit, EPA.
- Hydrometric & Groundwater Section, EPA.
- Informatics Section, EPA.
- Laboratories, EPA.
- Office of Environmental Enforcement, EPA.
- Department of Housing, Planning and Local Government.
- DAFM Forest Service.
- DAFM Agriculture.
- Bord Na Mona.
- Coillte.
- Teagasc.
- Geological Survey Ireland.
- National Federation of Group Water Schemes.
- National Parks and Wildlife Service.
- National Water Forum.

Appendix 1 High ecological status objective water bodies and sites

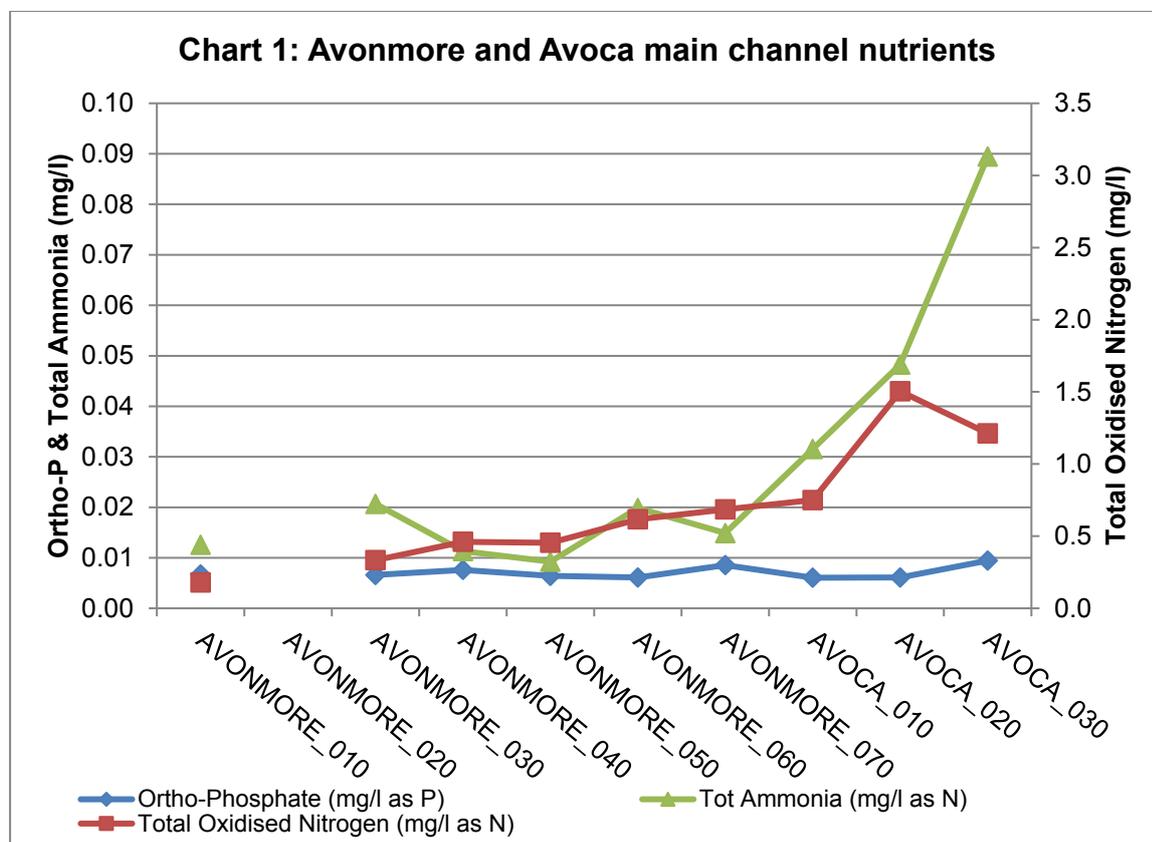
Water body/Site	Type	Codes	2015 Status
Askanagap Stream_010	River	IE_EA_10A060400	High
Ballycreen Brook_010	River	IE_EA_10B020400	High
Varty_010	River	IE_EA_10V010050	High
Dargle_010	River	IE_EA_10D010010	Good
Glencullen_010	River	IE_EA_10G020300	Good
Avonmore_020	River	IE_EA_10A050020	Good
Avonmore_010	River	IE_EA_10A050010	Moderate
Southwestern Irish Sea - Killiney Bay (HA10)	TraC	IE_EA_100_0000	High

Appendix 2 Catchment scale nutrient concentrations and in-stream loads

The results of the instream water quality assessment for the Avonmore and Avoca subcatchment are illustrated in Chart 1. This shows the 2015 baseline orthophosphate concentrations along the both main channels are relatively low and remains constant between 0.006mg/l up to 0.009mg/l.

The ammonia concentrations in the Avonmore Channel are relatively low (between 0.009 and 0.021mg/l) but increases downstream of Avoca_010 after which it becomes elevated above the EQS for good status (0.065mg/l) at Avoca_030 (0.089mg/l). The subcatchment assessment notes the impact from the discharge of raw sewage but does not state the source. The Avoca_030 discharges into the Avoca Estuary. The secondary discharges from the Arklow WWTP are all attributed to the Avoca Estuary however there may be some diffuse urban runoff from Arklow that is impacting on Avoca_020. The Avoca_030 is also noted as being impacted by industrial pressures (Honeywell IPPC).

The TON concentrations in the Avonmore Channel are relatively low and increase only slightly downstream of Avoca_010. The Avoca_20 is the receiving water for the Avoca waste water treatment plant which is not properly maintained and several misconnections from the village have been noted.



Appendix 3 Summary information on *At Risk* and Review surface water bodies

Subcatchment code	Water body code	Water body name	Water body type	Risk	Ecological Status 07-09	Ecological Status 10-15	High Ecological Status Objective Water Body Y/N	Significant Pressures	Date to Meet Environmental Objective	Recommended Area for Action Name
10_1	IE_EA_10K520710	Kilruddery_Deerpark_010	River	Review	Unassigned	Unassigned	N		2027	
10_1	IE_EA_10B080500	Ballyronan Stream_010	River	At risk	Unassigned	Moderate	N	DWW,Ind	2027	
10_1	IE_EA_10K010580	Kilcoole Stream_010	River	At risk	Unassigned	Moderate	N	UWW	2027	
10_1	IE_EA_10N010600	Newcastle (Wicklow)_010	River	Review	Moderate	Good	N		2027	
10_1	IE_EA_10N020600	Newtownmountkennedy_020	River	At risk	Poor	Poor	N	UWW	2027	
10_1	IE_EA_120_0100	Kilcoole Marsh	Transitional	Review	Unassigned	Unassigned	N		2027	
10_2	IE_EA_10C020500	Coolalug Stream_010	River	At risk	Good	Moderate	N	For	2027	
10_3	IE_EA_10A020200	Aughrim (Wicklow)_010	River	At risk	Good	Moderate	N	DU	2027	
10_3	IE_EA_10A020400	Aughrim (Wicklow)_020	River	At risk	Good	Moderate	N	Other,UWW	2027	
10_3	IE_EA_10A031050	Avoca_020	River	At risk	Unassigned	Bad	N	Other,UWW	LSO	
10_3	IE_EA_10O010100	Ow_010	River	At risk	Moderate	Moderate	N	For	2027	Ow Forestry
10_4	IE_EA_10I020430	Inchanappa_010	River	Review	Unassigned	Unassigned	N		2027	
10_4	IE_EA_10W080880	Wicklow_010	River	Review	Unassigned	Unassigned	N		2027	
10_4	IE_EA_130_0100	Broad Lough	Transitional	At risk	Moderate	Moderate	N	Ag,UWW	2027	
10_5	IE_EA_10C040350	Carrickmines Stream_010	River	At risk	Moderate	Moderate	N	DU	2027	Dargle and Carrickmines
10_5	IE_EA_10D010010	Dargle_010	River	At risk	High	Good	Y	Hymo	2021	Dargle and Carrickmines
10_5	IE_EA_10D010250	Dargle_030	River	At risk	Moderate	Poor	N	Hymo,UWW	2027	Dargle and Carrickmines
10_5	IE_EA_10G020300	Glencullen_010	River	At risk	Good	Good	Y	For	2027	
10_5	IE_EA_10K020200	Kill Of The Grange Stream_010	River	At risk	Poor	Poor	N	DU,Hymo,UWW	2027	
10_5	IE_EA_10K030600	Kilmacanoge_010	River	At risk	Moderate	Moderate	N	DU,UWW	2027	Dargle and Carrickmines
10_5	IE_EA_110_0100	Dargle Estuary	Transitional	Review	Unassigned	Unassigned	N		2027	
10_6	IE_EA_10_31	Ouler	Lake	Review	Unassigned	Unassigned	N		2027	
10_6	IE_EA_10_25	Tay	Lake	Review	Moderate	Moderate	N		2027	
10_6	IE_EA_10_29	Dan	Lake	Review	Moderate	Moderate	N		2027	
10_6	IE_EA_10A050010	Avonmore_010	River	At risk	High	Moderate	Y	Ag,For,Other	2021	pH (Wicklow) 2
10_6	IE_EA_10A050020	Avonmore_020	River	At risk	High	Good	Y	For	2021	pH (Wicklow) 2
10_6	IE_EA_10C010100	Cloghoge Brook_010	River	Review	Moderate	Moderate	N		2027	
10_6	IE_EA_10G030200	Glenmacnass_010	River	At risk	Moderate	Moderate	N	For	2027	
10_7	IE_EA_10_27	Nahanagan	Lake	Review	Unassigned	Unassigned	N		2027	
10_7	IE_EA_10_30	Lower	Lake	Review	Unassigned	Unassigned	N		2027	

Subcatchment code	Water body code	Water body name	Water body type	Risk	Ecological Status 07-09	Ecological Status 10-15	High Ecological Status Objective Water Body Y/N	Significant Pressures	Date to Meet Environmental Objective	Recommended Area for Action Name
10_7	IE_EA_10_5	Sevenchurches	Lake	Review	Unassigned	Unassigned	N		2027	
10_7	IE_EA_10_32	Upper Glendalough	Lake	At risk	Good	Moderate	N	For,Other	2027	
10_7	IE_EA_10G050400	Glenealo_020	River	At risk	Moderate	Moderate	N	For,Other	2027	
10_8	IE_EA_10H060930	Haughtons_010	River	At risk	Unassigned	Unassigned	N	Ag	2027	
10_8	IE_EA_10K550680	Kilpoole_Lower_010	River	Review	Unassigned	Unassigned	N		2027	
10_8	IE_EA_10R010600	Redcross_030	River	Review	Unassigned	Unassigned	N		2027	
10_8	IE_EA_10P010300	Potter's_010	River	At risk	Poor	Moderate	N	Ag,DWW,Hymo,M+Q	2021	Potters and Three Mile Water
10_8	IE_EA_10T010300	Three Mile Water_010	River	Review	Good	Good	N		2027	
10_8	IE_EA_10T010500	Three Mile Water_020	River	At risk	Unassigned	Moderate	N	Ag,M+Q,Other	2021	Potters and Three Mile Water
10_8	IE_EA_10T040500	Templrainy Stream_010	River	Review	Good	Good	N		2027	
10_9	IE_EA_10A031140	Avoca_030	River	At risk	Unassigned	Unassigned	N	Ind,Other,UWW	LSO	
10_9	IE_EA_10K310720	Kilmurry Stream_010	River	At risk	Unassigned	Unassigned	N	Ag	2027	
10_9	IE_EA_10B010200	Ballyduff Stream (Wicklow)_010	River	At risk	Moderate	Poor	N	Ag,UWW	2027	
10_9	IE_EA_150_0100	Avoca Estuary	Transitional	At risk	Moderate	Moderate	N	Other	2027	
10_10	IE_EA_10A030700	Avoca_010	River	At risk	Bad	Poor	N	Other	LSO	
10_10	IE_EA_10A040100	Avonbeg_010	River	At risk	Good	Moderate	N	For	2021	pH (Wicklow) 2
10_10	IE_EA_10A040400	Avonbeg_020	River	At risk	Good	Moderate	N	For	2021	pH (Wicklow) 2
10_10	IE_EA_10A040600	Avonbeg_030	River	At risk	Moderate	Moderate	N	Other,UWW	2027	

Ag: Agriculture

M+Q: Mines and Quarries

DWW: Domestic Waste Water

Peat: Peat Drainage and Extraction

For: Forestry

DU: Diffuse Urban

Hymo: Hydromorphology

UWW: Urban Waste Water

LSO: Less Stringent Objective

Ind: Industry

Note: Significant Pressures for Review water bodies have not been included as they will need to be confirmed as part of an Investigative Assessment.

Protected Area: If water body is one or more of the following, Drinking Water Protected Area, Bathing Water, Shellfish Water, Nutrient Sensitive Area or a Natura 2000 site with qualifying interest, then it has been highlighted as a protected area in this table.

Appendix 4 Drinking water supplies in the catchment

Scheme Code	Scheme Name	Water Body	Water Body Code	Objective met? Yes /No			
1000PUB1004_1	DLR_Zone 4	Wickow (GWB)	IE_EA_G_076	Yes			
1000PUB1004_2							
3400PUB1053_1	None						
3300PRI2426_1	Whitepark						
3400PUB1049_1	Ballinteskig Public Supply						
3400PRI1113_1	Askanagap						
3400PRI1115_1	Blainroe						
3400PRI1115_2							
3400PRI1134_1	Williams Caravan Park/Redcross						
3400PRI1356_1	Glencree Centre for Reconciliation, Enniskerry						
3400PUB1004_1	Arklow Public Supply						
3400PUB1004_2							
3400PUB1004_3							
3400PUB1004_4							
3400PUB1004_5							
3400PUB1016_1	Rathdrum Public Supply						
3400PUB1023_1	Aughrim Annacurra Public Supply						
3400PUB1025_1	Laragh Annamoe Public Supply						
3400PUB1028_1	Roundwood Public Supply						
3400PUB1028_2							
3400PUB1032_1	Redcross Conary Public Supply						
3400PUB1032_2							
3400PUB1035_2	Knockananna Public Supply						
3400PUB1039_1	Barndarrig Public Supply						
3400PUB1040_1	Ballycoog Public Supply						
3400PUB1044_1	Kirikee Public Supply						
3400PUB1050_1	Brittas Bay South Public Supply				GWDTE-Buckrone y Brittas Dunes (SAC000729) (GWB)	IE_EA_G_084	Yes
3400PRI1112_1	Cornagower						
3400PUB1045_1	Brittas Bay North PWS						
0700PUB1003_1	None	Vartry_020	IE_EA_10V010100	Yes			
1000PUB1003_1	DLR_ZONE3	Shanganagh_010	IE_EA_10S010600	Yes			
1000PUB1005_1	DLR_ZONE5						
1000PUB1005_2							
3400PUB1004_6	Arklow Public Supply	Aughrim (Wicklow)_020	IE_EA_10A020400	Yes			
3400PUB1005_1	Wicklow Regional Supply ⁵	Vartry_030	IE_EA_10V010150	Yes			
3400PUB1016_2	Rathdrum Public Supply	Avonmore_060	IE_EA_10A050300	Yes			
3400PUB1019_1	Enniskerry Public Supply	Glencullin_010	IE_EA_10G020300	Yes			
3400PUB1021_1	Glenealy Public Supply	Potter's_010	IE_EA_10P010300	Yes			
3400PUB1023_2	Aughrim Annacurra Public Supply	Ballycreen Brook_020	IE_EA_10B020700	Yes			
3400PUB1024_1	Avoca Ballinacash Public Supply	Avonbeg_040	IE_EA_10A040800	Yes			
3400PUB1025_2	Laragh Annamore Public Supply	Avonmore_030	IE_EA_10A050050	Yes			
3400PUB1043_1	None	Avonbeg_030	IE_EA_10A040600	Yes			

⁵ Note that the Wicklow Regional Supply was non-compliant (MCPA, picloram) in 2014, the source of which is Vartry_030. This record is noted as having been closed in 2016.

Appendix 5 Prioritisation of water bodies with Natura 2000 site qualifying interests

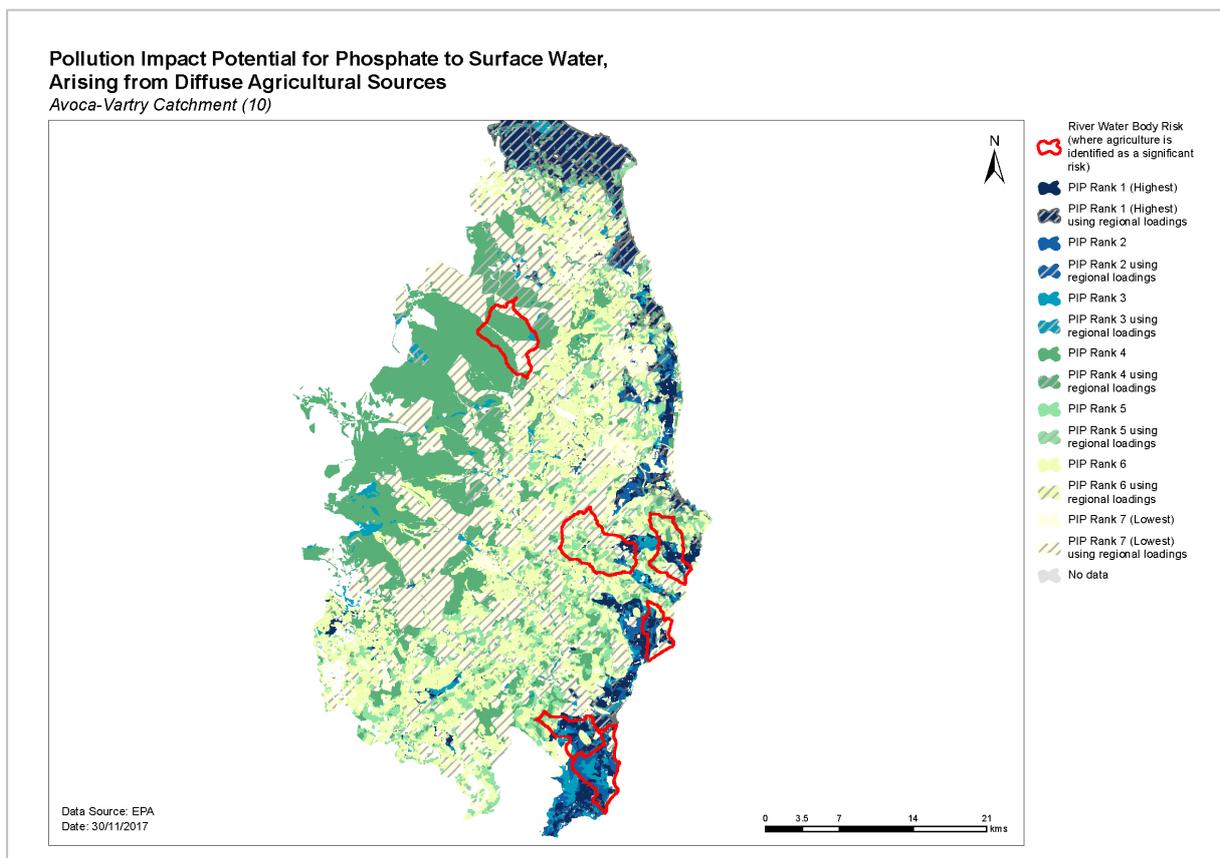
Note that additional water dependent species have been added that are not qualifying interests within the SACs (i.e. Salmon (*Salmo salar*; 1106) and Arctic char (*Salvelinus alpinus*) have been added to Wicklow Mountains SAC). River water bodies that are designated as salmonid rivers (under Salmonid Regulations (S.I. 293 / 1988)) but that are not located within SACs have also been listed.

SAC Name	Relevant Qualifying interests	Target status	Water body type	Water bodies	Status (risk)	Prioritise?	Code	Survey data?
Ballyman Glen SAC 000713	7220	Good GW level	Groundwater	Enniskerry Gravels GWB	Good (R)	No	IE_EA_G_038	No
	7230	Good GW level	Groundwater	Enniskerry Gravels GWB	Good (R)	No	IE_EA_G_038	No
Bray Head SAC 000714	none							
Buckronev-Brittass Dunes and Fen SAC 000729	2190	Good GW level	Groundwater	GWDTE-Buckronev-Brittass Dunes (SAC000729)	Good (R)	No	IE_EA_G_84	No
	7230	Good GW level	Groundwater	GWDTE-Buckronev-Brittass Fen (SAC000729)	Good (R)	No	IE_EA_G_81	No
Carriggower Bog SAC 000716	none							
Deputy's Pass Nature Reserve SAC 000717	none							
Glen of The Downs SAC 000719	none							
Kilpatrick Sandhills SAC 001742	none							
Knocksink Wood SAC 000725	7220	Good GW level	Groundwater	Enniskerry Gravels GWB	Good (R)	No	IE_EA_G_038	No
			Groundwater	Wicklow GWB	Good (R)	No	IE_EA_G_076	No
Magherabeg Dunes SAC 001766	7220	Good GW level	Groundwater	Wicklow GWB	Good (R)	No	IE_EA_G_076	No
The Murrrough Wetlands SAC 002249	7230	Good GW level	Groundwater	Wicklow GWB	Good (R)	No	IE_EA_G_076	No

SAC Name	Relevant Qualifying interests	Target status	Water body type	Water bodies	Status (risk)	Prioritise?	Code	Survey data?
Vale of Clara (Rathdrum Wood) SAC 000733	none							
Wicklow Mountains SAC 002122	3110	At least Good	Lake	Upper Glendalough	Moderate (AT RISK)	Yes	IE_EA_10_32	No
			Lake	Lower (Glendalough)	Unassigned (R)	No	IE_EA_10_30	No
			Lake	Tay	Moderate (R)	Yes	IE_EA_10_25	No
			Lake	Dan	Moderate (R)	Yes	IE_EA_10_29	No
			Lake	Loughs Bray (Upper)	Unassigned (NAR)	No	IE_EA_10_23	No
			Lake	Loughs Bray (Lower)	Good (NAR)	No	IE_EA_10_28	No
			Lake	Ouler	Unassigned (R)	No	IE_EA_10_31	No
			Lake	Nahanagan	Unassigned (R)	No	IE_EA_10_27	No
	Arctic char (possibly extinct)	Good	Lake	Dan	Moderate (R)	Yes	IE_EA_10_29	No
	1106 (not listed)	Good	River	Dargle_010	Good (AT RISK-HES obj)	No	IE_EA_10D010010	Yes
Salmonid rivers (outside SACs)	1106 (not listed)	Good	River	Dargle_020	Good (NAR)	No	IE_EA_10D010100	Yes
			River	Dargle_030	Poor (AT RISK)	Yes	IE_EA_10D010250	Yes
			River	Dargle_040	Good (NAR)	No	IE_EA_10D010300	Yes
			River	Vartry_010	High (NAR-HES obj)	No	IE_EA_10V010050	Yes
			River	Vartry_030	Good (NAR)	No	IE_EA_10V010150	Yes
			River	Vartry_040	Good (NAR)	No	IE_EA_10V010300	Yes

Appendix 6 Pollution Impact Potential (PIP) Map for Phosphate

For areas where agriculture is deemed as the significant pressure, areas of high risk to surface water can be targeted. The map below shows relative risk of loss of phosphate to surface water. The risk of phosphate losses is strongly correlated on whether the land is poorly draining or free draining and the loadings applied i.e. significant loadings applied on poorly draining areas result in a high potential risk to surface water. However, this figure does not imply that actual losses from these areas are occurring but is a useful tool for informing where resources should be focused (i.e. by allowing high risk areas to be identified and prioritised for further investigation). PIP maps are available online at a scale of 1:20,000 and can be accessed by public bodies via the EDEN process.



Appendix 7 Local catchment assessment categories

Category	Assessment & Measures Evaluation Details
IA1	Further information provision (e.g. from IFI, LAs, EPA)
IA2	Point source desk-based assessment
IA3	Assessment of unassigned status water bodies, requiring field visit(s)
IA4	Regulated point sources, requiring field visit/s
IA5	Stream (catchment) walk to evaluate multiple sources in a defined (1 km) river stretch (used as the basis for estimating resource requirements)
IA6	Stream (catchment) walk in urban areas
IA7	Stream (catchment) walk along >1 km river stretches
IA8	Stream (catchment) walk along high ecological status (HES) objective rivers
IA9	Lakes assessment, requiring field visits
IA10	Groundwater assessments, requiring field visits