

## Section 8

### *Characterisation of the Avoca/Vartry Catchment Area*

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#### 8.1 Driving Forces and Pressures in the Avoca/Vartry Catchment Area

The Avoca/Vartry (HA10) consists of three river basins, the Dargle in the north, the Vartry in the centre and the Avoca in the south. Despite its proximity to Dublin, HA10 contains some of the most beautiful scenery in Ireland, and therefore experiences tourist pressure. In common with the west and north of Dublin, some expansion of commuter towns is occurring, especially along the railway line which stretches down the coast. Towns of Greystones, Arklow and Wicklow are home to many workers that make the commute to Dublin. It would be fair to say that the rate of expansion in Wicklow is more limited than in many other counties bordering greater Dublin. The greatest rate of expansion has been seen in Bray which is already part of the greater Dublin conurbation, although Wicklow Town has also seen significant expansion in the last 10 years. HA10 contains around 6% urban coverage by area, which is greater than both the Boyne and Nanny/Delvin catchments. This might be surprising, but the larger urban areas are concentrated to relatively few locations such as Bray and the coastal towns to the south along the rail line. Improvements to the road network may also increase the pressure, but the presence of the Wicklow Mountains SAC may help to limit development in this portion of the catchment.

In terms of land use, HA10 has the lowest percentage of agricultural land at just over 51%. This land consists of predominantly pasture (67%) with arable and "other agricultural land" taking 18% and 15% respectively. It is important to note that HA10 also contains the greatest proportion of forestry lands, which at 23% of the catchment is 4 times that of the Liffey catchment, the next most forested of the ERBD catchments. Forestry can create its own unique pressure on water quality by causing acidity problems, particularly on the poorly buffered geology of the Wicklow Mountains, as well as problems with suspended solids from erosion and harvesting of tree crops. HA10 also contains the highest proportion of bogs and wetlands in the ERBD at 19% of the catchment area. Surface water is a primary source of drinking water to a majority of the residents. Water from the Wicklow Mountains also serves the needs of some water users in the greater Dublin area.

The main driving forces are population growth (residential and tourists), forestry, transportation, and resource demand and consumption. There may also be issues with waste disposal, with increasing numbers of illegal landfill sites being discovered around the Wicklow area.

The urbanisation, agricultural production and the other driving forces cause a number of pressures to exert negative impacts on water bodies and the larger natural environment. Environmental pressures present in the Avoca/Vartry Catchment (HA09) include:

- Diffuse sources
- Point sources
- Transport
- Waste management and
- Recreation and tourism.

Figure 8.1a: Municipal Point Sources (HA10)

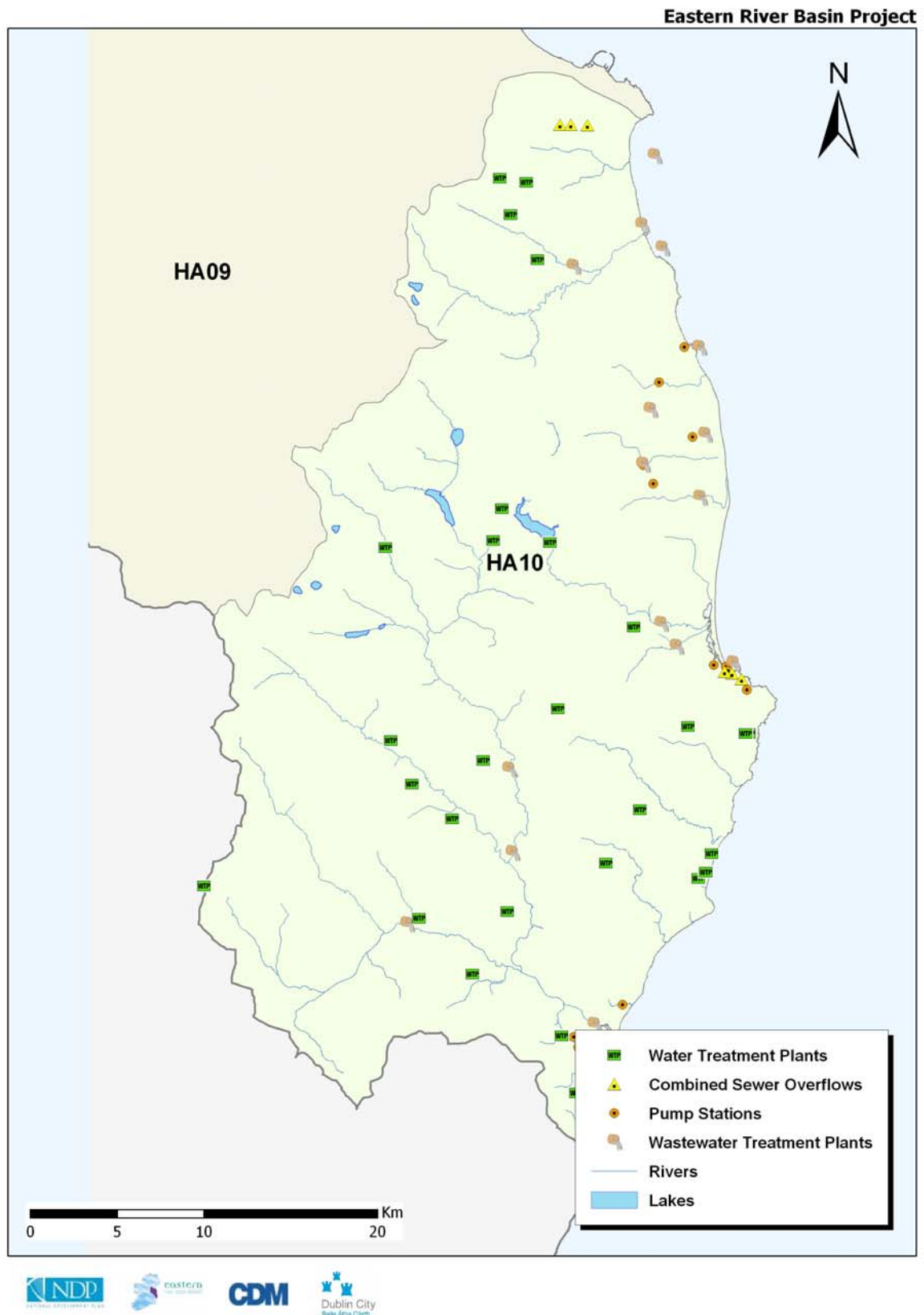
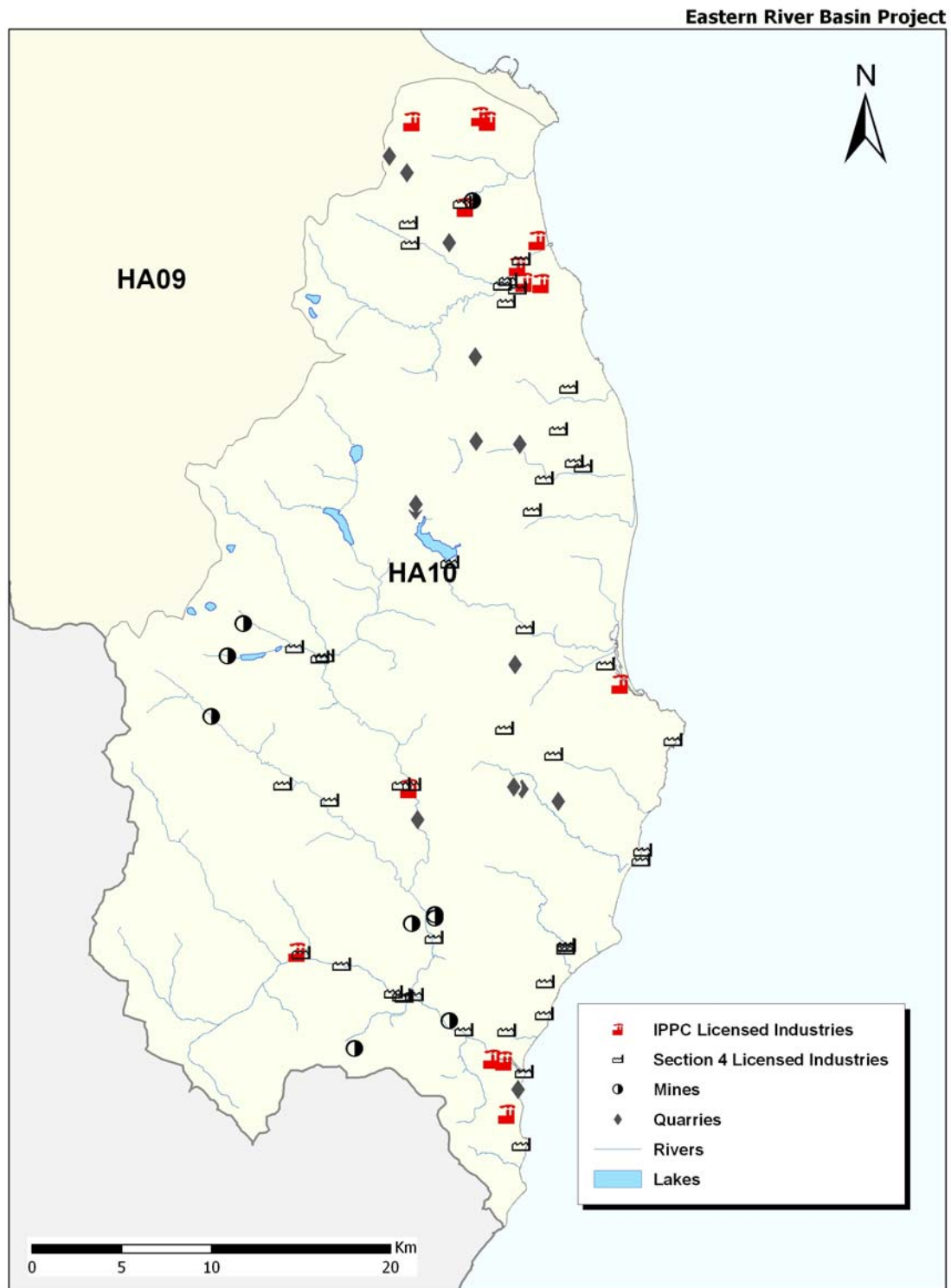


Figure 8.1b: Industrial Point Sources (HA07)



### 8.1.1 Point Sources

HA10 contains a total of 16 WWTPs, 2 being located in Dun Laoghaire/Rathdown and the remaining 14 in County Wicklow. These range in size from 500 p.e. (Avoca) to 67,500 (Shanganagh). All WWTPs discharge to surface waters, with 8 plants providing up to primary treatment and 8 secondary treatment. Eight discharges are to river, 3 to transitional waters and 3 to the Irish Sea.

In the Avoca/Vartry Catchment area, there are a total of 119 industrial dischargers, licensed under the following regimes:

- 14 Integrated Pollution Control (IPC) by EPA
- 49 Water Pollution Act (WPA) Section 4 (to water body) by Local Authority and
- 56 WPA Section 16 (to foul sewer) by Local Authority.

Most of the Section 16 discharges are located in the northern portion of the catchment, in the Bray/Dun Laoghaire area. This is the same area where the larger foul sewer network is located in the HA10. Section 4 discharges are distributed throughout the eastern side of the catchment. Typical industries represented include food processing, textiles maintenance and pharmaceuticals, however the greatest number of Section 16 licenses are held by garages (>30%). There are also a number of private sewage plants discharging from golf clubs, small developments, caravan parks and hotels, which account for over 50% of the Section 4 licenses. Other dischargers also include quarries, fish farms, food processing and ceramics. There are 14 quarries and 9 mines in the Avoca/Vartry Catchment. The mines are inactive and located in the Wicklow Mountains. These include the famous Avoca mine complex, the discharge of which causes serious pollution of the Avoca River. The quarries tend to be more concentrated to the northern and eastern portions of the catchment, presumably to aid in providing building materials to the centres of development. **Figure 8.1a/b** presents the point-source discharges in the Avoca/Vartry Catchment.

### 8.1.2 Diffuse Sources

The Avoca catchment generally contains the water courses that are currently of the highest quality in the ERBD. Water quality is impacted by urban run off in the lower reaches of the Dargle catchment. Agriculture is generally of lower intensity in this catchment when compared to other areas of the ERBD, reflecting less than desirable land and soils for farming. **Figure 8.2** shows the main land use pressures in the Avoca/Vartry catchment.

Sheep grazing and forestry dominate the areas of the HA bounded by the Wicklow Mountains. Forestry can create its own diffuse pressures. The effects of these pressures can be localised and not detrimental to more widespread catchment quality.

The soil drainage properties of the Avoca/Vartry catchment indicate that drainage is generally good. The catchment contains approximately 85% “excessive” or “well” drained soil and only 9% imperfectly draining soils. However, the high incidence of peat soils, 20% of the total area, provides the potential for high phosphate loss. The steep catchments and high rainfall amounts that occur in the Wicklow Mountains mean the application of organic and inorganic fertilisers must be carefully controlled to prevent wash-off. Consequently, more than 25% of HA10 soils are considered to be a “high runoff risk”. Export rates for nutrients are estimated to be medium to low for the majority of HA10.

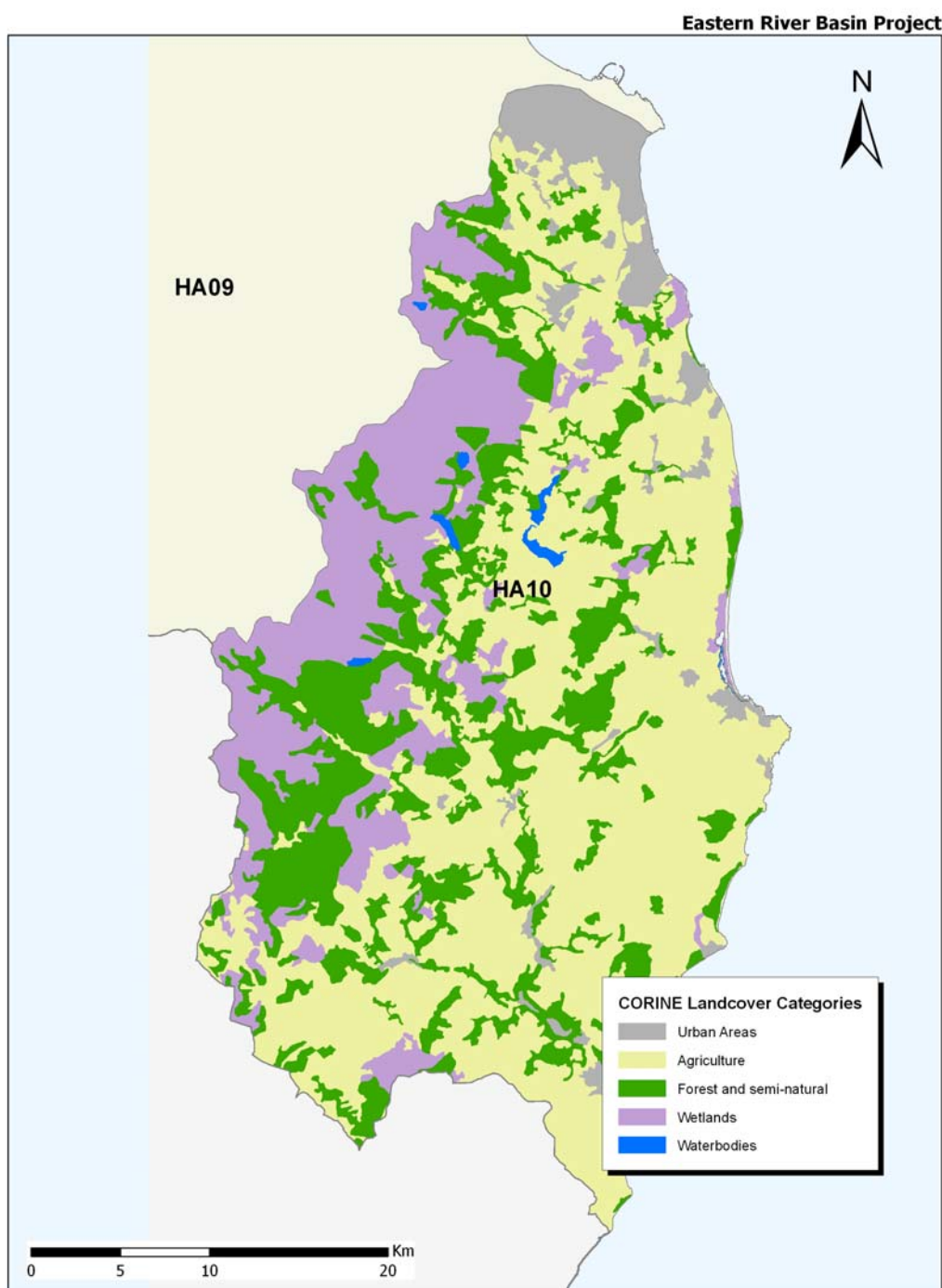
Outside the Greater Dublin area, urban pressures are localised to the towns strung along the coastal fringe such as Greystones, Wicklow and Arklow. In HA10, there are 10 towns with populations greater than 2000. Road runoff is of limited importance in HA10, apart from the areas on the northern fringe where road runoff constitutes part of general urban diffuse pollution. Some specific areas where road runoff may be of

particular interest, include in the Glen of the Downs to the southwest of Bray. Recent road improvements have lead to the Three Trouts Stream being culverted directly along the course of the N11, which carries extensive traffic south out of the Dublin area. Spillages and general runoff has direct access to the watercourse in this section.

The number of active and abandoned waste sites is given in **Section 8.1.4**.

The Avoca/Vartry Catchment contains 10 urban centres with greater than 2,000 population, of varying size, and associated facilities covering a total of 6% of the catchment. Unsewered urban and residential areas are widespread, and given the predominance of peat soil and steep catchments, the effect of nutrient loads from large numbers of septic tanks may be significant.

**Figure 8.2: Diffuse Sources (HA10)**



### 8.1.3 Physical Alterations

No river water bodies have been subject to OPW channelisation or embankments in HA10. There are 2 major impoundments in HA10, both located on the Vartry. The Vartry Upper and Lower reservoirs were formed for the process of abstraction of drinking water. There are also 7 known significant culverted sections of river water bodies.

There are a number of ports and marinas along the coast of HA10. These include Bray, Greystones, Wicklow and Arklow. There are 27 identified "coastal structures" (piers, groynes, outfalls etc.) totalling 24,512 metres in length.

### 8.1.4 Solid Waste Disposal

There are 29 known waste management sites in the Avoca/Vartry catchment area, with 3 of these active, 17 closed, 2 pending authorisation, 2 having applications withdrawn, 4 unauthorised sites and 1 with an unknown status.

### 8.1.5 Water Abstraction

In HA10, there are 12 significant abstractions from surface waters, providing a total of 77,300 m<sup>3</sup>/day. The most significant being at the 2 Vartry reservoirs, serving greater Dublin and areas of Wicklow. Vartry WTP currently treats up to 63,000 m<sup>3</sup>/day. There are 34 groundwater abstractions, which provide a total of 5,800 m<sup>3</sup>/day. Abstractions vary in size from less than 2 m<sup>3</sup>/day to over 1,800 m<sup>3</sup>/day.

### 8.1.6 Tourism

As previously stated, the Wicklow Mountains in particular receive significant amounts of tourists, to visit areas such as Sally Gap, Glendalough, Powerscourt and the Vale of Avoca. It is estimated that in 1999, Wicklow received over 300,000 overseas visitors (Bord Failte), as well as large numbers of day trippers from greater Dublin. This level of tourism can generate significant pressures. These can include erosion of upland footpaths from walkers and mountain bikers, and shock loading of small rural WWTPs from large influxes of visitors, especially at peak times such as public holidays or for special events.

Angling tourism should be a significant input to the Avoca catchment; however, long standing pollution of the river from the mine means that this resource is as yet unexploitable, although treatment of the mine water discharge should soon reap potential benefits. The Dargle and Vartry rivers both support good fisheries, particularly for sea trout.

## 8.2 Groundwater Evaluation

See Section 9.

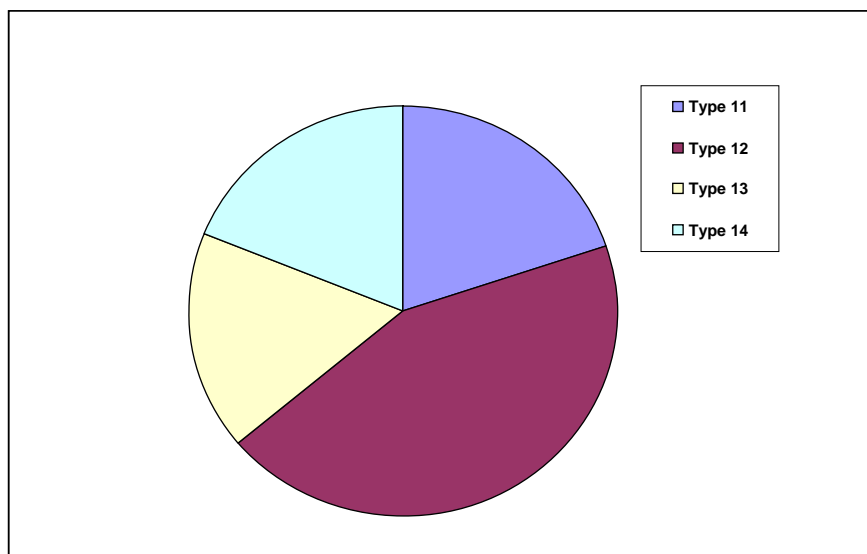


## 8.3 River Evaluation in the Avoca/Vartry Catchment Area

### 8.3.1 River Water Bodies in the Avoca/Vartry Catchment Area

The Avoca/Vartry catchment area contains 360.5 km of river channels designated as falling within WFD criteria for water bodies, covering 1,138.1 km<sup>2</sup>. A total of 78 river water bodies have been identified in the Avoca/Vartry catchment area. These water bodies are shown in **Figure 8.3** and are listed in **Table D.3 of Appendix D**. The most common typology categories, as defined in **Section 4.3.2**, are Type 12 (44%) with Type 11, 13 and 14 all having similar representations of around 20%. Types 2 and 3 rivers are not present, reflecting the siliceous geology. The type distributions are shown in **Figure 8.4**.

**Figure 8.4: River Typologies (HA10)**

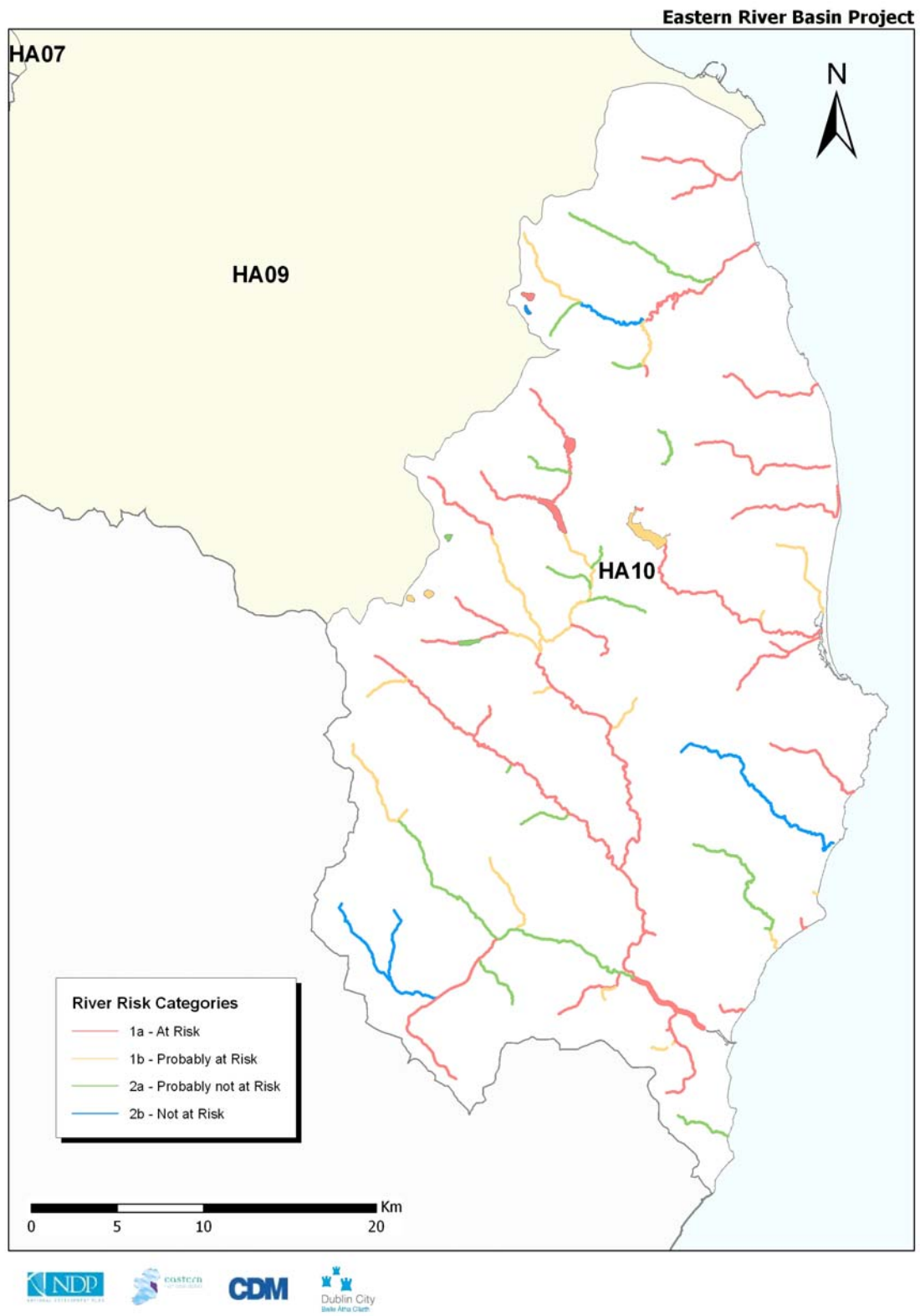


Water quality and biological monitoring results at 73 stations indicate that 74% of the stations are at river locations that are considered “unpolluted” (Class A), 9% as “slightly polluted” (Class B), 13% as “moderately polluted” (Class C) and 4% are considered “seriously polluted” (Class D). The Avoca/Vartry catchment has traditionally shown relatively good water quality compared to the other three hydrometric areas in the ERBD, and compares favourably with the national averages (Class A 70%, Class B 17%, Class C 12% and Class D 1%). The poorer water quality is generally found in the northern portion of the catchment, near the urbanised area of Bray, and also downstream of the Avoca Mines site on the Avoca river system.

Comparing trends over the last 20 years, the length of unpolluted water has dropped slightly, and there have been only slight fluctuations in the other river classes also. The percentage of Class A sites has decreased by 6% since the last survey and by 11% since 1987. The number of moderately polluted sites has increased by 8%. The incidence of moderately and severely polluted waters are lower in the HA10 than in other ERBD areas. However, when compared to the national average, the HA10 contains 17% of class C&D rivers versus 13% nationally.

A more detailed evaluation of water quality and quantity can be viewed in the Initial Characterisation Report (March 2004).

Figure 8.3: Overall Risk Rivers (HA10)





### 8.3.2 Risk Assessment of River Water Bodies in the Avoca/Vartry Catchment Area

Results of the risk assessment are summarised in **Table 8.1**. Overall, 20 of the river water bodies are classified as “Not At Risk”, or “Probably Not At Risk”, i.e. 2a or 2b, equating to 26% of the total. Of the 1a and 1b water bodies, approximately twice the number of water bodies are considered to be “At Risk” than “Probably At Risk”, representing 50% of the total water bodies, and 53% of the channel length. Each water body identified on the map in **Figure 8.3** has been colour coded to indicate the level of risk. Detailed results for individual water bodies are presented in **Table D.3** of **Appendix D**. Results are also presented on a county basis in **Appendices E-O**.

**Table 8.1: Summary of Risk Assessment for River Water Bodies in HA10**

Risk Category	Assessment Categories (number of water bodies)				Overall	River Length	% of Length
	Morpho-logical	Hydrology	Diffuse	Point Source			
<i>Not at risk (2b)</i>	27	71	0	41	4	34.3	9.5
<i>Probably not at risk (2a)</i>	19	3	29	16	16	72.1	20
<i>Probably at risk (1b)</i>	18	1	32	16	19	60.7	16.8
<i>At risk (1a)</i>	14	3	17	5	39	193.4	53.7
<b>TOTAL</b>	<b>78</b>	<b>78</b>	<b>78</b>	<b>78</b>	<b>78</b>	<b>360.5</b>	<b>100</b>

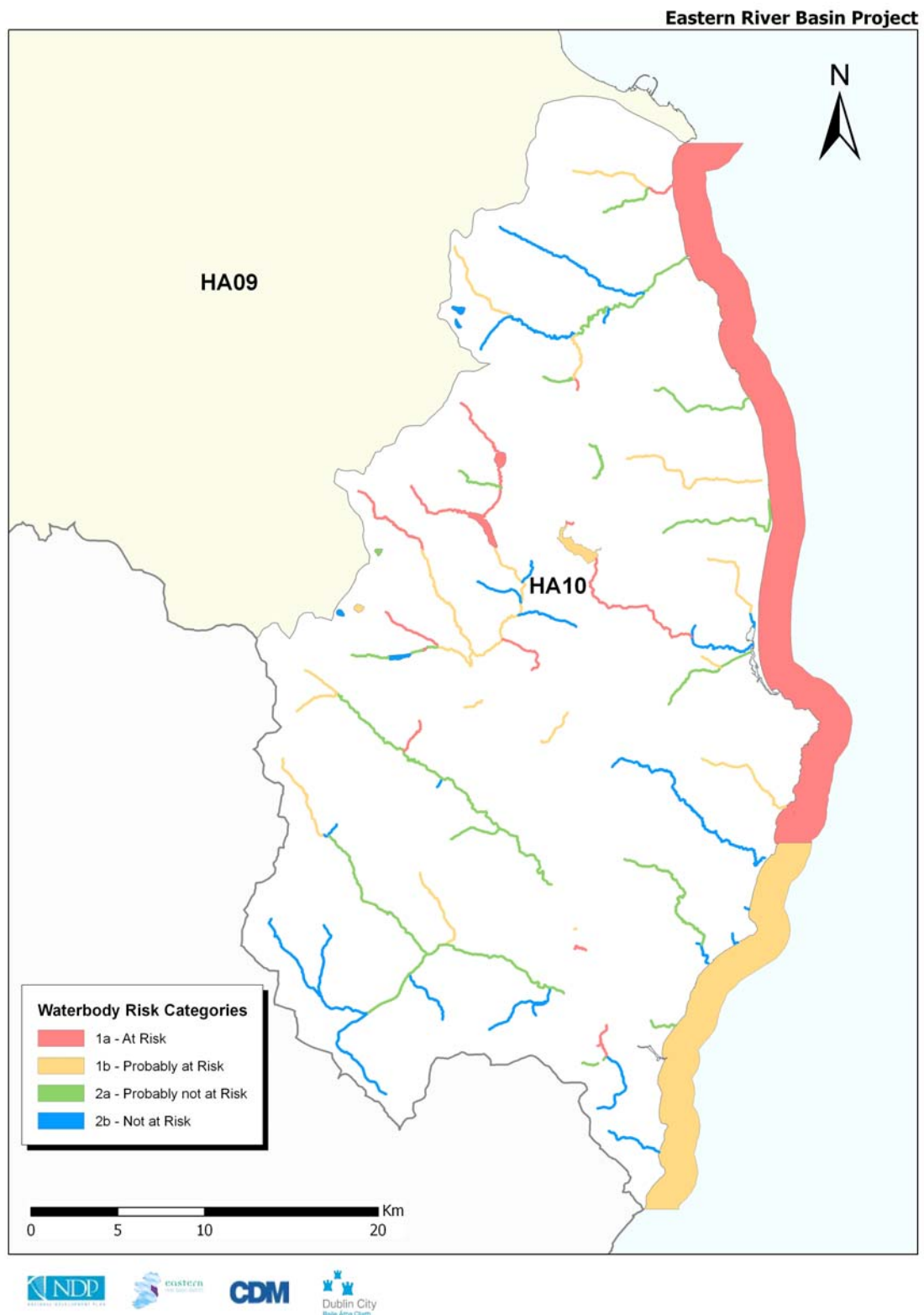
In common with the other hydrometric areas, diffuse pollution pressures are most significant causes of “At Risk” water bodies in the Avoca/Vartry catchment areas, although significant morphological pressures also exist. A total of 63% of river water bodies fall into the 1a/1b categories for overall diffuse risk, which is 11% lower than the neighbouring Liffey catchment. Morphology accounts for 41% of water bodies falling into these categories. Point sources accounts for 27% of 1a/1b water bodies whilst abstraction pressures only account for 5%.

The 41% of water bodies falling into the 2 “At Risk” categories for morphology pressures show one main significant sub-element, test RM5 or intensive land use. For test RM5, 12 water bodies (15%) of rivers water bodies were considered to be “At Risk” and 24% “Probably At Risk”. These are remarkably similar figures to the Liffey catchment for this test. In addition, test RM3 (Impoundment) also lead to 2 water bodies being at risk. These were located on the Vartry River. **Figure 8.5** shows the morphological risk status in map format.

#### Intensive Agricultural Land Use



Figure 8.5: Morphological Risk (HA10)



Figures 8.6: Diffuse Risk (HA10)

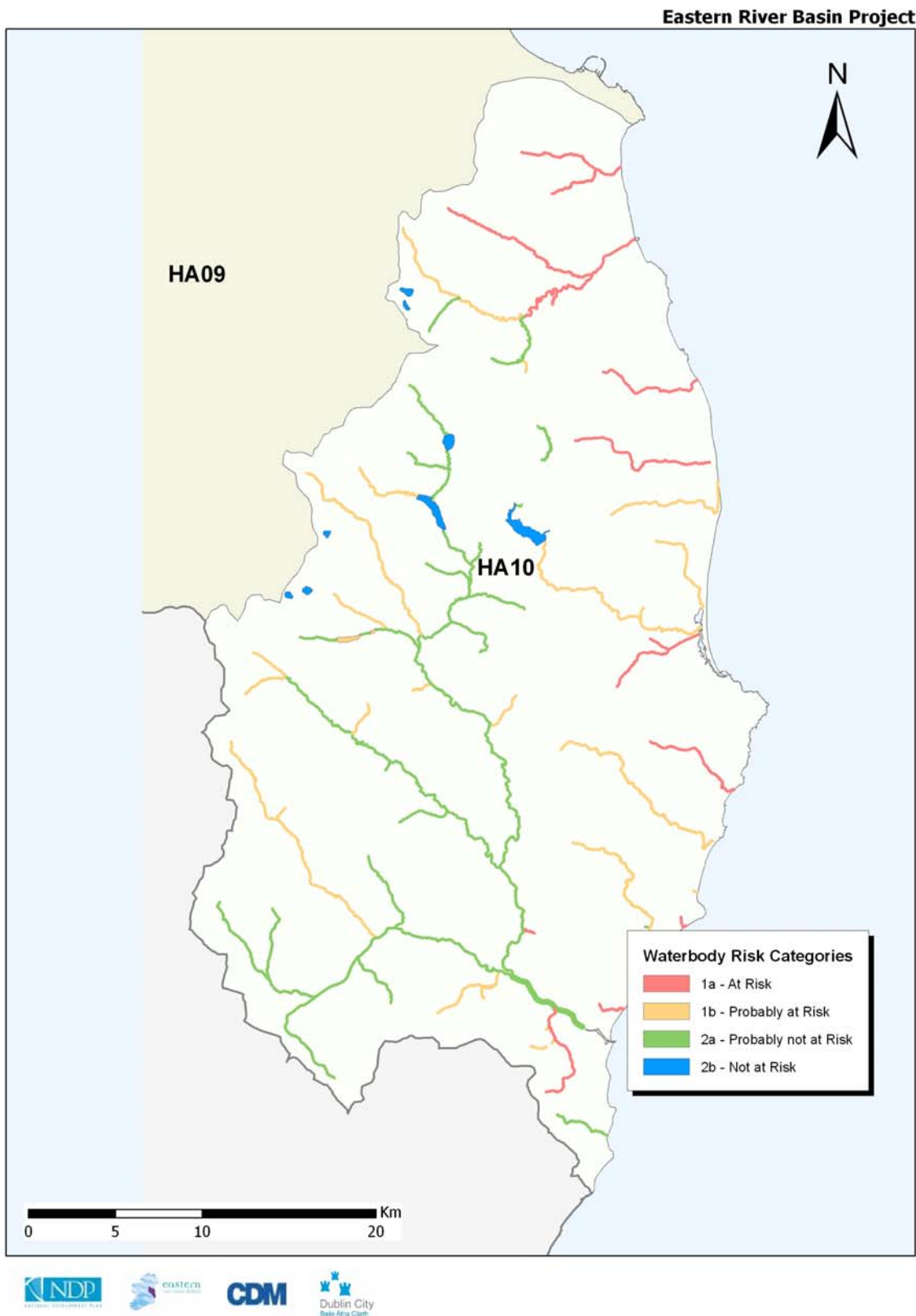
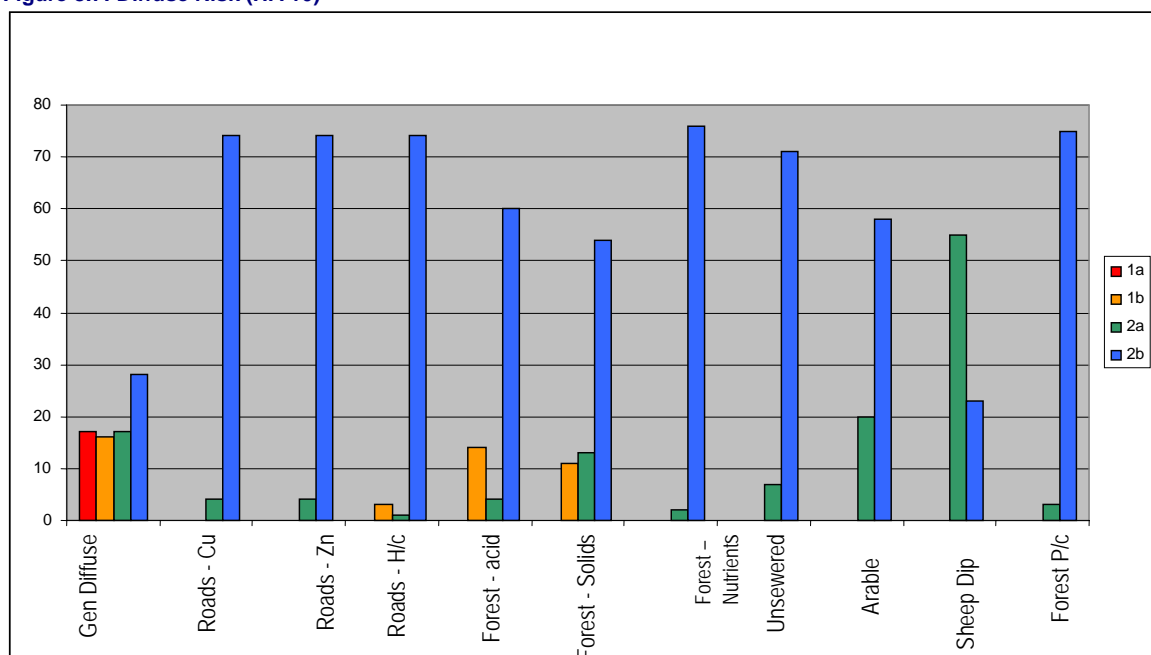


Figure 8.7 shows the breakdown of water bodies at risk in the main diffuse pollution elements. The highest incidence of risk comes from the general diffuse test (RD1). Agricultural and urban pressures cause 33 water bodies (43%) of the water bodies to be classified “At Risk” or “Probably At Risk” (Figure 8.6). These areas are generally found in the middle to lower reaches of the catchment and reflect the levels of intensification of human activity and the sensitive thresholds of the test. However, nearly 37% of water bodies are considered to be “Not At Risk” from general agricultural and urban pressures. Surprisingly, this is the same percentage of “Not At Risk” water bodies found in the Liffey catchment and probably reflects the effect of smaller upstream water bodies being less prone to risk than larger downstream ones.

Figure 8.7: Diffuse Risk (HA 10)



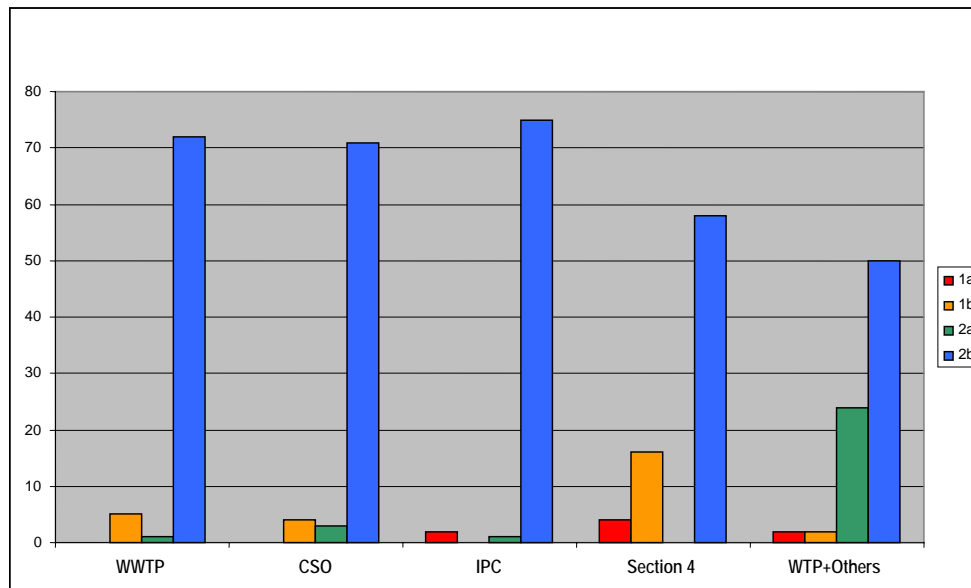
No other diffuse tests produce “At Risk” water bodies, and only three other tests produce water bodies with “Probably At Risk” assessments. These tests are Road Transport (total hydrocarbons), Forestry (acidification) and Forestry (suspended solids). The test for total hydrocarbons assessed 3 water bodies to be rated as “Probably At Risk”. These areas are associated with the M50/N11 and the road network in the northern portion of the catchment. The affected river water bodies are located in the Loughlinstown. Given the likely increase in the road network in this area, the impacts have the capacity to increase. Improved road design and maintenance could ameliorate potential polluting effects.

The Forestry Acidification test puts 14 water bodies “Probably At Risk”. These are based on critical levels of forest cover on acid geology. The majority of the Wicklow area features this type of geology and acidification problems have been studied in these areas for some time. Further characterisation will help to assess the actual impact caused by this risk. The Forestry Suspended Solids test produced 11 water bodies of 1b classification. These results are generated by the presence of forest on steep slopes, near to watercourses in areas of highly erodible soils. In general, however, most solids are released by forest operations during clearfell and planting operations, and particularly by the construction of temporary logging roads. It is difficult to generate generic predictive tests to assess where these areas are likely to be, and they should be assessed on an individual basis based in information gathered from the relevant organisations, such as Coillte.

When considering diffuse pollution as a whole, and bearing in mind the high quality of many of the rivers in HA10, it is surprising that a total of zero 2b water bodies are generated by the overall diffuse test. It appears that the high number of 2a results produced by the Sheep Dip test (RD6b) masks a significant number of otherwise 2b water bodies. As this test is based solely on the presence of relatively high densities of sheep,

which tend to be concentrated in upland areas where water quality is generally high, it is not surprising that this should occur.

**Figure 8.8: Point Sources (HA 10)**



**Figure 8.8** shows the risk status as affected by point sources. As in the neighbouring Liffey, they are not as significant as general diffuse sources and morphology in terms of risk, with a total of 5 water bodies classed as 1a and 16 as 1b risk class. This gives a total of 21 water bodies experiencing some risk, which translates to 27% of water bodies (**Figure 8.9**).

The most significant point sources are Section 4 discharges, in terms of overall risk, with 4 water bodies rated as 1a and 16 as 1b. Many of these discharges are package sewage treatment plants from rural communities, hotels and businesses not served by mains sewer. IPC discharges account for 2 water bodies being rated as 1a, and WTP and “others”, which include mines, quarries and tip sites, account for 2 water bodies rated 1a, and 2 rated 1b. These at risk water bodies are as a result of the Avoca mines.

Three water bodies were characterised as being 1a (“At Risk”) from hydrological pressures. i.e. abstraction, and 1 as 1b (“Probably At Risk”) (**Figure 8.10**). The 1a/1b water bodies include the Vartry and the Goldmine River.

#### Avoca Adit Discharge – Co. Wicklow





Figure 8.9: Point Source Risk (HA10)

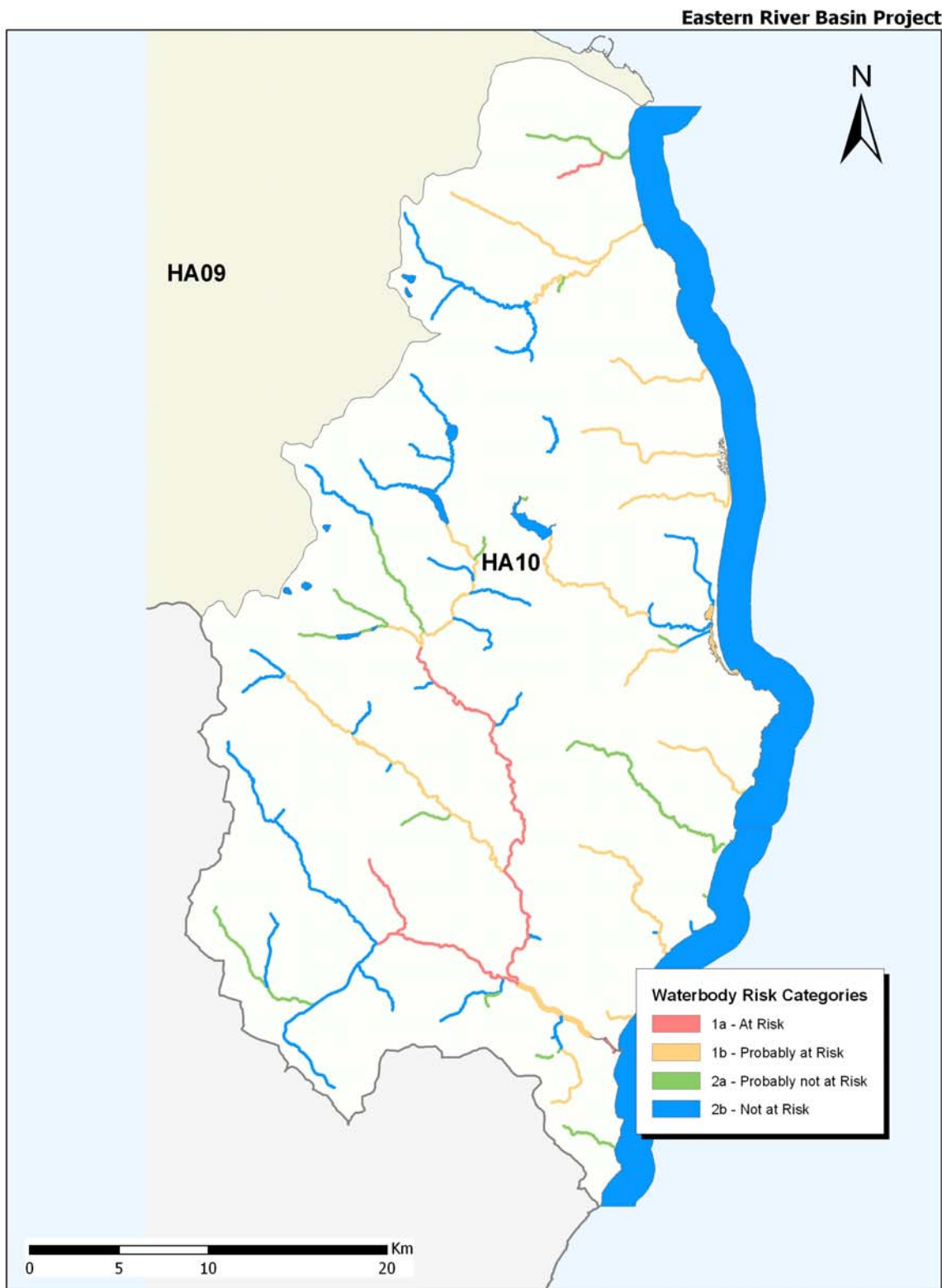




Figure 8.10: Hydrological Risk (HA10)



## 8.4 Lake Evaluation in the Avoca/Vartry Catchment Area

### 8.4.1 Lake Water Bodies in the Avoca/Vartry Catchment Area

The Avoca/Vartry catchment area contains 10 WFD qualifying “lakes”, one of which is Vartry reservoirs. The other lakes are Loughs Tay, Dan, Glendalough Upper and Lower, Bray Upper and Lower, Nahangan Upper and Lower and Ouler. With the exception of Vartry, Tay and Dan, all of the lakes are below 50 ha in size. These smaller lakes are being protected areas for water supply or habitats. The WFD qualifying lakes are identified in **Figure 8.11**. Dan is considered Type 2, Tay Type 3 and Vartry, Type 2 in the Typology scheme.

Lake quality is generally acceptable with relation to most parameters, with Loughs Bray (Upper and Lower), Dan, Glendalough (Upper and Lower), Nahangan and Vartry generally being considered as Oligotrophic in status, although Vartry and Dan have shown elevated levels of phytoplankton on occasion. However, based on expert opinion, some of these lakes have been assessed at higher risk class than might otherwise be ascertained, based on expert opinion and known quality issues.

### 8.4.2 Risk Assessment of Lake Water Bodies in the Avoca/Vartry Catchment Area

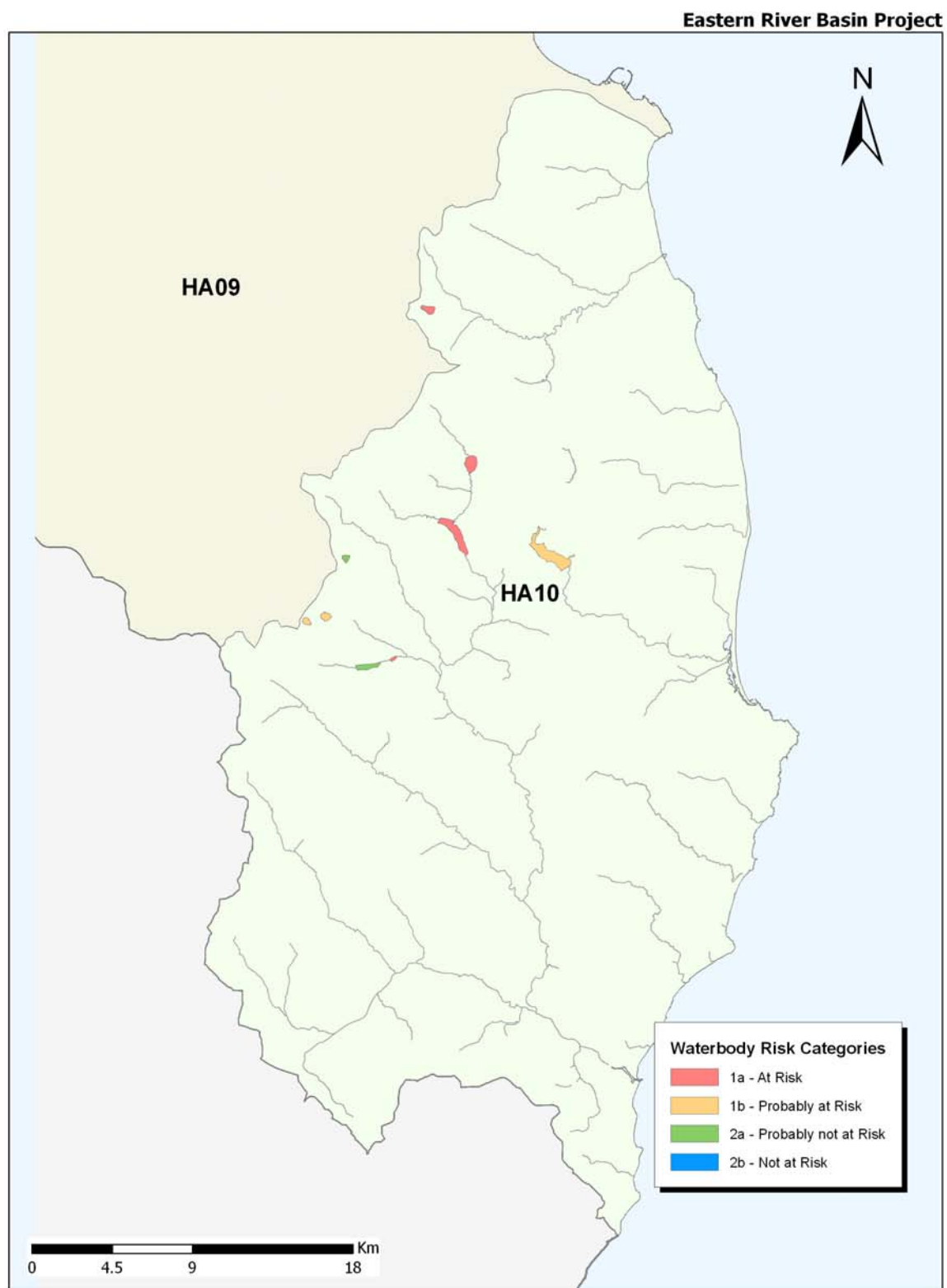
Results of the risk assessment performed on the WFD lakes located in the Avoca/Vartry catchment area are summarised in **Table 8.2**. Of the 10 WFD lakes, 1 (Bray Upper) is classified as “Not At Risk,” and 2 lakes (Ouler and Glendalough Upper) are classed as “Probably Not At Risk”, representing 13.8 % of the total lake area in HA10. Of the remaining 7 lakes, 4 are classified as “At Risk” and 3 “Probably At Risk”, representing 86.2% of the HA. Each WFD lake water body identified on the map in **Figure 8.11** has been colour coded to indicate the level of risk. Detailed results of the assessments for individual water bodies are presented in **Table D.4** of **Appendix D**. Results are also presented on a county basis in **Appendices E-O**.

**Table 8.2: Summary of Risk Assessment for WFD Lake Water Bodies in HA 10**

Risk Category	Assessment Categories (number of water bodies)				Overall*	Lake Area (ha)	% of area
	Morpho-logical	Hydrology	Diffuse	Point Source			
<i>Not at risk (2b)</i>	4	10	8	10	1	12.8	2.8
<i>Probably not at risk (2a)</i>	1	0	0	0	2	47.9	11
<i>Probably at risk (1b)</i>	2	0	2	0	3	191	43.9
<i>At risk (1a)</i>	3	0	0	0	4	184.2	42.3
<b>TOTAL</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>435.9</b>	<b>100</b>
* = Incorporating expert judgement							

The high degree of at risk and probably at risk lakes is surprising considering the general high quality of the lakes in HA10. Point sources and hydrological pressures lead to no lakes at all being considered “At Risk” or “Probably At Risk”.

Figure 8.11: Overall Risk Lakes (HA10)



The effect of diffuse pollution is hardly more significant, with 8 lakes being considered 2b, with only 2, Glendalough Upper and Lower being considered “Probably At Risk”. The main predictive test leading to risk is morphology, with 3 lakes being considered “At Risk” (Dan, Tay and Glendalough Lower), all due to intensive land use. Two lakes are considered to be “Probably At Risk” (Nahangan and Vartry), both because of the presence of impoundments. Vartry is a water supply reservoir and Nahangan is used for the generation of hydroelectric power.

The role of expert judgement in the risk assessment process for lakes needs to be considered. Here, information known to expert authorities such as the EPA, can over rule the predictive tests. This input has lead to a revision on some of the pollution based risk assessments, though not necessarily to the overall risk score. Bray Lower and Lough Dan scored 2b on all risk tests, but was judged by expert opinion to be 1a “At Risk”. Conversely, Glendalough Upper was rated 1b for diffuse pollution but revised to 2a based on expert input.

## 8.5 Transitional Waters Evaluation in the Avoca/Vartry Catchment Area

### 8.5.1 Transitional Water Bodies in the Avoca/Vartry Catchment Area

There are 4 transitional water bodies associated with HA10, as determined by the EPA from their draft typology (EPA 2003d). These are the Dargle and Avoca estuaries, Broad Lough and Kilcoole Marsh. Their locations are shown in **Figure 8.12**. The Dargle, Broad Lough and the Avoca Estuary are considered Type TW2, whilst Kilcoole Marsh is TW6 (Lagoon).

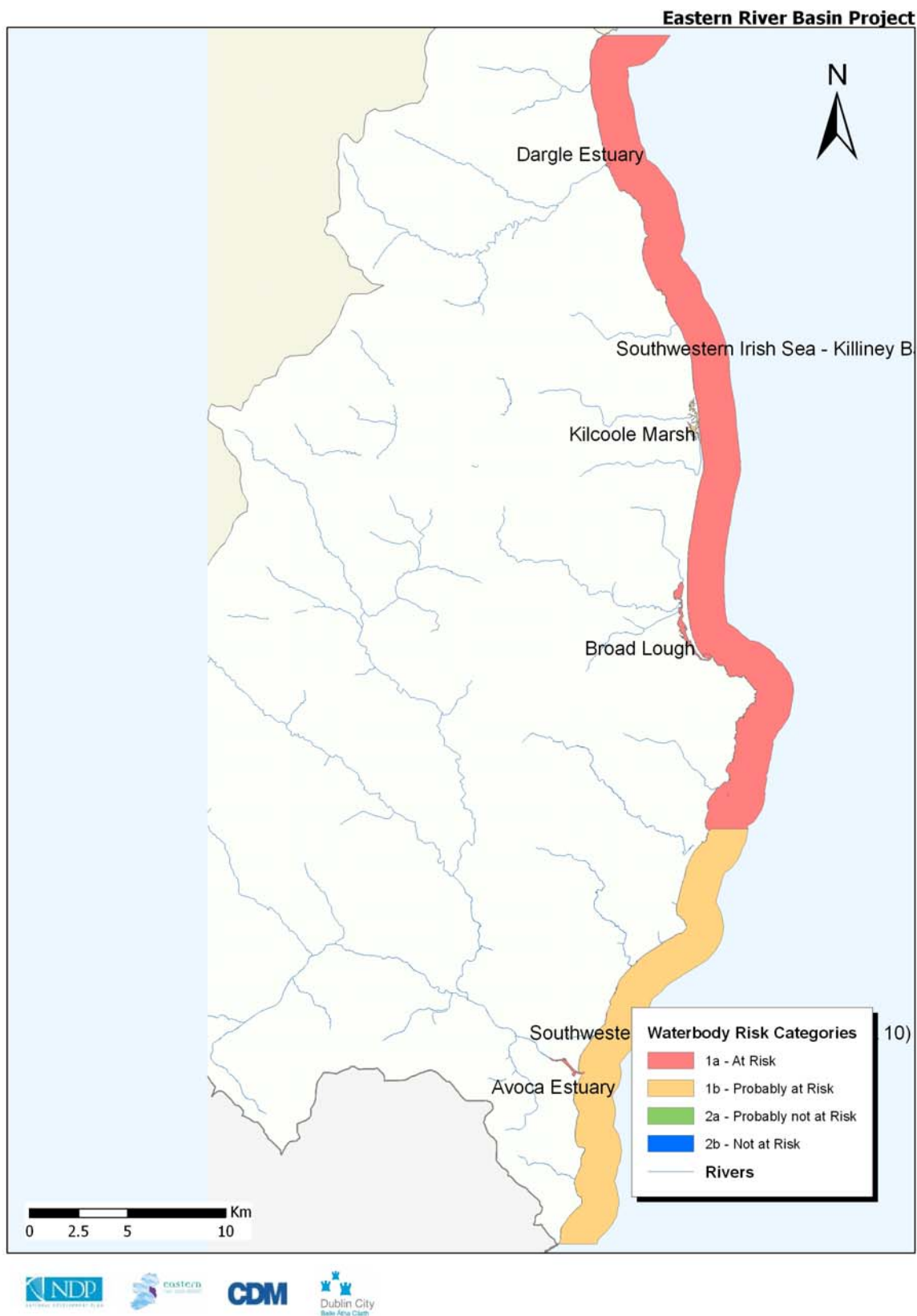
The Dargle Estuary is located in Bray, forming part of a small harbour, and is just 0.03 km in area. Survey information as to the quality of the estuary is limited, though 80% of the inland water course is considered class A in relation to its biological quality, and it supports a good sea trout fishery.

The Avoca Estuary discharges to the Irish Sea at the town of Arklow, and is 0.17 km<sup>2</sup> in area. The estuary has a small tidal range (0.2-0.8 m) and the limit of marine influence only extends a short distance upstream from Arklow. Flushing of the estuary to the Irish Sea is rapid due to the narrowing of the estuary to create a harbour. The estuary has been affected by serious pollution for many years from a number of sources. Acid mine drainage from the Avoca Mines causes the river and estuary to suffer from high loads of iron, low pH and contamination from other metals. Ortho-phosphate levels are low, due to the scavenging effect of the iron oxide in the water, although TON levels are similar to other rivers in the area. The estuary was also polluted by a large fertiliser plant which inputted up to 5,600 tonnes of ammoniacal nitrogen per year to the estuary at its peak, although this plant has subsequently closed. The full extent of the influence this plant would have had on biological quality was masked by the already impoverished fauna caused by the AMD problem. Eutrophication is not likely to be an issue in the estuary due to the estuarine characteristics and nutrient behaviour; however benthic studies have shown faunal impoverishment in the estuary, due to a combination of the reasons stated above.

Broad Lough is located just to the north of Wicklow Town and is 0.8 km in area. The River Vartry flows into the Lough before entering the sea.

Kilcoole Marsh is a transitional lagoon and is approximately 0.2 km in area. It is located just south of Kilcoole railway station and comprises an important part of the Murrough, a shingle ridge that runs along the coast almost the entire distance between Greystones and Wicklow.

Figure 8.12: Marine Waters Evaluation (HA10)



## 8.5.2 Risk Assessment of Transitional Water Bodies in the Avoca/Vartry Catchment Area

Of the 4 Transitional Waters in the Avoca/Vartry catchment area, 3 are considered to be “At Risk” (1a) and 1 “Probably At Risk” (1b). **Table D.5 of Appendix D**. The estuaries in **Figure 8.12** have been colour coded to indicate this level of risk.

The Dargle Estuary was rated as 1a “Probably At Risk” on the basis of intensive land use and the presence of coastal defences and intensive land use. Broad Lough was considered to be 1a due to port tonnage. It was also considered to be 1b due to the presence of WWTPs, CSO’s, Section 4 discharges and coastal defences.

The Avoca Estuary was rated as “At Risk” due to the presence of IPC authorised activities, coastal defences and the presence of intensive land-use. It was also considered “Probably At Risk” from the presence of WWTPs, CSOs, Section 4 discharges and OSPAR substances. The Kilcoole Marsh transitional lagoon was considered to be “Probably At Risk” due to the presence of CSOs.

## 8.6 Coastal Waters Evaluation in the Avoca/Vartry Catchment Area

### 8.6.1 Coastal Water Bodies in the Avoca/Vartry Catchment Area

There are 2 coastal water bodies directly associated with HA10. These are “Southwestern Irish Sea - Killiney Bay (HA10)” and Southwestern Irish Sea – Brittas Bay (HA10). Both are “Open” sub-types, with Killiney Bay being Type CW5 and Brittas Bay Type CW6. Their locations are shown in **Figure 8.12**. The Killiney Bay water body has an area of just over 87 km<sup>2</sup>, whilst Brittas bay is around half this size at 47 km<sup>2</sup>.

There is a lack of specific information regarding general water quality for this area. Most information relates to either Dublin Bay to the north or the Avoca Estuary. Water quality is generally good for most coastal and open sea areas, except where specific land based influences may occur, for example close to estuaries. Bacteriological monitoring is conducted for designated bathing waters and generally, HA10 bathing waters conform to both EC Mandatory and Guide limits. Bathing water locations are discussed in **Section 8.9**.

### 8.6.2 Risk Assessment of Coastal Water Bodies in the Avoca/Vartry Catchment Area

The Killiney Bay water body was rated 1a “At Risk” in the Characterisation exercise. This was on the basis of test CM4A which relates to port tonnage. All other quality elements were rated as “Not At Risk”, apart from coastal defences (“Probably At Risk”), “WTP + Others” and “built structures” (urban coast) which were rated as “Probably At Risk”.

Brittas Bay was rated as being 1b “Probably At Risk”. This water body was considered “Not At Risk” for all point source pressures and all morphology pressures, apart from CM3 (presence of coastal defences).

Further characterisation may change these ratings as more information is assessed. These large coastal water bodies may also be sub-divided into smaller stretches to make the effect of local pressures such as point sources more relevant.



## 8.7 Heavily Modified Water Bodies (HMWBs) Evaluation in the Avoca/Vartry Catchment Area

### 8.7.1 Heavily Modified Water Bodies in the Avoca/Vartry Catchment Area

Four pHWWB were identified in the Avoca/Vartry catchment area, covering both rivers and lakes. These are listed in Table 3.4.

The Vartry was designated in 2 separate water bodies due to the presence of impoundments that have lead to the formation of the Vartry Reservoir system. These reservoirs (Upper and Lower) have also been designated in line with the requirements of the WFD.

### 8.7.2 Risk Assessment of Heavily Modified Water bodies in the Avoca/Vartry Catchment Area

The Vartry River water bodies were rated as 1a "At Risk", due to abstraction and impoundment pressures. The Vartry reservoirs were rated as 1b "Probably At Risk", due to the impoundment.

Figure 8.13: Artificial Water Bodies (HA10)



## 8.8 Artificial Water Bodies Evaluation in the Avoca/Vartry Catchment Area

### 8.8.1 Artificial Water Bodies in the Avoca/Vartry Catchment Area

There are no designated AWB's in HA10. Constructed reservoirs in HA10 are shown in **Figure 8.13**.

## 8.9 Water Dependent habitats in the Avoca/Vartry Catchment Area

*The risk assessment has not been developed for water dependent habitats.*

## 8.10 Protected Areas in the Avoca/Vartry Catchment Area

### Abstraction

A total of 14 water bodies have been designated as protected areas on the basis of abstraction protection as shown on **Figure 8.14**. These are also listed in **Appendix D-7**. These protected areas include 1 lake, 3 ground waters and 10 rivers. Of these, 7 are "At Risk", 2 are "Probably At Risk", 4 are "Probably Not At Risk" and one "Not At Risk".

### Significant Aquatic Species

A total of 8 water bodies have been designated as Salmonid waters. They are found on the Dargle and Vartry Rivers and include one transitional and seven river water bodies as shown in **Figure 8.14**. Five are "At Risk", 1 "Probably At Risk" and 2 "Probably Not At Risk".

### Bathing Waters

Designated Bathing beaches are found at Bray Beach, Brittas Bay South, Clogga Beach, Greystones Beach, Killiney and Silver Strand as shown on **Figure 8.14**. Greystones, Killiney and Brittas Bay are Blue Flag beaches.

A total of 2 water bodies have been designated as protected areas for bathing waters. One water body is "At Risk" and the other is "Probably At Risk".

### Nutrient Sensitive Areas

No water bodies have been designated as nutrient sensitive waters in HA10.

### Protection of Species

A total of 47 water bodies have been designated as being associated with SPAs or SACs (**Figure 8.14**). These consist of 34 rivers, 9 lakes, 2 transitional and 2 coastal. Of these, 22 are considered "At Risk", 15 "Probably At Risk", 8 "Probably Not At Risk" and 2 "Not At Risk".

Figure 8.14: Protected Areas (HA10)

