Water Framework Directive

Humber River Basin District

Summary report of the characterisation, impacts and economics analyses required by Article 5

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HUMBER RIVER BASIN DISTRICT

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This document is also available at www.defra.gov.uk/environment/water/wfd/article5/index.htm

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1 Introduction

1.1 Background

Article 15 of the Water Framework Directive ("the Directive") requires member states to submit to the European Commission by 22nd March 2005 summary reports of the analyses carried out under Article 5 of the Directive. This is the summary report submitted by the government of the United Kingdom in relation to the Humber River Basin District ("the district").

The analyses required by Article 5 of the Directive are in three main parts: an analysis of the characteristics of the district; a review of the impact of human activity on the status of surface waters and groundwaters in that district; and an economic analysis of water use in the district. Detailed technical specifications in relation to each part are set out in Annexes II and III to the Directive.

Responsibility for overseeing general implementation of the Directive in the district falls to the Secretary of State for Environment, Food and Rural Affairs. The Secretary of State has placed primary responsibility for carrying out, in relation to the district, the first two parts of the Article 5 work – characterisation, and pressure and impact analysis – on the Environment Agency ("the Agency"). Responsibility for the economic analysis of water use rests with the Secretary of State. This report includes a summary of the work done by the both the Agency and the Secretary of State in accordance with those responsibilities.

1.2 Guidance on the Article 5 Analysis

In carrying out the analysis required by Article 5, regard has been had, where relevant, to Common Implementation Strategy (CIS) guidance issued in relation to the Directive and its implementation.[1]

The United Kingdom Technical Advisory Group (UKTAG) has also developed guidance in relation to the Article 5 analyses in the United Kingdom. UKTAG is a partnership of the UK environment and conservation agencies established in 2001 to provide co-ordinated advice on technical aspects of the implementation of the Directive. It includes partners from the Republic of Ireland.

UKTAG guidance documents[2] cover areas including typology, water body delineation, protected areas, wetlands, groundwater characterisation, pressure and impact analysis, reference conditions and economic analysis.

Similarly, a UK-wide Economics Steering group (ESG) exists to co-ordinate the economic analysis under the WFD in England, Wales, Scotland and Northern Ireland. This group also complements the work of the Economic Advisory Stakeholder Group (EASG) in England and Wales, which was established as a forum to ensure external stakeholder involvement in the economic analysis.

1.3 Guiding Principles

In preparing this summary report particular regard has been had to the strategic guidance agreed by EU Water Directors on *The principles and communication of the results of the first analysis under the Directive*. The key principles identified in that guidance are:

- The process and the results of the analysis should be transparent, comprehensible and all the data and information used in the analysis should be made available to the public;
- The analysis will help develop a targeted monitoring network but is not a classification of the status of water bodies;

[1] All WFD CIS guidance documents are available at http://europa.eu.int/comm/environment/water/water-framework/guidance_documents.html
[2] All UKTAG guidance documents are available at http://wfduk.org.uk/guidance

- The results will help identify and prioritise appropriate follow-up actions for the next stages of the planning process and those results are based on precaution;
- Member states should ensure a harmonised application of key issues, for example, in relation to the baseline scenario and the identification of heavily modified water bodies;
- Lack of data is not, of itself, an excuse. Member states should demonstrate that they have tried, including by undertaking a "gap analysis" and outlining steps to be taken subsequently to fill the gaps identified.

As a consequence the method statements[3] linked to this report state the assumptions made in undertaking each assessment and how any limitations were overcome. Four risk categories have been adopted across the UK to help target further work, including monitoring programmes, more effectively. The establishment of UKTAG and the dissemination of common UK guidance on technical aspects of this analysis have helped to ensure, wherever possible, a harmonised approach to key issues.

This analysis represents a risk assessment and not a classification process. As such, the results reported here should not be interpreted as a measure of the true status of waters at the present time, but rather as a first step in integrated river basin management. The results will be used to steer further characterisation including the development of a targeted and efficient monitoring system and as a starting point for the development of measures ensuring a cost-effective approach to water protection.

1.4 General issues relating to characterisation and the pressure and impact analysis

Analysis approach[4]

The pressure and impact analysis is based on a framework that identified, and assessed where possible, the relationship between: activities, source pressures, exposure pressures, sensitivities of the receiving waters and their consequent impacts.

As the CIS and strategic guidance both acknowledge, there is considerable variation between, and within, member states in relation to data availability. Such variations arise between geographical areas, types of water bodies, types of pressure, or the impacts of pressures.

Where monitoring data on impacts in relation to the district are available and relevant, they have been used to inform the pressure and impact analysis. However, the impacts of a number of pressures relevant to the analysis have not been routinely monitored across the UK or are not yet well understood, e.g. the impact of hydromorphology pressures on ecology. The analysis summarised in this report are therefore based on the predicted risks from information on pressures or activities which in some cases are based on impact data but in others may rely on pressure data, modelling or expert judgement. In most cases validation of the assessments has not been possible through site visits. The analysis broadly reflects the precautionary approach outlined in CIS guidance. For example, the point source assessments for rivers have used permit levels or consents to represent overall pollutant loads, whereas further refinement will consider the impact of the actual loads discharged to ascertain a more accurate measure of risk.

Our knowledge of the risks to the status of the water environment will improve as further work including modelling and targeted monitoring is guided by this initial analysis and so make future risk assessments more comprehensive and reliable.

Key challenges for this analysis

The Directive provides a new strategic framework within which new procedures for water management are to be established. Despite the advice provided by various CIS guidance documents, it is intrinsic to

[3] All method statements are available at http://www.environment-agency.gov.uk/wfd

[4] More detailed guidance on UKTAG guidance on the general principles for the pressure and impact analysis can be found at http://www.wfduk.org/tag_guidance/Article_05/Folder.2004-02 16.5332/TAG2003%20WP%207a%20%2801%29/view

the Directive itself that many key issues require further clarification, not least the definition of "good status" itself. It is therefore widely recognised, including in CIS guidance, that at this stage of the Directive's implementation a range of uncertainties have important implications for the Article 5 analyses and their outcomes. Some of the most significant aspects of this are set out in the strategic guidance on *The principles and communication of the results of the first analysis under the Directive*, in particular:

- **The environmental objectives are manifold and numerous**; an assessment needs therefore to be carried out on various levels;
- The **criteria** defining the environmental objectives are developed to a different level of detail and some will only become available after the analysis needs to be completed;
- The concept of "risk" implies that there is an element of **likelihood and uncertainty** which is not further discussed in the WFD;
- The **analysis** will need to be based on an **integrated evaluation of a large number of data** and information, some of which are not (readily) available.

The following paragraphs describe some of those challenges in carrying forward the Article 5 analysis and their consequences. More detail can be found at appropriate places in the body of this report.

Defining 'Good Status'

For **surface waters**, a key consideration is that good ecological status has not yet been fully defined across Europe. This task is underway through the intercalibration process, although it is unlikely that this will deliver harmonisation of all status class metrics by the end of 2006. In the absence of a common set of criteria across the EU, guidelines for this analysis were developed by UKTAG in accordance with the definitions set out in Annex V to the Directive and relevant CIS guidance.[5] Further details on how this guidance was applied in England and Wales are outlined in the Environment Agency method statements linked to this report.[6]

The criteria for good chemical status in surface waters are more clearly understood although the final agreed standards under the daughter directives including those for priority substances are not yet known.

For **groundwater**, Article 4 objectives mean that the assessments undertaken in accordance with Article 5 must take account of:

- the need to implement the measures necessary to prevent or limit the input of pollutants into groundwater and to prevent deterioration of the status of bodies of groundwaters;
- the need to protect, enhance and restore groundwater bodies and ensure a balance between abstraction and recharge of groundwater;
- the need to reverse any significant and sustained upward trend in pollutants resulting from human activity in order progressively to reduce pollution of groundwater;
- the application of a starting point for the assessment of trend reversal in the absence of criteria adopted under paragraph 4 of Article 17 at national level of a maximum of 75% of the level of the quality standards set out in existing Community legislation applicable to groundwater;
- the interaction with the chemical and ecological status of directly dependent surface water ecosystems or terrestrial ecosystems; and
- the requirement in Annex II to identify lower objectives for groundwaters where the achievement of good chemical status is infeasible or disproportionately expensive.

The assessments have been more difficult because the standards to be adopted under the daughter groundwater directive are not yet agreed. Indicative thresholds based on existing domestic and EU standards have been applied in assessing the risk of not achieving good chemical status. Further

[5] UKTAG guidance can be found at www.wfduk.org/guidance
[6] All method statements are available at http://www.environment-agency.gov.uk/wfd

refinement of these assessments will need to take account of the requirements of the groundwater daughter directive once adopted.

The lack of groundwater data required for the purposes of Annex II has meant that certain aspects of further characterisation and the reviews of the impact of human activity on groundwaters (Annex II, paragraphs 2.2 and 2.3) have not been undertaken in time for this report. This work is underway as part of the further characterisation programme being undertaken by the Environment Agency. Upward trends in pollutants have been assessed for nitrates only, and on a preliminary basis, given the current absence of readily available data on trends for other pollutants: the nitrate assessments are much broader in scope than those undertaken under existing water directives. Trends for pollutants will be assessed further in the next few years as far as possible.

Initial work on the identification of lower objectives for groundwaters required by Annex II, paragraphs 2.4 and 2.5 has been undertaken by the Environment Agency but is currently incomplete because a common UK methodology for assessing disproportionate costs remains under development as part of the UK Collaborative Programme.[7] Such groundwaters are therefore only provisionally identified in this report. This is discussed further in section 6.9.

Current knowledge of water status

The analysis will directly inform future monitoring, modelling and research programmes since it reveals where there remain significant gaps in our knowledge of the pressures and impacts on some of our waters. For example, there are currently no suitable or widely available datasets for identifying the impacts of hydromorphological pressures on ecological status (e.g. on macroinvertebrate communities).

Given that monitoring is not currently in place for some of the pressures covered by the WFD, modelling has been used where appropriate. The use of modelling techniques is described in each of the method assessments linked to this report. The Environment Agency's classification system for rivers (General Quality Assessment (GQA) – Biology) provides a partial assessment of the aquatic ecology and is the closest measure of status available for the macroinvertebrate biological quality element of the WFD's classification schemes. This existing classification has been used to provide impact information for some of the assessments that follow in this report. Maps showing the current GQA biology classification are shown in section 6.

Even where GQA biology monitoring has consistently shown that water bodies are good or very good, they may nevertheless be shown as at risk in this assessment. This, in part, reflects the wider parameters of the WFD as compared with the current GQA classification system. It also reflects the fact that pressures in a surrounding catchment may cause deterioration in a high quality water body if no risk management measures are applied.

Prediction of risks to 2015

Member states must aim to achieve the Directive's principal environmental objectives by 2015. It is difficult, however, to predict all the likely changes in pressures that may take place between now and 2015, or to assess the likely effects of (for example) current, proposed or future regulatory activity. For these reasons, the pressure and impact assessments are based on the general assumption that if a water body is at risk of not meeting the environmental objectives of the WFD by 2015 due to pressures operating in 2004, it is assumed the same level of pressure will still exist in 2015. However, in reality the pressures on those water bodies may decrease or increase during the period up to 2015.

There are, however, some trends that have been factored into the risk assessments. These are generally in cases where there is readily available trend data, or where planned investment is already funded. For England and Wales, the main trends incorporated into risk assessments are water industry investment plans for the periods 2000-2005 and 2005-2010 (which are considered in point source assessments for rivers); Environment Agency Water Resource Strategies (considered in abstraction and flow regulation

[7] Information on the UK Collaborative Programme can be found at http://www.defra.gov.uk/environment/water/wfd/economics/index.htm

assessments); and preliminary assessment of nitrate trends in groundwater (considered in diffuse source assessments for groundwater). Where trends are factored in they are noted in this report at the appropriate places, and are explained in detail in the pressure and impact method statements.

Other studies on future trends are being undertaken but have not been factored into the risk assessments, for example predictions of likely changes to agricultural land use resulting from the most recent round of CAP reform.[8]

Linking activities to pressures

Wherever possible we have attempted to link pressures to the main activities that cause them, for example by incorporating water resource forecasts into the risk analysis where possible and identifying the relevant economic trends within the river basin district for each pressure category. More detailed information on the predicted trends can be found in the economic supporting documents referred to in the text of this report. However, our current understanding on the relationship between pressures and activities is less well known for certain pressures e.g. diffuse pollution from non-agricultural activities or hydromorphology. We intend to strengthen our understanding of such links through further characterisation during 2005-2007 in order to develop the most cost-effective combinations of measures.

Risk Reporting categories

Annex II to the Directive requires the pressure and impact assessment to include an assessment of the likelihood that water bodies within the river basin district will fail to meet the environmental quality objectives set for them under Article 4. For the reasons already given, there remain gaps in our knowledge of the pressures and impacts on some of our waters. Different levels of uncertainty have therefore led us to adopt four risk assessment categories. These are outlined further in Table 1, Section 6 of this report:

- 'at significant risk' of not meeting the environmental objectives of the WFD by 2015 (1a);
- 'probably at significant risk' (1b);
- 'probably not at significant risk' (2a);
- 'not at significant risk' (2b)

The benefits of a more detailed differentiation of the risk assessment results are highlighted in the CIS document *The principles and communication of the results of the first analysis under the Directive*. In particular, it enables the Environment Agency to prioritise further work including monitoring efforts to focus on the most significant risks and to fill any data or knowledge gaps to increase certainty in the risk assessment results.

1.5 Monitoring

The four risk assessment categories will be used to prioritise and target the UK WFD monitoring programme. This will be fully operational from December 2006 and will provide the data to classify the status of water bodies after 2006 once intercalibration has delivered a common EU understanding of good ecological status. Targeted monitoring will be an essential part of the refinement of characterisation and should increase the certainty of the risk assessments and verify the initial assessments contained in this report.

1.6 Economics

Implementation of the Water Framework Directive requires the integration of economic and environmental information. This involves an economic analysis of sectors that use water and those that provide water services in the district. It involves an analysis of relevant economic datasets for the present and the future, based on forecasts of population, housing, employment and economic output. Analysis is also

[8] Information on the study on Business as Usual Projections of Agricultural Outputs is available at http://www.environment-agency.gov.uk/economics

required on the recovery of the costs of water services and the steps needed to undertake a cost-effectiveness analysis of actions required to meet WFD objectives. These analyses are presented in summary format within this report.

The Economic Analysis Supporting Documents[9] for each river basin district provide further detailed analysis. This information is based on national economics work described in reports on:

- Economic Importance and Dynamics of Use for River Basin Characterisation;
- Cost Recovery and Incentive Pricing;
- Cost-Effectiveness Analysis and Methodology for Disproportionate Costs.

A UK-wide Economics Steering Group (ESG) and England and Wales Economic Advisory Stakeholder Group (EASG) oversaw the production of the supporting documents. These outputs provide the basic information required to fulfil the requirements for the economic analysis at this stage, although further work is needed in relation to both cost-effectiveness analysis and cost recovery.

The information in this report summarises the work undertaken which is intended to provide:

- an overview of the socio-economic importance of water uses in the RBD;
- an assessment of the current level of financial cost recovery for water services together with a first picture of relevant cross subsidies;
- information relevant to the baseline scenarios particularly for the more complex sectors such as public water supply and agriculture;
- information on how the analysis will be improved in the future.

Constraints on available information have limited the analysis in many respects (e.g. it is not presently possible to report cost recovery accurately on a RBD basis, to estimate the level of environmental and resource costs or to identify cost recovery rates for all sectors). This report provides an analysis of gaps and relevant work plans to close these gaps in future.

1.7 Communication of results

Where possible we have made clear in the method statements linked to this report what the limitations and assumptions are to the assessment methodologies used and suggestions for improvement in the next phase of work. The assessment results have been subject to operational validation within the Environment Agency as well as an external quality review process which was undertaken with key national stakeholders during the period from 1 September – 30 November 2004. The draft results have also been publicised to the wider public through press statements and Ministerial announcements. This report will be made public on the Defra website from March 2005.

Other vehicles for public engagement include the holding of regular National (England) WFD Stakeholder Forum meetings, various national stakeholder sub-group meetings on communication aspects of the WFD and on economics (the Economic Advisory Steering Group for England and Wales), work in the Ribble Pilot Basin, key technical conferences and web based communications.

1.8 Next steps

Further characterisation, monitoring and river basin management

Further characterisation will be undertaken in accordance with section 1.5 and 2.2 of Annex II to the Directive and consistent with IMPRESS guidance.[10] This will increase our certainty in the outputs

[9] The Economic Analysis Supporting Documents can be found at http://www.defra.gov.uk/environment/water/wfd/economics/index.htm

summarised in this Report and inform the interim overview of significant water management issues to be published in 2007. Our monitoring strategies will be informed by the initial characterisation results.

The Ministerial Statement[11] accompanying transposition of the Directive in England and Wales made a firm commitment to an ongoing process of characterisation, beyond the "further characterisation" for which the Directive expressly provides. In March 2005, the Secretary of State, the Welsh Assembly Government, Scottish Ministers and the Department of the Environment Northern Ireland published a joint policy statement that further commits their respective Agencies to conduct this further characterisation up to and beyond 2007 to ensure that all significant pressures and impacts are captured within the river basin planning process.[12] This statement explains in more detail how the refinement process will improve our knowledge and allow us to utilise a wider range of data, especially local datasets.

In summary, further characterisation during 2005-2007 will include and take into account the following:

- establishment of a formal WFD monitoring regime by the end of 2006 to improve our knowledge of water status and the pressures acting on the water environment;
- the use of further existing datasets and the development of new ones including those of third parties where relevant;
- identification and characterisation of further important smaller water bodies, including groundwater-dependent wetlands;
- merger or subdivision of water bodies to improve the management of their water status;
- the outcome of the EU intercalibration exercise which will formally define where 'good status' lies (although by end 2006 this may only be completed for a limited number of ecological parameters);
- the outcome of negotiations on the daughter directives on groundwater and priority substances and the revised bathing water directive;
- better data on economic trends in river basin districts to determine risk of non-achievement of WFD objectives by 2015;
- continued stakeholder involvement in characterisation work, e.g. stakeholder workshops, consultations, bilateral meetings.

As a result of this refinement the proportion of water bodies identified as being 'at risk' in this report may alter during 2005-2007 as further risk assessment work (including monitoring data) improves our confidence in the risk to those waters. A greater certainty in the risk assessments should lead to a decrease in the proportion of water bodies in the 1b 'probably at significant risk' and 2a 'probably not at significant risk' categories, whilst those in the 1a 'at significant risk' or 2b 'not at significant risk' categories should increase. There will also be a greater knowledge of the relative contributions of the different pressures to the attainment of the environmental objectives of the WFD.

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[10] Analysis of Pressures and Impacts – Policy Summary to the Guidance Document, as ratified by Water Directors on 21/22 November 2002: *"the analysis should not stop in 2004. The assessment of pressures and impacts is one of the key ongoing processes within the river basin management planning cycle"*

[11] The Ministerial Statement on Further Characterisation can be found at http://www.defra.gov.uk/environment/water/wfd/

[12] The UK Policy statement on Further Characterisation can be found at http://www.defra.gov.uk/environment/water/wfd/

2 Humber River Basin District

River Basin Districts (RBDs) will be the main areas used to co-ordinate the management of the water environment. They comprise river basins and their associated transitional waters, coastal waters and groundwaters. There are 11 RBDs in England and Wales. Two cross the border with Scotland (the Solway Tweed District and Northumbria District), and a further two (the Dee and Severn Districts) cross the border between Wales and England. *Map 1* shows the RBDs in England and Wales.

This report refers to the Humber River Basin District (*Map 2*).

Environmental characteristics

The Humber RBD covers an area of 26,109 km^2, ranging from the North York Moors to Birmingham, the Pennines to the North Sea and Stoke on Trent to Rutland.

The River Trent flows from Staffordshire and drains industrial areas to the south and west of the district, largely in the Midlands. The River Ouse, which has its source in the Pennines, drains the less densely populated agricultural areas to the north and west, before joining with the Trent at Trent Falls to form the Humber. Tributaries of the Ouse include the Aire, Derwent, Calder, Don, Wharfe and Nidd. The tributaries of the Trent include the Tame, Soar and Dove. The River Hull drains directly into the Humber Estuary. The Humber Estuary has the second largest tidal range in the UK (7.2 m).

The predominant land use is agriculture, and production is intense on the flat and fertile floodplain. Almost half of the land is arable (mainly cereal crops) or horticultural and half is used for grazing. The Humber Estuary is an important resource in terms of recreation and nature conservation – most of the estuary is a candidate Special Protection Area, a Ramsar site and a proposed Special Area of Conservation.

The Ouse valley is a wide flat plain and, particularly in recent years, has been prone to flooding. Additionally, around 9000 km^2 of land that surrounds the Humber Estuary is less than 5 m above sea level. The Environment Agency maintains 280 km of flood defences within the estuary area, although other methods of protection, such as coastal realignment, are now also being considered.

The numbers of salmon and trout are beginning to increase across the district's rivers, because of improved estuary water quality. In 2002, substantial proportions of the district were designated as Nitrate Vulnerable Zones (NVZs) to protect groundwater from diffuse pollution.

The district has an annual rainfall of between nearly 600 and 1000 mm. Freshwater is abstracted from both surface water and groundwater sources.

Economic characteristics

The Humber RBD is home to over 10.8 million people. The population has remained the same between 1995 and 2002 and is forecast to grow marginally (by just 0.1 per cent per annum) between 2002 and 2015. The number of households is expected to increase slightly between 2002 and 2015.

The RBD has several major urban centres including Birmingham (977,087), Leeds (715,402) and Sheffield (513,324). There are several areas of high deprivation, and a proportion of the RBD is the focus of urban renewal programmes.

Services such as business, wholesale and health contribute most to the RBD's output. The most important non-services sectors include the metals and food, drink and tobacco sectors. The agriculture sector is small, relative to the size of the overall economy of the Humber RBD.[13]

[13] Further information is provided in section 2 of the Supporting Document for the Humber RBD which can be found at http://www.defra.gov.uk/environment/water/wfd/economics/index.htm

Total output in the region has grown by 2.3 per cent per annum between 1995 and 2002, with the greatest increases in output coming from the services sector such as business services and communications.

The health, retail and business services sectors are the largest employers in the Humber RBD. Between 1995 and 2002, the business services, education and health sectors have experienced the largest increases in employment levels, whereas employment has decreased the most in the textiles and clothing and metal manufacturing sectors.

Forecasts have shown that the highest increases in output will come from services such as business and communications. Strong growth is also predicted for the manufacturing sector, especially in the manufacture of electrical and optical equipment, chemicals and transport equipment. On the other hand, the textiles and clothing and metals sectors are expected to decline. Employment is expected to increase in the services sectors, but decline in the textiles and clothing and metals sectors.[14]

[14] Forecasts of population, households, output and employment have been compiled by Experian Business Services Limited. A full set of the forecasts is found at Annex 2 of the Supporting Document for the Humber RBD at http://www.defra.gov.uk/environment/water/wfd/economics/index.htm

3 Surface waters: water bodies, types and reference conditions

3.1 Water bodies

Water bodies are the reporting units of the Directive. For surface waters they can be whole or parts of rivers, canals, lakes, transitional or coastal waters. The main purpose of identifying water bodies is for their status to be accurately described and compared with their environmental objectives.

Surface water bodies have been identified mainly using natural features.[15] This has resulted in surface waters in the Humber River Basin District being divided into 890 rivers, 93 lakes, 5 transitional water bodies and 1 coastal water body.

For practical purposes size thresholds taken from the Directive were used initially to identify river and lake water bodies. These thresholds are 0.5 km^2 for the surface area of lakes and 10 km^2 for river catchment area. Water bodies identified using these size thresholds are referred to as baseline water bodies.

The Environment Agency has also identified additional small waters for assessment in the initial characterisation.[16] Lakes and saline lagoon clusters with a surface area greater than 0.05 km^2 and that are designated features under the Habitats and the Birds Directives or are drinking water supplies have been identified as water bodies. Rivers with catchments smaller than 10 km^2 and that are not part of a larger catchment, but with a river stretch greater than 1 km in length, have been identified as water bodies. Better information is needed to characterise these and other small rivers, lakes and lagoons, and this will be taken forwards in future years.

Numbers presented throughout this report refer to all baseline water bodies and the additional small water bodies described above. All water bodies have been assessed and reported at the 1:50,000 scale.

3.2 Water body types and reference conditions

Surface water bodies are grouped into different types according to their physical and chemical characteristics. The types indicate, in very general terms, the sorts of plants and animals likely to be present in water bodies of that type in undisturbed conditions. For example, the sorts of animals and plants found in upland, rocky, fast-flowing streams are very different to those found in lowland, slow-flowing, meandering rivers.

Reference conditions (equivalent to high status) will be set in relation to the ecology expected to be found in each type and represent undisturbed or nearly undisturbed conditions. They provide the basis on which the quality status classification scheme will be built, consisting of high, good, moderate, poor and bad status.

River types and reference conditions

River types in England and Wales are defined according to system A of the Directive.[17] This system uses altitude, catchment size and geology to define the types. This system creates 48 possible types of which 21 are found in England and Wales and 12 types are found in the Humber River Basin District (*Map 3*).

Reference conditions for river types describe the plants, macroinvertebrates, fish and the physicochemical and hydromorphological conditions expected to occur in undisturbed or nearly

[15] More detailed information on identification of surface water bodies can be found in the European guidance paper at http://forum.europa.eu.int/Public/irc/env/wfd/library?l=/framework_directive/guidance_documents/identification_bodies&vm=detailed&sb=Title

[16] More detailed information on small waters can be found at http://www.wfduk.org/tag_guidance/Article_05/Folder.2004-02-16.5420/view

[17] More detailed information on river typology can be found at http://www.wfduk.org/tag_guidance/Article_05/Folder.2004-02-16.5312/view and at http://www.environment-agency.gov.uk/wfd

undisturbed conditions.[18] The approach used to establish reference conditions in rivers varies with the availability of data. Where rivers or stretches of river were found in a specific type that display only very minor effects from pressures, these were used to help define reference conditions. However, for river types with few examples of undisturbed sites, reference conditions were derived by expert judgement and modelling.

Lake types and reference conditions

The ecological conditions of lakes, like other surface waters, change naturally to form a continuous variety of types. These are determined principally by the characteristics of their catchments. To achieve a balance between dividing lakes into a large number of different types and a smaller, manageable number, the lake types in the UK are based on the natural characteristics that have the greatest bearing on their ecological condition. These are the geology of the catchment, expressed as the base status (alkalinity) of the lake, and the depth of the lake, expressed as the mean depth.[19]

This approach complies with system B of the Directive. The other factors in System B required by the Directive (altitude, latitude, longitude and size) are of less relevance to ecological character at this scale and are therefore allocated to a single category for the UK. This results in 12 possible lake types, with a shallow and deep version of each of six geological types. The reference conditions described for these types inform non-specialists as to what fauna and flora might be expected to occur in each lake in an undisturbed condition.[20]

Of the 12 possible lake types, 7 types are present in the Humber River Basin District (*Map 4*).

Transitional and coastal water types and reference conditions

In the UK system B is used to divide transitional and coastal waters into types.[21] In this system the obligatory factors are latitude, longitude, tidal range and salinity. Optional factors of mixing characteristics, mean substratum composition and wave exposure are also used, as these are important in determining the ecology of transitional and coastal waters. This approach results in five transitional and seven coastal water types for England and Wales. Of these, 3 types of transitional waters and 1 type of coastal water are represented in the Humber River Basin District (*Maps 5* and *6*). One transitional water body within the Humber RBD crosses the river basin district boundary with Northumbria RBD. This water body is allocated to, and reported in, the Northumbria RBD Article 5 report.

This small number of physical types does not adequately describe the diverse range of habitats found in transitional and coastal waters. The Environment Agency is developing, in conjunction with UKTAG, additional habitat-specific reference conditions to be able to allocate a mix of appropriate habitat-specific reference conditions to each of the physical types.[22]

[18] Descriptions of reference conditions for rivers can be found at http://www.wfduk.org/tag_guidance/Article_05/Type%20specific%20reference%20conditions/view

[19] More detailed information on lake typology can be found at http://www.wfduk.org/tag_guidance/Article_05/Folder.2004-02-16.5312/view and at http://www.environment-agency.gov.uk/wfd

[20] Descriptions of reference conditions for lakes can be found at http://www.wfduk.org/tag_guidance/Article_05/Type%20specific%20reference%20conditions/view

[21] More detailed information on transitional and coastal water typology can be found at http://www.wfduk.org/tag_guidance/Article_05/Folder.2004-02-16.5312/view and at http://www.environment-agency.gov.uk/wfd

[22] Descriptions of reference conditions for transitional and coastal waters can be found at http://www.wfduk.org/tag_guidance/Article_05/Type%20specific%20reference%20conditions/view

3.3 Artificial and Heavily Modified Water Bodies

Artificial Water Bodies[23]

Artificial Water Bodies (AWBs) are bodies of surface water created by human activity. There are a number of reasons why AWBs are important including:

- Many AWBs currently or potentially support important aquatic ecosystems;
- Some AWBs may have a significant impact on non-AWBs and it is beneficial to manage them to protect the non-AWBs;
- Many AWBs are important for water supply reasons and it is important to manage their water quality and hydrology for the purposes of satisfying the WFD requirements;
- Many AWBs have secondary uses other than for the reason they were designed, (e.g. artificial reservoirs are often used for recreation), which requires the water quality, ecological or water quantity to be managed appropriately;
- AWBs have been designed to support specified uses, which provide valuable social and economic benefits, which should be allowed to continue within a framework of sustainable management;
- Many AWBs support significant wider environmental interests such as wetlands and heritage features.

A separate classification scheme will be developed for AWBs that need to attain good ecological potential, as opposed to good ecological status.

As part of the characterisation work we have identified provisional AWBs. To date lake-type AWBs, such as man-made reservoirs and flooded gravel pits, have been provisionally identified as AWBs, whereas canals and other 'linear' waters (open water transfers) have been identified as provisionally artificial, but not split into specific water bodies yet. This work will be developed in the near future as typology and classification schemes are developed.

Map 7 shows provisional AWBs, canals and water transfers.

Heavily modified water bodies[24]

Sometimes it is not possible for a water body to achieve good status because of substantial alterations made for specified purposes such as navigation, water storage, flood defence and land drainage. The Directive recognises that the benefits of such uses need to be retained and allows these water bodies to be designated as heavily modified water bodies (HMWBs).

The presence of physical alterations does not lead automatically to designation and neither does designation necessarily mean that mitigation measures will not be required. Designation enables objectives to be set that allow the benefits of the use to be maintained while ensuring that other pressures can be managed and, where possible, the adverse effects of the physical alterations mitigated. A separate classification scheme will be developed for HMWBs that need to attain good ecological potential, as opposed to good ecological status.

As part of the characterisation work we have identified provisional HMWBs (shown as 1a and 1b water bodies in *Map 30*). See section 6.6 for further information.

[23] More detailed information on provisional AWB identification can be found at http://www.environment-agency.gov.uk/wfd

[24] More detailed information on provisional HMWB identification can be found at http://www.environment-agency.gov.uk/wfd

4 Groundwaters: water bodies and characteristics

4.1 Water bodies and characteristics

England and Wales are geologically diverse, containing many aquifers with different characteristics. The aquifers are grouped into categories based on how groundwater flows within them and how much water is available for abstraction. They range from low productivity uplands to low-lying, highly productive chalk basins.

The flow mechanism and size of the aquifer is important as this indicates how much interaction there is between the rock and the groundwater. Greater interaction means that more contaminants are likely to be removed or reduced by physical filtration, or chemical or biological reactions. The protection provided by overlying soil and rock layers is also important in assessing aquifer vulnerability to pollution.

Groundwater bodies[25] have been identified by dividing aquifers into 'aquifer types' according to hydro-stratigraphic boundaries, and then dividing them up on Catchment Abstraction Management Strategy (CAMS) catchment hydrological boundaries. Where available, information on groundwater catchment divides has also been used. The main groundwater types are Primary, Secondary, Significant Drift and Unproductive Strata.

Where groundwater bodies do not fully follow a particular river basin, they have been assigned to the most appropriate river basin district. There are 356 groundwater bodies in England and Wales, and 57 are allocated to the Humber River Basin District (*Map 8*).

Six groundwater bodies within the Humber RBD cross the river basin district boundary with the Severn and Northumbria RBDs. Two of these groundwater bodies are allocated to the Humber RBD, three are allocated to the Severn RBD, one is allocated to the Northumbria RBD and are reported in these Article 5 reports respectively.

4.2 Terrestrial ecosystems and surface water bodies dependent on groundwater

The environmental objectives for groundwater also consider ecosystems and waters dependent on groundwater quality and quantity. For example, a wetland or river fed by groundwater may require certain amounts or quality of water to allow it to function properly. Land-based areas like this, for example wetlands, are called 'groundwater dependent terrestrial ecosystems' (GWDTEs) and were identified in association with English Nature following UK guidance.[26] In order to be able to prioritise work on these ecosystems, only GWDTEs in areas designated under the Habitats and the Birds Directives were included in this initial assessment. Further work is required to assess other GWDTEs in the future.

Surface water bodies are considered to be groundwater dependent when they are thought to be linked to a productive aquifer at the surface. For example, for rivers we have used a Base Flow Index that is a measure of the ratio of groundwater-to-surface water supply to river flow to identify which rivers may be dependent on groundwater.

Map 9 shows terrestrial ecosystems and surface water bodies dependent on groundwater.

[25] For more detailed information on how groundwater bodies were delineated see http://www.wfduk.org/tag_guidance/Article_05/Folder.2004-02-16.5420/view and at http://www.environment-agency.gov.uk/wfd

[26] For more detailed information on how groundwater dependent terrestrial ecosystems were identified see http://www.wfduk.org/tag_guidance/Article_05/Folder.2004-02-16.5420/view and at http://www.environment-agency.gov.uk/wfd

5 Protected areas

Protected areas are given particular protection under the Directive. They include areas designated under a number of other EC Directives and areas identified in accordance with Article 7 of the Directive itself, to protect the surface water or groundwater within them.

The Directive requires that a **register** of protected areas be established. This will help to ensure that water bodies are managed to achieve the protected area objectives. The register consists of a database that lists the protected areas, their location and the originating Directive.[27]

The Directive also requires us to assess whether these areas are likely to achieve their objectives by 2015.[28] Those objectives are imposed by Article 4 and are generally derived from the Directive under which the area is designated.

5.1 Waters used for the abstraction of drinking water

Drinking water protected areas are the only protected areas which must be identified by virtue of the Water Framework Directive itself, rather than as a result of another Directive. They will replace the system of drinking water protection currently provided by the Surface Water Abstraction Directive (75/440/EEC), to be repealed at the end of 2007.

Protected areas for drinking water supplies have been identified as water bodies that supply a daily average of more than $10m^3$ water for drinking or supply more than 50 persons. In the Humber River Basin District 199 water bodies are identified as drinking water protected areas (*Map 10*).

5.2 Areas designated to protect economically significant species

These are protected areas established under earlier EC directives aimed at protecting shellfish (79/923/EEC) and freshwater fish (78/659/EEC). There is one shellfish water, 6633 km of river stretches and 16 lakes designated under the Freshwater Fish Directive which are allocated to the Humber River Basin District (*Map 11*).

5.3 Recreational waters

These are bathing waters designated under the Bathing Waters Directive (76/160/EEC). There are 23 bathing waters allocated to the Humber River Basin District (*Map 12*).

5.4 Nutrient sensitive areas

These comprise nitrate vulnerable zones designated under the Nitrates Directive (91/676/EEC) and areas designated as sensitive areas (eutrophic or nitrate) under the Urban Waste Water Treatment Directive (91/271/EEC). There are both surface water and groundwater nitrate vulnerable zones, 16 river sensitive areas and 3 lake sensitive areas allocated to Humber River Basin District (*Map 13*).

5.5 Areas designated for the protection of habitats or species

These are areas previously designated for the protection of habitats or species where maintaining or improving the status of water is important for their protection. They comprise the aquatic part of Natura

[27] The protected area register for England and Wales is available at http://www.environment-agency.gov.uk/wfd

[28] More detailed information on the identification of protected areas is available at http://www.environment-agency.gov.uk/wfd

2000 sites designated under the Birds Directive (79/409/EEC) and the Habitats Directive (92/43/EEC).[29] 34 areas are designated as water dependent Natura 2000 sites and allocated to Humber River Basin District (*Map 14*).

5.6 Assessment of protected area objectives[30]

An assessment of whether protected areas are likely to achieve their objectives was undertaken where possible using 2003 compliance reporting. Shellfish Waters Directive and Freshwater Fish Directive reporting were used for the assessment of economically significant species protected areas (*Map 15*). Bathing Waters Directive reporting was used for the assessment of recreational protected areas (*Map 16*). Of those areas allocated to this RBD, the following failed their mandatory standards in 2003 - 1 lake and 346 km of Freshwater Fish Directive river stretches, 2 Bathing Waters.

The exceptions to this assessment approach are nutrient sensitive protected areas and water dependent habitats and species protected areas. For nutrient sensitive protected areas, designation as vulnerable zones under Directive 91/676/EEC (Nitrates Directive) and sensitive areas under Directive 91/271/EEC (Urban Waste Water Treatment Directive) were taken to indicate a risk of failing the objectives. See *Map 13* for location of designated areas.

Water dependent habitats and species protected areas were assessed using data from English Nature on the conservation status of the areas and Environment Agency information from Habitats Regulations assessments (*Maps 17 and 18*). The assessments made by English Nature are preliminary and do not pre-empt those to be reported under the Habitats Directives in 2007. 31 water dependent conservation areas allocated to this RBD have been assessed as at risk of not achieving their objectives.

There is no assessment for drinking water protected areas as these are new protected areas established by the Water Framework Directive and no objectives have yet been set.

[29] More detailed information on how these areas were selected can be found at http://www.wfduk.org/tag_guidance/Article_06-07/view

[30] More detailed information on the assessment of protected areas can be found at http://www.environment-agency.gov.uk/wfd

6 Pressure and impact analysis

6.1 Introduction

The pressure and impact analysis reviews the impact of human activity on surface waters and on groundwater. It is an integrated assessment bringing together the skills of many disciplines and data from a wide range to sources to identify those water bodies at risk of failing to meet the Directive's environmental objectives for surface and groundwater bodies. The first iteration of this analysis represents a risk screening exercise. The default objective used for these assessments is an estimation of good status, which includes good ecological status and good chemical status for surface water and good quantitative status and good chemical status for groundwater. Protected area objective assessments are based mainly on the latest compliance reporting (see section 5.6).

Annex 1 summarises the environmental objectives and discusses the issues and difficulties that surround the analysis. The assessment is important because it will shape monitoring programmes, provide a starting point for identifying programmes of measures and provide the basis for river basin management planning.

Good status has not yet been defined across Europe. This is a significant uncertainty in carrying out the pressure and impact analysis. The task of defining good status is underway and will feed into further iterations of risk assessment and the final classification scheme used. For this report, criteria set by the United Kingdom Technical Advisory Group (UKTAG) were used in the assessments.[31] Some assessments undertaken in relation to this District are not covered by UKTAG guidance. In such cases, alternative methods were used.[32]

The principal objective of the Directive is for member states to aim to achieve good status, and to comply with protected area standards and objectives, by 2015. As it is difficult to predict the changes in pressures between now and 2015 we have made the general assumption that if a water body is at risk in 2004 it will be at risk in 2015. The few exceptions to this are where we have accurate trend data to suggest otherwise and where planned investment is already funded and we could factor this into the assessments. These exceptions are noted in the following sections and explained in detail in the pressure and impact method statements.

Although the Directive requires water bodies to be reported as either at risk or not at risk of failing their objectives by 2015, to help prioritise future action, the results are reported using the categories agreed by UKTAG (Table 1). This will enable us to concentrate our efforts first on the most significant risks. In addition to the risk assessments, we will also use new monitoring data, information on classification status and other information gathered from stakeholders through the river basin planning and management process.

[31] Detailed guidance on the criteria used in the pressure and impact analysis can be found at http://www.wfduk.org/tag_guidance/Article_05/Folder.2004-02-16.5332/view

[32] Detailed information on Environment Agency pressure and impact assessment methodologies is available at http://www.environment-agency.gov.uk/wfd

Table 1: Reporting categories and subsequent action

Directive reporting category	UK reporting category Risk of failing WFD objective	Action
At risk	(1a) Water bodies at significant risk.	Consideration of appropriate measures can start as soon as practicable.
	(1b) Water bodies probably at significant risk, but for which further information is needed to make sure this view is correct.	Focus for more detailed risk assessments to determine whether or not the water bodies in this category are at significant risk in time for the interim overview of significant water management issues in 2007.
Not at risk	(2a) Water bodies probably not at significant risk.	Focus on improving quality of information in time for second pressure and impact analysis report in 2013.
	(2b) Water bodies not at significant risk.	Review for next pressure and impact analysis report in 2013 to identify any significant changes in the situation.

Tables are presented which summarise the numbers, lengths, areas and percentages of water bodies (subject to rounding errors) in each of the reporting categories above.

The pressure and impact analysis uses a variety of methods and datasets to reflect differences in the availability and quality of data. Some assessments use data on environmental impacts, such as water quality and fish populations. Others are based on pressures on the environment, such as water abstraction points and location of physical structures (e.g.barrages and weirs), which themselves may lead to an environmental impact.

These different approaches reflect the nature of the data and information available to make these first assessments. The extent and quality of data and information will improve, and so make future assessments more comprehensive and reliable. Nevertheless, we consider that this first analysis provides a sound basis from which to develop monitoring programmes, to improve the risk assessments and to progress river basin management planning.

Although economic data and methods have been employed in the analysis to the extent possible, separate overviews of the economic characteristics[33] of the river basin district have been developed. These provide additional economic information relevant to future risk assessment and river basin planning.

6.2 Impact data – General Quality Assessment biology

What is the issue?

The Environment Agency reports annually on the biological quality of the main freshwater watercourses in England and Wales. The General Quality Assessment (GQA) scheme classifies water quality in rivers and canals. The scheme provides a way of comparing river quality from one river to another and for looking at changes over time.

GQA biology provides a partial assessment of the aquatic ecology and is the closest measure for status we have for the macroinvertebrate biological quality element of the WFD's classification schemes. This information has been used to provide impact information for some assessments that follow in this report. However, the GQA biology system mainly reflects the impact of sanitary pollutants (e.g. oxygen

[33] Supporting Documents on the Economic Analysis have been prepared for all River Basin Districts. They summarise the outputs of the economic analysis led by Defra with the help of the Economic Advisory Stakeholder Group. The documents are available at http://www.defra.gov.uk/environment/water/wfd/economics/index.htm

demanding substances and ammonia) on invertebrates in river systems and so does not reflect all pressures that are covered by the WFD. The GQA biology assessment and map may assist in providing context for the pressure and impact analysis.

How did we do the assessment?[34]

Between 2001-2003, a third of the 7000 GQA monitoring sites in England and Wales were sampled for macroinvertebrates. The range of species found is compared with the range that would be expected in the river if it was not polluted or physically damaged. This takes account of natural differences expected due to different types of geology and flow. One of six classes – very good to bad (A to F) – is allocated to each river length.

What does the map show?

Map 19 shows the latest GQA Biology results (from 2001, 2002, 2003) for the Humber RBD.

6.3 Point source pressures

What is the issue?

Discharges from sewage works and industrial processes can contain substances that damage the ecology of waters. Authorised point sources are all those sites that have permits to discharge at a specific place, like sewage works or industrial discharges. There may also be accidental discharges of harmful substances which, where known, are also considered in the assessments.

The Environment Agency uses permits to control the amounts of substances discharged from point sources. Operators of sewage works and industrial sites commonly discharge effluent at a quality that is much better than their permit allows. This gives them a safety margin to guard against failure of the permit conditions. Therefore most of the sites we have looked at currently pass the targets we have used.

The European Commission has identified a list of 33 priority substances based on their toxicity, persistence and liability to bioaccumulate. While European environmental quality standards (EQS) for these substances have not yet been set, failure of existing UK standards has been taken to indicate a risk of not achieving good chemical status.

How did we do the assessment?[35]

For rivers we used the permit limits for each substance to calculate what its concentration would be in rivers at average flows. We used permit limits that have been revised and tightened as a result of improvements being undertaken as part of the approved five-year programmes of the water companies. We compared these concentrations with the most stringent targets that applied to each water body. During further refinement the Environment Agency will use datasets of actual discharge pollutant concentrations to ascertain a more accurate measure of risk.

For transitional and coastal waters we calculated the load discharged and took into account the rate of flushing of the estuary. These load calculations were ranked for metals and ammonia to show the risk of not achieving the Directive's objectives. An assessment of the impact of oxygen-demanding substances in transitional and coastal waters was undertaken. It used the calculated load of biological oxygen demand, from both direct point sources and the river catchment, water-quality monitoring data of dissolved oxygen levels, evidence of impact on migratory fish, such as salmon, and the diversity of the seabed invertebrate community. Some of these oxygen-demanding substances may also come from diffuse as well as point sources.

[34] The Environment Agency's GQA assessment for 2003 can be found at: http://www.environment-agency.gov.uk/gqaresults

[35] Further information on point source assessment methods can be found at http://www.environment-agency.gov.uk/wfd

These surface water bodies are also considered as being at risk of not achieving good chemical status if there is a risk that Environmental Quality Standards (EQS) are exceeded for any of these substances under the Dangerous Substances Directive. This assessment was done using existing EQS, although work under Article 16 of the WFD may tighten these standards in the future. Note that some of these EQS exceedences may be due to diffuse source pressures, however it is not possible to distinguish the sources at the present time.

For lakes, the most significant point source pressure is considered to be phosphorus from treated sewage effluent discharges. These discharge either directly to the lake or indirectly to rivers that subsequently discharge to lakes. We also looked at diffuse sources of phosphorus where this, in combination with point sources, caused a lake to be at risk.

The assessment of groundwater used our existing knowledge of groundwater pollution incidents and pollution pressures to identify groundwater bodies at risk of pollution, particularly those with dependent wetlands or those used as sources for public water supply. The risk to groundwater from List I and List II Dangerous Substances is reported under the diffuse source pressure assessment.

For all waters, an assessment to identify water bodies at risk from radioactive substances was also carried out.[36] This work shows there are no water bodies at risk from radioactive substances in this RBD.

What do the maps show?

Map 20 shows examples of the point source pressures considered in the pressure and impact assessments. Many of these point sources are already subject to controls and do not cause any damage to the water environment.

Maps 21 (surface waters) and *22* (groundwater) show river, lake, transitional, coastal and groundwater bodies at risk of not achieving good status because of point source discharges, including metals, nutrients, ammonia, oxygen-demanding substances and pesticides.

Tables 2-6 show the numbers, length and area of water bodies at risk of failing good status from point source pressures for rivers, lakes, transitional waters, coastal waters and groundwaters, respectively.

Figures 1-2 show the main point source pressures that affect river water bodies and transitional water bodies at risk of failing WFD objectives. There is no figure for lake water bodies as the main point source pressure is phosphorus from sewage. There are also no figures for coastal waters or groundwaters as no coastal and groundwater water bodies are at risk from point source pressures in this RBD. A water body is often affected by more than one substance or pressure and can therefore be counted more than once in the pie chart.

Economic analysis

Point source pressures are clearly linked to economic activities, for example household growth affects the level of sewage discharge and economic growth will affect the level of trade discharges. To the extent possible these relationships are factored into the risk assessment but further work is needed to link point source pressures to activities. The Economic Analysis Supporting Document provides information on the economic characteristics of the main activities related to point source pressures.

[36] Further information on the radioactive substances assessment can be found at http://www.environment-agency.gov.uk/wfd

Table 2: River water bodies at risk from point source pressures

	Reporting Category	Number of water bodies	% of number	Length (km)	% of Length
Rivers	1a - At Risk	272	30.6	4257	46.1
	1b - Probably At Risk	13	1.5	104	1.1
	2a - Probably Not At Risk	11	1.2	99	1.1
	2b - Not At Risk	594	66.7	4769	51.7
Total		890	100.0	9229	100.0
Total At Risk	**1a + 1b**	**285**	**32.0**	**4361**	**47.3**

Figure 1: Point source pressures in 1a and 1b river water bodies

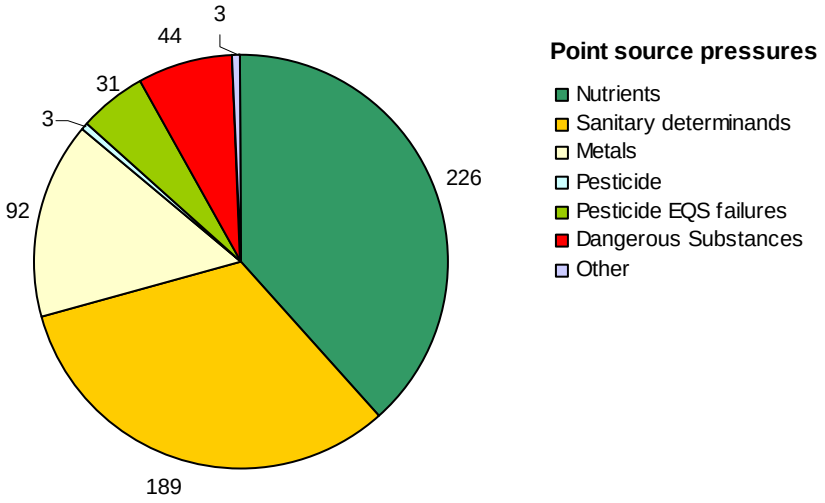


Table 3: Lake water bodies at risk from point source pressures

	Reporting Category	Number of water bodies	% of number	Area (km^2)	% of Area
Lakes	1a - At Risk	11	11.8	10	26.1
	1b - Probably At Risk	3	3.2	1	2.8
	2a - Probably Not At Risk	62	66.7	18	49.9
	2b - Not At Risk	17	18.3	8	21.2
Total		93	100.0	37	100.0
Total At Risk	**1a + 1b**	**14**	**15.1**	**11**	**28.9**

Note: Includes diffuse source pressures where these, in combination with point source pressures, cause a water body to be at risk.

Table 4: Transitional water bodies at risk from point source pressures

	Reporting Category	Number of water bodies	% of number	Area (km^2)	% of Area
Transitional	1a - At Risk	1	20.0	336	99.6
	1b - Probably At Risk	0	0.0	0	0.0
	2a - Probably Not At Risk	4	80.0	1	0.4
	2b - Not At Risk	0	0.0	0	0.0
Total		5	100.0	337	100.0
Total At Risk	**1a + 1b**	**1**	**20.0**	**336**	**99.6**

Note: Includes diffuse source pressures in combination with point source pressures where it was not possible to disaggregate sources.

Figure 2: Point source pressures in 1a and 1b transitional water bodies

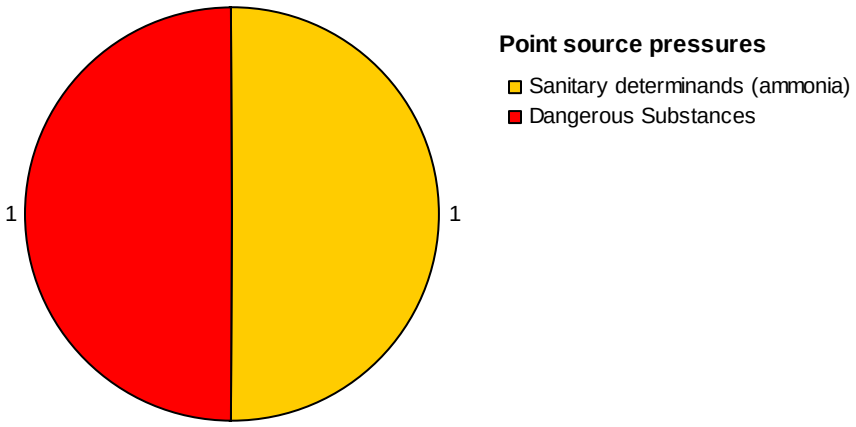


Table 5: Coastal water bodies at risk from point source pressures

	Reporting Category	Number of water bodies	% of number	Area (km^2)	% of Area
Coastal	1a - At Risk	0	0.0	0	0.0
	1b - Probably At Risk	0	0.0	0	0.0
	2a - Probably Not At Risk	1	100.0	329	100.0
	2b - Not At Risk	0	0.0	0	0.0
Total		1	100.0	329	100.0
Total At Risk	**1a + 1b**	**0**	**0.0**	**0**	**0.0**

Note: Includes some diffuse source pressures in combination with point source pressures where it was not possible to disaggregate sources.

Table 6: Groundwater water bodies at risk from point source pressures

	Reporting Category	Number of water bodies	% of number	Area (km^2)	% of Area
Groundwater	1a - At Risk	0	0.0	0	0.0
	1b - Probably At Risk	0	0.0	0	0.0
	2a - Probably Not At Risk	57	100.0	23998	100.0
	2b - Not At Risk	0	0.0	0	0.0
Total		57	100.0	23998	100.0
Total At Risk	**1a + 1b**	**0**	**0.0**	**0**	**0.0**

6.4 Diffuse source pressures

What is the issue?

Diffuse source pressures arise from a wide variety of activities. They can arise from *land use activities*, both *rural* and *urban*, that are dispersed across a catchment and may have an individually minor, but collectively significant environmental impact. Examples of diffuse pollution include the transport of nutrients and sediment from farmland or the run-off of water contaminated with pollutants from vehicle emissions from hard surfaces in towns to groundwater and surface waters. Diffuse pollution is often associated with heavy rainfall when pollutants are flushed into watercourses.

Enrichment of surface waters by nutrients, particularly compounds of phosphorus and nitrogen, may give rise to eutrophication. This is the process by which nutrients cause excessive growths of algae (some of which may be toxic) and other plants. This can lead to adverse effects on biodiversity and water quality, and reduces the value of the water body for amenity, recreation and water supply. Nutrients enter water bodies from point sources and deposition from the atmosphere, as well as from land use activities.

Atmospheric pollution also causes diffuse water pollution. *Acidification* is truly diffuse in nature. It occurs when gases such as ammonia, oxides of nitrogen and sulphur dioxide, emitted from transport and industry, react in the atmosphere to form nitric and sulphuric acids. When acid rain falls on catchments, particularly upland ones where there are thin soils and little to buffer or neutralise the acid, the rivers and lakes become affected by acidification. Fish populations (particularly salmon, sea trout and brown trout) and the invertebrates that these species feed on can often be severely affected.

Transitional waters and coastal waters are not affected by acidification. Similarly, because of the buffering capacity of the rocks that make up many aquifers, groundwaters do not suffer from acidification.

Unless carefully managed, some *mines* can contaminate the water environment, whether working or closed. Poor quality water can be discharged to streams and rivers from pumping to de-water working mines or from rising minewaters in closed sites where pumping has stopped. Rivers can also be polluted by contaminated water that runs off mine wastes such as spoil heaps. The main problems are acidity, heavy metals (such as iron, manganese, aluminium, copper, nickel and zinc), high salinity and high chemical oxygen demand, which reduces concentrations of dissolved oxygen.

The Environment Agency's current surface water monitoring is designed mainly to assess the impacts from point source discharges. As a result, knowledge of diffuse source impacts at a national scale is less than that for point sources. Groundwater monitoring focuses mainly on nitrate and pesticides.

How did we do the assessment?[37]

To reflect these various causes of diffuse pollution, we separately assessed whether water bodies are at risk of failing the Directive's objectives from the following pressures or activities: nutrients, sediment, pesticides and sheep dip, urban land use, acidification, mines and minewaters. We have combined these assessments to present the overall risk of water bodies not achieving the Directive's objectives as a result of diffuse source pressures. Different combinations of pressures are used for different water categories, depending on data availability.

For the nutrient nitrogen assessments, in the absence of an operational regulatory standard relating to the environmental impact of nitrate in surface waters, and the absence of agreement of the groundwater daughter directive, a 50 mg/l risk threshold has been used as providing an initial basis for assessment of risk of not meeting the environmental objectives of the Water Framework Directive.

For the nutrient nitrogen assessment in groundwaters we have estimated the pressure trend to 2015. The groundwater assessment for List I and List II Dangerous Substances under the Groundwater Directive 80/68/EEC is included pending agreement of the daughter directives. The assessment for groundwater bodies must also take into account whether groundwater dependent ecosystems (see section 3.2) are at risk of being damaged by chemical inputs from groundwater.

What do the maps show?

Diffuse pollution is strongly linked to land use activity – *Map 23* shows a land use map for the Humber River Basin District. Water bodies at risk from diffuse source pressures are shown in *Maps 24* (surface waters) and *25* (groundwater).

Tables 7-11 show the numbers, length and area of water bodies at risk of not achieving good status because of diffuse source pressures for rivers, lakes, transitional waters, coastal waters and groundwater, respectively.

Figures 3-6 show the pressures or activities that affect water bodies in each category at risk of failing the WFD objectives. There is no figure for coastal waters as no coastal water bodies are at risk from diffuse source pressures in this RBD. A water body is often affected by more than one pressure or activity and can therefore be counted more than once in the pie chart.

Economic analysis

Diffuse source pressures are largely associated with dispersed activities taking place in urban areas which contribute to run-off from hard surfaces and from the use of specific substances in agriculture (fertilisers and pesticides) which can enter the water environment. Links between economic activities and diffuse pollution pressures are very difficult to determine and further work is needed to link diffuse source pressures to activities. The Economic Analysis Supporting Document provides information on the economic characteristics of the main activities related to diffuse source pressures, of which population and agricultural production are important drivers. In the Humber RBD there is an expectation of steady population levels and a small decline in agricultural output.

[37] Further information on diffuse source pressure assessment methods can be found at http://www.environment-agency.gov.uk/wfd

Table 7: River water bodies at risk from diffuse source pressures

	Reporting Category	Number of water bodies	% of number	Length (km)	% of Length
Rivers	1a - At Risk	673	75.6	6775	73.4
	1b - Probably At Risk	135	15.2	1732	18.8
	2a - Probably Not At Risk	78	8.8	714	7.7
	2b - Not At Risk	4	0.4	8	0.1
Total		890	100.0	9229	100.0
Total At Risk	**1a + 1b**	**808**	**90.8**	**8507**	**92.2**

The pressures considered for rivers are nutrients, sediment, pesticides and sheep dip, urban land use, acidification, mines and minewaters.

Figure 3: Diffuse source pressures in 1a and 1b river water bodies

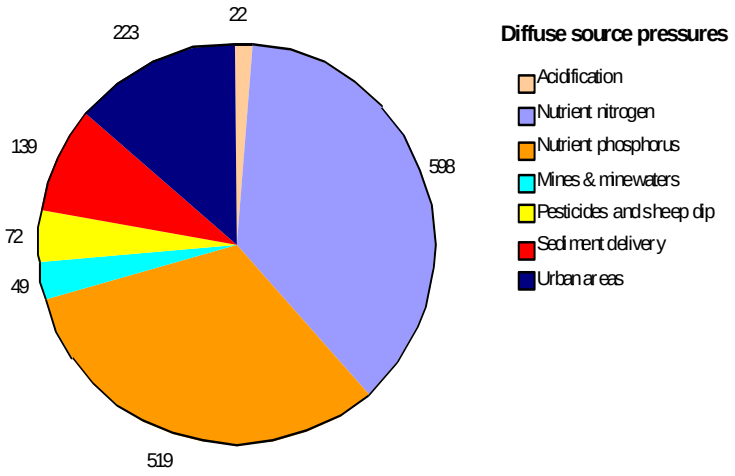


Table 8: Lake water bodies at risk from diffuse source pressures

	Reporting Category	Number of water bodies	% of number	Area (km^2)	% of Area
Lakes	1a - At Risk	31	33.3	14	37.5
	1b – Probably At Risk	29	31.2	8	20.8
	2a – Probably Not At Risk	32	34.4	15	40.1
	2b - Not At Risk	1	1.1	1	1.6
Total		93	100.0	37	100.0
Total At Risk	**1a + 1b**	**60**	**64.5**	**21**	**58.3**

Note: Includes point source pressures for nutrients where these, in combination with diffuse source pressures, cause a water body to be at risk.

The pressures considered for lakes are nutrients and acidification.

Figure 4: Diffuse source pressures in 1a and 1b lake water bodies

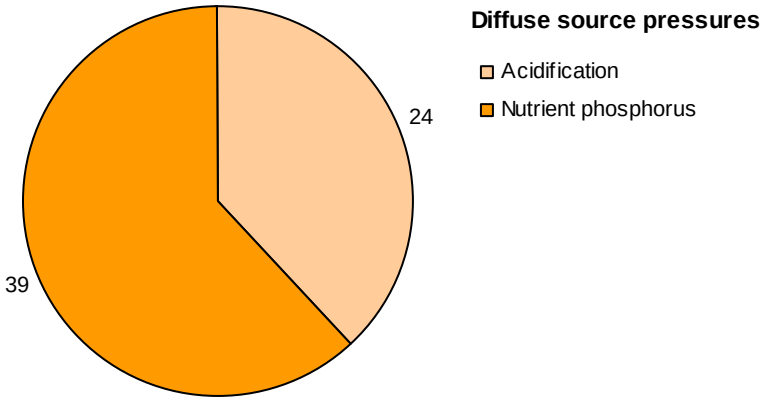


Table 9: Transitional water bodies at risk from diffuse source pressures

	Reporting Category	Number of water bodies	% of number	Area (km^2)	% of Area
Transitional	1a - At Risk	1	20.0	336	99.6
	1b - Probably At Risk	0	0.0	0	0.0
	2a - Probably Not At Risk	4	80.0	1	0.4
	2b - Not At Risk	0	0.0	0	0.0
Total		5	100.0	337	100.0
Total At Risk	**1a + 1b**	**1**	**20.0**	**337**	**99.6**

Note: Point source pressures may be included in this assessment as it is not currently possible to disaggregate these pressures from diffuse source pressures.

The pressures considered for transitional waters are nutrients and pesticides (tributyltin).

Figure 5: Diffuse source pressures in 1a and 1b transitional water bodies

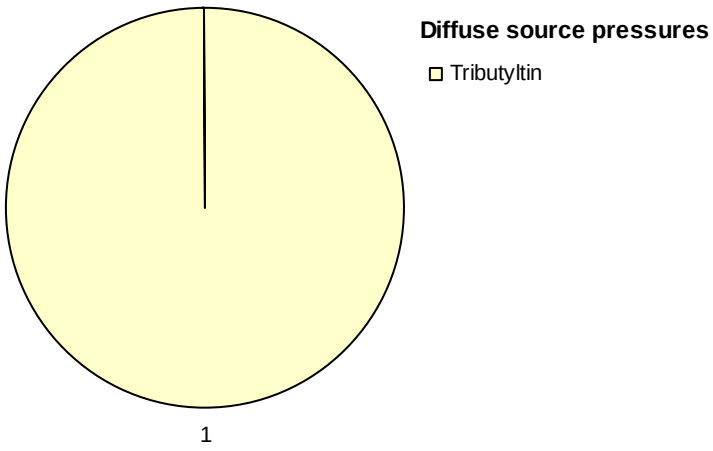


Table 10: Coastal water bodies at risk from diffuse source pressures

	Reporting Category	Number of water bodies	% of number	Area (km^2)	% of Area
Coastal	1a - At Risk	0	0.0	0	0.0
	1b - Probably At Risk	0	0.0	0	0.0
	2a - Probably Not At Risk	1	100.0	329	100.0
	2b - Not At Risk	0	0.0	0	0.0
Total		1	100.0	329	100.0
Total At Risk	**1a + 1b**	**0**	**0.0**	**0**	**0.0**

Note: Point source pressures may be included in this assessment as it is not currently possible to disaggregate these pressures from diffuse source pressures.

The pressures considered for coastal waters are nutrients and pesticides (tributyltin).

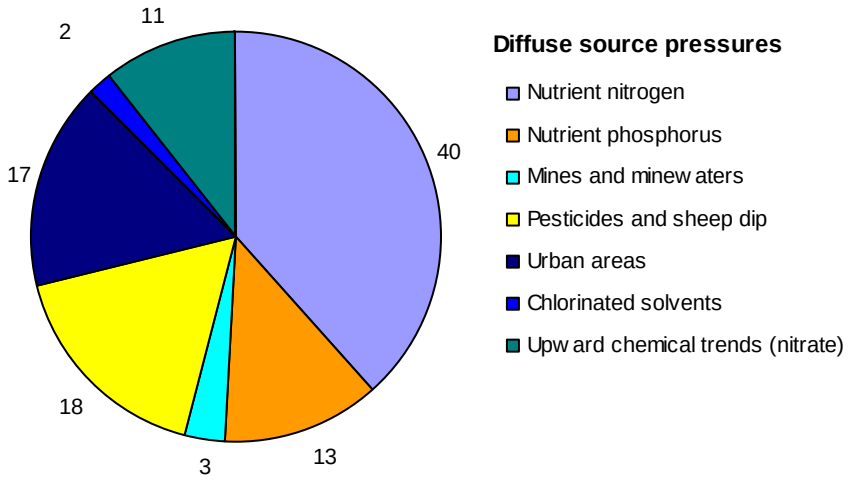
Table 11: Groundwater water bodies at risk from diffuse source pressures

	Reporting Category	Number of water bodies	% of number	Area (km^2)	% of Area
Groundwater	1a - At Risk	26	45.6	8366	34.9
	1b - Probably At Risk	24	42.1	11355	47.3
	2a - Probably Not At Risk	7	12.3	4277	17.8
	2b - Not At Risk	0	0.0	0	0.0
Total		57	100.0	23998	100.0
Total At Risk	**1a + 1b**	**50**	**87.7**	**19721**	**82.2**

Note: Some of the pressures included here can be considered to be point or diffuse source in nature depending on the scale of assessment. They are grouped under diffuse source pressures for convenience.

The pressures considered for groundwater are nutrients, pesticides and sheep dip, urban land use, mines and minewaters, List I and List II Dangerous Substances.

Figure 6: Diffuse source pressures in 1a and 1b groundwater bodies



6.5 Abstraction and flow regulation pressures

What is the issue?

Water is abstracted from rivers, canals, reservoirs, lakes, transitional waters or underground rocks (aquifers) to provide public water supplies and serve industry and agriculture. The main challenge in managing abstraction is to meet the reasonable needs of water users, while leaving enough water in the environment to conserve river, lake and wetland habitats and species.

Abnormally low river flows can damage river and estuarine ecology, which may take years to recover. Low river flows may be caused by periods of low rainfall, but the effects can be prolonged or made worse by abstraction at critical periods. Unsustainable abstraction from groundwater can lower groundwater levels and have knock-on impacts on river flows or wetlands.

In England and Wales, abstraction is controlled by a licensing system administered by the Environment Agency. The Environment Agency also regulates other major influences on water flows, including transfers of water from one catchment to another and flow-controlling structures, such as dams.

How did we do the assessment?[38]

The Environment Agency is developing Catchment Abstraction Management Strategies (CAMS) for managing water resources at a local level. CAMS will include an assessment of water resources in rivers and groundwater. This helps us to meet the requirements of the Water Framework Directive to assess the risks from abstraction and flow regulation to rivers and groundwaters. CAMS for all catchments in England and Wales will be completed by 2008.

For this initial assessment the best-available national datasets have been used to estimate the risk to river flows, lakes, transitional waters and groundwater, using methods developed from CAMS. The return of good quality water to the river system by discharges is an important resource and is taken into account. Abstraction trends projected to 2015 have been included in the assessment as far as possible, based on existing Environment Agency Water Resource Strategies.

If water bodies are water supply reservoirs, the risk of not achieving Directive objectives as a result of abstraction pressures is not currently reported, as the assessment method was not appropriate for this. This is because the method uses the change in annual flow estimates as an indicator of human impact on residence time. Whilst this is appropriate for natural lakes it doesn't reflect the large water level fluctuations that reservoirs can experience throughout the year. Further work to assess the risk of not achieving good ecological potential for artificial and heavily modified water bodies will be developed in the future. See section 3.3 and 6.6 for further detail on artificial and heavily modified water bodies.

The assessment for groundwater bodies takes into account the groundwater balance and whether dependent ecosystems, such as rivers, lakes and wetlands, are at risk of being damaged by groundwater abstraction.

The assessment for transitional waters includes the risk from reduced freshwater flows as a result of abstraction in upstream catchments and also from direct water abstractions for industrial use.

Coastal water bodies are not at risk from abstraction pressures. Flow regulation pressures on coastal water bodies, such as barrages, are reported under the morphological assessment for convenience.

What do the maps show?

Map 26 shows examples of the pressures that have been considered. Water bodies affected by abstraction and flow regulation pressures are shown in *Maps 27* (surface waters) and *28* (groundwater).

[38] Further information on abstraction and flow regulation assessment methods can be found at http://www.environment-agency.gov.uk/wfd

Tables 12-15 show the numbers, length and area of water bodies at risk of failing WFD objectives from abstraction and flow-regulation pressures for rivers, lakes, transitional waters and groundwater, respectively.

Figures 7-10 show the general industry sectors that affect water bodies at risk from abstraction and flow-regulation pressures. A water body is often affected by more than one industry sector and can therefore be counted more than once in the pie chart.

Economic analysis

Abstraction and flow related pressures are clearly linked to economic activities, for example household and economic growth will affect the level of water demand. To the extent possible these relationships are factored into the risk assessment but further work is needed to link abstraction and flow related pressures to specific activities. The Economic Analysis Supporting Document provides information on the economic characteristics of the main activities related to these pressures.

Next to public water supply, abstractions for agriculture and manufacturing are the next biggest water uses. The agricultural sector is predicted to decline slightly over the forecast period. The performance of the manufacturing sector is generally positive, although some sectors are expected to decline.

Table 12: River water bodies at risk from abstraction and flow regulation pressures

	Reporting Category	Number of water bodies	% of number	Length (km)	% of Length
Rivers	1a - At Risk	0	0.0	0	0.0
	1b - Probably At Risk	140	15.7	1704	18.5
	2a - Probably Not At Risk	218	24.5	2834	30.7
	2b - Not At Risk	532	59.8	4691	50.8
Total		890	100.0	9229	100.0
Total At Risk	**1a + 1b**	**140**	**15.7**	**1704**	**18.5**

Note: 417 river water bodies have been provisionally identified as heavily modified water bodies (HMWB). Linear artificial waters, such as canals, have not yet been split into water bodies (AWB).

Figure 7: General industry sectors that affect 1a and 1b river water bodies (abstraction and flow-regulation pressures)

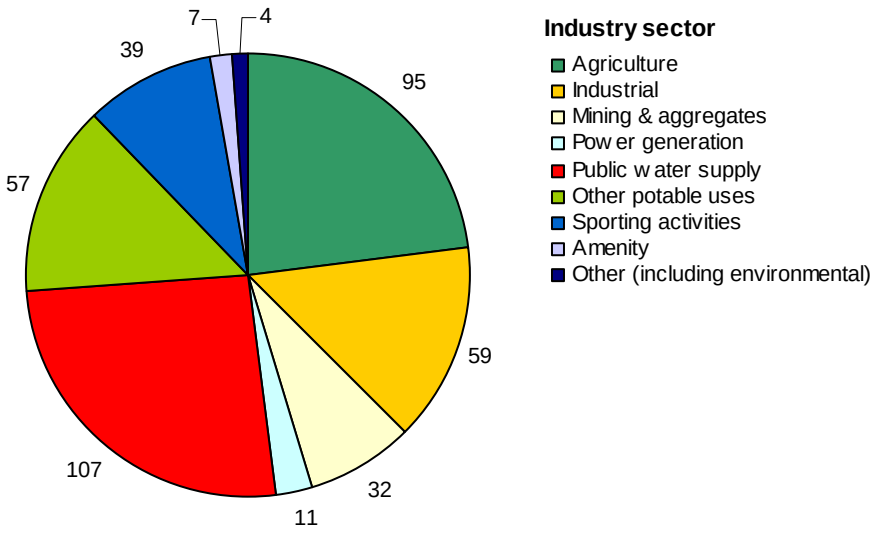


Table 13: Lake water bodies at risk from abstraction and flow regulation pressures

	Reporting Category	Number of water bodies	% of number	Area (km^2)	% of Area
Lakes	1a - At Risk	0	0.0	0	0.0
	1b - Probably At Risk	2	2.2	0	0.6
	2a - Probably Not At Risk	2	2.2	1	4.0
	2b - Not At Risk	3	3.2	3	6.9
	Not Assessed	86	92.5	32	88.5
Total		93	100.0	37	100.0
Total At Risk	**1a + 1b**	**2**	**2.2**	**0**	**0.6**

Note: 82 and 9 lake water bodies have been provisionally identified as HMWB and AWB respectively.
86 reservoirs and offline lakes have not been assessed for this pressure as the method was not applicable to these water bodies.

Figure 8: General industry sectors that affect 1a and 1b lake water bodies (abstraction and flow regulation pressures)

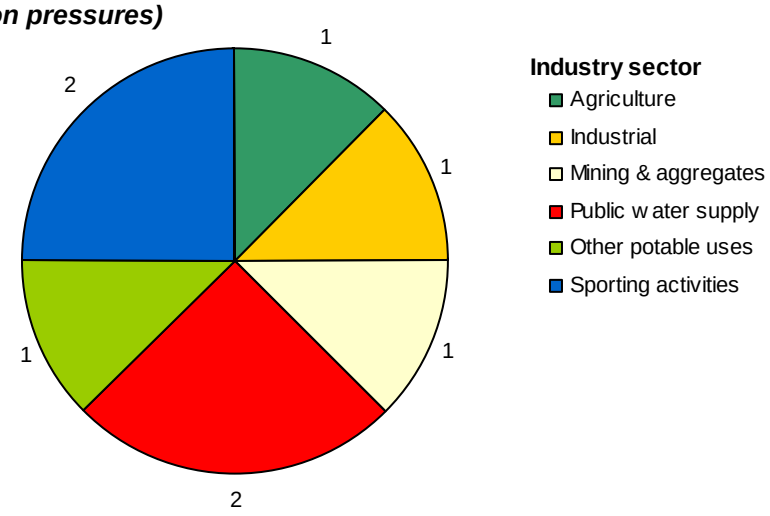


Table 14: Transitional water bodies at risk from abstraction and flow regulation pressures

	Reporting Category	Number of water bodies	% of number	Area (km^2)	% of Area
Transitional	1a - At Risk	0	0.0	0	0.0
	1b - Probably At Risk	1	20.0	336	99.7
	2a - Probably Not At Risk	3	60.0	1	0.3
	2b - Not At Risk	1	20.0	0	0.0
Total		5	100.0	337	100.0
Total At Risk	**1a + 1b**	**1**	**20.0**	**336**	**99.7**

Note: 5 transitional water bodies have been provisionally identified as HMWB. There are no transitional AWB in this RBD.

Figure 9: General industry sectors that affect 1a and 1b transitional water bodies (abstraction and flow regulation pressures)

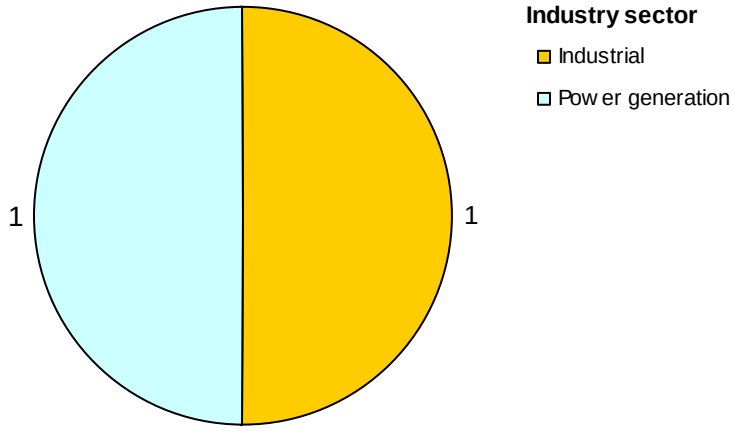
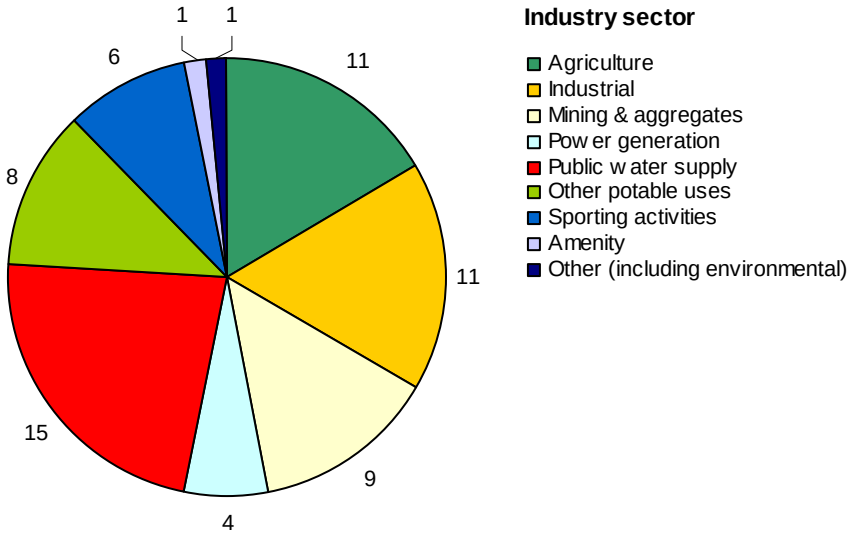


Table 15: Groundwater water bodies at risk from abstraction pressures

	Reporting Category	Number of water bodies	% of number	Area (km^2)	% of Area
Groundwater	1a - At Risk	4	7.0	1778	7.4
	1b - Probably At Risk	11	19.3	3959	16.5
	2a - Probably Not At Risk	42	73.7	18261	76.1
	2b - Not At Risk	0	0.0	0	0.0
Total		57	100.0	23998	100.0
Total At Risk	**1a + 1b**	**15**	**26.3**	**5736**	**23.9**

Figure 10: General industry sectors that affect 1a and 1b groundwater bodies (abstraction pressures)



6.6 Morphological pressures

What is the issue?

Physical alterations to a river, lake, transitional or coastal water can cause habitat damage or loss that results in a decline or loss of species.

Land reclamation, shoreline reinforcement or physical barriers (such as flood defences, barrages and sluices) can affect all categories of surface waters. Weirs, dams and barrages can alter water and sediment movements, and may impede the passage of migratory fish such as salmon. Activities such as maintenance and aggregate dredging, placement of dredged material and commercial fishing using towed bottom-fishing gear can also damage physical habitats. Using water for transport and recreation often requires physical alteration to habitats and affects the flow of water.

How did we do the assessment?[39]

The assessment for rivers used information from our River Habitat Survey, our flood defence asset databases and data on the extent of urbanisation. The assessment for lakes took into account the presence of roads, buildings and the land use around lakes, as well as water level changes and impoundment of upstream rivers.

In transitional and coastal waters, the physical pressures assessed included:

- reclamation of land from the sea by human intervention;
- shoreline reinforcement and physical barriers such as barrages, weirs and sluices;
- maintenance and aggregate dredging, placement of dredged material and commercial fishing using towed bottom-fishing gear and hydraulic harvesting devices.

Provisional Heavily Modified Water Bodies

As part of the pressure and impact assessment process we have identified provisional HMWBs.[40] If a water body is at risk or probably at risk as a result of morphological pressures, it is provisionally identified as a HMWB. However, the final designations for the river basin management plan are not required until 2009, although designations may be made some time before this because objectives and programmes of measures for HMWB (and AWB) also have to be developed by 2009.

The Environment Agency is developing operational guidance for the identification and designation of heavily modified water bodies based on European guidance.[41] The European guidance splits the assessment process into provisional identification (for 2004) and formal designation (for 2009 or before). As part of this process water bodies are initially assessed against good ecological status (not potential) leading to provisional identification as HMWB if they are at risk or probably at risk of not achieving good status. The work done to date represents the first few steps in this process. This includes assessing whether the modifications that support a use, put the water body at risk of not achieving good ecological status.

What do the maps show?

Map 29 shows examples of the pressures that have been considered as well as the Environment Agency's River Habitat Survey monitoring sites. Surface water bodies at risk through morphological alterations are shown in *Map 30* – these have been provisionally identified as being heavily modified.

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[39] Further information on morphological pressure assessment methods can be found at http://www.environment-agency.gov.uk/wfd

[40] Further information on identification of provisional HMWBs can be found at http://www.environment-agency.gov.uk/wfd

[41] European guidance paper on identification of heavily modified water bodies - http://forum.europa.eu.int/Public/irc/env/wfd/library?l=/framework_directive/guidance_documents/modified_guidance&vm=detailed&sb=Title

Tables 16-19 show the numbers, length and area of water bodies at risk of failing WFD objectives from morphological pressures for rivers, lakes, transitional waters and coastal waters.

Figures 11-12 show the specific activities or pressures that affect transitional and coastal water bodies at risk of failing their objectives. A water body is often affected by more than one activity or pressure and can therefore be counted more than once in the pie chart. Data limitations mean it is not yet possible to report on river and lake water bodies in this way.

Economic analysis

Some morphological pressures can be linked to economic activities but others are more difficult, often being related to historical activities. The Economic Analysis Supporting Document provides information on the economic characteristics of the main activities related to morphological pressures, particularly in terms of land reclamation, shoreline reinforcement, navigation dredging and dredge spoil placement. The supporting documents also provide more information on the extensive canal networks, for example the Grand Union and Coventry Canals, in the southern sections of the RBD. Further work linking morphological pressures to activities is however, necessary.

Table 16: River water bodies at risk from morphological pressures

	Reporting Category	Number of water bodies	% of number	Length (km)	% of Length
Rivers	1a - At Risk	161	18.1	2035	22.0
	1b - Probably At Risk	256	28.8	3155	34.2
	2a - Probably Not At Risk	464	52.1	3945	42.7
	2b - Not At Risk	9	1.0	95	1.0
Total		890	100.0	9229	100.0
Total At Risk	**1a + 1b**	**417**	**46.9**	**5190**	**56.2**

Note: 417 river water bodies have been provisionally identified as HMWBs.
Linear artificial waters, such as canals, have not yet been split into water bodies (AWB).

Table 17: Lake water bodies at risk from morphological pressures

	Reporting Category	Number of water bodies	% of number	Area (km^2)	% of Area
Lakes	1a - At Risk	51	54.8	17	45.2
	1b - Probably At Risk	31	33.3	9	24.8
	2a - Probably Not At Risk	2	2.2	2	5.3
	2b - Not At Risk	0	0.0	0	0.0
	Not Assessed	9	9.7	9	24.7
Total		93	100.0	37	100.0
Total At Risk	**1a + 1b**	**82**	**88.2**	**26**	**70.0**

Note: 82 and 9 lake water bodies have been provisionally identified as HMWBs and AWBs, respectively.
AWB lakes have not been included in this assessment as the method was not applicable.

Table 18: Transitional water bodies at risk from morphological pressures

	Reporting Category	Number of water bodies	% of number	Area (km^2)	% of Area
Transitional	1a - At Risk	1	20.0	336	99.6
	1b - Probably At Risk	4	80.0	1	0.4
	2a - Probably Not At Risk	0	0.0	0	0.0
	2b - Not At Risk	0	0.0	0	0.0
Total		5	100.0	337	100.0
Total At Risk	**1a + 1b**	**5**	**100.0**	**337**	**100.0**

Note: 5 transitional water bodies have been provisionally identified as HMWBs. There are no provisional transitional AWBs in this RBD.

Figure 11: Morphology pressures in 1a and 1b transitional water bodies

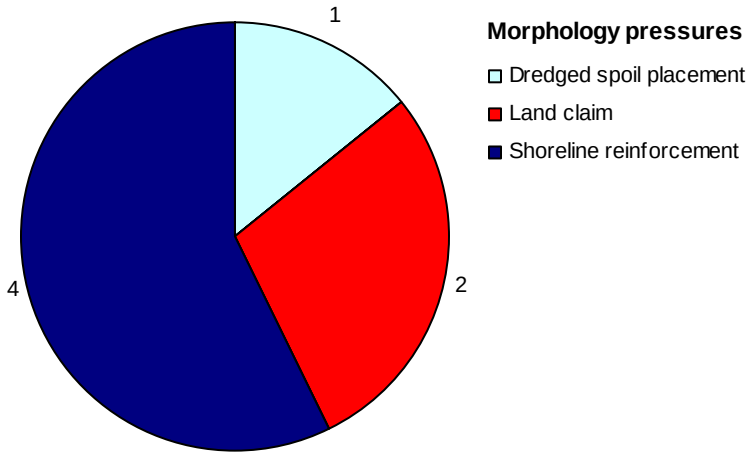
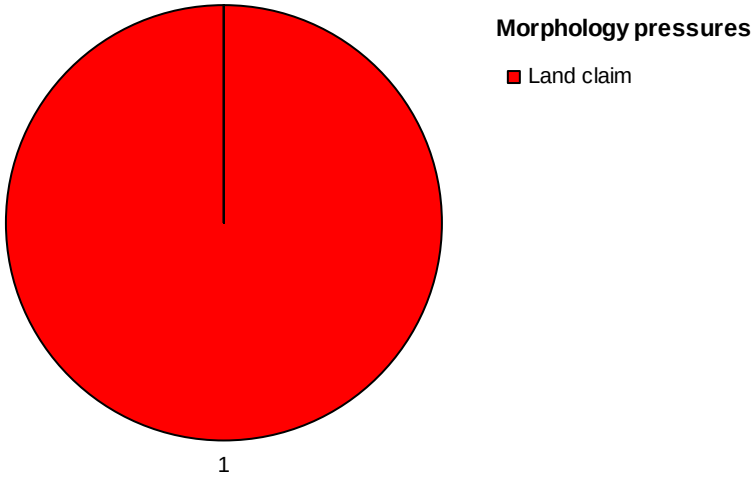


Table 19: Coastal water bodies at risk from morphological pressures

	Reporting Category	Number of water bodies	% of number	Area (km^2)	% of Area
Coastal	1a - At Risk	1	100.0	329	100.0
	1b - Probably At Risk	0	0.0	0	0.0
	2a - Probably Not At Risk	0	0.0	0	0.0
	2b - Not At Risk	0	0.0	0	0.0
Total		1	100.0	329	100.0
Total At Risk	**1a + 1b**	**1**	**100.0**	**329**	**100.0**

Note: 1 coastal water body has been provisionally identified as HMWBs. There are no provisional coastal AWBs in this RBD.

Figure 12: Morphology pressures in 1a and 1b coastal water bodies



6.7 Other human pressures (alien species)

What is the issue?

Alien species are non-native organisms that establish themselves in, and may disrupt, native ecosystems. Alien species have been deliberately or accidentally introduced by humans and there is growing evidence that they can cause a major threat to native flora and fauna. They can result in loss of natural biodiversity and may have significant economic impacts.

How have we done the assessment?[42]

The assessment carried out for this report focused on 10 species in rivers, lakes, transitional and coastal waters, selected because of data availability and the severity of their impact.

The species assessed are:

Australian swamp stonecrop	*Crassula helmsii*
Floating pennywort	*Hydrocotyle ranunculoides*
Water fern	*Azolla filiculoides*
Parrot's feather	*Myriophyllum aquaticum*
Common cord-grass	*Spartina anglica*
Japanese weed	*Sargassum muticum*
North American signal crayfish	*Pacifastacus leniusculus*
Zebra mussel	*Dreissena polymorpha*
Chinese mitten crab	*Eriocheir sinensis*
Slipper limpet	*Crepidula fornicata*

English Nature identified records of known locations of alien species. Their presence indicates a risk that the water body will not achieve Directive objectives. The analysis is not a comprehensive assessment of all alien species, but indicates the potential extent of the problem in the Humber River Basin District.

What does the map show?

Map 31 shows river, lake, transitional and coastal water bodies that have known occurrences of the alien species and so are at risk of not achieving WFD objectives.

[42] Further information on the alien species assessment method can be found at http://www.wfduk.org/tag_guidance/Article_05/Folder.2004-02-16.5332/TAG%202004%20%28PR1-16-03-04%29/view and at http://www.environment-agency.gov.uk/wfd

Tables 20-23 show the numbers, length and area of water bodies at risk of not achieving good status as a result of alien species in rivers, lakes, transitional and coastal waters.

Table 20: River water bodies at risk from the presence of alien species

	Reporting Category	Number of water bodies	% of number	Length (km)	% of Length
Rivers	1a - At Risk	0	0.0	0	0.0
	1b - Probably At Risk	129	14.5	2617	28.4
	2a - Probably Not At Risk	761	85.5	6613	71.6
	2b - Not At Risk	0	0.0	0	0.0
Total		890	100.0	9229	100.0
Total At Risk	**1a + 1b**	**129**	**14.5**	**2617**	**28.4**

Table 21: Lake water bodies at risk from the presence of alien species

	Reporting Category	Number of water bodies	% of number	Area (km^2)	% of Area
Lakes	1a - At Risk	0	0.0	0	0.0
	1b - Probably At Risk	6	6.5	2	6.7
	2a - Probably Not At Risk	87	93.5	34	93.3
	2b - Not At Risk	0	0.0	0	0.0
Total		93	100.0	37	100.0
Total At Risk	**1a + 1b**	**6**	**6.5**	**2**	**6.7**

Table 22: Transitional water bodies at risk from the presence of alien species

	Reporting Category	Number of water bodies	% of number	Area (km^2)	% of Area
Transitional	1a - At Risk	0	0.0	0	0.0
	1b - Probably At Risk	1	20.0	336	99.6
	2a - Probably Not At Risk	4	80.0	1	0.4
	2b - Not At Risk	0	0.0	0	0.0
Total		5	100.0	337	100.0
Total At Risk	**1a + 1b**	**1**	**20.0**	**336**	**99.6**

Table 23: Coastal water bodies at risk from the presence of alien species

	Reporting Category	Number of water bodies	% of number	Area (km^2)	% of Area
Coastal	1a - At Risk	0	0.0	0	0.0
	1b - Probably At Risk	1	100.0	329	100.0
	2a - Probably Not At Risk	0	0.0	0	0.0
	2b - Not At Risk	0	0.0	0	0.0
Total		1	100.0	329	100.0
Total At Risk	**1a + 1b**	**1**	**100.0**	**329**	**100.0**

6.8 Summary of water bodies at risk

Sections 6.2 to 6.7 present information in relation to the different types of impacts and pressures on water bodies and the resulting risk of not achieving good status in the Humber River Basin District. As many water bodies are affected by more than one type of pressure, this section provides an overall summary of the main issues in this district.

Maps 32 (surface waters) and *33* (groundwater) show all water bodies at risk of failing the Directive's environmental objectives.

Tables 24-28 show the numbers, length, area and percentages of surface and groundwater bodies at risk.

Figures 13-17 show the pressures causing the risk of failing the Directive's objectives in each of the water categories in the Humber River Basin District.

In the Humber River Basin District, diffuse pollution pressures and morphological pressures are the most common cause of river and lake water bodies being at risk of not achieving good status. There is only one coastal water body, which is at risk from morphological pressures and from the presence of alien species. All five transitional water bodies are at risk from morphological pressures. Diffuse source pollution pressures are significant for groundwater, accounting for around 90% of the groundwater bodies at risk. Abstraction pressures account for around a third of the groundwater bodies at risk of not achieving good status.

Economic analysis

A supporting document[43] on the Economic Analysis has been prepared for the Humber RBD. This provides an overview of the socio-economic importance of water uses in the Humber RBD and summarises work completed to date to establish a baseline scenario including forecasts of population, households, output and employment for the District.

Population pressures arise from public water supply abstractions and sewage discharges. The population in the Humber is expected to stay about the same, although a moderate increase in the number of households is expected.

Industrial sector abstraction and trade discharges are related to the manufacturing sector in the Humber RBD. Output in the manufacturing sector is generally expected to be positive over the next decade.

The agricultural sector, one source of diffuse pollution and abstractions, makes up only a small part of the Humber economy. Agricultural output is expected to decline slightly over the forecast period.

Table 24: River water bodies at risk

	Reporting Category	Number of water bodies	% of number	Length (km)	% of Length
Rivers	1a - At Risk	711	79.9	7538	81.7
	1b - Probably At Risk	126	14.2	1321	14.3
	2a - Probably Not At Risk	53	6.0	371	4.0
	2b - Not At Risk	0	0.0	0	0.0
Total		890	100.0	9229	100.0
Total At Risk	**1a + 1b**	**837**	**94.0**	**8859**	**96.0**

[43] http://www.defra.gov.uk/environment/water/wfd/economics/index.htm

Table 25: Lake water bodies at risk

	Reporting Category	Number of water bodies	% of number	Area (km^2)	% of Area
Lakes	1a - At Risk	71	76.3	25	69.0
	1b - Probably At Risk	17	18.3	6	15.4
	2a - Probably Not At Risk	5	5.4	6	15.6
	2b - Not At Risk	0	0.0	0	0.0
Total		93	100.0	37	100.0
Total At Risk	**1a + 1b**	**88**	**94.6**	**31**	**84.4**

Table 26: Transitional water bodies at risk

	Reporting Category	Number of water bodies	% of number	Area (km^2)	% of Area
Transitional	1a - At Risk	1	20.0	336	99.6
	1b - Probably At Risk	4	80.0	1	0.4
	2a - Probably Not At Risk	0	0.0	0	0.0
	2b - Not At Risk	0	0.0	0	0.0
Total		5	100.0	337	100.0
Total At Risk	**1a + 1b**	**5**	**100.0**	**337**	**100.0**

Table 27: Coastal water bodies at risk

	Reporting Category	Number of water bodies	% of number	Area (km^2)	% of Area
Coastal	1a - At Risk	1	100.0	329	100.0
	1b - Probably At Risk	0	0.0	0	0.0
	2a - Probably Not At Risk	0	0.0	0	0.0
	2b - Not At Risk	0	0.0	0	0.0
Total		1	100.0	329	100.0
Total At Risk	**1a + 1b**	**1**	**100.0**	**329**	**100.0**

Table 28: Groundwater water bodies at risk

	Reporting Category	Number of water bodies	% of number	Area (km^2)	% of Area
Groundwater	1a - At Risk	26	45.6	8366	34.9
	1b - Probably At Risk	24	42.1	11355	47.3
	2a - Probably Not At Risk	7	12.3	4277	17.8
	2b - Not At Risk	0	0.0	0	0.0
Total		57	100.0	23998	100.0
Total At Risk	**1a + 1b**	**50**	**87.7**	**19721**	**82.2**

Figure 13: Pressures acting on river water bodies

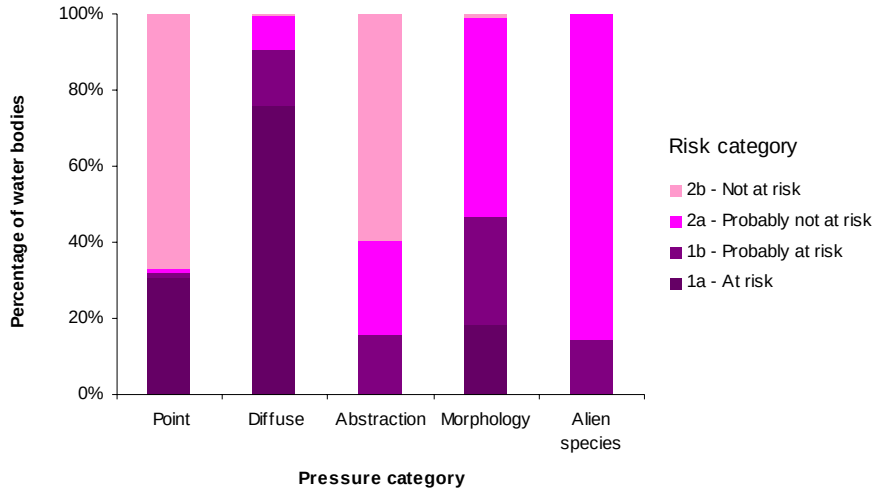


Figure 14: Pressures acting on lake water bodies

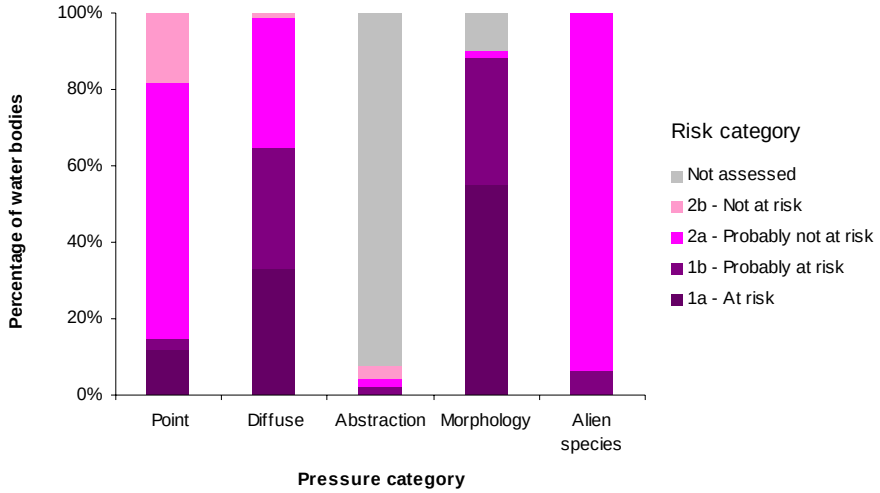


Figure 15: Pressures acting on transitional water bodies

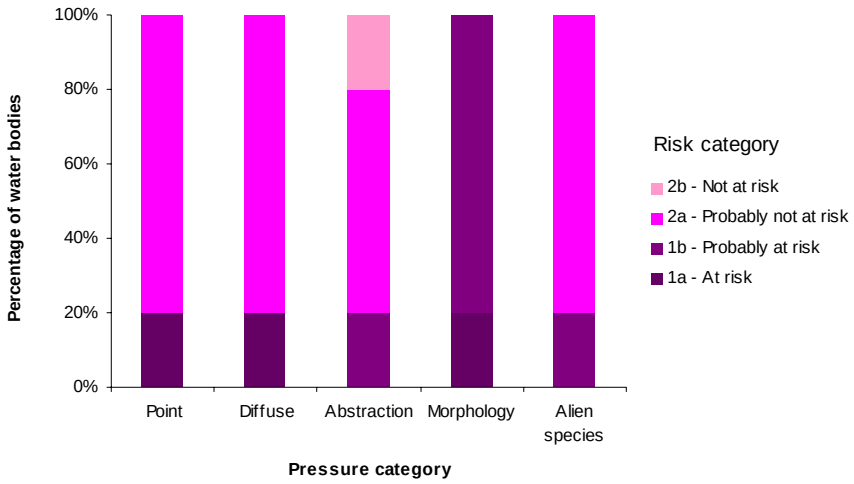


Figure 16: Pressures acting on coastal water bodies

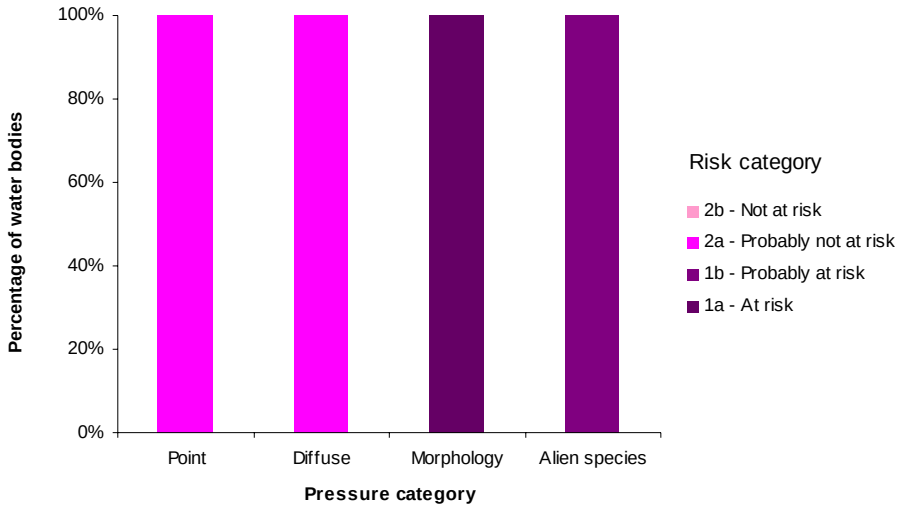
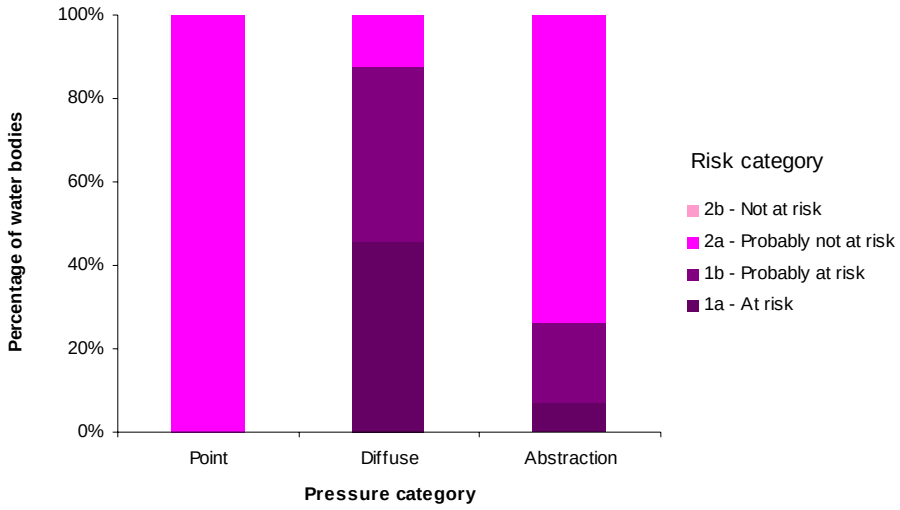


Figure 17: Pressures acting on groundwater bodies



6.9 Groundwater bodies for which lower objectives may be specified

Sections 2.4 and 2.5 of Annex II of the Directive require member states to identify those bodies of groundwater for which lower objectives are to be specified under Article 4 including where achieving good groundwater chemical and quantitative status is infeasible or disproportionately expensive.

Such groundwater bodies are provisionally identified within this river basin district in *Map 34* (for quantitative objectives) and *Map 35* (for chemical objectives)**.**

This provisional identification is based on a hydrogeological expert assessment of whether remedial action will be sufficiently effective by 2027 and the likelihood of remedial action being disproportionately expensive.[44]

The identification of such bodies of groundwater should be regarded as preliminary. It is based on the best available information at the present time. However, the gaps in current information and the uncertainties include:

- A daughter directive on groundwater, which will clarify the approach to 'good status', has yet to be agreed;
- Standards to be applied in setting 'good status' have yet to be established;
- Uncertainties remain on the meaning of ecological and chemical status for surface waters, on which the definition of good groundwater status is dependent;
- Consideration (at EU and UK level) of how exemptions, including lower objectives, should operate in accordance with Article 4 are at an early stage. The identification of bodies of groundwater likely to require such exemptions at this stage pre-empts much of this ongoing work;
- No consideration of socio-economics has yet been undertaken.

[44] UKTAG guidance on lower objectives for groundwater can be found at www.wfduk.org/guidance and method statements on applying this guidance can be found at http://www.environment-agency.gov.uk/wfd

Further characterisation will provide more information about groundwater characteristics and pressures and impacts. This work, together with progress establishing the approaches to good status, setting lower objectives and considering socio-economic factors, should address uncertainties listed above.

Consequently, revisions are likely to be made to the number of bodies of groundwater likely to require lower objectives included in this report, when the time comes to identify such groundwater bodies in River Basin Management Plans in 2009.

6.10 General trends and future pressures

While there is no direct relationship between economic activity and pressures, considering trends in activity may assist in understanding and responding to future pressures. Specific trends and pressures are considered in turn below.

Future development pressures and land use change

There is limited information available about the future development pressures associated with the main water uses (agriculture, industry and households) on a river basin district basis. What information is available is summarised in the Economic Analysis Supporting Documents.

- Agriculture and forestry

The common agricultural policy (CAP) has led to land use changes over the last 30 years. Agricultural intensification, such as increased stocking, fertiliser and pesticide use, has resulted in increased pressures and impacts on the water environment. Intensification has slowed in recent years and the reform of CAP, which will become effective from 2005, may provide water quality, landscape and biodiversity benefits. Whilst CAP reform is expected to lead to overall de-intensification, some farmers are likely to expand and intensify production. Regional forecasts indicate that output from the agricultural sector in the Humber RBD is predicted to decline over the period to 2015[45] although the implications for land cover are less clear.

In the case of forestry, the England Forestry Strategy encourages and anticipates a continued steady expansion of woodland with the focus of new woodland creation in the lowlands, including areas close to towns and cities. The impacts of these changes on the water environment are being studied by the Environment Agency and the Forestry Commission.

- Industry

Economic activity in the Humber is predicted to continue to increase with the services sector and some of the more water-intensive industrial sectors experiencing growth. Although overall the manufacturing sector is forecast to grow, within this broad sector output from textiles and clothing manufacturing is expected to decline as well as the manufacturing of metals. The strongest growth in the manufacturing sector is forecast to be in electrical and optical equipment, chemicals and transport equipment. These trends are reflected in the relevant Regional Economic Strategies (RES) for the area which mainly covers parts of Yorkshire and Humber and East Midlands Regions.

In the Yorkshire and Humber Region's Regional Economic Strategy (2003-2012)[46], specific priority is associated with investing in the regional clusters of advanced engineering and metals, bioscience, chemicals, digital industries and food and drink. A portfolio of strategic sites has been identified to meet development needs. In line with regional planning guidance these will be developed in a sequential approach with the priority given to development on brownfield sites that meet business needs, and which enjoy good access by public transport for local communities. As a result most of the focus of

[45] University of Cambridge, 2004, Business as Usual Projections of Agricultural Outputs.
See http://www.environment-agency.gov.uk/economics
[46] Yorkshire and Humber Region's Regional Economic Strategy (2003-2012).
See http://www.yorkshire-forward.com/images/2536.pdf

development will be in existing urban centres as well as the planned Development Zones including the Humber Trade Zone (building on the opportunities for the Humber ports) and the Strategic Economic Zones in South Yorkshire including the Dearne Valley.

The East Midlands Regional Economic Strategy[47] identifies significant clusters in terms of high performance engineering, clothing and textiles, food and drink, health care and creative industries. The availability of development sites to support cluster development and other RES aims varies across the region, which is divided in terms of the Eastern, Northern, Core Cities, Southern and Peak areas. Work is ongoing to identify strategic sites to fulfil the development needs in these areas. The Eastern area generally has a poor balance between demand and supply, given a concentration of demand in the south but the existence of an oversupply of available industrial land in the north. In the Northern area significant development sites include Markham Employment Growth Zone (Chesterfield) and the Mansfield Ashfield Regeneration Route. The Core Cities area represents the urban areas of Derby, Leicester, Nottingham, where competition for good quality sites is high. The main issue in the Peak area relates to the strategic transport needs for the Derby-Manchester route. There is an aspiration for much of the development in the East Midlands as a whole to be directed towards the former coalfield areas.

- Households

In contrast to the RBDs in the south and south east of England, it is not expected that there will be significant new household formation in the Humber. There has, in recent years, been a net over-supply of houses in the Yorkshire and Humber region and consequently a weak housing market. Policy interventions will largely aim to reduce the rate of local population loss in these areas while supporting the historic settlement hierarchies. The consequent impact on water supply, waste water and sewerage infrastructure is expected to be limited.

Climate change

It is predicted that climate change will bring milder, wetter winters and hotter, probably drier, summers to the UK, and extremes are expected to occur more frequently. More detailed information about projected climate changes and their impacts for the UK are available from the UK Climate Impacts Programme (UKCIP).[48]

While climate change will affect all aspects of the water environment there are still uncertainties about precisely what impacts will occur over the next ten years at the river basin district level. For example, increased rainfall may dilute the pollutants present in water bodies but will also flush a greater concentration of compounds into receiving waters, such as nitrates in winter, or cause more frequent sewer overflows in the summer, both resulting in deteriorating water quality.

The Directive states that temporary deterioration in the status of water bodies is allowable if this arises from exceptional circumstances such as extreme floods and prolonged droughts, but these may occur more frequently as climate changes. Even more moderate changes in weather patterns could have an indirect impact on the water environment, with changes in weather variability making it more difficult to assess the risks and pressures, the long-term effectiveness of the programmes of measures and the efficacy of sampling and monitoring regimes. Surveillance monitoring will be designed to assess the impact of climate change. We also expect to see changes in land-use and water consumption related to changes in climate, and these may prove to be an additional significant factor in achieving the overall environmental objectives of the Directive.

[47] *Destination 2010: regional economic strategy for the east midlands 2003-2010*
See http://www.emda.org.uk/res/DEST_MAIN.pdf
[48] *Climate Change Scenarios for the United Kingdom* is available from the UKCIP website - http://www.ukcip.org.uk

7 Recovery of costs for water services

This section provides an assessment of the current level of cost recovery for water services together with information on relevant cross subsidies. Further information on how the cost recovery analysis was carried out and how it may be improved in the future is also referenced.

The Directive defines all activities that have a significant impact on the status of water, including water services, as water uses. Water services, notably the water industry, are intermediaries between the water environment and water users (although other organisations also perform similar activities). The Directive requires information to be reported on the recovery of the costs of water services. In addition, many water users perform water service activities themselves and information on these "self-services" also needs to be considered.

Information on the recovery of the costs of water services is provided in the Supporting Document on the Economic Analysis[49] for the Humber River Basin District. Further information is available in the *Report on Cost Recovery and Incentive Pricing* prepared as part of the economic analysis of water use.[50]

Water services in the Humber River Basin District

The principal providers of water services in the Humber RBD are licensed water and sewerage undertakers. They are private companies appointed to provide water and sewerage services in specified areas. The boundaries of these licensed areas do not correspond with the boundaries of the River Basin District (see Map 4 in the Humber Supporting Document). This makes the cost recovery analysis more difficult than otherwise.

Providers, users and polluters

Anglian Water Services, Severn Trent Water, Yorkshire Water Services and South Staffordshire Water all provide businesses and households with water services. All of Yorkshire Water Services customers are within the Humber RBD. Only small proportions of Anglian Water Services customers are within the District. These companies supply water to around 4.6 million households and 363,000 commercial and business sites in the Humber RBD. They also provide sewerage services to approximately 4.3 million households and 289,000 business customers in the District. The companies are estimated to supply 3,002 million mega-litres of water per day and to collect 2,042 mega-litres of sewage in the Humber River Basin District.

The costs of providing water services are recovered from businesses and households through tariffs. Analysis of capital and operating expenditure in order to mitigate the environmental impact of the water services since 1989, shows that capital expenditure in the Humber is in the region of £2.4 billion (1989-2003). Taken together with operating expenditure this means that around £200 million of the water service providers costs are associated with mitigating environmental impacts per annum.

Analysis of the operation costs of the four companies in the Humber RBD suggests that around £49.1 million of their costs arise from diffuse pollution. These costs are mainly incurred to deal with nitrates, pesticides and other contaminants and in managing the risk from the parasite cryptosporidium.

Financial costs of providing water services

In 2003-04 the financial costs of the water and sewerage services were £687 million and £668 million respectively for the Humber River Basin District. This is based on a population allocation of services by company for each RBD. In 2003-04 the unit water supply cost was £0.75 per m^3 and for the sewerage service £0.90per m^3.

[49] The Economic Supporting Document can be found at http://www.defra.gov.uk/environment/water/wfd/economics/index.htm

[50] The *Report on Cost Recovery and Incentive Pricing* can be found at http://www.defra.gov.uk/environment/water/wfd/economics/index.htm

Revenues and overall cost recovery

The identified water service providers recover the costs of providing water services from customers within their water service areas.

Revenue in the four companies arises from the provision of a range of services which make up the overall water service. These are measured and unmeasured water and sewerage charges, trade effluent charges, large user charges and other sources. The cost recovery mechanism is slightly different in each case but for each source of charge, income prices are cost-reflective.

The financial costs and revenues of the water and sewerage services for the Humber RBD are shown in *Tables 29* and *30* below. The information on financial costs and revenues is provided by water companies annually to the economic regulator for the water industry in England and Wales (Ofwat) in a report called the June Return. This is available on the Ofwat web-site.[51]

The proportion of water companies' financial costs and revenues allocated to a particular RBD is based on the estimated population in the RBD served by each company.

Table 29: Public water supply – cost recovery for Humber RBD (£m, 2003-04 prices)

Cost component	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04
Total revenues	716.5	748.8	676.0	677.8	673.1	685.9
Subsidies	0.0	0.0	0.0	0.0	0.0	0.0
Total financial costs (inclusive of taxes)	718.2	753.4	684.8	679.6	678.7	687.0
Cost recovery rate	**100%**	**99%**	**99%**	**100%**	**99%**	**100%**

Table 30: Sewerage service – cost recovery for Humber RBD (£m, 2003-04 prices)

Cost component	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04
Total revenues	767.1	769.9	640.3	647.8	640.7	660.7
Subsidies	0.0	0.0	0.0	0.0	0.0	0.0
Total financial costs (inclusive of taxes)	764.9	774.4	646.4	650.0	645.3	667.7
Cost recovery rate	**100%**	**99%**	**99%**	**100%**	**99%**	**99%**

In any specific year, because of the five-year cycle of the regulatory regime, water companies' total costs and total revenues do not always match exactly. However, the balance between costs and revenues is necessarily achieved over a longer time horizon in the economic regulatory regime in England and Wales. The licensed providers of water and sewerage services are totally financed by revenues from customers. Further information is provided in the Economic Analysis Supporting Document.

Water companies (and other organisations that abstract water and discharge into water bodies) pay abstraction and discharge fees for the water they abstract to use and on-sell and the discharges they make to water bodies. The Environment Agency administers the abstraction and impoundment licensing system for all water users, including the water and sewerage service companies. The Environment Agency levies (administrative) charges to recover its costs of administering abstraction licences and discharge consents. The Environment Agency also recovers part of its costs in dealing with water pollution incidents from some polluters.

[51] http://www.ofwat.gov.uk/aptrix/ofwat/publish.nsf/Content/junereturn

Environmental and resource costs

Presently it is not possible to estimate the environmental and resource costs of water use. However, it is possible to use the available assessment methods to provide contextual information that shows the significance of environmental and resource costs. Further work is needed on this subject. Analysis reveals that the two largest contributors to environmental damage caused by current water pollution and abstraction are the water industry and agriculture, together accounting for about 85 per cent of these costs. Other diffuse and point sources such as diffuse urban pollution, landfill sites and contaminated land account for the remaining 15 per cent of environmental damage costs.[52] However, the assessment does not include important environmental pressures identified by the river basin characterisation exercise as affecting risks of achieving good status (e.g. morphological pressures such as flood risk management structures which may impact on rivers, lakes, coastal and transitional waters).

Various Government Departments, Agencies and stakeholders in the UK are carrying out research to develop the economic analyses and appraisal techniques for efficient implementation of the Water Framework Directive. This will improve the assessment of environmental and resource costs of water use in future.

[52] Further information on these estimates and the methodology applied to derive them can be found in *The environmental damage costs of current water quality and flows in England and Wales* available at http://www.environment-agency.gov.uk/economics

8 Cost-effectiveness analysis

The pressure and impact analysis reveals that a large number of activities contribute towards pressures in the Humber Basin District. Many water bodies are at risk from multiple pressures. Information on costs and benefits, including environmental and resource costs and benefits, is needed to inform the design of cost-effective programmes of measures and the consideration of lower environmental objectives.

It is important that a common approach to assessment of cost-effectiveness and information on disproportionate costs is adopted. A method has been developed in a study entitled *Cost-Effectiveness Analysis and Developing a Methodology for Assessing Disproportionate Costs*.[53] Work is underway as part of the Collaborative Research Programme (CRP) to develop this into a practical approach. The CRP is outlined in more detail in the Economic Supporting Document.

[53] http://www.defra.gov.uk/environment/water/wfd/economics/index.htm

9 Conclusions and next steps

This report summarises the results of the characterisation, pressure and impact, and economic analyses of the Humber River Basin District's water environment. The Water Framework Directive requires a wide range of pressures to be addressed, rather than focusing mainly on point source pollution and abstraction as we have in the past. Pressures such as impoundments, engineering and land use have been examined and the resulting risks assessed. This will allow the Environment Agency and stakeholders in the Humber River Basin District to take a more holistic and integrated approach to water management in the future.

This assessment is the first step in the process of improving our aquatic environment through river basin management planning. The next stages include:

- Design of the monitoring network by 2006 taking into account the full range of pressures. The results from this pressure and impact assessment will be used to define the network. A monitoring strategy is being taken forward by the Environment Agency in partnership with other organisations.
- Review of water bodies probably at risk of failing the environmental objectives prior to 2007. This will be done using additional information that becomes available such as monitoring data, information from new licence applications or modelling results.
- Preparation of data presentation for use in river basin management planning.
- Assess costs and economic impacts for each of the distinctly different sectors for which control options will need to be appraised in the management plans. This is being done through the Collaborative Research Programme and will include consultation with stakeholders.

The process of river basin management is iterative. Information will continually be improved making the next cycle of assessment easier and more reliable. This process will improve our water environment even further while still allowing for all water uses such as energy production, transport, agriculture and tourism.

List of abbreviations

AWB	Artificial Water Body
CAMS	Catchment Abstraction Management Strategy
CAP	Common Agricultural Policy
CRP	Collaborative Research Programme
Defra	Department for Food, Environment and Rural Affairs
EC	European Community
EQS	Environmental Quality Standards
EU	European Union
GWDTE	Groundwater Dependent Terrestrial Ecosystem
HMWB	Heavily Modified Water Body
RBD	River Basin District
RBM	River Basin Management
RBMP	River Basin Management Plan
RES	Regional Economic Strategy
RIA	Regulatory Impact Assessment
SEPA	Scottish Environment Protection Agency
UKCIP	UK Climate Impacts Programme
UKTAG	United Kingdom Technical Advisory Group

Annex 1: Summary of environmental objectives and issues surrounding their assessment

Objectives

The environmental objectives that need to be achieved under the Directive are summarised as:

	Environmental objectives
For surface waters	• achievement of good ecological status and good surface water chemical status by 2015 • achievement of good ecological potential and good surface water chemical status for heavily modified water bodies (HMWBs) and artificial water bodies (AWBs) • prevention of deterioration from one status class to another • achievement of water-related objectives and standards for protected areas
For groundwater	• achievement of good groundwater quantitative and chemical status by 2015 • prevention of deterioration from one status class to another • reversal of any significant and sustained upward trends in pollutant concentrations and prevent or limit input of pollutants to groundwater • achievement of water related objectives and standards for protected areas

Water bodies are identified as being at risk if they are likely to fail any of these environmental objectives. Protected Area objectives are assessed and reported separately as they are not always set against water bodies.

Prediction of risk to 2015

The risk assessment is generally based on the current situation and does not take into account future scenarios or planned improvements. Therefore, we assume that if a water body is currently at risk, it will also be at risk in 2015. There are exceptions to this:

- Where improvements are being undertaken as part of the approved five-year programmes (2000-2005, 2005-2010) of the water companies (rivers only);
- Where we have accurate trend data these are used to predict the situation in 2015; for example, the preliminary assessment of nitrate trends to 2015 in groundwaters and water resource demands predicted in the Environment Agency's Water Resource Strategies.

Relative scale of water bodies and assessment

Groundwater bodies and some transitional and coastal water bodies are typically very large and may be identified as being at risk from localised pressures that affect only small portions of a water body. This scale issue is relevant to all water bodies to some extent, although particularly in the larger bodies, and any monitoring strategy and programme of measures established will take this into account.

Pressure and impact assessment issues

A number of difficulties surround the assessments. Below we highlight the main issues encountered and how we have dealt with them.

Difficulty	Solution	Outcome
Good ecological status has not yet been defined across Europe.	A European process of intercalibration is currently addressing this matter. In the meantime we have used preliminary criteria established by UKTAG, or where that is absent we have used and documented Environment Agency criteria.	A water body 'at risk' cannot automatically be interpreted as meaning the water body is not of good ecological status.

Difficulty (continued)	**Solution** (continued)	**Outcome** (continued)
Good chemical status has not yet been defined as EQSs for the Priority Substances have not yet been agreed, the approach to dealing with other specific pollutants has not yet been determined in detail, and it is not clear whether standards will be set for sediments or biota.	As an initial indication of the risk of not achieving good chemical status, existing UK standards, where they exist, have been used in the assessments.	A water body 'at risk' cannot automatically be interpreted as meaning the water body is not of good chemical status.
The alternative objective of good ecological potential has not yet been defined. This standard applies to HMWBs and AWBs. Related to this, HMWBs and AWBs do not need to be designated until 2009.	HMWBs and AWBs have been provisionally identified and have been assessed in relation to good status (as recommended by European guidance).	A large proportion of HMWBs and AWBs identified as at risk may, in fact, meet good ecological potential in future.
Exceptions (e.g. extended deadlines or lower objectives) and disproportionate costs have not been taken into account at this stage, apart from provisional proposals for lower objectives for groundwater bodies.	Groundwater bodies which may require lower objectives have been provisionally identified. This will be considered for other water bodies at a later stage, as recommended by European guidance. At present we have assessed water bodies in relation to good status by 2015.	Some water bodies identified as at risk may later be exempt from achieving good status by 2015.
The aim is to achieve the environmental objectives (Annex I) by 2015. It is difficult to predict changes between now and 2015 in relation to good status and other objectives, especially since good status or the other objectives have not yet been defined.	We have made the general assumption that if a water body is at risk in 2004 it will be at risk in 2015. There are a few exceptions to this, where we have accurate trend data to suggest otherwise and where improvements are being undertaken as part of the approved five-year programmes of the water companies (with regard to sewage discharges to rivers only).	Water bodies at risk will be taken forwards into the first river basin management process to determine appropriate programmes of measures.
Drinking water protected areas have only recently been identified, so we have not assessed specific objectives for these areas.	This will be considered at a later stage and reported in the next characterisation report in 2013. At present we have assessed water bodies in relation to an estimation of good status.	Water bodies at risk will be taken forwards into the first river basin management process to determine appropriate programmes of measures.
Lack of nationally consistent data or absence of data.	We have used the best information available and accessible. In the absence of data we have used alternative methods, such as modelling or expert judgement.	Many of the water bodies affected by these difficulties have been identified as 'probably at risk' or 'probably not at risk'. Water bodies probably at risk will be reviewed before 2007 and water bodies probably not at risk will be reviewed before 2013 (see section 5.1).
Protected area objectives for water dependent Natura 2000 sites have been assessed by English Nature to determine if there is a risk of failure of objectives.	This work pre-empts reporting under the Habitats and the Birds Directive due in 2007.	These assessments should be seen as provisional until reported under the Habitats and the Birds Directives.

Annex 2: Sources of information

Defra: Economic Supporting Documents:
http://www.defra.gov.uk/environment/water/wfd/economics/index.htm

Europa: European guidance on heavily modified water bodies:
http://forum.europa.eu.int/Public/irc/env/wfd/library?l=/framework_directive/guidance_documents/modified_guidance&vm=detailed&sb=Title

Europa: European guidance on identification of surface water bodies:
http://forum.europa.eu.int/Public/irc/env/wfd/library?l=/framework_directive/guidance_documents/identification_bodies&vm=detailed&sb=Title

Europa: Water Framework Directive text:
http://europa.eu.int/eur-lex/pri/en/oj/dat/2000/l_327/l_32720001222en00010072.pdf

Environment Agency's consultation, June 2002, The Water Framework Directive.
Guiding principles on the technical requirements:
http://www.environment-agency.gov.uk/wfd

Environment Agency's GQA assessment for 2003:
http://www.environment-agency.gov.uk/gqaresults

Environment Agency: characterisation and pressure and impact method statements

- Water body identification and typing
- Identification of provisional HMWBs
- Identification of provisional AWBs
- Identification of groundwater dependent ecosystems
- Identification of protected areas
- Assessment of protected areas
- Pressure and impact assessments (various papers)
  - Point source pressure assessments
  - Diffuse source pressure assessments
  - Abstraction and flow regulation pressure assessments
  - Morphological pressure assessments
  - Alien species assessments
- Provisional identification of groundwater bodies which may require lower objectives

http://www.environment-agency.gov.uk/wfd

Environment Agency: protected area register for England and Wales
http://www.environment-agency.gov.uk/wfd

Environment Agency: Business as Usual Projections of Agricultural Outputs
Centre for Rural Economics Research, University of Cambridge, Environment Agency, July 2004.
http://www.environment-agency.gov.uk/economics

Environment Agency: The environmental damage costs of current water quality and flows in England and Wales
http://www.environment-agency.gov.uk/economics

Ofwat: June Return
http://www.ofwat.gov.uk/aptrix/ofwat/publish.nsf/Content/junereturn

Regional Economic Strategies:

- *Destination 2010: regional economic strategy for the east midlands 2003-2010*
  http://www.emda.org.uk/res/DEST_MAIN.pdf

- *Yorkshire and Humber Region's Regional Economic Strategy (2003-2012).* http://www.yorkshire-forward.com/images/2536.pdf

UKTAG guidance on groundwater body delineation:
http://www.wfduk.org/tag_guidance/Article_05/Folder.2004-02-16.5420/view

UKTAG guidance on groundwater dependent terrestrial ecosystems (identification):
http://www.wfduk.org/tag_guidance/Article_05/Folder.2004-02-16.5332/TAG2003%20WP%205a-b%20%2801%29/view

UKTAG guidance on pressure and impact analysis (various papers):
http://www.wfduk.org/tag_guidance/Article_05/Folder.2004-02-16.5332/view

UKTAG guidance on protected areas (identification):
http://www.wfduk.org/tag_guidance/Article_06-07/view

UKTAG guidance on small waters:
http://www.wfduk.org/tag_guidance/Article_05/Folder.2004-02-16.5420/view

UKTAG guidance typology (lakes):
http://www.wfduk.org/tag_guidance/Article_05/Folder.2004-02-16.5312/view

UKTAG guidance typology (rivers):
http://www.wfduk.org/tag_guidance/Article_05/Folder.2004-02-16.5312/view

UKTAG guidance typology (transitional and coastal waters):
http://www.wfduk.org/tag_guidance/Article_05/Folder.2004-02-16.5312/view

UKTAG reference condition descriptions:
http://www.wfduk.org/tag_guidance/Article_05/Type%20specific%20reference%20conditions/view

UKCIP *Climate Change Scenarios for the United Kingdom:*
http://www.ukcip.org.uk