Nanny-Devlin Catchment Assessment 2010-2015 (HA 08)

Catchment Science & Management Unit

Environmental Protection Agency

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Preface

This document provides a summary of the characterisation outcomes for the water resources of the Nanny 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 Nanny and Delvin and by all streams entering tidal water between Mornington Point and Sea Mount, Co. Dublin, draining a total area of 711km². The largest urban centre in the catchment is Swords. The other main urban centres in this catchment are Donabate, Lusk, Skerries, Balbriggan, Stamullen, Laytown, Bettystown, Duleek, Ashbourne, Ratoath and Dunshaughlin. The total population of the catchment is approximately 159,230 with a population density of 224 people per km².

The Nanny River flows east from Kentstown, after which it is joined from the south by the River Hurley, which drains the area north of Ashbourne. The Nanny continues east through Duleek before flowing into the Irish Sea at Laytown. The Delvin River flows north east from Garristown and through Stamullin before entering the sea at Knocknagin Viaduct.

The coastal part of the catchment from Balbriggan to Rush is drained by a series of small rivers including the Matt, Balcunnin and Palmerstown Rivers. The Ballyboghil River flows east through Ballyboughal before entering Rogerstown Estuary and flowing into the sea around the Burrow north of Portraine. The Broadmeadow River flows east from Dunshaughlin, through Rathoath and Ashbourne, and into Malahide Estuary north of Swords. The Ward River drains the southern edge of the catchment, flowing east and through Swords, then joining the Broadmeadow River and continuing to sea via Malahide Estuary.

An arterial drainage scheme was completed on the Broadmeadow and Ward Rivers by the OPW between 1961 and 1964 and on the Matt River between 1964 and 1965. Flood relief works were completed on the Nanny River around Duleek in 1998.

The Nanny-Devlin catchment comprises six subcatchments with 34 river water bodies, no lakes, three transitional and three coastal water bodies, and ten groundwater bodies (Table 1, Figure1).

Table 1. List of subcatchments in the Nanny-Devlin catchment

Subcatchment ID	Subcatchment Name
08_1	Delvin_SC_010
08_2	PALMERSTOWN_SC_010
08_3	Broadmeadow_SC_010
08_4	Nanny[Meath]_SC_010
08_5	Nanny[Meath]_SC_020
08_6	Ballough[Stream]_SC_010

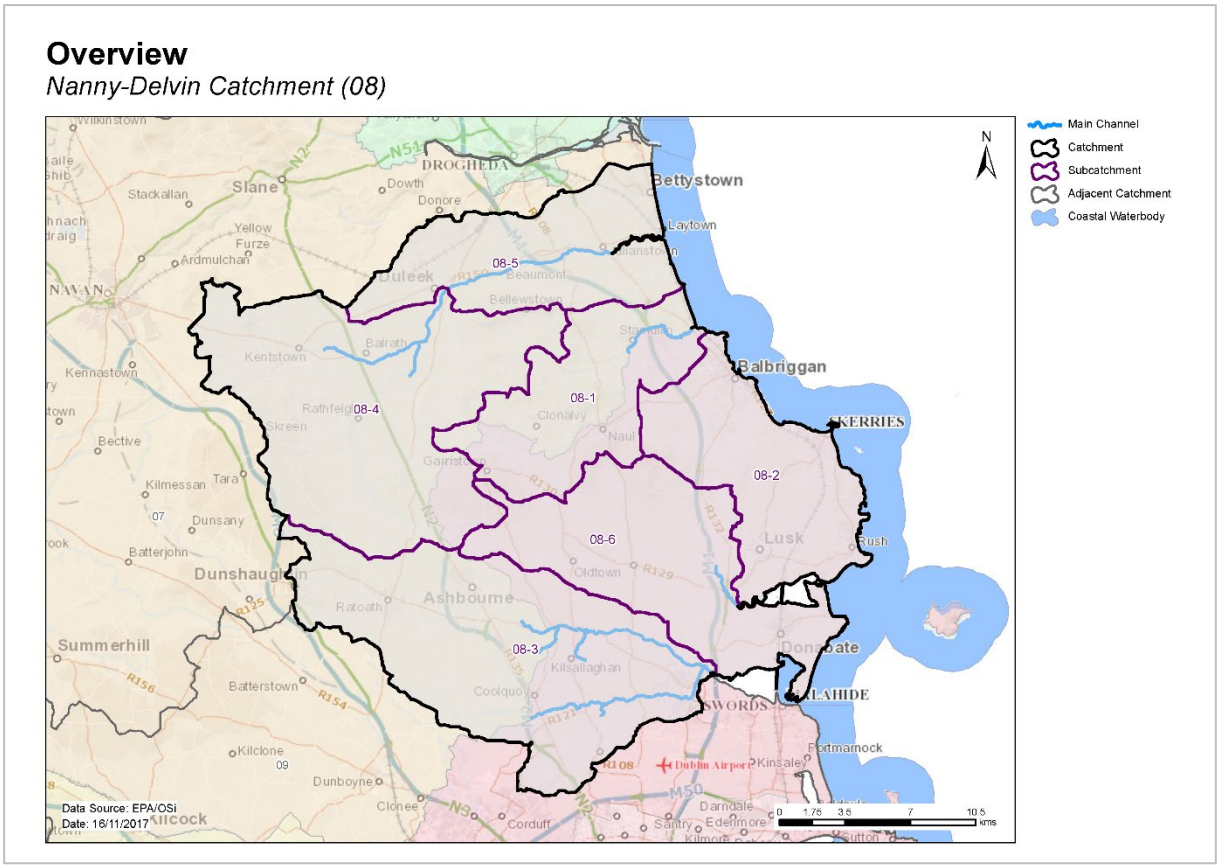


Figure 1. Subcatchments in the Nanny-Devlin catchment

2 Water body status and risk of not meeting environmental objectives

2.1 Surface water ecological status

2.1.1 Rivers

- There were three (9%) river water bodies at Good or High status, and 20 (59%) at less than Good status in 2015 (Table 2, Figure 2). Eleven (32%) river water bodies are unassigned.
- There are no river water bodies and that have a high ecological status objective.
- The numbers of water bodies at each status class in 2007-09 and 2010-15 are shown in Figure 4 (rivers).
- Five water bodies have improved and two have deteriorated since 2007-09 (Figure 6).
- The variation in nutrient concentrations and loads in the Nanny main channel is illustrated in Appendix 1.

2.1.2 Transitional and Coastal (TraC)

- Of the six TraC water bodies, one (17%) was at Good status (North-western Irish Sea (HA 08)), two were at Moderate status (Malahide Bay and Broadmeadow Water), and one was at Bad status (Rogerstown Estuary) (50%) in 2015 (Table 2, Figure 2). Two TraC water bodies (33%) are unassigned (Nanny Estuary and Rockabill).
- There is one TraC water body with a high ecological status objective, North-western Irish Sea HA08. This water body was at Good ecological status in 2015. Figure 3 Appendix 1.

- The numbers of TraC water bodies in each status class in 2007-09 and 2010-15 is shown in Figure 5.
- Note the coastal water body (North-western Irish Sea (HA 08), is shared with Catchment 07 and Catchment 09.

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	34	0	3	4	16	0	11	0	9	25
TraC	6	0	1	2	0	1	2	1	2	3

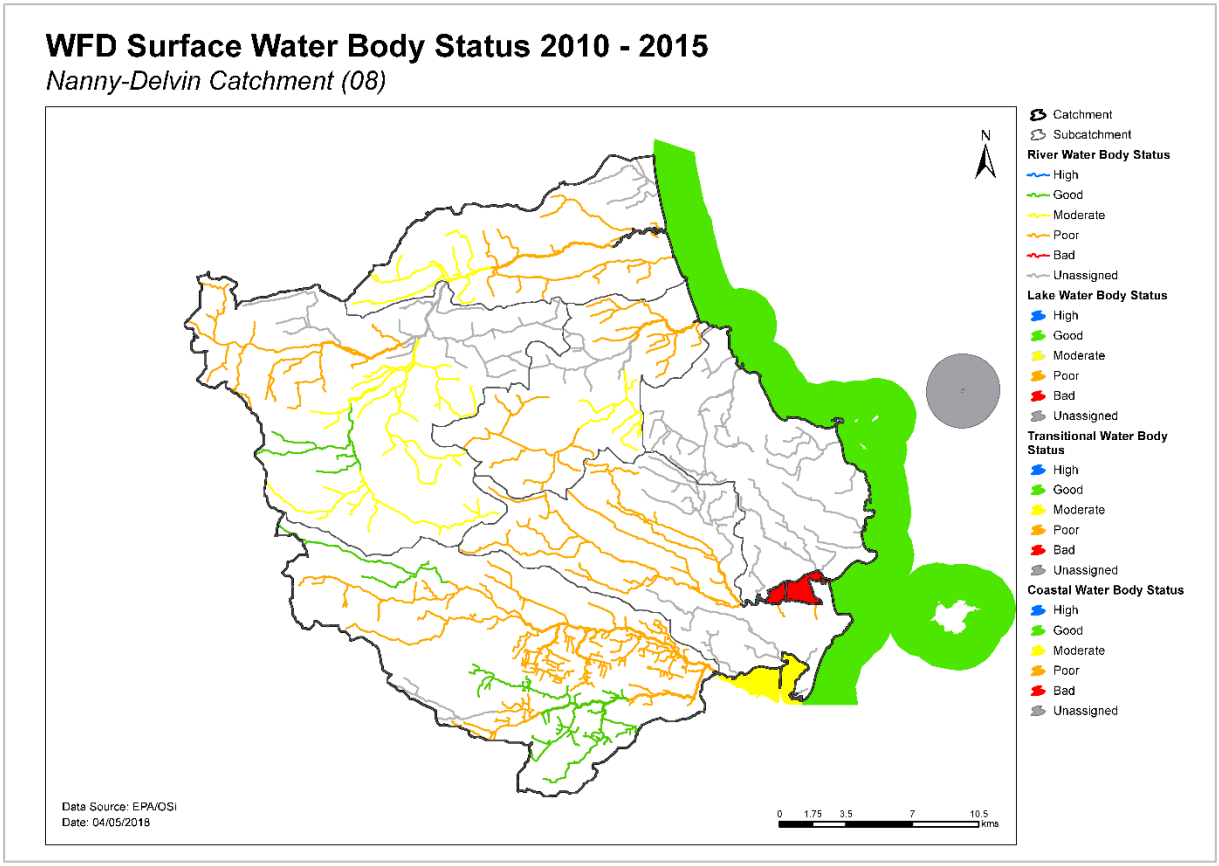


Figure 2 Surface water ecological status

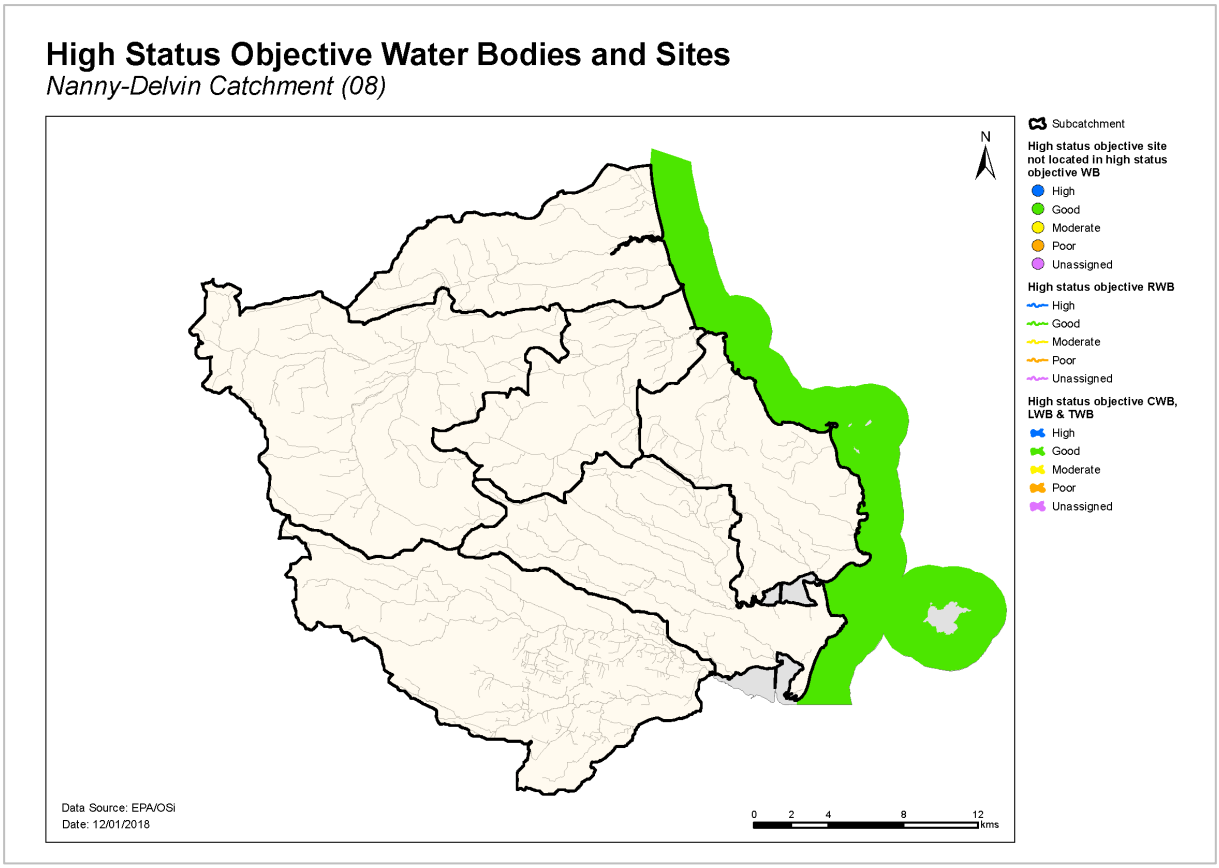


Figure 3. High ecological status objective water bodies and sites.

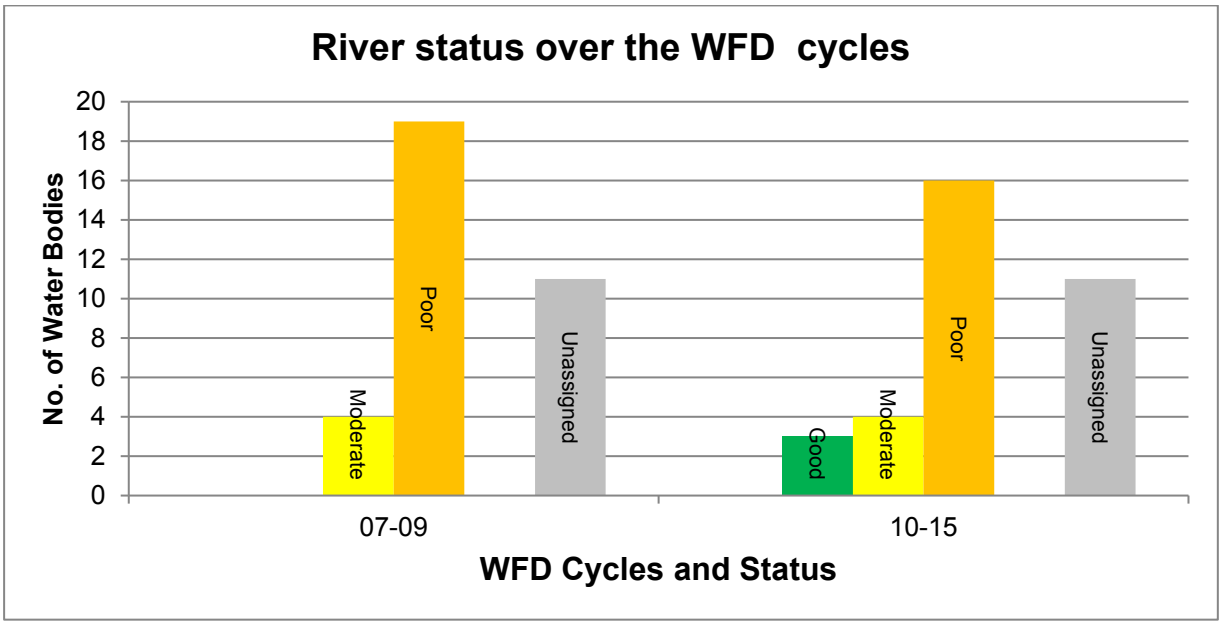


Figure 4. Number of rivers at each status class in 2007-09 and 2010-15

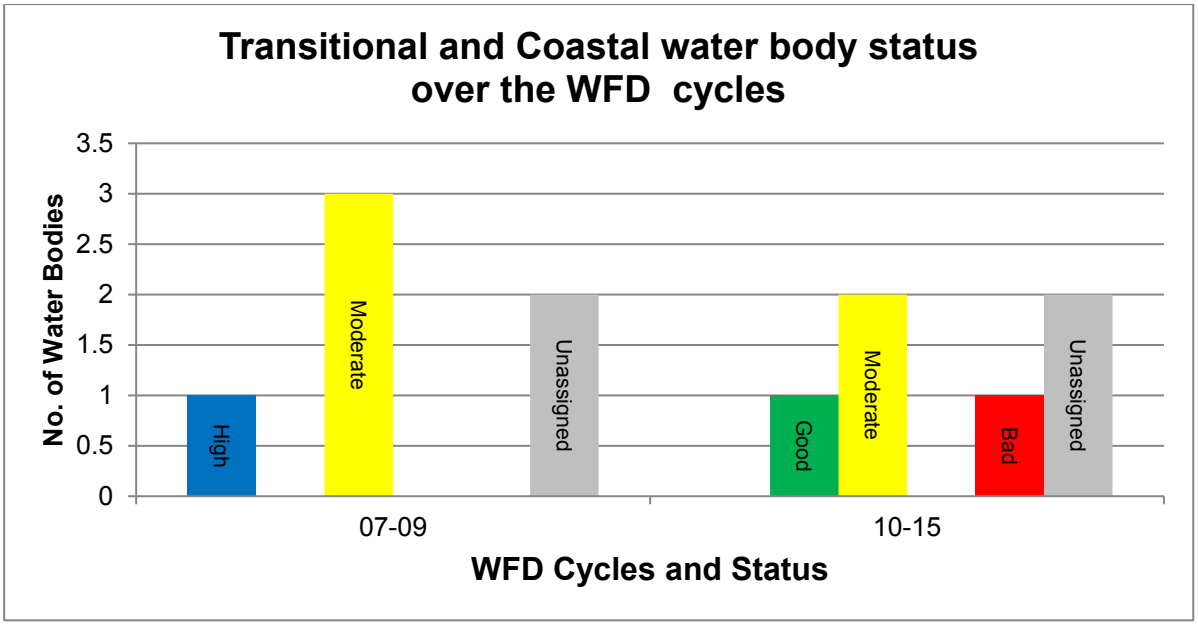


Figure 5. Number of transitional and coastal water bodies at each status class in 2007-09 and 2010-15

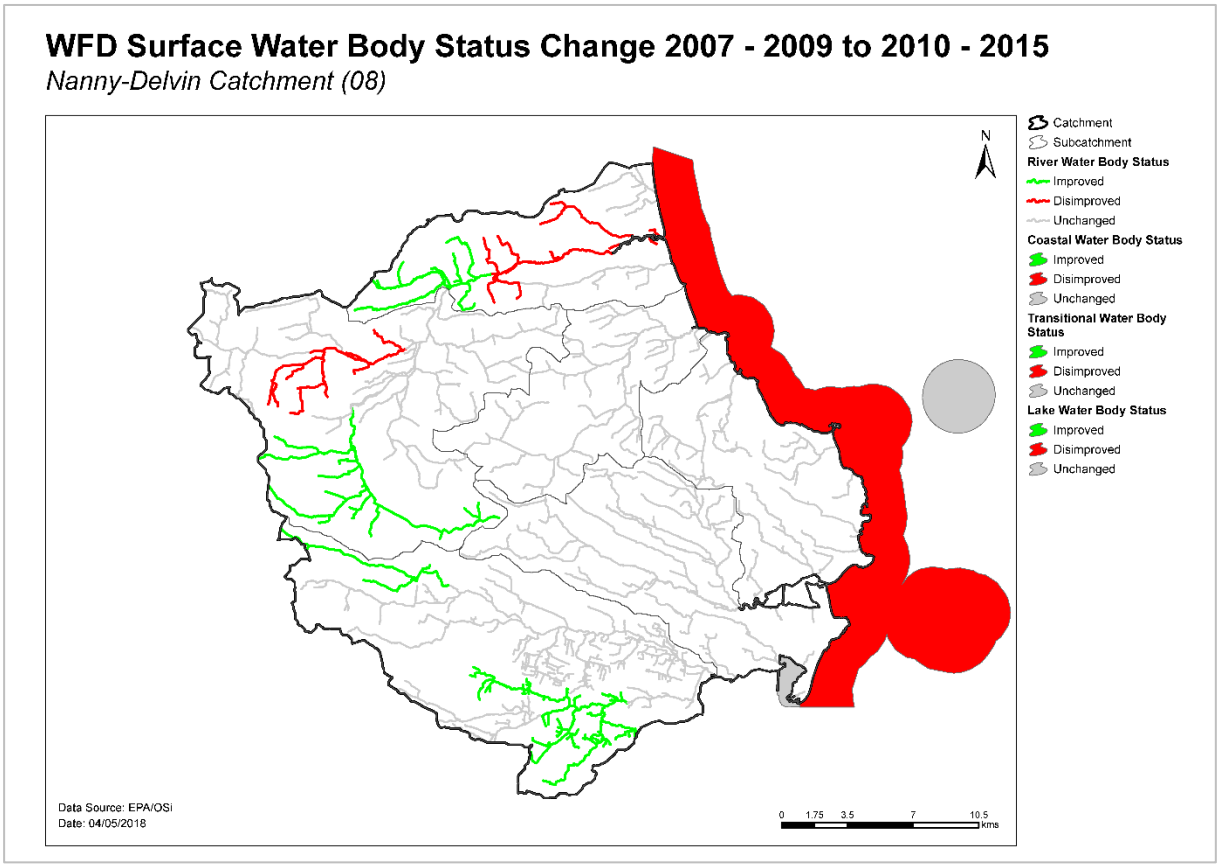


Figure 6. Surface water body status changes from 2007-09 to 2010-15

2.2 Groundwater status

- There were eight groundwater bodies at Good status (80%) and two (Bettystown and Industrial Facility (P0014-03) IE_EA_G_062) at Poor (20%) status in 2015 (Table 3, Figure 7 and 8).

Table 3. Summary of water body status and risk for ground waters

	Number of water bodies	2010-15 Status		Risk Categories		
		Good	Poor	*Not at Risk*	*Review*	*At Risk*
Groundwater	10	8	2	3	5	2

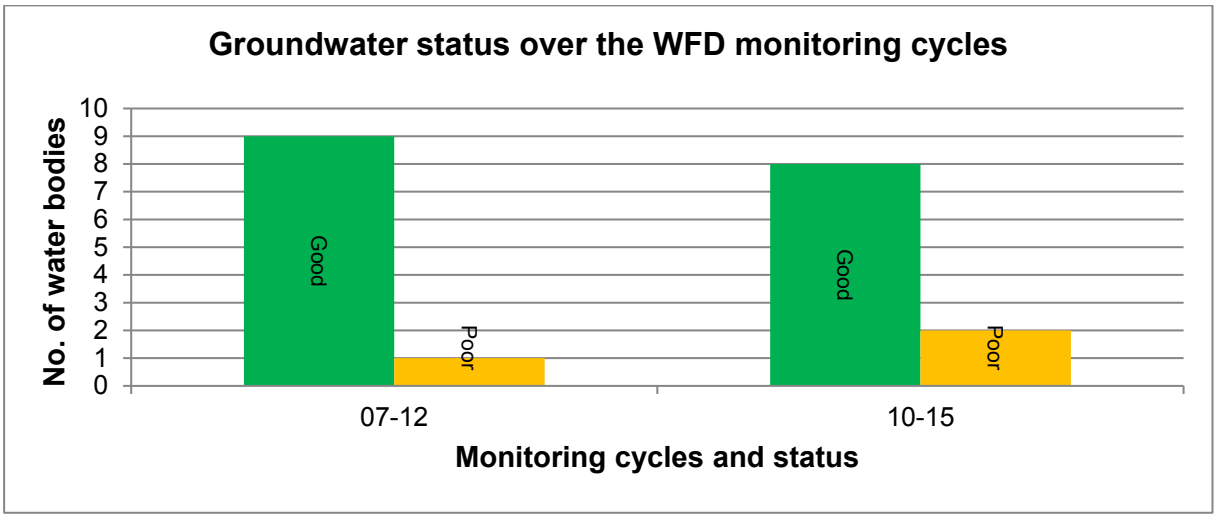


Figure 7. Number of groundwater bodies at each status class in 2007-12 and 2010-15

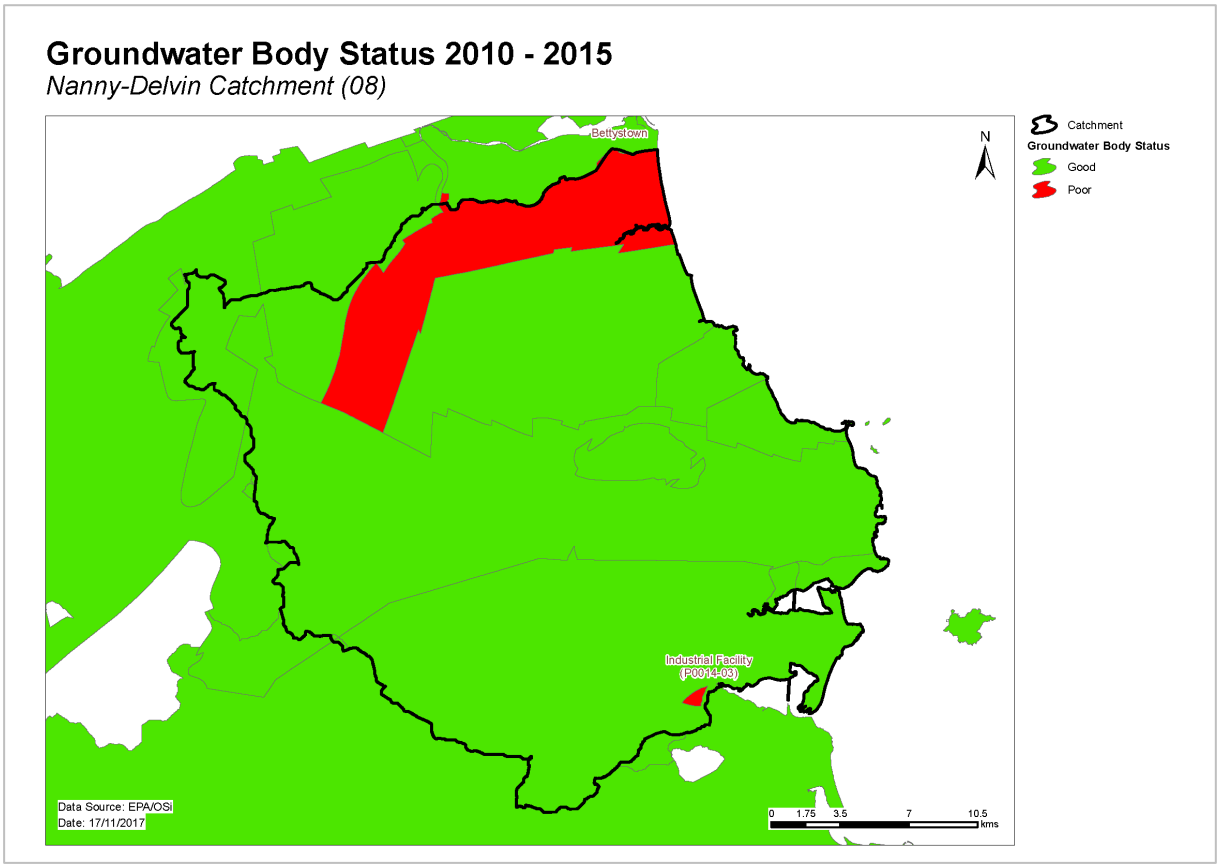


Figure 8. Groundwater body status 2010-15

2.3 Risk of not meeting surface water environmental objectives

2.3.1 Rivers

- There are no *Not At Risk* river water bodies in the catchment.
- There are nine river water bodies in *Review*. This applies to five water bodies where more information is required and three water bodies where measures have recently been implemented and improvements have not yet been realised.
- Twenty-five surface water bodies 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)

- One TraC water body (Rockabill) is *Not at Risk* (Figure 9, Table 2) and requires no additional investigative assessment or measures to be applied, other than those measures that are already in place.
- Two TraC water bodies (North-western Irish Sea (HA 08) coastal and Nanny Estuary, transitional) are in *Review* where more information is required.
- Three TraC water bodies including two transitional (Rogerstown Estuary and Broadmeadow Water) and one coastal water body (Malahide Bay) 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.

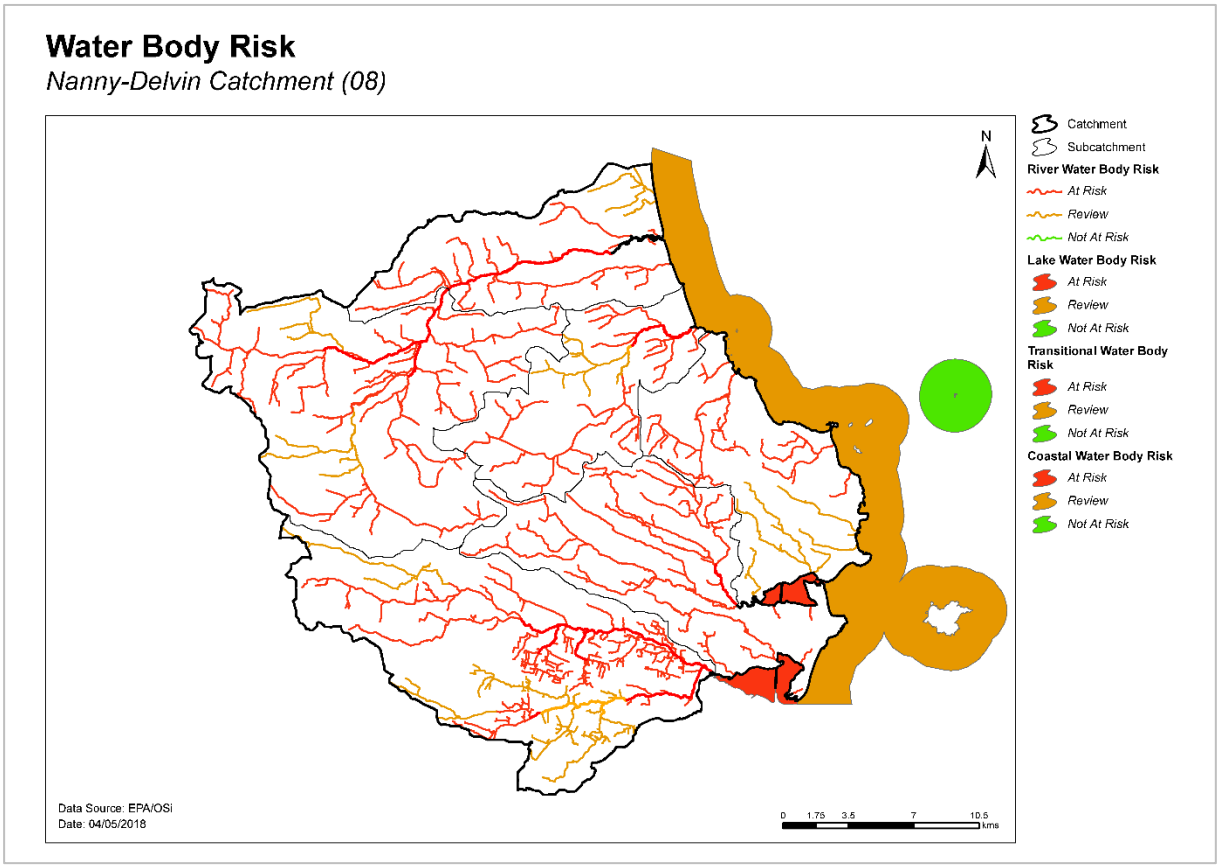


Figure 9. Surface water body risk

2.4 Risk of not meeting groundwater environmental objectives

- Three groundwater bodies are *Not at Risk* (Figure 10, Table 3) and require no additional investigative assessment or measures to be applied, other than those measures that are already in place.
- Five groundwater bodies are in *Review* (Duleek, Realtage, Hynestown, Balbriggan and Balrothery) (Figure 10) because of elevated nitrate concentrations.
- Two groundwater bodies are *At Risk* and measures will be needed in these water bodies to improve the water quality outcomes. Bettystown is *At Risk* due to groundwater contribution of phosphate to *At Risk* surface waters that are not meeting their water quality objectives (Table 4). Industrial Facility (P0014-03) IE_EA_G_062 is *At Risk* because of DCM, MTBE and TBA.

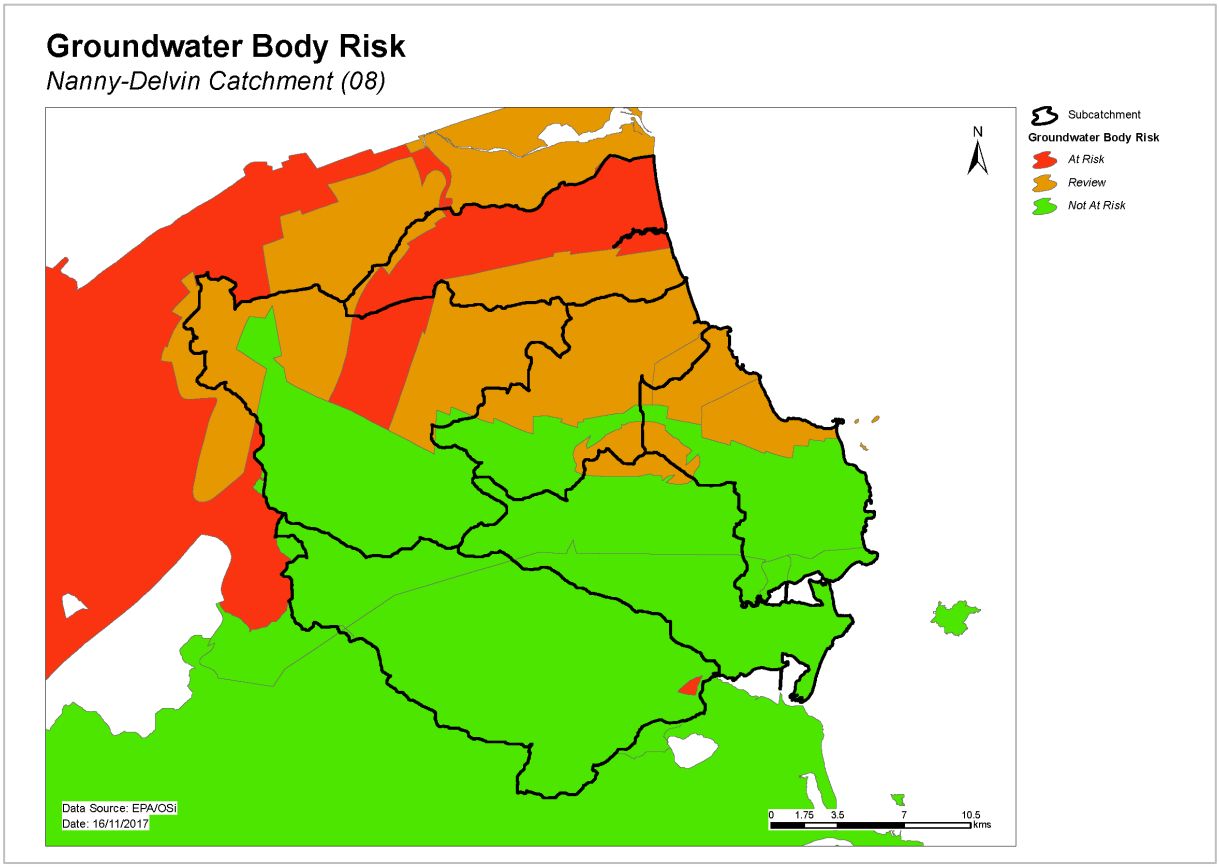


Figure 10. Groundwater body risk

Table 4. Summary of *At Risk* surface water bodies where phosphate from groundwater may contribute to an impact.

Groundwater body name	Receiving water body code	Receiving water body name
Bettystown	IE_EA_08H010400	HURLEY_030
Bettystown	IE_EA_08N010280	NANNY (MEATH)_020
Bettystown	IE_EA_08N010400	NANNY (MEATH)_030
Bettystown	IE_EA_08N010500	NANNY (MEATH)_040
Bettystown	IE_EA_08N010700	NANNY (MEATH)_050

2.5 Protected areas

2.5.1 Drinking water abstractions

- There are 12 abstractions in the Nanny Catchment comprising of six public supplies and three private supplies (Appendix 3).
- All 12 of the abstractions are from four groundwater bodies (Lusk-Bog of the Ring IE_EA_G_014, Swords IE_EA_G_011, Duleek IE_EA_G_012 and Realtage IE_EA_G_020). The list of the public supplies and the associated water bodies is provided in Appendix 3.
- All sources were compliant with the standard for nitrate in 2015.
- One source was non-compliant for pesticides in 2015 (East Meath RWS), which is abstracted from Lusk-Bog of the Ring. The key issue was total pesticides. All other sources were compliant.

2.5.2 Bathing waters

- There are eight designated bathing waters in the catchment.
- Four of the bathing waters are in satisfactory condition, however four (Rush, South Beach; Loughshinny Beach; Skerries, South Beach and Balbriggan, Front Strand Beach) failed to meet their bathing water objectives, due to bacteriological water quality.
- The list of the bathing waters and the associated water bodies is provided in Table 5.

2.5.3 Shellfish areas

- There are two designated shellfish areas in the catchment (Malahide and Balbriggan/Skerries). They are compliant with the relevant standards and there no water quality issues of concern.
- Details on the shellfish area and its associated water body is summarised in Table 6.

Table 6. Designated shellfish areas in the catchment

Shellfish area		Water body intersection		Objective met?	
Name	Code	Name	Code	Yes	No
Malahide	IEPA2_0057	North-western Irish Sea (HA 08)	IE_EA_020_0000	✓	
Balbriggan\Skerries	IEPA2_0063	North-western Irish Sea (HA 08)	IE_EA_020_0000	✓	

2.5.4 Nutrient Sensitive Areas

- There is one designated Nutrient Sensitive Area (NSA) (Broadmeadow Estuary (Inner)) in the catchment.
- The NSA is associated with Swords waste water treatment which has tertiary treatment and, therefore, is compliant with environmental objectives for NSAs.
- The NSA, associated agglomeration and intersecting water body is provided in Table 7.

Table 7. Nutrient sensitive areas in the catchment

Nutrient Sensitive Area		Agglomeration		Water body intersection		Objective met?		Comment
Name	Code	Name	Code	Name	Code	Yes	No	
Broadmeadow Estuary (Inner)	IETW_EA_2001_0026	Swords	D0024	Broadmeadow Water	IE_EA_060_0100	✓		Tertiary treatment is in place.

Table 5. Designated bathing waters in the catchment

Bathing Water	Water Body Intersection	Objective met?	Comment	Objective met?		Comment
Name	Code	Name	Code	Yes	No	
Rush, South Beach	IEEABWC020_0000_0300	North-western Irish Sea (HA 08)	IE_EA_020_0000		✓	Rush South beach was classified as having poor water quality (based on the assessment of bacteriological results) during 2011-2014 and 2012-2015.
Loughshinny Beach	IEEABWC020_0000_0400	North-western Irish Sea (HA 08)	IE_EA_020_0000		✓	Loughshinny showed one exceptionally poor sample after heavy rain in 2014 but would otherwise meet 'Sufficient' quality. Management plan actions include decommissioning of existing Septic tank and diversion of flows to Barnageeragh WWTP (Skerries). Expected by end 2017.
Skerries, South Beach	IEEABWC020_0000_0500	North-western Irish Sea (HA 08)	IE_EA_020_0000		✓	Sufficient quality: 2012-2015. Less than Good quality E.coli, 95th percentile: 525 and 90th percentile: 305. Good quality IE, 95th percentile: 144 and 90th percentile: 77. If comparable performance is achieved in 2016, Good quality is possible.
Balbriggan, Front Strand Beach	IEEABWC020_0000_0600	North-western Irish Sea (HA 08)	IE_EA_020_0000		✓	Sufficient quality: 2012-2015. Sufficient quality Ecoli, 95th percentile: 702 and 90th percentile: 402. Marginal sufficient status IE, 95th percentile: 210, 90th percentile: 114. If 2016 results are similar, it may remain at 'Sufficient'. Balbriggan remains extremely vulnerable to pollution from the Matt River and activities within Balbriggan harbour area. Control measures indicated in the 2013 BW profile to be followed up with Fingal Co. Co.
Laytown/Bettystown	IEEABWC020_0000_0700	North-western Irish Sea (HA 08)	IE_EA_020_0000	✓		
Portrane, the Brook Beach	IEEABWC020_0000_0200	North-western Irish Sea (HA 08)	IE_EA_020_0000	✓		
Donabate, Balcarrick Beach	IEEABWC020_0000_0100	North-western Irish Sea (HA 08)	IE_EA_020_0000	✓		
Rush, North Beach	IEEABWC020_0000_0350	North-western Irish Sea (HA 08)	IE_EA_020_0000	✓		

2.5.5 Natura 2000 Sites

- There are two Special Areas of Conservation (SACs) in the catchment (Appendix 4). However, these SACs do not have water quality and/or quantity conservation objectives for their qualifying interests.
- There are three Special Protected Areas (SPAs) in the catchment:
    - Broadmeadow/Swords Estuary SPA
    - River Nanny Estuary and Shore SPA
    - Rogerstown Estuary 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 priority action for WFD protected area purposes in the second cycle.

2.6 Heavily modified water bodies

- There is one designated heavily modified water body (HMWB) in the catchment – Broadmeadow Water due to public transport infrastructure. It was classified as having Moderate Ecological Potential in 2013-15.
- 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 rivers.
- Alteration of hydromorphological (or physical) conditions are impacted (including the input of excessive fine sediment) due to land drainage and channelisation. The excessive release of fine sediment has also occurred through animal access to water bodies. Such impacts have altered the morphology of water bodies and in turn, altered habitat conditions. The Broadmeadow and Rogerstown estuaries are also impacted hydromorphologically by the Dublin-Belfast railway line.
- The Rogerstown Estuary IE_EA_050_0100 is being impacted by nutrients (DIN) and deteriorated dissolved oxygen conditions, fish and opportunistic macroalgae are an issue, and the seagrass beds are in decline. Broadmeadow Water IE_EA_060_0100 is impacted by excess nutrients (DIN), deteriorated dissolved oxygen conditions and BOD; and fish, phytoplankton and opportunistic macroalgae are at less than Good status. Malahide Bay IE_EA_060_0000 has macroalgae issues, however nutrient conditions are satisfactory.
- Groundwater bodies act as a pathway to surface waters and may be contributing some of the phosphate in places. There is also an issue in relation to chemistry, specifically DCM, MTBE and TBA in IE_EA_G_062.

4 Significant pressures

4.1 Water bodies

- Where water bodies have been classed as *At Risk*, by water quality or survey data, significant pressures have been identified.
- Figure 11 show a breakdown of the number of *At Risk* water bodies in each significant pressure category.

4.1.1 Rivers, Transitional and Coastal (TraC)

- Significant pressures have been identified by the initial characterisation process in 28 surface water bodies, 24 of which have multiple pressures. The significant pressures will be refined as further characterisation is carried out.
- The significant pressure affecting the greatest number of water bodies is agriculture, followed by hydromorphological pressures, urban waste water, diffuse urban, domestic waste water, industry, mines and quarries and other.
- The significant pressures affecting the Rogerstown Estuary IE_EA_050_0100 are agriculture and domestic waste water. Broadmeadow Water IE_EA_060_0100 is also impacted by domestic waste water, as well as urban waste water. Malahide Bay IE_EA_060_0000 is impacted by urban waste water.

4.1.2 Groundwater

- There is one *At Risk* groundwater body, Bettystown IE_EA_G_016, which is impacted by agriculture; and another groundwater body, Industrial Facility (P0014-03) IE_EA_G_062, which is impacted by industry.

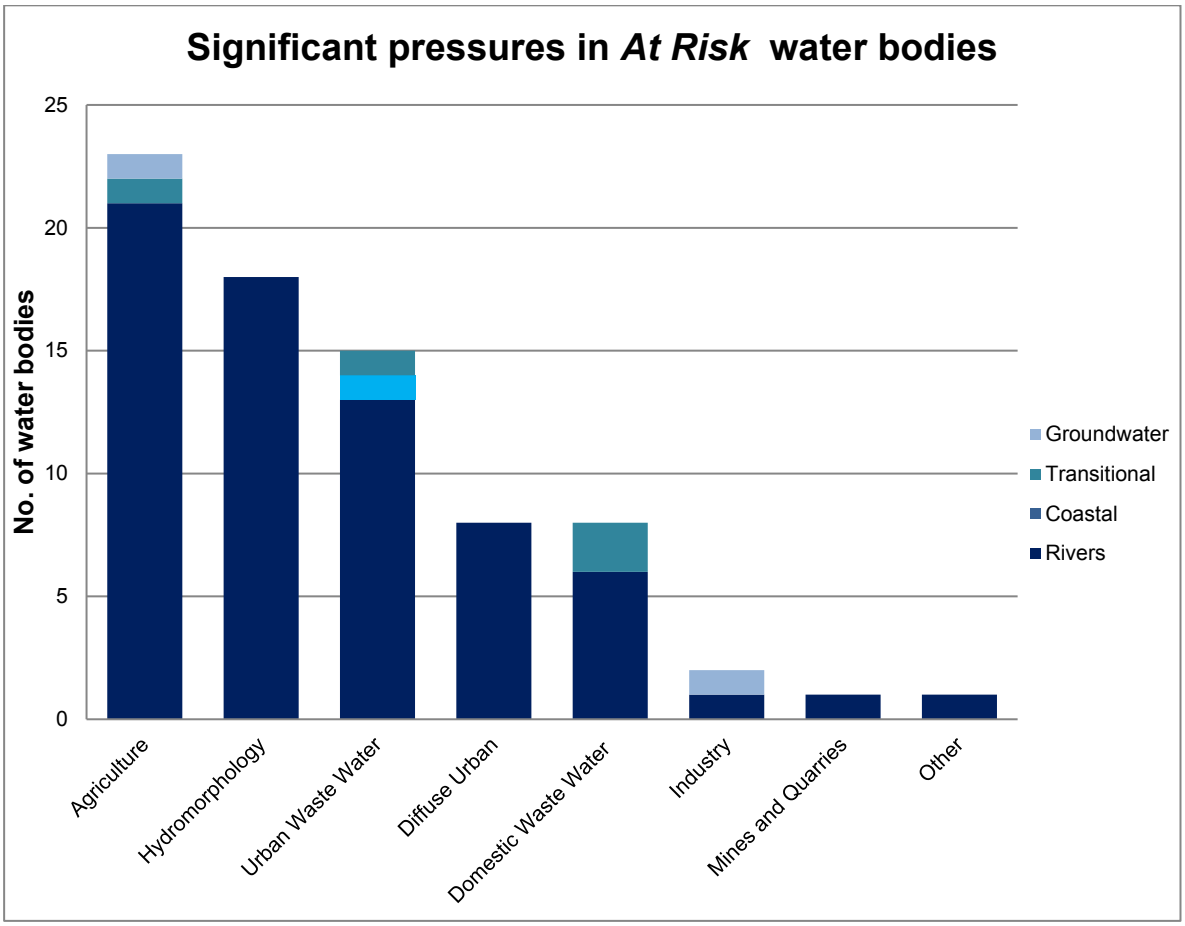


Figure 11. Significant pressures impacting on *At Risk* water bodies

4.2 Pressure type

4.2.1 Agriculture

- Agriculture is a significant pressure in 21 river water bodies, one transitional water body (Rogerstown Estuary) (Figure 12, Appendix 3) and one groundwater body (Bettystown (IE_EA_G_016)). The issues related to farming in this catchment are predominantly due to enrichment from diffuse phosphorus loss 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. Issues with sheep dipping was also noted in one water body. One groundwater body is impacted by agriculture, and is acting as a pathway to surface water, contributing to phosphate issues in receiving waters. The pollution impact potential map showing areas of relative risk for phosphorus loss from agriculture to surface water is given in Appendix 5.

4.2.2 Hydromorphology

- Eighteen river water bodies within the Delvin, Palmerstown, Broadmeadow and Nanny [Meath] subcatchments are subject to extensive modification due to the presence of drainage schemes. Siltation was also identified as an issue within three of these channelised river water bodies located within Delvin, Broadmeadow and Nanny [Meath]. An impoundment is impacting a water body within the Delvin subcatchment. See Appendix 3 for information on these water bodies. Figure 13.

Table 6a – Hydromorphological pressures on the Nanny/Delvin Catchment

Pressure	Sub-Catchment	Water body Code
Modification due to Drainage Schemes (Channelisation)	Delvin_SC_010	Delvin_010
	Palmerstown_ SC_010	Matt_010
	Broadmeadow_ SC_010	Broadmeadow_010
		Broadmeadow_020
		Broadmeadow_030
		Broadmeadow_040
		Fairyhouse Stream_010
		Ratoath Stream_010
		Ward_020
		Ward_040
	Nanny_ SC_010	Hurley_010
		Hurley_030
		Nanny_010
		Nanny_020
		Nanny_030
	Nanny_ SC_020	Nanny_040
		Nanny_050
In River Structures	Delvin_ SC_010	Delvin_010

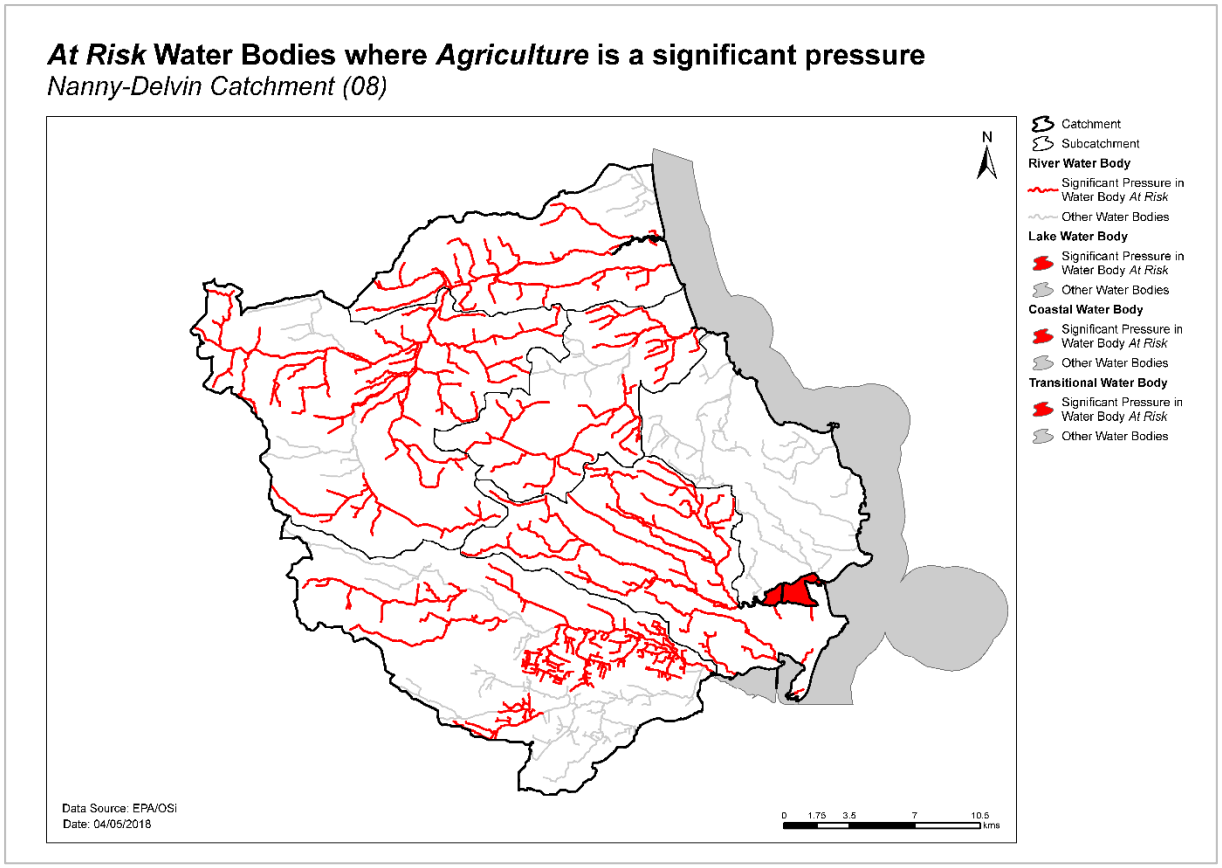


Figure 12. Water bodies that are *At Risk* and are impacted by agricultural activities

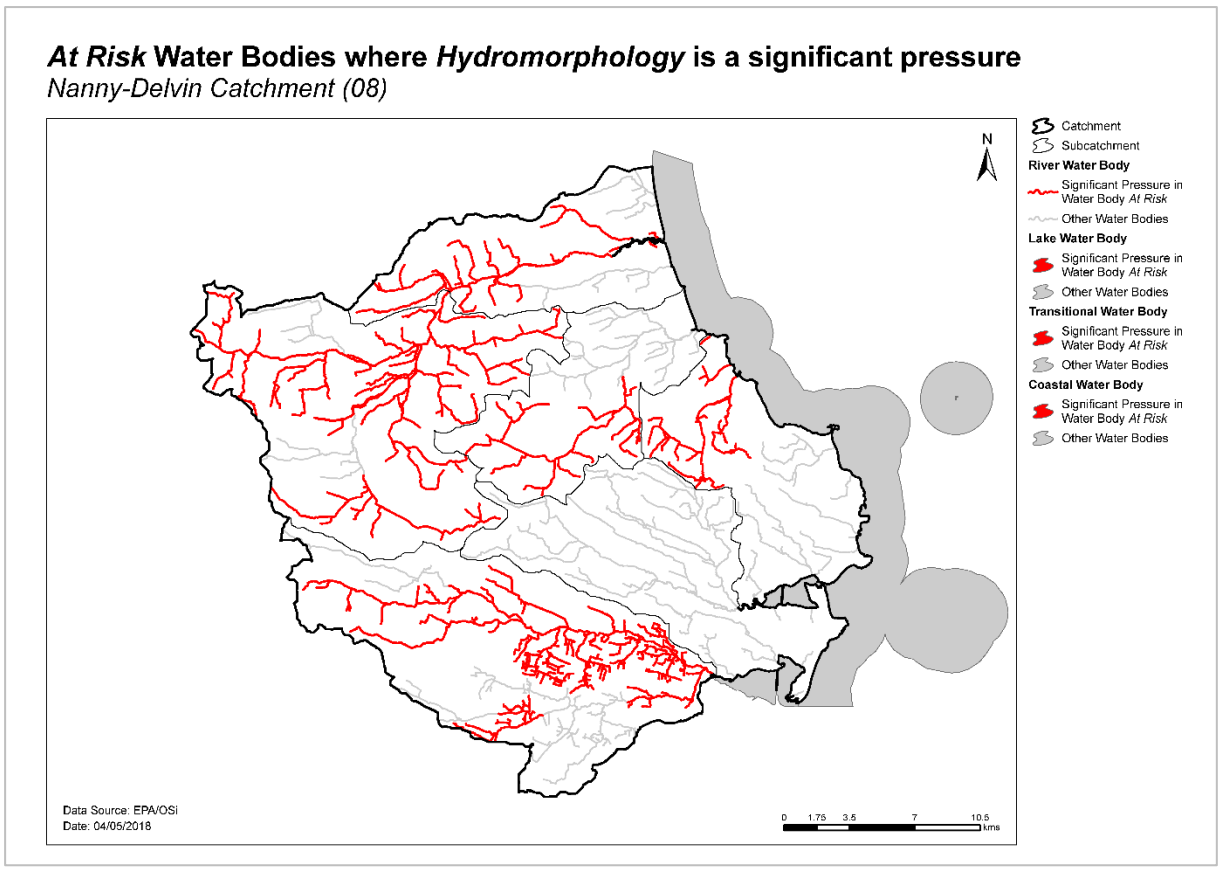


Figure 13. Water bodies that are *At Risk* and are impacted by hydromorphological pressures

4.2.3 Urban waste water treatment plants

- Urban Waste Water Treatment Plants (WWTPs) and agglomeration networks have been highlighted as a significant pressure in 15 *At Risk* water bodies; details are given in Table 8 and Figure 14. Five *At Risk* water bodies are impacted by WWTPs and agglomeration networks that are scheduled to be upgraded before 2021. Four *At Risk* water bodies are impacted by the Ringsend Agglomeration, which is due to be upgraded post 2027, one water body, Delvin_040, is impacted by Stamullen WWTP, which is scheduled to be upgraded in 2025, and one water body, Broadmeadow Water, is impacted by the Swords WWTP, which will be upgraded in 2017.

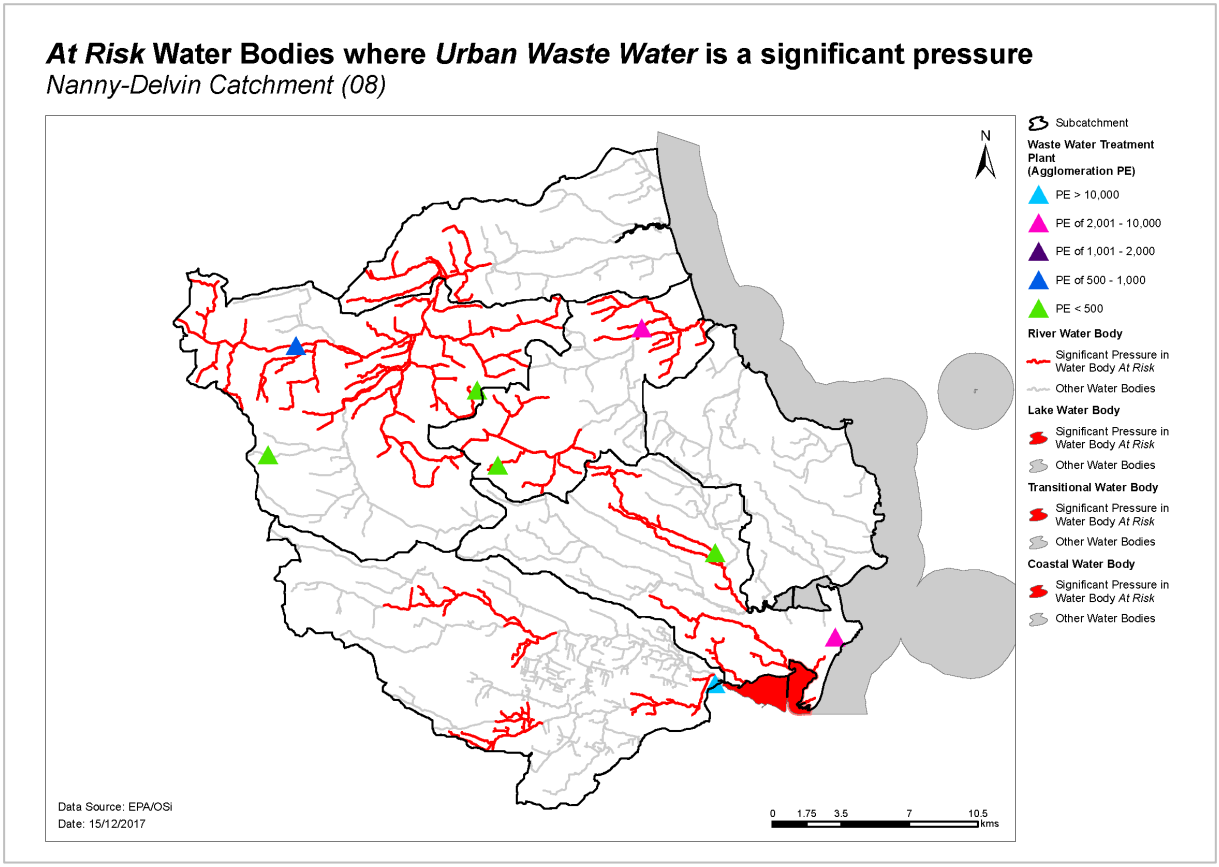


Figure 14. Water bodies that are *At Risk* and are impacted by urban waste water

4.2.4 Diffuse urban

- Diffuse urban pressures, caused by misconnections, leaking sewer, pumping station overflows and runoff from paved and unpaved areas (including a motorway), have been identified as a significant pressure in eight water bodies (Figure 15, Appendix 3) for several towns which include Balbriggan, Swords, Dunshaughlin, Ratoath and Ashbourne. The significant issues are a combination of enrichment due to orthophosphate and ammonia concentrations. There are also impacted oxygenation conditions.

4.2.5 Domestic waste water

- Domestic waste water has been identified as a significant pressure in six river water bodies and two transitional Rogerstown and Broadmeadow estuaries. The significant issues arise from unsuitable domestic waste water treatment systems when they are poorly sited on areas of high pollution impact potential/poorly draining soils, resulting in enrichment and organic contamination (Figure 16, Appendix 3).

Table 8. 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
Garristown A0110	< 500 p.e.	Delvin_010	Poor	*NA* [1]
Stamullen D0262	2,001 to 10,000 p.e.	Delvin_040	Poor	2023
Ringsend D0034	> 10,000 p.e.	*Ward_020* [2]	Poor	Post 2027
Ringsend D0034	> 10,000 p.e.	*Broadmeadow_010* [2]	Poor	Post 2027
Ringsend D0034	> 10,000 p.e.	*Broadmeadow_020* [2]	Poor	Post 2027
Ringsend D0034	> 10,000 p.e.	*Ward_040* [2]	Poor	Post 2027
Ardcath A0017	< 500 p.e.	Hurley_030	Moderate	*NA* [1]
Kentstown D0479	500 to 1,000 p.e.	Nanny (Meath)_010	Poor	2019
Kentstown D0479	500 to 1,000 p.e.	Nanny (Meath)_020	Poor	2019
Kentstown D0479	500 to 1,000 p.e.	Nanny (Meath)_030	*Unassigned* [3]	2019
Kentstown D0479	500 to 1,000 p.e.	Nanny (Meath)_040	Moderate	2019
Ardcath A0017	< 500 p.e.	Nanny (Meath)_040	Moderate	*NA* [1]
Skreen A0055	< 500 p.e.	Nanny (Meath)_040	Moderate	*NA* [1]
Portrane, Donabate, Rush, Lusk D0114	2,001 to 10,000 p.e.	*Turvey_010* [2]	*Unassigned* [3]	2018
Colecot Cottages A0107	< 500 p.e.	Ballough Stream_020	Poor	*NA* [4]
Swords D0024	> 10,000 p.e.	Broadmeadow Water	Moderate	2017
Malahide D0021	> 10,000 p.e.	Malahide Bay	Moderate	*NA* [1]

[1] *Currently not specified in improvement plans.*

[2] *The agglomeration network, rather than the WWTP, has been identified as a significant pressure impacting Broadmeadow_010, Broadmeadow_020, Ward_020, Ward_040 and Turvey_010.*

[3] *Ecological Status is not available for Nanny (Meath)_030 and Turvey_010, however, following discussions at the local authority workshops, both water bodies were deemed to be At Risk of not meeting their environmental objectives.*

[4] *Colecot Cottages agglomeration network is scheduled to be upgraded by 2024, however, the WWTP, which is not scheduled to be upgraded, has been identified as the significant pressure impacting Ballough Stream_020.*

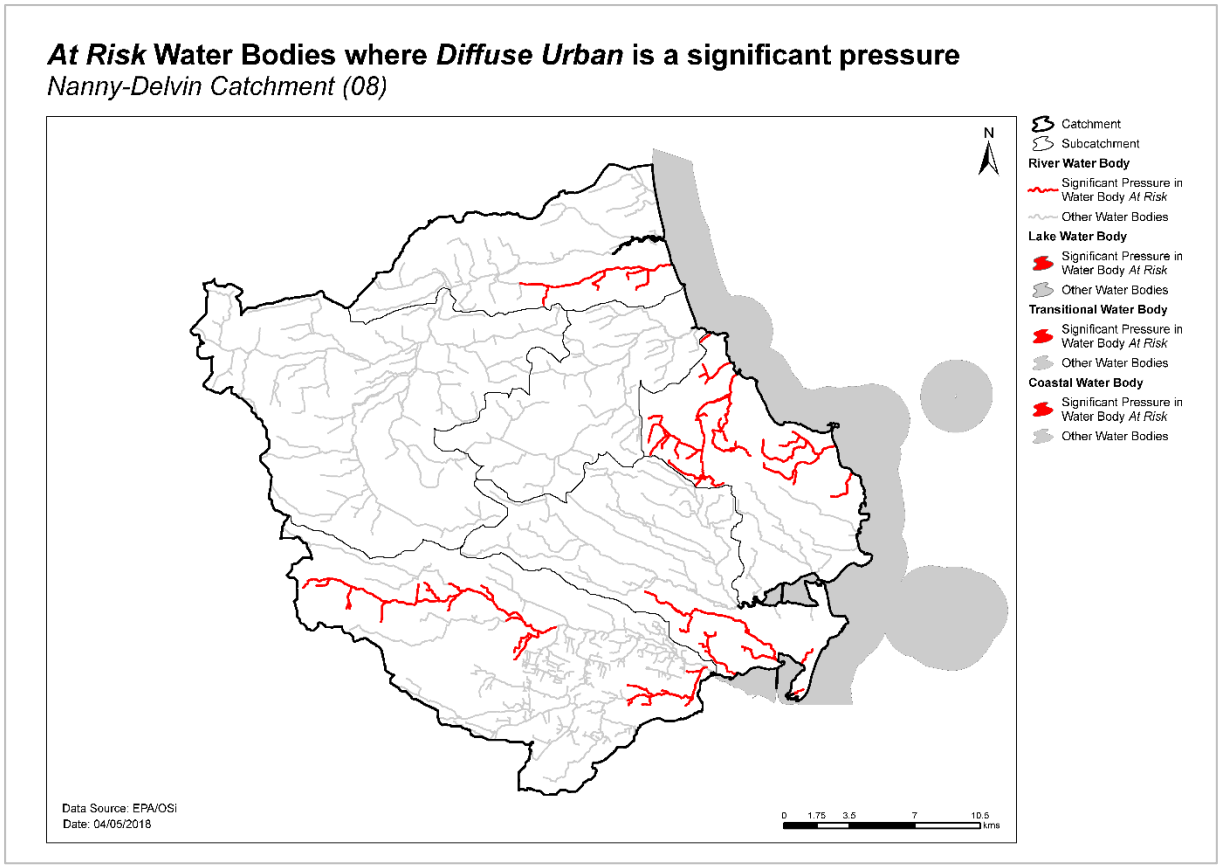


Figure 15. Water bodies that are *At Risk* and are impacted by diffuse urban pressures

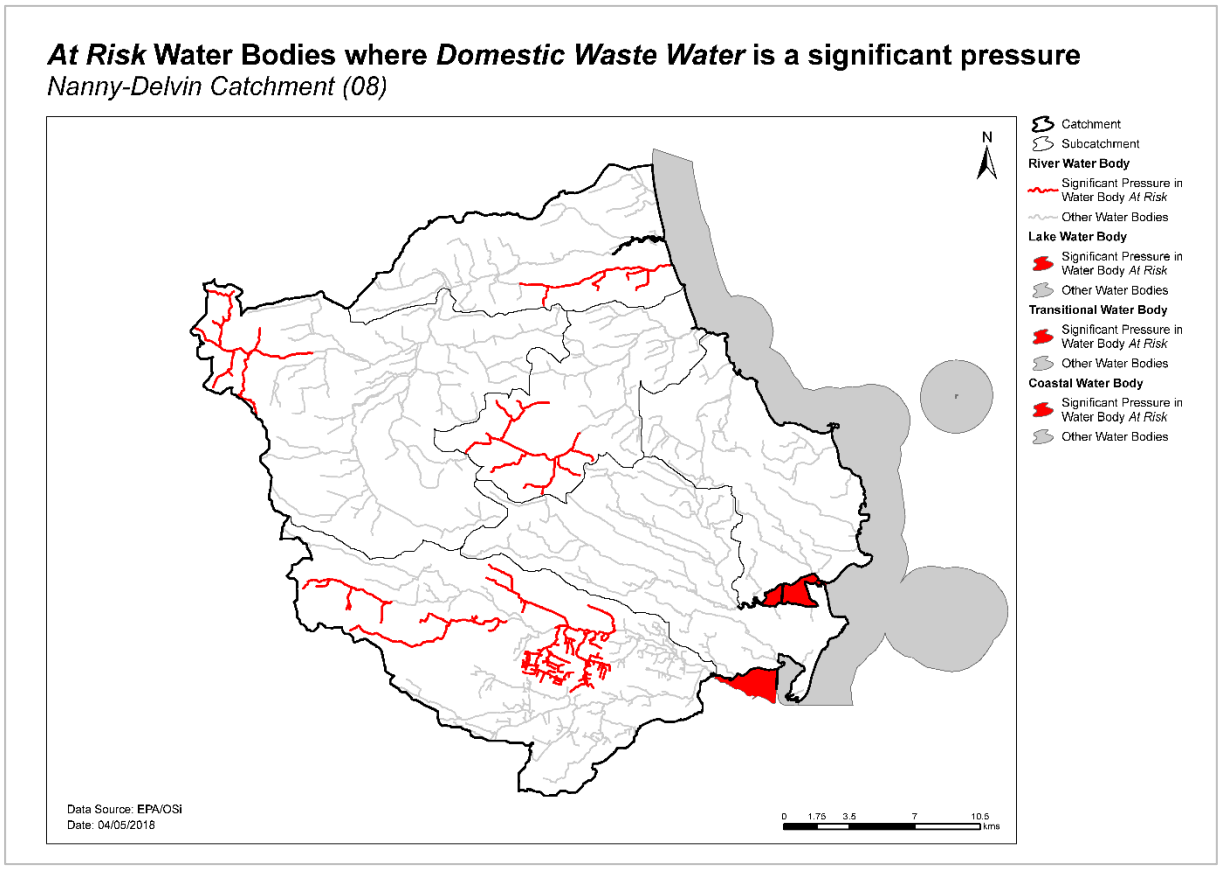


Figure 16. Water bodies that are *At Risk* and are impacted by domestic waste water

4.2.6 Industry

- One industrial facility has been identified as a significant pressure impacting Nanny (Meath)_030 (Appendix 3). Elevated concentrations of orthophosphate and total ammonia are the significant issues related to this point source discharge. Groundwater body IE_EA_G_062 has an Industrial Facility (P0014-03) as a significant pressure, with DCM, MTBE, TBA having an impact.

4.2.7 Extractive industry

- *Mines & Quarries*
  A quarry has been identified as a potentially significant pressure in Delvin_020 water body. The significant issues are a combination of sediment release (clay is being stockpiled beside the water body) and organic pollution.

4.2.8 Other significant pressures

- *Waste*
  There is an unauthorised landfill which has been identified as a potentially significant pressure on Hurley_030, with an upward trend in ammonia concentrations.

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.
- In the Nanny-Devlin catchment, water chemistry data available indicates that load reductions are required in 15 of the 35 river water bodies (Table 9).

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 Ospar 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 in insufficient, an ongoing programme of modelling has been undertaken to estimate potential nutrient load removal 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.

- The Rogerstown Estuary is impacted by excess nutrients which are derived from the upstream catchment area of the Ballough stream and Ballyboghil_010, both of which are also at less than Good status because of excess nutrients. Estuarine modelling has not been carried out and therefore the extent of the load reduction that is required cannot be estimated. However, as a first step, reduction of diffuse losses of N and P should be targeted within the catchment areas of the Ballough stream and Ballyboghil_010.
- The Broadmeadow Estuary is impacted by excess nutrients from the discharge from the Swords WWTP, and from the upstream catchment areas of the Broadmeadow and Ward Rivers. Estuarine modelling has not been carried out and therefore the extent of the load reduction that is required has not been estimated. As a first step, improvements in the estuary from the nutrient reductions achieved through the planned upgrading of the Swords WWTP should be monitored, followed by an assessment of any further reductions that may then be required from the catchment area.
- The Malahide estuary is impacted by excess nutrients from the Broadmeadow estuary and the Malahide WWTP. The required load reduction is unknown. Improvements following the upgrade of the Swords WWTP should be monitored as a first step.

Table 9. Relative load reductions required in monitored water bodies that are At Risk.

Water Body	P Load Reduction Required
NANNY (MEATH)_030	High
BALLYBOGHIL_010	Med
BALLOUGH STREAM_020	High
DELVIN_040	Med
BROADMEADOW_010	V. High
HURLEY_030	Low
NANNY (MEATH)_010	Med
RATOATH STREAM_010	Med
DELVIN_010	Low
HURLEY_010	Low
FAIRYHOUSE STREAM_010	Low
NANNY (MEATH)_020	Low
WARD_020	Low
DELVIN_020	Low
WARD_040	Low

6 Further Characterisation and Investigative Assessments

- Further characterisation through local catchment assessments is needed in 25 of the *At Risk* 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 nine *Review* water bodies to refine the understanding of the significant pressures 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 6 and the number of IAs required for each scenario are given in Table 10.

Table 10. Local catchment 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
At Risk	21	8	2	0	7	8	9	0	0	0	55
Review	8	3	2	0	0	3	1	0	0	0	17
Note water bodies may have multiple categories of Local Catchment Assessments											

7 Catchment summary

- Of the 34 river water bodies, 25 are *At Risk* of not meeting their WFD objectives.
- Excess nutrient loss, mainly phosphate, leading to eutrophication is a major issue for rivers in the catchment. The significant pressures relating to excess nutrients are primarily agricultural (diffuse and point), but also waste water (urban and domestic) and diffuse urban.
- Hydromorphological (or physical) conditions (including the input of excessive fine sediment) and poor habitat quality are also an issue for 18 river water bodies.
- There are three TraC water bodies *At Risk*, Rogerstown Estuary IE_EA_050_0100 and Broadmeadow Water IE_EA_060_0100 are *At Risk* and are impacted by excess nutrients, with the significant pressures being agriculture and domestic waste water for Rogerstown Estuary, and domestic and urban waste water for Broadmeadow Water. Malahide Bay IE_EA_060_0000 is impacted by urban waste water, resulting in macroalgae issues.
- There are two *At Risk* groundwater bodies in the catchment - Bettystown IE_EA_G_016 and Industrial Facility (P0014-03) IE_EA_G_062. Bettystown IE_EA_G_016 is impacted by agriculture, and is acting as a pathway to surface water, contributing to phosphate issues in places. Industrial Facility (P0014-03) IE_EA_G_062 is impacted by an industrial facility, which is impacted by DCM, MTBE and TBA.

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 3 areas for action in the Nanny/Delvin 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 Overview of process

The outcomes for the Nanny catchment are summarised below.

- Three recommended areas for actions (Table 11, Figure 17) were selected.
- These are the Rogerstown Estuary, Lower Nanny Tillage and Ashbourne Diffuse Urban.
- These include eight river water bodies – seven *At Risk* and one *Review.*
- One groundwater body, which is *At Risk* due to groundwater contribution of nutrients to surface water bodies, intersects with one of the recommended areas for action, see Table 12. Actions taken to improve surface water will need to take account of the groundwater contribution to surface water.

A remaining 31 *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 18. These include:

- 26 river water bodies – 18 *At Risk* and eight *Review,* and
- Five transitional and coastal water bodies – three *At Risk* and two *Review.*

Table 11. Recommended Areas for Action in the Nanny catchment

Recommended area for action	Number of water bodies	SCs	Local authority	Reason for Selection
Rogerstown Estuary	5	08_6 08_2	Fingal	• Building on improvements by IW, including sewer improvement in Turvey, installation of reed beds and discussion with Tesco on their facility. • Building on monitoring completed by Fingal County Council. • Discharges into two designated bathing waters (Portrane and Donabate). • Headwaters to Rogerstown Estuary. • Subcatchment project.
Lower Nanny Tillage	2	08_5	Meath	• Pilot project to examine impact of tillage on poorly draining soils. • The Nanny Meath river discharges into coastal waters which have both designated bathing and shellfish areas. • Building on existing improvements by Irish Water at Duleek waste water treatment plant. • One deteriorated water body.
Ashbourne Diffuse Urban	1	08_3	Meath	• Pilot project to address urban diffuse pressures with focus on 500m stretch of Broadmeadow_020. Building on work carried out by Meath and Irish Water to rehabilitate leaky sewers. • Small and manageable area with single pressure (urban diffuse).

Table 12. Groundwater body intersecting with surface water bodies in one Recommended Area for Action

Groundwater body			Intersecting surface water bodies		Recommended Area for Action
Code	Name	Risk	Code	Name	
IE_EA_G_016	Bettystown	At risk	IE_EA_08N010500	NANNY (MEATH)_040	Lower Nanny Tillage Project
			IE_EA_08N010700	NANNY (MEATH)_050	

9 Environmental Objectives

9.1 Surface Water

- Assuming resources are available and actions are taken in the recommended areas for action, of the seven *At Risk* surface water bodies, it is predicted that all will achieve their objective by 2027. For the one *Review* surface water body, the absence of information on this water body means that there is no scientific basis to quantify an environmental objective date and therefore a 2027 date is set, see Table 13.

Table 13. 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			
At Risk	7	0	7
Review	1	0	1
Total	8	0	8

- One surface water body has met its 2015 environmental objective.
- As action is not yet planned to be taken in the remaining 21 *At Risk* surface water bodies, a 2027 date is applied to all 21 of the water bodies.
- For the 10 *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 14.

Table 14. 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
Rivers			
At Risk	18	0	18
Review	8	0	8
TraC's			
At Risk	3	0	3
Review	2	0	2
Total	31	0	31

9.2 Groundwater

- Eight of the ten groundwater bodies are currently Good status and, therefore, have met their environmental objectives.
- Of the two groundwater bodies in the Nanny catchment that are less than Good status, both have a 2027 environmental objective.

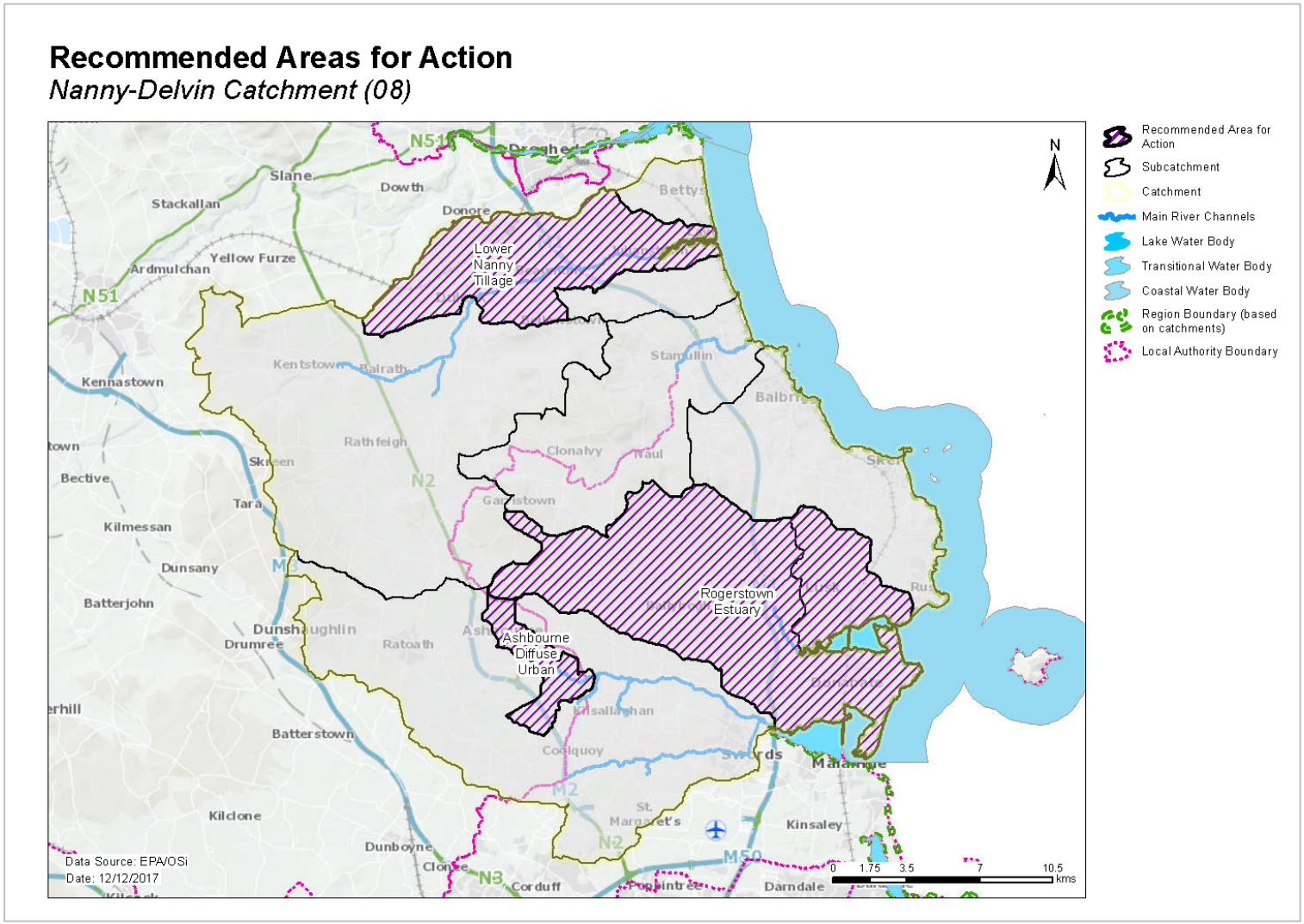


Figure 17. Location of Recommended Areas for Action in the Nanny-Devlin Catchment

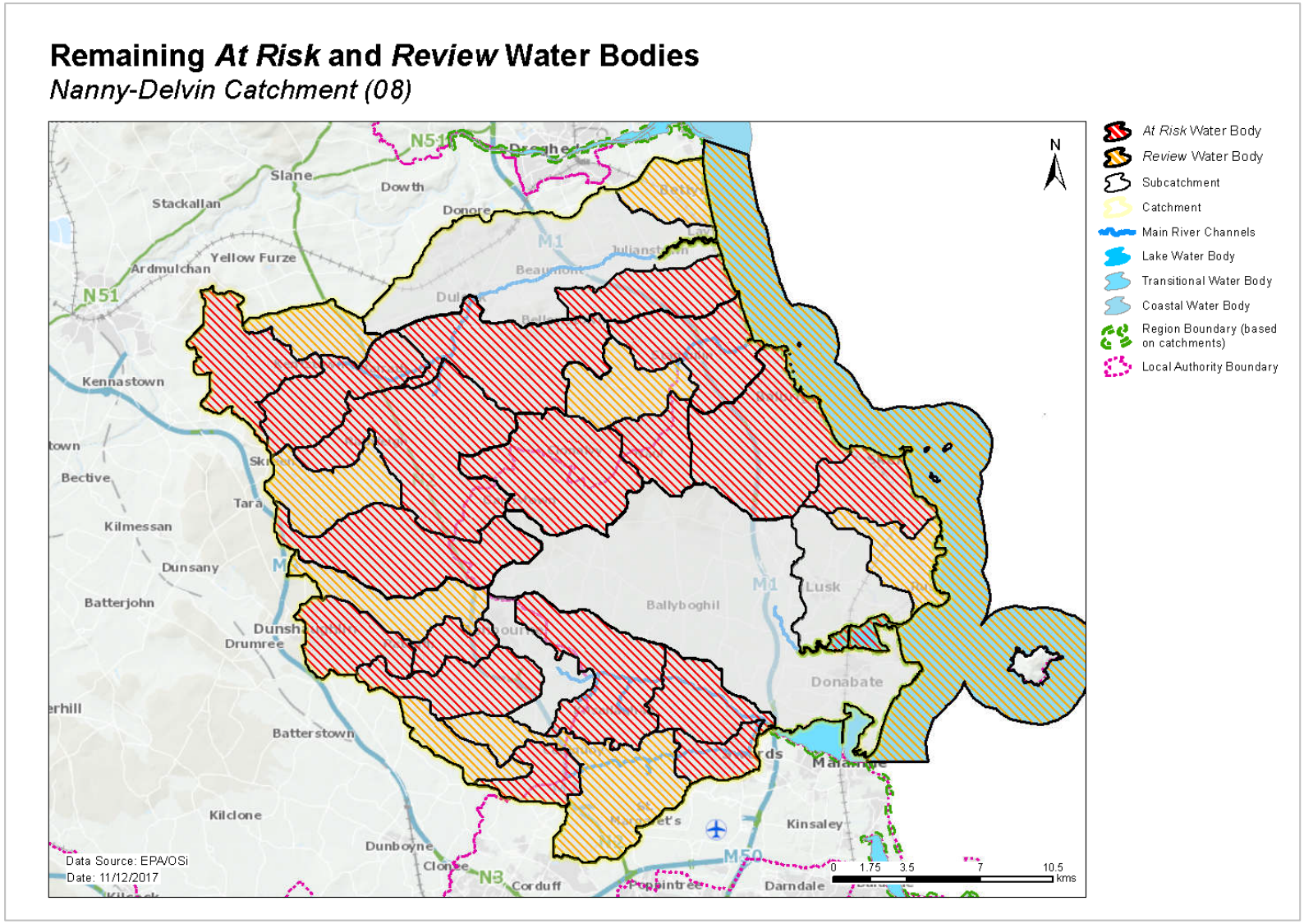


Figure 18. Location of *At Risk* and *Review* water bodies located outside Recommended Areas for Action in the Nanny-Devlin Catchment

10 Acknowledgements

This Nanny -Devlin Catchment Assessment (Version 3) has been produced by the Catchment Science & Management Unit, EPA, with the assistance of the following:

- Fingal County Council
- Meath 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
North-western Irish Sea (HA 08)	TraC	IE_EA_020_0000	Good

Appendix 2 Catchment scale nutrient concentrations and in-stream loads

The results of the instream water quality assessment for the Nanny and Delvin main channel catchments are illustrated in Chart 1 and Chart 2, respectively. The assessment is based on the mean concentrations between 2013 and 2015 at each site from the headwaters down to the estuary. The results show that nutrients are elevated in both main channels.

Chart 1 shows the highest concentration of orthophosphate is observed in the head waters Nanny (Meath)_010 at 0.11mg/l, which is the receiving water for the Kentstown Waste water Treatment Plant (WWTP) and decreases gradually to 0.042mg/l at the catchment outlet (Nanny (Meath)_050.

Similarly, to the orthophosphate concentrations, ammonia concentrations spike in the head waters at 0.237mg/l and decrease rapidly downstream but remain only marginally below the Environmental Quality Standard (EQS) for good status (0.065mg/l), with the exception of the Nanny (Meath)_040 which exceeds the EQS at 0.067mg/l.

The TON concentrations remain elevated above the 2.6mg/l drinking water threshold along the main channel with a spike towards the catchment outlet Nanny (Meath)_050 at 3.87mg/l, which is the receiving water for the Bellewstown WWTP.

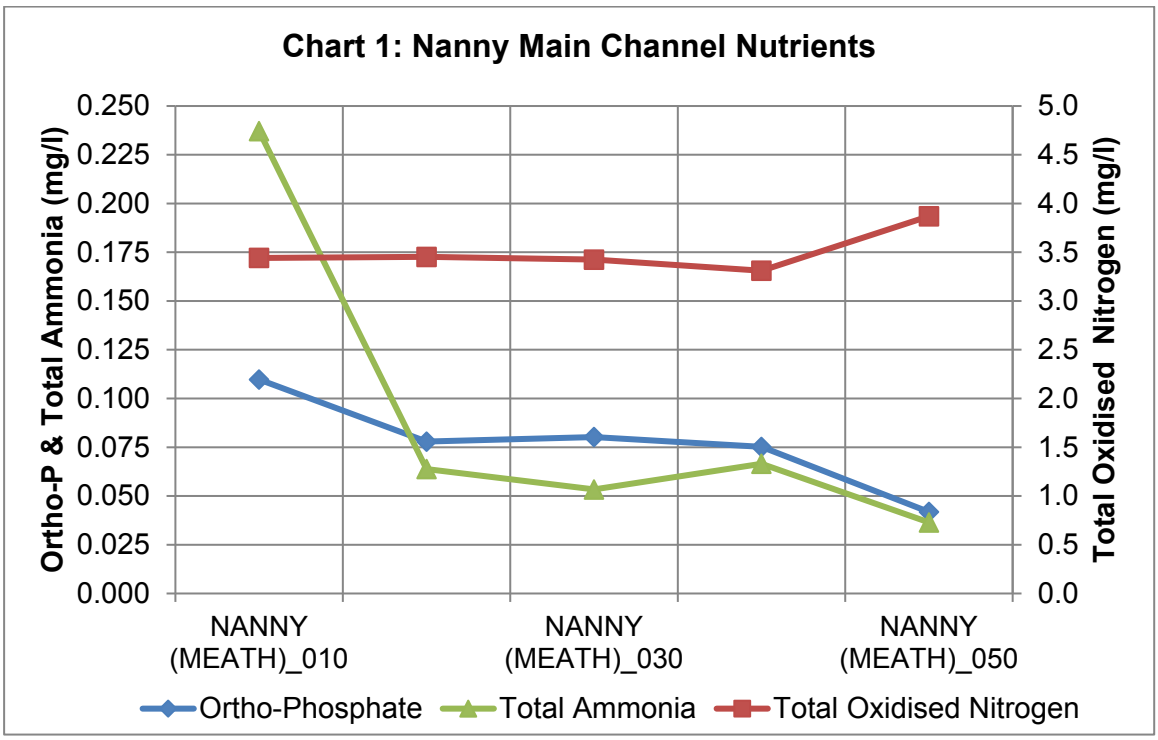
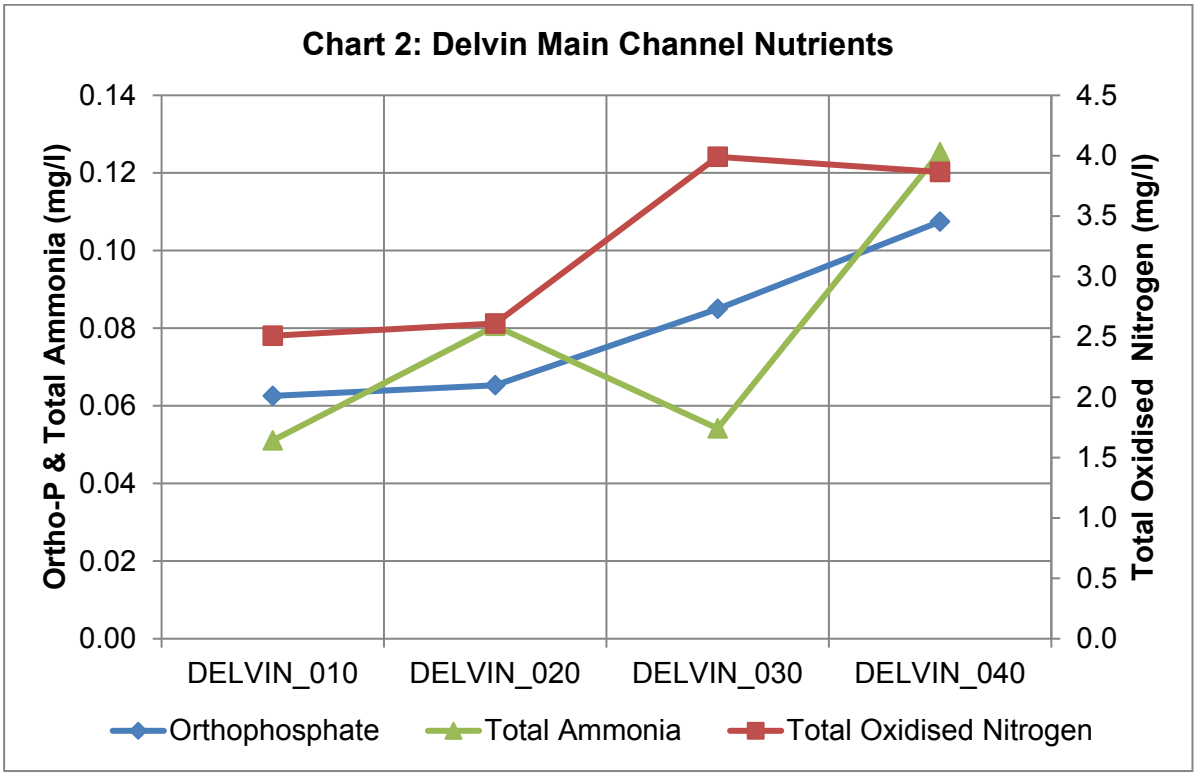


Chart 2 shows that nutrient concentrations increase downstream along the Delvin main channel. The Delvin_010 to Delin_040 water bodies are the receiving waters for a small number of WWTPs including the Clonalvy, Garristown, Naul and the Stamullen.

The average 2013-2015 orthophosphate concentrations are elevated and range from 0.063mg/l in the headwaters to 0.11mg/l to the catchment outlet.

Ammonia concentrations increase from 0.051 to 0.125mg/l towards the catchment outlet and are elevated above the Environmental Quality Standard (EQS) for good status (0.065mg/l) in Delvin_020 and Delvin_040.

The TON concentrations remain elevated along the main channel with the highest concentrations of 3.9 to 4.0mg/l in the Delvin_030 and Delvin_040, respectively.



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
08_1	IE_EA_08D010300	Delvin_030	River	Review	Unassigned	Unassigned	N		2027	
08_1	IE_EA_08D010080	Delvin_010	River	At risk	Poor	Poor	N	Ag,DWW,Hymo,UWW	2027	
08_1	IE_EA_08D010250	Delvin_020	River	At risk	Moderate	Moderate	N	Ag,Hymo,M+Q	2027	
08_1	IE_EA_08D010400	Delvin_040	River	At risk	Poor	Poor	N	Ag,UWW	2027	
08_1	IE_EA_020_0000	North-western Irish Sea (Ha 08)	Coastal	Review	High	Good	Y		2027	
08_2	IE_EA_08B310940	Balcunnin_010	River	Review	Unassigned	Unassigned	N		2027	
08_2	IE_EA_08M010900	Matt_010	River	At risk	Unassigned	Unassigned	N	DU,Hymo	2027	
08_2	IE_EA_08M030500	Mill Stream (Skerries)_010	River	At risk	Unassigned	Unassigned	N	DU	2027	
08_2	IE_EA_08P030930	Palmerstown 08_010	River	Review	Unassigned	Unassigned	N		2027	Rogerstown Estuary
08_2	IE_EA_050_0100	Rogerstown Estuary	Transitional	At risk	Moderate	Bad	N	Ag,DWW	2027	
08_3	IE_EA_08W010050	Ward_010	River	Review	Poor	Unassigned	N		2027	
08_3	IE_EA_08B020400	Broadmeadow_010	River	At risk	Poor	Poor	N	Ag,DU,Hymo,UWW	2027	
08_3	IE_EA_08B020600	Broadmeadow_020	River	At risk	Poor	Poor	N	DU,Hymo,UWW	2027	Ashbourne Diffuse Urban
08_3	IE_EA_08B020700	Broadmeadow_030	River	At risk	Unassigned	Poor	N	Ag,DWW,Hymo	2027	
08_3	IE_EA_08B020800	Broadmeadow_040	River	At risk	Poor	Poor	N	Ag,Hymo	2027	
08_3	IE_EA_08D030300	Dunshaughlin Stream_010	River	Review	Poor	Good	N		2027	
08_3	IE_EA_08F010500	Fairyhouse Stream_010	River	At risk	Poor	Poor	N	Ag,DWW,Hymo	2027	
08_3	IE_EA_08R010150	Ratoath Stream_010	River	At risk	Poor	Poor	N	Ag,DU,DWW,Hymo	2027	
08_3	IE_EA_08W010070	Ward_020	River	At risk	Poor	Poor	N	Ag,Hymo,UWW	2027	
08_3	IE_EA_08W010300	Ward_030	River	Review	Poor	Good	N		2027	
08_3	IE_EA_08W010610	Ward_040	River	At risk	Poor	Poor	N	DU,Hymo,UWW	2027	
08_3	IE_EA_060_0100	Broadmeadow Water	Transitional	At risk	Moderate	Moderate	N	DWW,UWW	2027	
08_4	IE_EA_08F050930	Flemingstown 08_010	River	Review	Unassigned	Unassigned	N		2027	
08_4	IE_EA_08N010400	Nanny (Meath)_030	River	At risk	Unassigned	Unassigned	N	Ag,Hymo,Ind,UWW	2027	
08_4	IE_EA_08H010200	Hurley_010	River	At risk	Poor	Moderate	N	Ag,Hymo	2027	
08_4	IE_EA_08H010280	Hurley_020	River	Review	Poor	Good	N		2027	
08_4	IE_EA_08H010400	Hurley_030	River	At risk	Moderate	Moderate	N	Ag,Hymo,Other,UWW	2027	
08_4	IE_EA_08N010110	Nanny (Meath)_010	River	At risk	Poor	Poor	N	Ag,DWW,Hymo,UWW	2027	
08_4	IE_EA_08N010280	Nanny (Meath)_020	River	At risk	Moderate	Poor	N	Ag,Hymo,UWW	2027	
08_5	IE_EA_08B330980	Betaghstown 08_010	River	Review	Unassigned	Unassigned	N		2027	

08_5	IE_EA_08M020100	Mosney_010	River	At risk	Poor	Poor	N	Ag,DU,DWW	2027	
08_5	IE_EA_08N010500	Nanny (Meath)_040	River	At risk	Poor	Moderate	N	Ag,Hymo,UWW	2027	Lower Nanny Tillage
08_5	IE_EA_08N010700	Nanny (Meath)_050	River	At risk	Moderate	Poor	N	Ag,Hymo	2027	Lower Nanny Tillage
08_5	IE_EA_030_0100	Nanny Estuary	Transitional	Review	Unassigned	Unassigned	N		2027	
08_6	IE_EA_08B031500	Ballough Stream_010	River	At risk	Unassigned	Unassigned	N	Ag	2027	Rogerstown Estuary
08_6	IE_EA_08T020700	Turvey 08_010	River	At risk	Unassigned	Unassigned	N	Ag,DU,UWW	2027	Rogerstown Estuary
08_6	IE_EA_08B012200	Ballyboghil_010	River	At risk	Poor	Poor	N	Ag	2027	Rogerstown Estuary
08_6	IE_EA_08B031600	Ballough Stream_020	River	At risk	Poor	Poor	N	Ag,UWW	2027	Rogerstown Estuary
08_6	IE_EA_060_0000	Malahide Bay	Coastal	At risk	Moderate	Moderate	N	UWW	2027	

Ag: Agriculture

DWW: Domestic Waste Water

For: Forestry

Hymo: Hydromorphology

Ind: Industry

M+Q: Mines and Quarries

Peat: Peat Drainage and Extraction

DU: Diffuse Urban

UWW: Urban Waste Water

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

Appendix 4 Drinking water supplies in the catchment

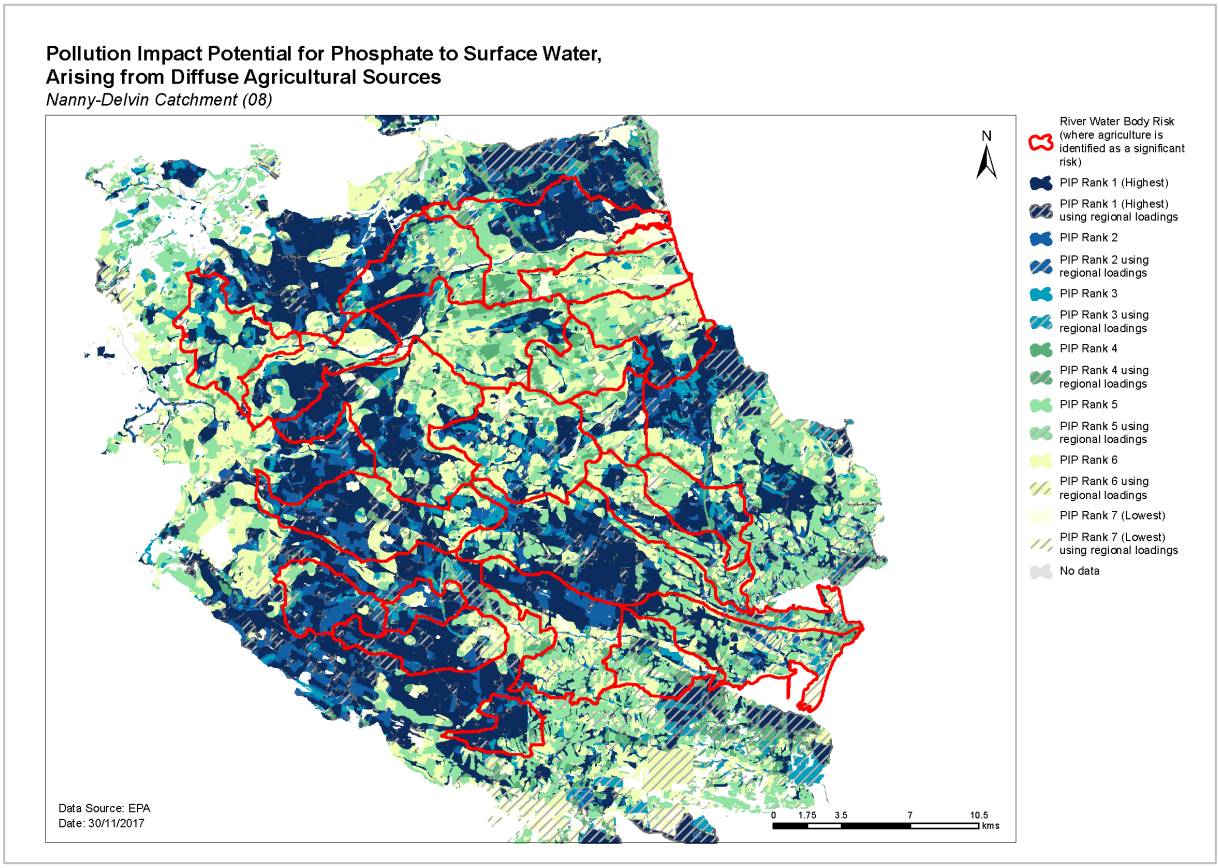
Scheme Code	Scheme Name	Water Body	Water Body Code	Objective met? Yes /No	Reason why not met
2300PRI2153	Largo Foods	Lusk-Bog of the Ring	IE_EA_G_014	Yes	N/A
0900PRI9021	Cooneys, Annasbrook	Lusk-Bog of the Ring	IE_EA_G_014	Yes	N/A
2300PRI4011	Churchfields Housing Estate	Swords	IE_EA_G_011	Yes	N/A
2300PUB1008	East Meath RWS	Lusk-Bog of the Ring	IE_EA_G_014	No	Total pesticides
2300PUB1051	Bellowstown Borehole	Duleek	IE_EA_G_012	Yes	N/A
2300PUB1052	Hollymount Borehole	Duleek	IE_EA_G_012	Yes	N/A
2300PUB1104	Dean Hill Borehole	Realtage	IE_EA_G_020	Yes	N/A
2300PUB1105	Danestown Borehole	Realtage	IE_EA_G_020	Yes	N/A
0900PUB1003	F_ZONE3 Bog of the Ring Borehole PW2	Lusk-Bog of the Ring	IE_EA_G_014	Yes	N/A
	F_ZONE3 Bog of the Ring Borehole PW3	Lusk-Bog of the Ring	IE_EA_G_014	Yes	N/A
	F_ZONE3 Bog of the Ring Borehole PW4	Lusk-Bog of the Ring	IE_EA_G_014	Yes	N/A
	F_ZONE3 Bog of the Ring Borehole PW5	Lusk-Bog of the Ring	IE_EA_G_014	Yes	N/A

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

SAC Name	Relevant Qualifying interests	Target status	Water body type	Water bodies	Status (risk)	Prioritise?	Code	Survey data?
Malahide Estuary SAC 000205	none							
Rogerstown Estuary SAC 000208	none							

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