Cyfoeth Naturiol Cymru
Natural Resources Wales

Consultation on updating the River Basin Management Plan

River Basin Management Planning Overview Annex

Our purpose is to ensure that the natural resources of Wales are sustainably maintained, used and enhanced, now and in the future
We will work for the communities of Wales to protect people and their homes as much as possible from environmental incidents like flooding and pollution. We will provide opportunities for them to learn, use and benefit from Wales' natural resources
We will work for Wales' economy and enable the sustainable use of natural resources to support jobs and enterprise. We will help businesses and developers to understand and consider environmental limits when they make important decisions.
We will work to maintain and improve the quality of the environment for everyone. We will work towards making the environment and natural resources more resilient to climate change and other pressures.

Contents

1. Introduction to this document

The European Water Framework Directive (WFD) provides the main framework for managing the water environment throughout Europe. At its heart is an ecosystem approach that requires measures to be taken to encourage the sustainable use of water and to protect and improve inland surface waters, ground waters and coastal waters, with the aim of achieving good status. It recognises that interested groups need to work together to design and implement improvements, taking a holistic and integrated approach to managing the water environment.

Under the Water Framework Directive, a management plan must be developed for each river basin district. Natural Resources Wales, as competent authority for implementing the Water Framework Directive in Wales, first published these in December 2009. The river basin management plans (the plans) outlined the actions that would need to be taken so that more waters were at good status by 2015 and what needed to be investigated to test whether all waters could justifiably achieve this by 2027.

The plans and the objectives and measures contained within them must be reviewed and updated every six years; therefore updated plans for each river basin district in Wales are due to be published in December 2015.

The purpose of this consultation

Natural Resources Wales, working with others, started the process of updating the current plans in 2012. This consultation presents draft updates to the plans. There are two main documents that form the consultation on the draft update to the river basin management plans. These are:

Draft river basin management plan and consultation questions

This sets out the current state of the river basin district, the challenges it faces and the future objectives and measures that might apply. The consultation questions ask you to give your response to the choices available**.** There are three of these documents for Wales, the Dee and Western Wales are led by NRW and the Severn is led by the EA.

The river basin management planning overview annex (this document)

This document sets out the detail behind the decision making which has shaped this draft update to the river basin management plan. It explains each step of the process, linking to more detailed information where appropriate. It allows the reader to find the level of detail required to respond to the consultation.

The data and information used to develop this consultation are the result of work undertaken before the end of May 2014. Additional data and information provided in response to this consultation, the ongoing river basin management processes, any further advice from Ministers on the use of Water Framework Directive exemptions will be used to produce the updated plans in 2015.

Supporting information
The following data for every water body in Wales is available on Water Watch Wales:

- 2013 status assessments
- Reasons for not achieving good status
- Proposed long term objectives
- Reasons for alternative status objectives

1.1 What this document covers

The next section, **Managing the water environment** describes why water is such an important resource and summarises the policies, both European and domestic, which shape how the water environment in Wales is managed.

The Water Framework Directive (section 3) describes the aims and objectives of the Water Framework Directive including the application of exemptions. The river basin management planning process used in Wales is described including how Natural Resources Wales is working with others. This section also describes how the updated plans in 2015 will be developed following this consultation.

Defining and describing the water environment (section 4) describes how the water environment is divided up and characterised for the purposes of implementing the Water Framework Directive. It set out how the environment is monitored and the results of that monitoring used to assess and report on the status of the water environment. The latter part of the section describe the main challenges affecting management of the water environment in Wales, how future risks have been assessed and current causes of problems identified.

Identifying measures and objectives (section 5) sets out the overall process used for determining environmental objectives, including water body status objectives and developing measures. It describes the role of economic appraisal and the objectives that are proposed within this consultation.

Summary of engagement (section 6) looks at the engagement work we have done including public access to information, consultations and a forward look

2. Managing the water environment

Summary of this section
This section provides an introduction to the management of the water environment, describes why water is such an important resource and the policies (European and domestic) that shape how the water environment is managed in Wales.

Topics covered:
Importance of water management; policy context; Natural Resources Wales's role.

2.1 Water – a vital resource

Water and water environments are essential for life and livelihoods. The average person in the UK uses 150 litres of water every day in their home. If you include all the water used in growing and manufacturing the things used or consumed, each of us uses on average around 4,600 litres (over 1,000 gallons) of water per day, over 60% of which is from sources in the UK.

Water is a vital resource for businesses and agriculture and is critical to ensure the economy can grow and prosper.

Rivers, lakes, estuaries, coastal areas, wetlands and groundwater provide many different benefits to society, from supplying drinking water and supporting fisheries to providing an essential resource for business and agriculture, transport routes and opportunities for leisure that promote wellbeing such as physical and mental health.

Healthy water environments also help protect the nation from floods and droughts and regulate the quality of the air and the climate.

Everyone benefits from using water and enjoying the water environment, but it is essential that these activities are managed in a sustainable way. This will ensure that the natural environment, business and economic growth will be protected and the long-term benefits to health and wellbeing improved.

2.2 The policy context

Much of the policy relating to water management is driven by European Directives that have been introduced over the last 40 years. Some relate to the water quality required for different uses of water such as drinking water, bathing waters and shellfisheries. Some set the requirements to protect wildlife such as the Directives on habitats and birds. Others concern the control of pollution from particular chemicals such as nitrates and hazardous substances.

There is also legislation that sets standards for the performance of sewerage systems and wastewater treatment and emissions from industrial processes. These have been important in driving investment by water companies and others. They have led to major improvements in the water environment.

Over recent years there has been a move to introduce a more strategic approach to water management policy. The Water Framework Directive (see section 3) provides a major

overarching framework for river basin management. The Floods Directive (see section 2.2.2.) sets out a strategic approach to flood risk management planning. As competent authority for implementing these Directives Natural Resources Wales has an important role in coordinating their implementation in Wales (see section 2.3). The European Commission has recently carried out a major review of water-related policy and legislation through its 'Water Blueprint' initiative. It concluded that reforming the allocation of water resources and measures to improve water efficiency are important priority areas for future action.

Welsh Government is responsible for policy on water management in Wales. There are a number of current policy initiatives that are important in shaping the future of water management in Wales, namely: The Environment Bill, Planning Bill, National Flood and Erosion Risk Strategy, Marine and Fisheries Strategic Action Plan, Rural Development Plan Consultation, Future Generations Bill and Wales National Marine Plan

The Environment Bill, together with the Wales National Marine Plan, sets out a new statutory framework and integrated natural resource management for the sustainable management of natural resources.

This new framework for managing natural resources, will build on the UN ecosystem approach, defined as 'an integrated strategy for the management of natural resources'. Therefore the Environment Bill will legislate for a more joined-up management process, focused on delivering a healthier, more resilient Wales through economic, social and environmental benefits.

In April 2014 Welsh Government consulted on the 'Water Strategy for Wales', which sets out the long term policy direction in relation to water and dovetails with the wider policy positions, both current and under development. It aims to balance long term needs of a sustainable and resilient environment with the need to ensure that there are sufficient, reliable water resources and waste water services available to encourage sustainable growth and job creation.

2.2.1 Government guidance on river basin planning

To support the first cycle of river basin management plans, the Government issued two volumes of statutory guidance to the Environment Agency on the implementation of the Water Framework Directive: Volume 1 (2006) and Volume 2 (2008). The guidance set out the expectations of Government in relation to the important steps and principles of the river basin management planning process and the content of the documents.

The guidance was reviewed and reissued in July 2014 and replaces the previous volumes 1 and 2.

Changes include an emphasis on catchment planning and working with partners, use of economic appraisal within the planning process, new environmental standards and revised water body classifications and integrating requirements relating to protected areas.

Supporting information

River basin planning guidance - statutory guidance on how the Water Framework Directive is being implemented in England and Wales is available from the Gov.UK website

2.2.2 Managing flooding in Wales

The Flood and Water Management Act 2010 sets out the roles and responsibilities for managing flood and coastal erosion risk in Wales. The Act gives Natural Resources Wales responsibility for managing flooding from main rivers, the sea and large raised reservoirs. The Act gives Lead Local Flood Authorities (Unitary Authorities in Wales) responsibility for managing local flooding from surface water, ground water and ordinary watercourses. It also set out the need for the Welsh Government to develop a National Strategy for Flood and Coastal Erosion Risk Management that provides the national policy framework for managing flood and coastal erosion risk in Wales.

i. Implementing the Floods Directive

The European Floods Directive aims to provide a consistent approach to managing flood risk across Europe. The Directive is implemented through the Flood Risk Regulations 2009 which require some LLFAs and Natural Resources Wales to publish flood risk management plans (FRMPs). These plans are important because they will set out how risk management authorities and communities will work together to reduce the potential adverse consequences of flooding. They will be published in December 2015 and will set out the main outputs for the six-year planning cycle to 2021.

Natural Resources Wales will publish FRMPs for flooding from main rivers, the sea and reservoirs for Wales. LLFAs must publish FRMPs covering local sources of flooding for the Flood Risk Areas that were identified during the preliminary flood risk assessment stage in accordance with Government guidance.

The major milestones already met in developing the FRMPs are the publication of:

- Preliminary Flood Risk Assessments
  - LLFAs prepared Preliminary Flood Risk Assessments (PFRA) that were published in December 2011. These identified Flood Risk Areas where local flood risk was considered sufficiently significant to warrant maps and plans being prepared to complete the first cycle of planning.
  - Natural Resources Wales were exempt from preparing these assessments on the grounds that they would prepare flood hazard and risk maps, and flood risk management plans covering flooding from Main River, the sea and reservoirs for the whole of Wales.
  - The PFRA were reported to the European Commission in March 2012.
- Flood hazard and risk maps
  - Flood hazard and flood risk maps covering flooding from main rivers and the sea were published for each river basin district in England and Wales in December 2013. Flood hazard and flood risk maps were also published in December 2013 for the ‘Flood Risk Areas’). Maps showing the extent of and hazard from flooding from reservoirs were published in December 2013 and April 2014 respectively.
  - The flood hazard and flood risk maps were reported to the European Commission in March 2014.

ii. The approach to developing flood risk management plans

In August 2012 Environment Agency Wales (now Natural Resources Wales) consulted on the approach to developing flood risk management plans.

In June 2013, Natural Resources Wales consulted on the ‘challenges and choices’ as part of river basin management planning for updating the river basin management plans. Both consultations asked how best to coordinate consultation on the river basin management plans and the flood risk management plans. Feedback from the consultation steered

Natural Resources Wales towards developing the first FRMP separately from the updated river basin management plans but aligning the consultation to enable a read across the plans and ensure objectives and measures were aligned as far as possible.

Guidance on what flood risk management plans are, who is responsible for them and how to prepare them has been developed in collaboration with Welsh Government, Defra, Natural Resources Wales and Environment Agency; and was published in May 2014. The guidance sets out the need to coordinate with the updated river basin management plans.

In June 2014 Natural Resources Wales published scoping reports for each river basin district flood risk management plan. These set out where LLFAs would prepare FRMPs for local sources of flooding separately from the plans prepared by Natural Resources Wales. The scoping reports also set out the timescales for consultation.

Both the river basin management plans and flood risk management plans are subject to strategic environmental assessment (SEA), with reporting requirements at a common river basin district scale. Although separate SEA reports will be produced for each plan common approaches to SEA are being used where appropriate and the environmental effects of the plans are being reported in a consistent way, for example:

- Using a common ecosystem services method of environmental assessment across both plans.
- Using the same evidence base for the current environmental context for the river basin district.
- Reviewing other organisations' plans for how they relate to both plans
- Identifying how the proposals of the draft FRMP would be required to meet requirements of the updated river basin management plans.

Supporting information
A map of Flood Risk Areas is available at Gov.UK
Preliminary Flood Risk Assessments are available on the Environment Agency archive website
Flood Risk Maps are available on the Environment Agency archive website
Information on flood risk management plans is available on the Gov.UK website

2.2.3 Estuarine and coastal waters and other Marine Policy

Marine Strategy Framework Directive

The Marine Strategy Framework Directive (MSFD) came into force on 15th July 2008. The Directive establishes an integrated policy for the protection of the marine environment, in a similar manner to the Water Framework Directive, by focusing on the achievement of 'good environmental status' in marine waters. The scope of the MSFD is broader than that of the Water Framework Directive, covering a greater range of biodiversity components and indicators. However, there are some significant areas of overlap with good ecological and chemical status for the Water Framework Directive, particularly in relation to chemical quality, eutrophication and aspects of ecological and hydromorphological quality. Where both directives apply in coastal waters, the MSFD covers those aspects of good environmental status not covered by the Water Framework Directive, for example noise, litter and aspects of biodiversity.

Given the strong links between the MSFD and the Water Framework Directive it is important for stakeholders interested in implementation of the MSFD to engage in river basin management planning and associated consultations. The Water Framework Directive will monitor and contribute to certain aspects of the MSFD in coastal waters including the monitoring of contaminants, eutrophication and aspects of biodiversity. The Marine Strategy Framework Directive does not apply to estuarine waters.

The requirements of the MSFD are transposed into UK law by the Marine Strategy Regulations 2010 and the Welsh Ministers are competent authority for the Welsh inshore region. Natural Resources Wales is continuing to work with Welsh Government, Defra and others to ensure that implementation of both Directives is complementary where they overlap. The UK targets and indicators for good environmental status have been aligned, as far as possible, with existing Water Framework Directive assessment tools. The UK's overall approach to implementing the Marine Strategy Directive is set out in the UK Marine Strategy Part 1. Monitoring programmes will be established in 2014 with a programme of measures established by 2016. Progress towards achieving Good Environmental Status will next be evaluated in 2020.

Marine Spatial Plans

It is also important that the River Basin Management Plan aligns with the objectives of the Marine Policy Statement, or any relevant marine plans that cover estuarine and coastal water bodies. Marine plans will fulfil the commitment to the Marine and Coastal Access Act (2009). The development and implementation of Marine plans in Welsh inshore and offshore waters is led by Welsh Government.

Supporting information

Further information on the Marine Strategy Framework Directive including consultation processes, timescales and links with the Water Framework Directive can be found on the Gov.UK website

The UK Marine Policy Statement and information on marine planning can be also be viewed on the Gov.UK website

2.2.4 Eel management plans

The European eel (Anguilla anguilla) population has declined by as much as 95% across Europe since the 1980s. In 2007, the European Union adopted a new regulation establishing measures for the recovery of the eel stock. In 2009 the UK and other member states produced an eel management plan for each of their river basin districts.

These plans aim to achieve an increase in escapement of adult silver eel to the sea to spawn. The objective is to achieve at least 40% of pristine escapement levels in the long term. These plans address the causes of the decline by implementing management actions which are achievable. The UK must continue to implement the actions described in the eel management plans and in any addendum to those plans. There is a statutory obligation to report on progress in implementing eel management plan actions to the European Commission every three years.

Supporting information
You can find the 15 UK eel management plans on the Gov.UK website

2.2.5 Biodiversity conservation

Improving the water environment through Water Framework Directive actions will be a core contribution to achieving Welsh Government's nature conservation and biodiversity obligations and outcomes. Part of this contribution comes from the fact that the Water Framework Directive includes specific requirements to meet conservation objectives for water dependent Natura 2000 (N2k) protected areas.

The updated river basin management plans will have a key role in supporting the delivery of UK, European and global Welsh Government biodiversity commitments by contributing to habitat quality, habitat creation and restoration outcomes for priority water dependent habitats.

Although the Water Framework Directive's statutory requirements only apply to protected areas and water bodies, delivering other Water Framework Directive actions for water quality and resources or invasive species for example will also be key contributions to improving biodiversity and many other important nature conservation areas too. It is the Welsh Governments' policy that the environment should be managed in an integrated way and the river basin management planning process will help with this by taking into account and also contributing to the objectives of relevant N2k site conservation plans.

River basin management plans also provide an opportunity to integrate other biodiversity improvement drivers. These include national legislation and policy requirements to meet water dependent Sites of Special Scientific Interest (SSSI) objectives and requirements under the Welsh Government's Nature Recovery Plan once this has been finalised next year for example.

Habitat improvement or creation activity needs to focus towards implementing larger-scale schemes in the most appropriate places, more cheaply. Measures will need to be prioritised to contribute to this objective where they are cost beneficial and affordable. In the case of wetlands for example, targeting restoration activities toward sites with the greatest potential to become priority wetland habitat as part of a natural resource management approach will deliver wider ecosystem as well as supporting the Government's' biodiversity outcomes. Restoring functioning floodplains will provide multiple benefits including better flood storage, mitigating diffuse pollution, establishing more natural hydrological regimes, storing carbon, and protecting groundwaters and wetlands as well as benefiting biodiversity more generally.

Outside of the Natura 2000 sites, new priority river and lake habitat maps could be developed and used to also help prevent deterioration of the remaining and most natural freshwater habitats – especially those streams and rivers which contain a dynamic mosaic of habitats and associated species. They would help with targeting, monitoring and reporting on measures to conserve and enhance these rivers. For these rivers and lakes, measures that restore natural processes could be considered where it is cost beneficial to do so. In addition, measures that include restoring natural processes anywhere in the surface water network will be seen as part of the broad contribution river basin management plans are making to help to achieve priority habitat and broader biodiversity objectives.

Supporting information
More information on Welsh Government's Nature Recovery Plan and other associated work to deliver the Government's biodiversity obligations can be found on the Biodiversity Wales website

ii. Ramsar sites and non-Natura 2000 Sites of Special Scientific Interest

Welsh Government expects Natural Resources Wales to apply the same considerations to environmental water objectives for Ramsar sites as to Water Framework Directive protected areas (designated under Article 6 and annex IV of the WFD), including Natura 20000 sites. Most Ramsar sites in Wales have corresponding Natura 2000 designations and it is envisaged that for the majority of these sites few, if any, additional measures will be required to meet protected area objectives.

Meeting the conservation requirements for water dependent Natura 2000 sites should also meet the corresponding conservation requirements for most corresponding water dependent Ramsar sites. Ramsar selection criteria, that is the reasons for Ramsar site designation, are less specific than designated Natura 2000 features, however the "justifications" for the Ramsar Selection Criteria are either identical or broadly equivalent to Natura 2000 features. Natural Resources Wales has therefore advised that the Special Sites Actions Database should be used as the principle reference for determining the required measures under the Water Framework Directive for any Ramsar site areas and additional habitats and species "features" which do not also have Natura 2000 designation, supplemented by reference to published Conservation Objectives for Natura 2000 and Ramsar sites.

Supporting information
Further information on Natura 200and and Ramsar protected areas is available on the Joint Nature Conservation Committee (JNCC) website
Further information on all protected conservation sites in Wales (including N2K, Ramsar and SSSI) is available on the Countryside Council for Wales archive website

iii. Other non-Natura 2000 and non-Ramsar Sites of Special Scientific Interest

SSSI that are not Natura 2000 or Ramsar sites are not normally treated as Water Framework Directive 'protected areas'. Whilst designation of SSSI are under UK national legislation it should be recognised that many water dependent SSSI (except for some wetlands) are also Water Framework Directive water bodies. The attainment of good ecological status for these water bodies, whilst not necessarily equivalent to a SSSI achieving 'favourable condition' (as targets for SSSI may in some cases be more stringent), is likely to be an important step toward those sites meeting their conservation objectives and contributing to the Welsh Government's objectives for SSSI under 'The Environment Strategy for Wales'.

Natural Resources Wales will take a coordinated approach to ensure that the setting of ecological status objectives on these water bodies also supports the requirements detailed in the Special Sites Actions Database for meeting SSSI conservation objectives and does not risk their achievement.

2.2.6 Taking account of climate change

To be sustainable, any action in the river basin should:

- Recognise, and ideally contribute to, the UK's greenhouse gas (GHG) emissions reduction targets.
- Be adapted, or easily adaptable, to the changes in climate that are now inevitable given past global emissions.

Actions to address climate change should be considered right at the outset of any work, and not bolted on as an afterthought.

The Governance Framework

The UK Climate Change Act 2008 provides the main context in this area. It legally binds the UK to reducing emissions by at least 80% by 2050, compared to 1990 levels, and sets interim carbon budgets along the way. It also provides the legal framework for adaptation policy in the UK. It requires the UK Government to undertake a Climate Change Risk Assessment (CCRA) every five years, and to prepare a National Adaptation Programme (NAP) to address the most pressing climate change risks. The NAP covers all policy areas in England, but only the non-devolved ones in Wales. The first CCRA was published in January 2012 and the first NAP in July 2013.

The Welsh Government laid out its climate change policies in its Climate Change Strategy for Wales (October 2010). This set a target for reducing GHG emissions by 3% year-on-year from 2011 in areas of devolved competence, against a baseline of average emissions over the period from 2006-10. The Government also committed to preparing five Sectoral Adaptation Plans (SAP's) covering: Health; Natural Environment; Infrastructure; Communities; and Business and Tourism. Together, these five SAP's can be seen as the Welsh equivalent of the NAP in England.

Future Climate and Climate-related Risks and Opportunities

The most recent climate change projections for the UK are the UKCP09 projections (June 2009). In Wales we can expect:

- More intense rainfall events.
- More flooding of low-lying coastal areas.
- Hotter, drier summers.
- More extremely warm days.
- Milder, wetter winters.
- Less snowfall and frost.
- Lower groundwater levels.

While the direction of travel is clear, the rate of change is still uncertain. The UKCP09 projections allow for this by covering three scenarios (High, Medium and Low future global emissions) and by adopting a probability-based approach. The weather will also continue to vary from year to year. The Met Office report "Too hot, too cold, too wet, too dry" (March 2014) confirmed the underlying UKCP09 trends but also stated "new analysis suggests that we should also plan to be resilient to wet summers and to cold winters throughout this century".

The first CCRA identified the following top risks in Wales:

- Increases in hot-weather related death and illness.
- Changes in soil conditions, biodiversity and landscape due to warmer, drier summers.
- Reductions in river flows and water availability during the summer, affecting water supplies and the natural environment.
- Increases in flooding on the coast and inland, affecting people, property and infrastructure.

- Changes in coastal evolution including erosion and coastal squeeze, affecting beaches, intertidal areas and other coastal features.
- Changes in species including a decline in native species, changes in migration patterns and increases in alien and invasive species.
- Increases in the risk of pests and diseases affecting agriculture and forestry. The risk to livestock was a particular concern.

It also identified the following opportunities:

- Increases in grass yields, allowing a potential increase in livestock production.
- Increases in tourist numbers and a longer tourist season.
- Reductions in cold-weather related illness and death.

Implications for the Water Framework Directive

As far as GHG emissions reductions are concerned, land use and agriculture are the most important sectors in relation to the Water Framework Directive. Depending upon its use and the associated management regime, land can either be a net source of emissions or a net sink. In particular, if peat lands are kept wet (or re-wetted) they absorb carbon; if they are allowed to dry out they release carbon. Trees also play a significant role in sequestering carbon. The Forestry Commission publication Forests and Climate Change: UK Forestry Standard Guidelines (2011) provides guidance on how to protect and expand forests and woodlands in the face of climate change.

Under the Kyoto Protocol Member States assess carbon stocks and fluxes under the heading Land Use, Land Use Change and Forestry (LULUCF). All land in the country is identified as having remained in one of six classes since a previous survey, or as having changed to a different (identified) class in that period. The six land classes are: Forest Land, Cropland, Grassland, Wetlands, Settlements and “Other” land. Fluxes within the LULUCF framework are predominantly of carbon dioxide. In 2012, in Wales, they represented a net carbon sink, equivalent to around 1% of Welsh emissions. The Centre for Ecology & Hydrology provide full details in their report Mapping Carbon Emissions and Removals for the Land Use, Land Use Change & Forestry Sector (2014).

Agriculture emits two potent greenhouse gases. Nitrous oxide arises from the application of nitrogenous fertilisers. Methane is emitted directly by livestock, and by the handling of slurries. These agricultural emissions are significant: in 2012 they contributed some 13% of total emissions in Wales – the same figure as for transport.

Turning to adaptation, the first CCRA identified impacts on water as a high risk across each of its five central themes, as shown in the table below.

Table 1. High risk impacts on water

Theme	Main risks
Agriculture and Forestry	Drier soils; reducing crop and timber yields, extra demand for water for irrigation; loss of agricultural land for flood plain.
Business	Flooding; increased competition for water; disruption of transport networks and communication links; indirect risks from changes in agriculture and the natural environment.
Health and Wellbeing	Injury, death and stress/mental health problems due to flooding; increase in water-borne diseases and food poisoning.
Buildings and Infrastructure	Flooding of road, rail, river bridges, water supply and energy infrastructure; performance of buildings in higher

Theme	Main risks
	temperatures; “Urban Heat Island” effect.
Natural Environment	Lower summer river flows may lead to poor water quality; warmer rivers and lakes may suit some species but others will not thrive; invasive species may gain advantage; native species may not be able to move to track favoured conditions; more rain falling in intense bursts might increase agricultural runoff.

Evidence suggests that the following measures are particularly useful in mitigating these risks:

- Vegetation planting within catchments (including riparian tree planting to provide river shading) to increase habitat connectivity, keep rivers cool and manage run-off.
- Increase soil carbon and improve soil structure (including peatland restoration) to manage run-off, improve habitat condition and avoid carbon losses to water and the atmosphere.
- Reconnecting rivers with their floodplains and naturalising river channels to increase habitat connectivity and manage increases in rainfall intensity.
- Promotion of water efficiency and high flow storage to avoid deterioration in wetland habitats and help agriculture to remain viable in the face of decreasing water resource availability.
- Adopting Water Sensitive Urban Design, which brings multiple benefits including: reducing flooding; reducing discharges of storm water to watercourses; resilience to drought; and more attractive neighbourhoods with more green space.

This list of adaptation measures is not exhaustive. More general advice, and specific advice on flood risk management and water resources management, can be found in Guidance document No. 24 “River Basin Management in a Changing Climate”, issued under the Common Implementation Strategy for the Water Framework Directive (2000/60/EC). In particular, this guidance advocates that, where feasible, “no-regret”, or “win-win” measures should be adopted as these yield beneficial outcomes regardless of the eventual outcomes of climate variability and change. Although climate change is not explicitly included in the text of the Water Framework Directive, the step-wise and cyclical approach of the river basin management planning process makes it well suited to adaptively manage climate change impacts.

Two further publications are relevant to the UK specifically:

- The Living with Environmental Change (LWEC) Water Report Card 2012-13 presents information on a range of potential climate change impacts, and explicitly states the degree of confidence for each projection.
- The Centre for Ecology and Hydrology has published a report on Future Flows and Groundwater Levels, which assesses the impact of climate change across 282 catchments in the UK. This can be used to inform planning at the catchment scale.

2.3 Natural Resources Wales's role in managing the water environment

Natural Resources Wales is the lead organisation for water management and environmental regulation in Wales. Established in 2013, it has taken over the functions of the Countryside Council for Wales, Forestry Commission Wales, Environment Agency Wales, as well as some functions of Welsh Government.

Our responsibilities include:

- Managing flood risk to protect people and property.
- Strategically planning water resources to ensure adequate supplies of water for water supply.
- Maintaining, improving and developing salmon and freshwater fisheries.
- Maximising the social, economic, environmental and heritage benefits of the waterways for which Natural Resources Wales is the navigation authority.
- Helping to conserve and enhance the diversity of native wildlife and habitats, the landscape and historic environment.
- Promoting the recreational use of inland and coastal waters and associated land
- Protecting, enhancing and restoring the environmental quality of inland and coastal surface water and groundwater.
- Protecting important, recognised sites that make up 30% of Wales' land and waters – including National Nature Reserves, Marine Nature Reserves, Sites of Special Scientific Interest, Ramsar sites, Special Areas of Conservation and Special Protection Areas
- Managing many hectares of woodlands, marketing over 650,000 tonnes of timber to fulfil 300 tree harvesting contracts

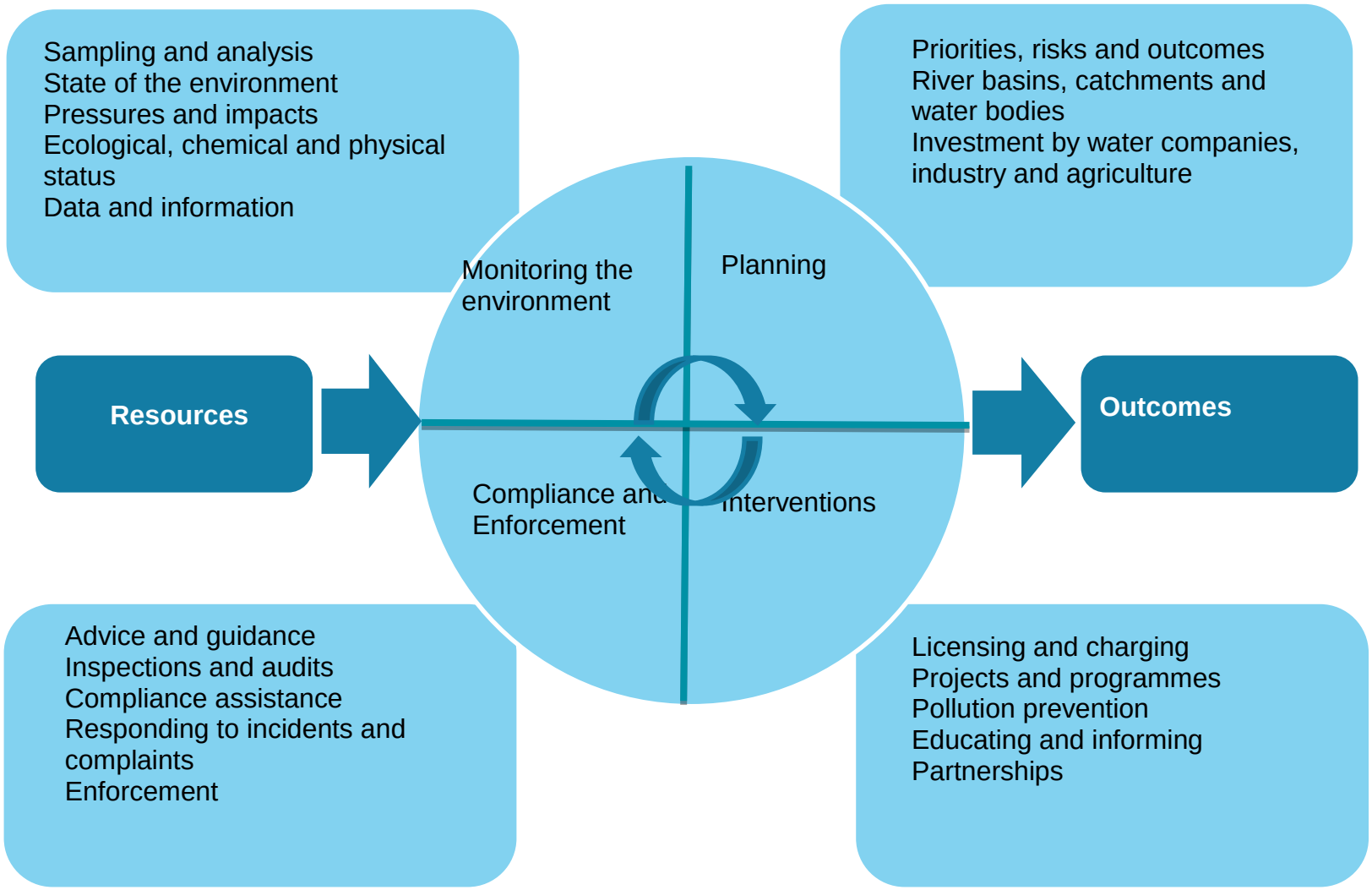
We work within a framework of government policy and legislation (see section 2.1) that defines our powers and duties, and the environmental aims, objectives and standards to which we work. Much of this is based on European requirements.

Managing the water environment involves targeting effort and resources to reduce risks and to provide the greatest benefits for people and wildlife. We bring together our different water management functions through a number of iterative activities including:

- Monitoring the environment to understand the state it is in and why.
- Planning the action needed to achieve agreed outcomes.
- Taking action and working with others to achieve these outcomes.
- Checking compliance with standards and permit conditions, and carrying out enforcement activities, if necessary, to make sure that the legal requirements are met.

Some of these water management responsibilities are summarised below:

Figure1. Water management responsibilities of Natural Resources Wales



3 The Water Framework Directive

Summary of this section
This section provides an introduction to the Water Framework Directive, its aims and objectives before giving an overview of the approach to river basin management planning used in Wales. The important role of all stakeholders, including the work in catchments, is discussed. The section finishes by setting out the timetable for updating the river basin management plans and briefly describes the Strategic Environmental Assessment that has been produced to support the review and update of the plans.

Topics covered:
Water Framework Directive and its objectives; river basin management planning; working with others; catchment approach; river basin management planning timetable; assessments to support the development of the updated river basin management plans.

3.1 The Water Framework Directive

The Water Framework Directive (WFD) is focused on establishing an integrated approach for the protection and sustainable use of the water environment. This requires a holistic approach to managing waters, looking at the water within the wider ecosystem and taking into account the movement of water through the hydrological cycle.

The Water Framework Directive is implemented through river basin management and planning that involves setting environmental objectives for all groundwaters and surface waters (including estuaries and coastal waters) and devising and implementing programmes of measures (sets of actions) to meet those objectives.

The Water Framework Directive also requires that other environmental priorities, economic considerations and social issues have to be considered and taken into account when setting water management objectives.

WFD aims (Article 1)

- prevent further deterioration and protect and enhance the status of aquatic ecosystems and associated wetlands;
- promote the sustainable consumption of water;
- reduce pollution of waters from priority substances;
- prevent the deterioration in the status and to progressively reduce pollution of groundwaters;
- contribute to mitigating the effects of floods and droughts.

WFD environmental objectives (Article 4)

- prevention of deterioration in status of surface waters and groundwater;
- achievement of objectives and standards for protected areas;
- aim to achieve good status for all water bodies by 2015. Where this is not possible and subject to the criteria set out in the Directive, aim to achieve good status by 2021 or 2027 or set a less stringent objective;
- aim to achieve good ecological potential and good surface water chemical status for heavily modified water bodies and artificial water bodies;
- reversal of any significant and sustained upward trends in pollutant concentrations in groundwater;
- cessation of discharges of priority hazardous substances into surface waters;

3.1.1 Preventing Deterioration

The current no deterioration baseline for each water body is the status reported in the river basin management plans published in December 2009. This baseline will be revised when ministers approve the update of the plans in December 2015.

Deterioration is formally assessed and reported over the 6 years of a river basin management planning cycle. The updated 2015 river basin management plans will report any water bodies which show deterioration in status in 2015 compared to the 2009 baseline.

The Water Framework Directive does not allow any deterioration in status of water bodies, except in particular circumstance. The following are the main aspects of Natural Resources Wales's approach to implementing the no deterioration requirements of the Water Framework Directive:

- Deterioration from one status class to a lower one is not permitted.
- While deterioration within a status class does not contravene the requirements of the Water Framework Directive, (except for Drinking Water Directive parameters in drinking water protected areas, and provided that the objectives and requirements of other domestic or European Community legislation are complied with) action should be taken to limit within status class deterioration as far as practicable. For groundwater quality, measures must also be taken to reverse any environmentally significant deteriorating trend, whether or not it affects status.
- Where the water body is already in the lowest status class (bad ecological status or potential; fail to achieve good chemical status; poor groundwater chemical status; or poor groundwater quantitative status) no significant further deterioration shall be permitted.
- The no deterioration requirements are to be applied independently to each of the elements that come together to form the water body classification as required by Annex

V of the Water Framework Directive and Article 4 of the Groundwater Daughter Directive. This requirement may not apply to elements at high status.

- To manage the risk of the deterioration of the status of the biological elements for surface waters, the no deterioration requirements shall be applied to the environmental standards for the physico-chemical elements, including those for the moderate/poor and poor/bad status boundaries.
- For groundwater the no deterioration requirements will be applied to each of the four component tests for quantitative status and the five component tests for chemical status.
- Elements at high status may be permitted to deteriorate to good status provided:
  - The water body's overall status is not high.
  - The river basin management plan has not set an objective for the water body of high status.
  - The objectives and requirements of other domestic or European Community legislation are complied with.
  - Action is taken to limit deterioration within the high and good status classes as far as practicable.
- Where appropriate, consideration of exemptions under Article 4.7 still applies.
- As an exception, where the morphology element is at high status, deterioration to good status is not permitted.

As the climate changes there may be fundamental changes to the character of some of our water bodies, for example coastal freshwater water bodies becoming saline due to sea-level rise or streams becoming ephemeral (only flowing in winter). We do not yet know exactly how, when and where these changes will take place, particularly in the shorter term, and so in line with European guidance we do not intend to proactively change the objectives we will seek to achieve. We need to focus on building a baseline understanding of state of the water bodies and monitor and review the performance of measures (for example fish passes, abstraction changes) to ensure they deliver the benefits and resilience required.

3.1.2. Protected areas

The objectives for protected areas are either governed by the European Community legislation under which they are designated, for example the Habitats and Birds Directives for N2K sites or the objectives as set out in the Water Framework Directive itself, for example Drinking Water and Shellfish Water protected areas.

The Water Framework Directive requires member states to establish a register of protected areas. The types of protected areas that must be included in the register are:

- Areas designated for the abstraction of water for human consumption (Drinking Water Protected Areas).
- Areas designated for the protection of economically significant aquatic species (Shellfish).
- Bodies of water designated as recreational waters, including Bathing Waters.
- Nutrient-sensitive areas, including areas identified as Nitrate Vulnerable Zones under the Nitrates Directive or areas designated as sensitive under Urban Waste Water Treatment Directive (UWWTD).

- Areas designated for the protection of habitats or species where the maintenance or improvement of the status of water is an important factor in their protection including relevant Natura 2000 sites.

Supporting information
The register of protected areas was first published in 2004 and has been updated for this plan. You can find the register on the Water Framework Directive pages on the Natural Resources Wales website

i Drinking Water Protected Areas

The objectives for Drinking Water Protected Areas (DrWPA) are to:

- Ensure that, under the water treatment regime applied, the drinking water produced meets the requirements of the Drinking Water Directive. This will be achieved by meeting the requirements of the Drinking Water Directive (including the standards in the Directive plus any UK requirements to ensure drinking water is free from contamination).
- Ensure necessary protection to achieve the aim of avoiding deterioration in the water quality in DrWPAs in order to reduce the level of purification treatment required. This will be

Under Article 7, Drinking Water Protected Areas (DrWPAs) have been designated to protect raw waters used for public supply. DrWPAs were designated at a WFD Waterbody scale.

In Wales the 2011 Risk Assessment, together with subsequent supporting data submitted by the Water Companies operating within Political Wales, has identified 'at risk' DrWPAs where there is evidence of failure, or risk of failure, of the Drinking Water Inspectorate (DWI) targets with upward trend.

These 'at risk ' DrWPAs (and all upstream Waterbodies) have been taken forward as 'candidate' Safeguard Zones (SgZ) for funded AMP Investigations to assess whether they are valid sources of the raw water failure and, if so, whether there are viable catchment solutions to investment in treatment at the Water Treatment Works.

Where catchment solutions are found to be a possible solution, and NRW can secure stakeholder agreement, Safeguard Zones will be formally designated for funded improvement measures. The safeguard zone will describe the extent of the agreed measure, and may be designated to cover a part of a WB, a complete WB, group of WBs or even a whole catchment – depending on the extent at which the improvement measures are applied. While the safeguard zone assessment process is statutory, once designated safeguard zones do not bring any additional statutory powers. Improvements within safeguard zones rely on stakeholder buy-in and NRW's extant regulatory powers.

- There are currently no groundwater SgZ and one surface water SgZ (covering at risk surface water DrWPA).

ii. Economically Significant Species

In the 2009 river basin management plans, Freshwater Fish and Shellfish Waters were designated as protected areas under their respective European Directives. Since then both Directives have been repealed and their requirements transferred to the Water Framework Directive. We continue to retain designated shellfish protected areas but there will not be any freshwater fish protected areas and no further requirements for areas that were

designated under the Freshwater Fish Directive. The Water Framework Directive is designed to give more relevant and up to date standards for protection of freshwater fish.

When waters are designated as shellfish waters protected areas the aim is to protect and improve water quality to support the growth of healthy shellfish (bivalve and gastropod molluscs) and contribute to good quality edible shellfish.

iii. Recreational Waters (Bathing Waters)

Until the end of 2014 the objective for bathing waters designated under the current Bathing Waters Directive is to protect the environment and public health whilst bathing. This objective will be achieved by meeting the imperative standards and aiming to meet the guideline standards of the current Bathing Waters Directive.

From the end of 2014 the objective for bathing waters as defined by the revised Bathing Waters Directive will be to preserve, protect and improve the quality of the environment and to protect human health by complementing Directive 2000/60/EC. This objective will be achieved by meeting the 'sufficient' quality standards of the revised Bathing Waters Directive (2006/7/EC); and by taking such realistic and proportionate measures considered appropriate with a view to increasing the number of bathing waters classified as 'excellent' or 'good'.

Supporting information
Further information on the issues at each bathing water can be found on the Environment Agency bathing water data explorer

iv. Nutrient Sensitive Areas (Urban Waste Water Treatment Directive)

A sensitive area in the Urban Waste Water Treatment Directive (UWWTD) is a water body identified as affected by eutrophication or having a surface water abstraction affected by elevated nitrate concentrations from waste water treatment works. Designating a sensitive area is a trigger for action to reduce or prevent further pollution caused by nutrients.

The general objective of the UWWTD is to protect the environment from the adverse effects of urban waste water discharges and waste water discharges from certain industrial sectors.

This is to be achieved by ensuring that discharges from relevant urban waste water treatment plants meet the appropriate emission standards set out in the directive. For areas affected by eutrophication this includes phosphorus and/or nitrogen reduction measures.

v. Nutrient Sensitive Areas (Nitrate Vulnerable Zones)

The general objective of the Nitrates Directive is to reduce water pollution caused or induced by nitrates from agricultural sources and prevent further such pollution.

This is to be achieved through designating nitrate vulnerable zones (NVZs) and action programmes to reduce agricultural nitrate losses being implemented within them, or by applying measures throughout the national territory. In addition a code of good agricultural practice must be established for voluntary implementation by all farmers. The entire area of England has not been designated for the application of measures. Instead, NVZs have been identified which include all land draining to 'polluted waters' as defined by the directive. 'Polluted waters' are fresh surface waters or groundwaters which do, or could, exceed 50 mg/l nitrate. They are also defined as waters which are, or may become, eutrophic due to nitrates from agricultural sources.

vi. Natura 2000 Protected Areas

Natura 2000 is a key legal instrument to protect and enhance biodiversity in the European Union. It is an ecological network of protected areas, set up to conserve Europe's most valuable and threatened species and habitats. It is composed of Special Protection Areas (SPA) designated by member states under the Birds Directive (2009) to protect wild birds and their habitats, and Special Areas of Conservation (SAC) designated by member states under the Habitats Directive (1992) to protect habitats and plant and animal species. These areas are intended to enable the favourable conservation status of the species and habitats across their bio-geographic range within the EU.

Natural Resources Wales is the statutory nature conservation body for Wales and works towards ensuring that Wales's unique natural environment including its flora and fauna, land and seascapes, geology and soils is protected and improved. This includes in particular the protection, improvement and management of Natura 2000 sites. Natural Resources Wales has a lead role in ensuring the appropriate management of the sites. It must carry out its own regulatory and land management functions so as to meet the requirements of the Habitats and Birds Directives, as well as provide advice to local authorities, Welsh Government and other bodies to enable them to comply with their obligations under the Directives.

In addition to Natura 2000 sites, Wales has a number of wetlands designated under the 1971 Ramsar convention on the protection of internationally important wetlands. As matter of Welsh and UK government policy, these 'Ramsar sites' have the same level of protection and management as Natura 2000 sites. Most Ramsar sites are also designated within the Natura 2000 network.

In Wales, there are approximately 700,000 hectares of Natura 2000 and Ramsar Protected Areas (113 out of 122 sites) which have water dependent features.

EU member states must take appropriate conservation measures to maintain or restore the habitats and species on Natura 2000 sites to a favourable conservation status. Monitoring undertaken between 2008 and 2013 found that only 25% of habitat and species features on Natura 2000 sites were favourable. To achieve favourable condition, and so ensure that the conservation objectives of the Natura 2000 sites are being met, further or ongoing action is needed. Appropriate management of those currently in favourable condition is required to ensure they maintain this status.

Supporting information

Further information on Natura 200and and Ramsar protected areas is available on the Joint Nature Conservation Committee (JNCC) website

Further information on all protected conservation sites in Wales (including N2K, Ramsar and SSSI) is available on the Countryside Council for Wales archive website

3.1.3 Artificial and heavily modified water bodies

Some water bodies contain features that provide valuable social and economic benefits or uses, for instance through flood risk management schemes or reservoirs that supply drinking water. In many cases significant physical modifications have been required to support this use, for example the installation of a weir or a dam. To achieve good ecological status in many of these water bodies we would have to alter the modifications to such an extent that their function was compromised, for example the removal of a weir installed for flood defence purposes. It is vitally important to protect the uses that benefit

society and the economy and therefore we are able to designate these water bodies as artificial or heavily modified (under Article 4.3 of the WFD), and determine objectives accordingly. An exception to this would be if there were other options for achieving the same benefits for society; in these cases designation would not be allowed (European Union CIS guidance document 4, 2003).

Once designated, artificial and heavily modified water bodies are required to reach the objective of good ecological potential (GEP). Good ecological potential is similar to good ecological status but takes into account the constraints imposed by the social and/or economic uses and involves using a Mitigation Measures Assessment (MMA). This MMA is considered alongside the classification of other elements to determine whether the water body will achieve an overall status of good ecological potential.

In some instances is may not be appropriate to implement a specific mitigation measure if doing so is likely to have a significant adverse impact on the designated use/social and economic benefits provided by the water body. Where it is not appropriate to implement a mitigation measures due it having a significant adverse impact on use, that mitigation measures is then excluded from the classification process and would not prevent a water body from achieving good ecological potential.

Artificial and heavily modified water bodies are still required to aim to achieve good chemical status.

3.1.4. Exemptions to the environmental objectives (alternative objectives)

Water Framework Directive also allows for alternative objectives (i.e. an extended deadline or less stringent objective) to be set where certain conditions are met. We must provide justifications within the RBMP. These are set out in Paragraphs 4.4 and 4.5 of the Directive.

We can extend a deadline where:

- the scale of improvements required can only be achieved in phases exceeding the timescale, for reasons of technical feasibility
- natural conditions do not allow timely improvement in the status of a water body (can extend beyond 2027)
- completing the improvements within the timescale would be disproportionately expensive

Where appropriate we can set a less stringent objective (i.e. less than good) where measures are:

- technically infeasible, or
- disproportionately expensive

When applying a less stringent objective we must still aim for the highest status possible.

ii. Temporary deterioration in status

In certain circumstances (set out in Article 4.6 of the WFD) a temporary deterioration in status of a water body, caused by exceptional or unforeseen events such as extreme floods, prolonged droughts or accidents, is allowed. The exception does not apply to those effects of extreme floods and prolonged droughts which could reasonably have been planned for and prevented, nor does it apply in the case of accidents which could reasonably have been foreseen.

This exemption requires responsible authorities to demonstrate that:

- all practicable steps were taken to prevent further deterioration in status
- the measures to be taken under exceptional circumstances are included in the programme of measures and will not compromise the recovery of the quality of the body of water once the circumstances are over;
- all practicable measures are taken to restore the body of water to its status prior to the effects of those circumstances as soon as reasonably practicable, and
- a summary of the effects of the circumstances and the measures taken are included in the next update of the river basin management plan.

Prolonged droughts

In Wales, the main bodies responsible for managing water resources are Natural Resources Wales, water companies and the Welsh Government. All of these bodies have a role in drought management. Natural Resources Wales and water companies prepare for droughts by producing Drought Plans detailing the actions that will be taken if a drought occurs.

Natural Resources Wales is responsible for securing the proper use of water resources in Wales and making sure there is enough water available for all needs including the environment. We achieve this by regulating the abstraction of water, monitoring the environment and working closely with the water industry and other abstractors to manage resources. During droughts we monitor and report on the impacts on the environment, monitor water company actions to confirm they are following their drought plans and determine drought permit applications.

Water companies are responsible for developing and maintaining an efficient and economical system for public water supply in their area, without damaging the environment or affecting the needs of other water users. During a drought they will take actions to maintain public water supplies, as set out in their drought plans, whilst minimising any impacts on the environment.

The Welsh Government is responsible for the policies relating to water resources in Wales. They ensure the legislative framework for water resource management is fit for purpose. They direct water companies on the development and content of their water resource management plans and drought plans. During a drought they will confirm that water companies are taking appropriate actions and determine drought order applications.

Defining and then monitoring indicators (often called drought ‘triggers’) helps Natural Resources Wales and water companies decide when a drought is happening and determine what actions to take. The decision to take action will be based on a range of factors, including present and forecast weather conditions and how effective the action would be. The sequence of actions will not always be the same as all drought events are different and need to be managed on an individual basis.

Prolonged and severe droughts may impact water body status through reduced river flows, damage to or loss of habitat, alterations to bio-chemical composition of the river and detrimental impact to water dependent species. A drought is a natural, unpredictable phenomenon and it is not always possible, even with the implementation of appropriate mitigation measures, to avoid the impacts of drought or prevent temporary deterioration in water body status throughout a prolonged drought.

Drought plans set out the actions that will be taken to minimise environmental impacts and maximise available supplies during a drought, without causing deterioration where possible. These plans set out how the environment will be monitored and the possible

mitigation measures that can be implemented to prevent as much environmental harm as possible during a drought. Effective monitoring of environmental indicators also helps to differentiate the natural impacts of drought and impacts caused by human activity such as the implementation of drought permits and orders. This is important to show any temporary deterioration resulted from the natural impacts of the drought.

If the impacts of a drought event temporarily cause deterioration to water body status and all the criteria in Article 4.6 can be met, this exemption can be used after a drought event as a justification as to why an objective which was set in a river basin management plan has not been met. This is always done on a case by case basis and should be detailed in the update of the river basin management plan.

Supporting information
Natural Resources Wales is currently revising the drought plan for Wales, which will be available on our website by the end of 2014.

Extreme floods

Natural Resources Wales is responsible for providing flood forecasting and warnings to the public in Wales. This involves monitoring rainfall, river levels and sea conditions. Combined with weather data and tidal reports Natural Resources Wales provides local area forecasts on the possibility of flooding and its likely severity.

There are four levels of flood warning: three of the codes indicate the severity of the warning (Flood Watch, Flood Warning, and Severe Flood Warning) and a fourth is an 'All Clear', meaning the threat has passed.

Severe floods may impact on water body status through effects such as the loss of habitat (scouring of sediments and in stream vegetation), the physical displacement of species or increased inputs of pollutants including sediment. These impacts may be localised and of insufficient magnitude to affect the status of an entire water body. Water bodies are classified on an annual basis and therefore any deterioration in status due to a severe flood may not be detected until up to a year after the event.

Accidents

The Environmental Damage (Prevention and Remediation) Regulations 2009 bring the Environmental Liability Directive into effect in Wales. Under the Regulations, environmental damage of either surface water or groundwater is defined as damage causing a change of water body status,

This means either a deterioration of water status overall, for example the water body as a whole would now be classified as 'poor' rather than 'good' or a deterioration of any of the individual elements or parameters such that the value of that element or parameter is now consistent with a lower status than before. This applies even if the water body is not reclassified as being of lower status. Adverse effects that are short-term or limited in their geographical extent are unlikely to amount to environmental damage.

When environmental damage is confirmed, the Regulations include a remediation objective of achieving the same level of natural resources or services that would have existed if the damage had not occurred.

iii. New modifications or sustainable development

New modifications or new sustainable human development activities may be permitted even though they might compromise the achievement of certain Water Framework

Directive objectives (set out in article 4.7 of WFD). Certain new developments provide extremely valuable benefits to society that outweigh the environmental or societal benefits of achieving the Water Framework Directive objectives. Such benefits may include those provided by activities, for example:

- Public water supply
- Flood defence
- Navigation and transport
- Urban development
- Rural land management

Any modifications or activities that are considered likely to compromise Water Framework Directive objectives must undergo a thorough assessment before they can be permitted using the Art 4.7 defence and must also ensure other related objectives are not compromised as a result of the proposed activities. An assessment must provide evidence to satisfy the following are true:

- All practicable steps are taken to mitigate the adverse impact on the status of the water body.
- The benefits to human health or human safety or sustainable development outweigh the benefits of achieving Water Framework Directive objectives or the activity is of overriding public interest.
- There are no other means of providing the services offered by the activity that are technically feasible or of a proportionate cost and provides a significantly better environmental option.

In addition, the reasons for the modifications or activities are specifically explained in the RBMP and relevant objectives are reviewed every six years.

Natural Resources Wales works with public bodies, developers and its own operational functions to ensure Water Framework Directive objectives (including the correct application of Article 4.7 defence) are met. Natural Resources Wales utilises regulatory advice/guidance to ensure the specific requirements of Art 4.7 are achieved.

3.2 River basin management planning

River basin management planning is a cyclical process that is punctuated at intervals by consultation and reporting required by the Water Framework Directive. The ongoing planning process can be broken down into four main stages as shown below:

Stage 1 – identify whether there is an environmental problem

A problem could be the failure of a protected area or water body to achieve its objective, or a deterioration in status over time.

The condition of protected areas and water bodies is assessed by Natural Resources Wales. The current status of water bodies is assessed through the process of classification and comparison of these results over time will indicate whether any deterioration in that status is occurring. Classification results can indicate whether there is an environmental problem in a water body but other information, including information from stakeholders, can also be used. (See also section 4)

Stage 2 – identify the cause(s) of the environmental problem

The cause of the problem must be determined in order to identify appropriate solutions.

In order to understand the causes of problems, Natural Resources Wales has completed over a thousand investigations since the current river basin management plans were published in 2009. These have greatly improved the understanding of the reasons why water bodies are not at good status. Investigations will continue where they are required to understand new failures and also where deterioration is detected. (See also section 4)

Stage 3 – identify and assess measures to resolve the environmental problem

Actions (known as measures in the Water Framework Directive) may be needed to reduce the impact of current problems or prevent future problems such as deterioration in status.

Where more than one technically feasible measure is available options should be assessed (including use of cost-benefit and ecosystem services assessment). All of the measures required to fully resolve the problem are identified. (See also section 5)

Stage 4 – identify the relevant objectives and when they can be achieved

When objectives will be achieved is determined by considering how and when the measures to achieve the outcomes will be funded and implemented.

Priorities will be reflected in an updated river basin management plan presented to Welsh Government ministers in September 2015. Ministers will make a decision on affordability and overall ambition which will be published in the updated river basin management plan in December 2015.

Once objectives have been agreed, monitoring and classification are used to assess compliance against those objectives. (See also section 5)

3.3 Working with others

Working with others is at the heart of a successful river basin management planning process. Protecting and improving the water environment needs action from all parts of society. By working effectively with others, we agree better solutions and protect the things that matter most to people.

The Water Framework Directive includes legal obligations (under Article 14) on consultation. This includes encouraging the active involvement of all interested parties in the implementation of the Directive, in particular in the production, review and updating of the river basin management plans.

This is the third of three consultations to update the river basin management plans. These consultations help us to build understanding about the value of integrated river basin management, gather input from others to help improve the plans, and build support from others to drive action.

Many different groups work towards improving and protecting the water environment.

3.3.1 Welsh Government Water Framework Directive Stakeholder Forum

This strategic forum was established in 2007 and is chaired by Welsh Government. It is made up of representatives of major stakeholder sectors and important national organisations. The Forum provides a focus for communication and consultation on a broad range of Water Framework Directive related issues

3.3.2 River basin district liaison panels

Representatives of major stakeholders make up the river basin district liaison panels. The liaison panels continue to be very important in enabling river basin management planning to:

- Contribute evidence to enable decision making and reporting on river basin management plans
- Devise and track measures and projects as part of a programme of work to prevent deterioration and improve the environment
- Work together to develop river basin management plans and other documents required
- Liaise between members and their sectors so as to ensure a broad base for decision making and communication.

To achieve this, liaison panel members communicate with and work through their organisations and sector or catchment networks.

3.4 Working at the catchment scale and integrated natural resources management

In response to the current river basin management plans stakeholders called for greater engagement and involvement at a more local level to influence those who use water, those involved in land use planning and those involved in land management.

During 2013-14 Natural Resources Wales held a series of catchment workshops across Wales in order to raise awareness of the issues impacting our water environment, develop local partnerships to put actions in place and to help inform the river basin management plans. These workshops have also helped us better understand how Water Framework Directive outcomes fit within the approach we are developing to integrated natural resources management.

Integrated natural resource management is a key element of the Welsh Government's legislative programme. The natural resource management framework is still being developed in Wales but the river basin management plans reflect the essential elements of the new approach in the following ways:

Be area based.
The river basin management plans encompass all of the issues and pressures on the water environment and the actions to manage them at a river basin scale. We are developing a catchment approach for delivery of actions which will focus at a scale more relevant to communities and other stakeholders.
By looking at a catchment scale (see Figure 1), rather than individual issues or sectors, we can move beyond addressing issues reactively and in isolation. This will enable an integrated, proactive approach, addressing opportunities and constraints in a whole system, cross-sectoral way.

Involve stakeholder engagement throughout.
Natural Resources Wales is the appropriate authority for the Water Framework Directive but only manages a relatively small percentage of Wales itself. It is essential that we involve stakeholders, including local authorities, communities, developers and industry, throughout the process of drawing up and implementing the river basin management plans.

Plan and present at the most appropriate scale.
The natural processes we are working with, and the management processes we are aiming to influence, tend to work at different scales. The area based natural resources management process should reflect this and aim to manage ecosystem services at the most appropriate scale, whilst taking into account the best management mechanisms for doing so. The Water framework Directive requires that we produce and review management plans at the river basin scale. But many of the problems facing the water

environment are best understood and tackled at the catchment scale. This will help to tackle local issues such as pollution from diffuse sources which is a significant pressure across Wales.

Plan for the long term.
To create a sustainable Wales we need to consider the opportunities and constraints Wales will face in the long term. River basin management plans consider long term objectives for improvement and are reviewed every six years.

Plan to deliver multiple benefits.
The new approach will need to plan to deliver multiple, longer term benefits for the environment and also for the economy and society – reflecting long-term well-being goals for Wales. Ensuring the resilience of the supporting ecosystems and their functioning will be key to the long term sustainability of the services and benefits they can provide.

The actions proposed in this river basin management plan can deliver multiple benefits, for example improving land management in the uplands can have significant benefits in climate change resilience, carbon capture, flood storage and improved downstream water quality.

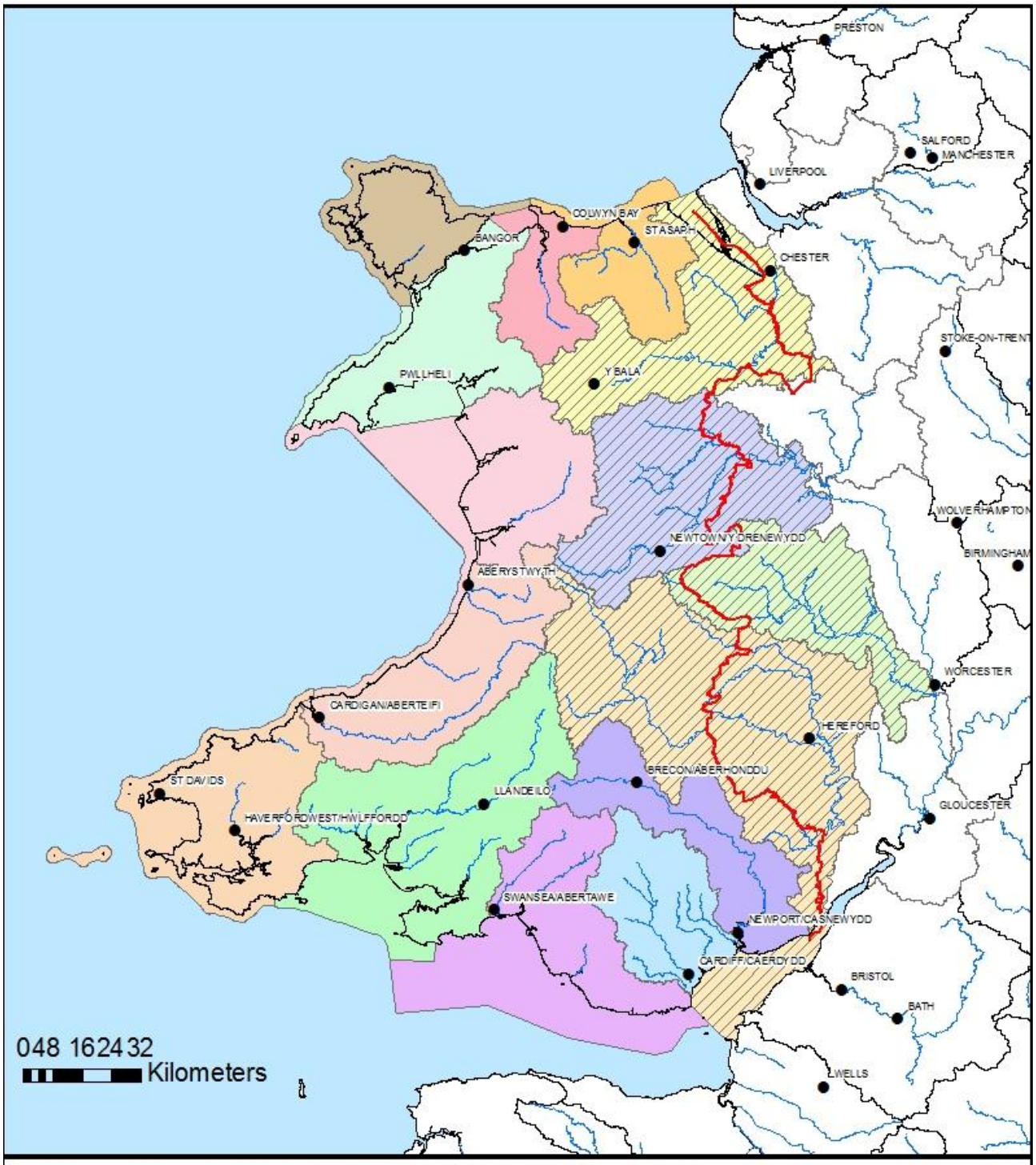
Be evidence based.
To inform the development of the area based approach we need to use the best available evidence from a range of sources, building on both our knowledge and that of our stakeholders and local communities. We will take a pragmatic approach to evidence and apply the principle of collect once, use many times.

The contents of this river basin management plan are the result of a significant evidence base, collected through our monitoring programmes, investigations and economic assessments.

People focussed.
The natural resource planning process will need to reflect the principles of co-production and stakeholder engagement. It will need to aim to deliver outcomes that are equitably distributed and focus on delivering benefits for the people of Wales.

By working with others in catchments the aim is to:
- Understand the issues in the catchment and how they interact
- Understand how the issues are affecting the current local benefits and future uses of water
- Involve local people, communities, organisations and businesses in making decisions by sharing evidence.
- Identify which issues to tackle as a priority

Figure 2: Management catchments in Wales



Management Catchments - Wales

- Cities and towns
- National border
- Main rivers
- English management catchments
- Carmarthen Bay and the Gower
- Cleddau and Pembrokeshire Coastal Rivers
- Clwyd
- Conwy
- Llyn and Eryri
- Meirionnydd
- South East Valleys
- Tawe to Cadoxton
- Teifi and North Ceredigion
- Usk
- Ynys Mon

Cross border

- Dee
- Severn Uplands
- Teme
- Wye

3.5 River basin management planning timetable

Although most of the river basin management planning activities are continual and iterative there are defined points at which consultation and reporting take place as part of developing and updating river basin management plans. The timetable for these steps is set by the Water Framework Directive and shown in the table below.

Table 2. Water Framework Directive river basin management planning timetable

Step	Date and duration	What's the purpose?
Working together consultation	June 2012 6 months	**''How should we all work together to update the river basin management plans?''** Asking how you want to be involved Explaining the key steps in the river basin management planning process for cycle 2 Establishing a network of contacts for cycle 2 planning
Challenges and choices engagement	June 2012 to May 2013 Approx 12months	**''What are the most significant water environment issues, what are the options for tackling them and which do you prefer?''** Improving the evidence base that will be used to inform the review of the river basin management plan Seeking broad agreement about the principles behind taking action
Challenges and choices consultation	June 2013 6 months	**''Have the significant issues been fairly summarised and what can be done about them?''** Sharing the latest evidence including results of investigations and assessment of the risk of water bodies deteriorating or not achieving their objectives Seeking views on how to prioritise action Explaining catchment plans and how they relate to the river basin management plans
Follow up engagement	October 2013 to May 2013 Approx 8 months	Following the consultation, Natural Resources Wales will consider the responses and where necessary facilitate further engagement for groups of stakeholders where there are areas which need further discussion

Consultation on the draft updated river basin management plans	10 October 2014 6 months	**''Does this plan set the right level of ambition for the water environment and a strong commitment to deliver?''** Estimating the likely state of the water environment in 2021 and 2027 Proposing water body objectives Outlining who would be involved to achieve these objectives, how much it will cost and the benefits
Follow up engagement	November 2014 to August 2015 Approx 10months	Following the consultation, Natural Resources Wales will consider the responses and where necessary further develop the content of the plans with delivery partners to ensure the updated plans are the best possible and fully supported
Publish river basin management plans	September – December 2015	**''This is the plan to address the issues''** Publishing proposed river basin management plans in September and submitting to Government for approval. The approved RBMPs will be published in December. These plans will be used as a framework to direct planning and action and to track progress in each river basin district.

3.6 Updating the plans in 2015

This consultation on the draft updated river basin management plans is based on the data, information and best understanding of the water environment available at the end of May 2014.

Work to prepare the final updated plans for publication in 2015 will continue throughout 2014 and 2015. This planning work will take into account additional and updated information that becomes available from June 2014 onwards.

3.6.1 Responses to the consultation on the draft updated river basin management plan

The responses Natural Resources Wales receives to this consultation, including responses to the consultations on the Strategic Environmental Assessment will be considered and where practicable and appropriate taken into account in the updated plans.

3.6.2 Updated information on where environmental problems are present

The results of further monitoring will be available in autumn 2014 and the baseline classifications for the updated plans will be available in 2015. In addition to the data on the status of elements and water bodies there will be further information from investigations and engagement with local stakeholders to improve certainty in environmental problems. This will include better understanding of where deterioration has occurred as well as an understanding of failures to achieve good status or protected area objectives.

3.6.3 Updated information on the causes of environmental problems

Investigations to understand the causes of problems such as a failure to reach good status or deterioration in status will continue through 2014 and into 2015. Engagement with local stakeholders and partners through catchment groups will also contribute to a better understanding of the causes of problems in catchments and water bodies. This information will help to identify the measures that might be required to address the problems.

3.6.4 Revised costs and benefits

Where new information on the costs and benefits becomes available and this is considered significant enough to be likely to change the outcome of the economic assessment of measures for a water body, then the economic assessment will be reassessed.

3.6.5 Guidance on affordability of measures

As described elsewhere, the work undertaken to date in appraising measures and identifying the objectives presented in this consultation has not considered when those measures will be implemented and the objectives achieved. That step in the river basin management planning process requires an understanding of available funding, who will pay and what is an affordable level of investment for different sectors. Guidance on the affordability of measures will be provided by government to allow proposed objectives to be submitted in the updated plans in 2015.

3.6.6 Ongoing engagement activity

Information on any aspect of river basin management planning that becomes available through ongoing activities including engagement with stakeholders and catchment groups will, where relevant and practicable, be taken into account in producing the updated plans.

3.7 Assessments of the river basin management plan

3.7.1 Strategic Environmental Assessment

A strategic environmental assessment (SEA) has been undertaken to fulfil the requirements of the Environmental Assessment of Plans and Programmes Regulations 2004 (known as the 'Strategic Environmental Assessment Regulations'). This requires plans within certain sectors (including the water sector) that provide a framework for future development to be subject to a strategic environmental assessment to ensure that the environment is considered from the outset.

The river basin management plan is a plan to improve the water environment. As a result it is anticipated that most environmental effects are likely to be positive. Nevertheless, the plan has the potential to have intended or unintended consequences for people and the wider environment. We have used SEA to assess the potential effects of the plan and reported the results in an Environmental Report that accompanies the consultation on the draft updated river basin management plan. Our approach to SEA is summarised below.

i. Scope of SEA

The scope of the SEA for the updated river basin management plans was set out in scoping reports as part of the Challenges and Choices consultation in 2013. It ensures the SEA is focused on potentially significant positive and negative effects at a river basin district scale.

ii. SEA and river basin management plan alternatives

Natural Resources Wales has developed four scenarios to help explain and describe at the river basin district scale the outcomes that are achievable by 2021; the overall costs and benefits; apportionment of costs across the types of intervention and relative cost-effectiveness.The wider environmental effects of these high level sets of measures were

assessed as part of the SEA so that the results could be considered in the selection of an option for the final updated river basin management plans.

iii. SEA and local appraisal

The river basin management planning process applied proposed measures to waterbodies aimed at achievement of good ecological status or potential. The positive and negative environmental effects were identified at a management catchment scale using ecosystem services. These management catchment assessments were then aggregated and assessed at the river basin district scale.

iv. Reporting the high level SEA

The Environmental Report considers the aggregated effects of the measures across all management catchments on the environmental baseline of the river basin district. At this strategic level the SEA does not consider the effects of individual measures and locations, but rather the overall pattern of proposed types of measures in the programme and their overall significance across the river basin district. The SEA focuses on the ecosystem services where the most significant positive or negative effects have been recorded.

v. SEA and climate change

The SEA considered the likely impacts of climate change in the absence of the plan, and the extent to which the proposed measures provide mitigation or resilience, across a number of ecosystem services. For example, at this scale of assessment measures could include reducing peat erosion as a natural means of maintaining water quality, as well as improving riparian habitat and setting aside agricultural buffer strips to help build climate resilience. From the evidence used to date, there is uncertainty that climate change effects can be considered to be significant at the river basin district scale and therefore these are not assessed in detail in the Environmental Report. It is clear that such measures can help manage local impacts of a changing climate, particularly in vulnerable areas, and should be considered as part of an overall catchment based approach.

vi. SEA Consultation and links to the Environmental Reports

The SEA Environmental Reports are published alongside the consultation on the draft updated river basin management plans. The consultation seeks views on the information used in the SEA, the approach taken to ensuring the SEA informs the plan, and the significance of effects reported for the river basin district.

Supporting information

The Environmental Report and the mechanisms for responding to the SEA consultation questions can be found on the Natural Resources Wales website alongside the ‘Challenges and Choices’consultation

3.7.2 Habitats Regulations Assessment

A Habitats Regulations Assessment of each final updated river basin management plan will be carried out to consider whether each plan is likely to have a significant effect on any Natura 2000 sites. The assessment will be undertaken by Natural Resources Wales, with internal consultation with conservation teams and the results will be published alongside the final updated plans in December 2015.

3.8 Competent authorities for river basin management planning

In Wales the appropriate authority for the implementation of the WFD is Welsh Government. The appropriate authority has general responsibility for ensuring the WFD is

given effect. The appropriate authority also has specific responsibilities for ensuring that appropriate economic analysis is carried out, approving proposals for environmental objectives and programmes of measures and approving river basin management plans. The appropriate authority may also give guidance or directions to Natural resources Wales, and any other public body, on the practical implementation of the WFD. The appropriate authority also has the duty to ensure that the requirements of the WFD are given effect in relation to each river basin district as a whole.

Natural Resources Wales is the competent authority for producing and updating river basin management plans in Wales. Natural Resources Wales is responsible for carrying out the analysis required for characterisation, monitoring, identifying waters used for the abstraction of drinking water, and establishing a register of those waters and other protected areas. It has to prepare proposals for environmental objectives and programmes of measures for each river basin district and prepare draft river basin management plans. Natural Resources Wales must also ensure public participation in preparation of the river basin management plans and make certain information required under the WFD accessible to the public

4. Defining and describing the water environment

Summary of this section
This section describes how the water environment is divided up and characterised to support implementation and reporting for WFD. It explains how the water environment is monitored and its condition assessed and reported. The section then describes the main challenges affecting management of the water environment in Wales, how future risks have been assessed and causes of current problems identified.

Topics covered:
River basin districts and water bodies; typology; designation of artificial and heavily modified water bodies; protected areas; monitoring networks; classification methodologies; recent changes to how classification is carried out; significant water management issues; risk assessments; reasons for not achieving good status.

4.1 River basin districts, management catchments and water bodies

The Water Framework Directive covers all waters, including inland surface waters, groundwater, estuaries and coastal waters, independent of size and characteristics. For example, 'inland water' is defined as 'all standing or flowing water on the surface of the land'.

For the purpose of implementing the Directive, all waters were assigned to geographical or administrative units, namely the river basin, river basin district and water body.

The river basin is the geographical area from which all surface run-off flows through a sequence of streams, rivers and, possibly, lakes into the sea at a single river mouth or estuary.

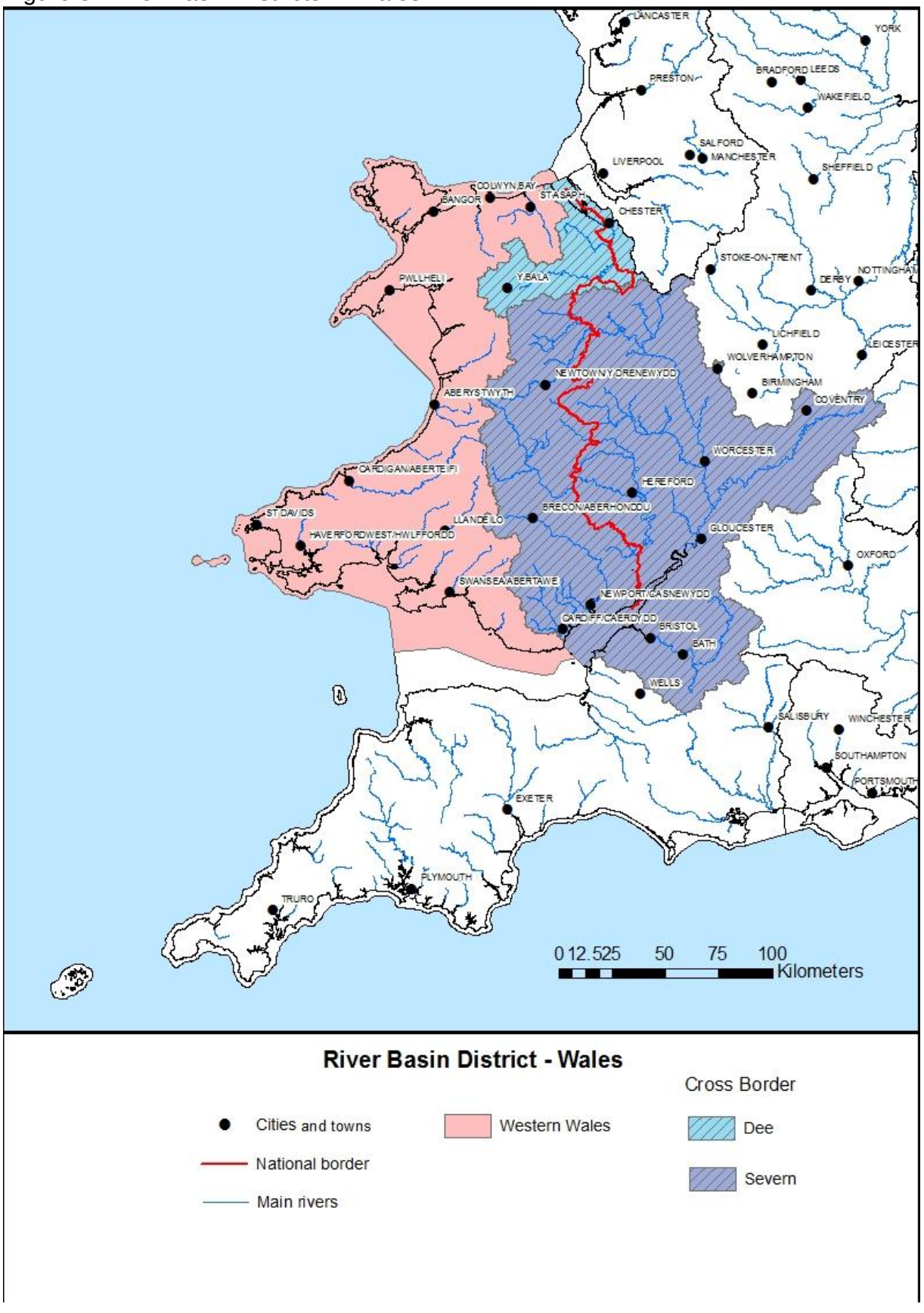
The river basin district is the main unit for management of river basins under the Water Framework Directive and river basin districts were designated by each Member State. A river basin district can consist of one or more river basins. In Wales 'management catchments' are being used as the most significant unit for analysis, planning and management. These catchments are amalgamated up to river basin districts for reporting purposes. The river basin districts in Wales and those that are cross border with England are shown on the map below.

Water bodies are the units used for reporting and assessing compliance with the Directive's principal environmental objectives. The environmental objectives of the Directive apply to 'water bodies' and so the main purpose of identifying water bodies is to enable status to be accurately described and compared to the environmental objectives set out in the Directive.

The Directive defines a surface water body as a "discrete and significant element" of surface water such as a lake or reservoir or entire (or part) stream, river or canal, estuary or stretch of coastal water (out to 1 nautical mile, and for chemical status only this extends to the limit of territorial waters which may extend up to 12 nautical miles). A groundwater

body is a distinct volume of groundwater within one or more aquifers. Water bodies in Wales were identified as part of a 'characterisation' process.

Figure 3. River Basin Districts in Wales



Most water body categories, such as groundwater or coastal waters, are delineated as a discrete area and are shown as this total area for reporting purposes.

Whilst each river water body also has a defined catchment area, river water bodies are reported (for example in the river basin management plans) using a river line within that catchment. For the first cycle of river basin management planning this river line (often referred to as the 'blue line') was derived from the 1:50,000 scale river network. This has been updated using the 'Detailed River Network'. This river line is purely a reporting network and it is this river line which appears on maps in the updated river basin management plans.

4.1.1 Surface water body types and reference conditions

Because 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, surface water bodies are grouped into different types according to their physical and chemical characteristics. The types dictate, in very general terms, the sorts of plants and animals likely to be present in water bodies of that type.

Reference condition descriptions covering the sorts of plants and animals expected to be found in the different types of water bodies in undisturbed conditions have been produced for each type or group of types (see references below). These types are the ones that have been used in the initial characterisation of each river basin district. In some cases there are no examples of reference condition in the UK and descriptions are based on similar types in other Member States, or extrapolation from modelling studies, or historic data.

Reference conditions and the conditions found in high status waters is the same thing. For example, if a classification tool shows that the diatom community in a water body is at high status, then the species composition and abundance of diatoms in that type of water body are what would be expected under reference or undisturbed conditions. The Ministerial Directions on Environmental Standards give the values for high status for both biological and physico-chemical elements and include screening approaches for high status hydrology and morphology. It is important to understand, that to be in overall reference condition a water body would need to comply with all the criteria including hydrological regime and morphological criteria.

Supporting information
For more detail on how reference values have been determined for each of the biological elements see the UK Technical Advisory Group (UKTAG) Assessment Methodologies can be found on the WFDUK website
The reference conditions descriptions for rivers, lakes, estuarine and coastal waters are given in detail on the UKTAG website

4.1.2 Designation of artificial water bodies and heavily modified water bodies

Prior to publication of the current river basin management plans we designated water bodies according to their specified use and the current extent of that use. This followed a series of consultations, cross-references and quality checks, and the involvement of the river basin district liaison panels, which comprise representatives of important stakeholder sectors.

In 2011 Natural Resources Wales performed a significant review of the designations of all river water bodies. Since then we have changed designations in response to a changing environment, or where errors have been identified. A wider review of heavily modified water bodies in transitional and coastal water bodies will be conducted and consulted upon by 2018. This will utilise existing assessments to improve the understanding between environmental pressure and biological response leading to better evidence based designations.

Shellfisheries are currently considered as a hydromorphological pressure for designation of heavily modified water bodies in transitional and coastal water bodies. However new information suggests that this designation is not appropriate and in Wales we propose to de-designate the four transitional and coastal water bodies for shellfisheries. Further information is available on request and feedback on this proposal is welcome.

The table below shows the number of surface water bodies in Wales designated as artificial or heavily modified (A/HMWB) as part of the update to the river basin management plans.

Table 3. Heavily modifed and artificial water bodies

	River*	Lake	Canal	Estuary	Coastal	Totals
Artificial and heavily modified water bodies	98	95	7	14	6	220
Non-designated water bodies	619	29		17	17	682
Total number of water bodies	717	124	7	31	23	940
% of total designated as A/HMWB	14	77	100	45	26	23

* River data includes 1 surface water transfer water bodies

The tables below show the specified uses that have led to the designation of water bodies in Wales as artificial or heavily modified. Each water body can be designated for more than one specified use.

Table 4. Designated uses of artificial and heavily modified water bodies - freshwaters

Specified uses for designation	River	Lake	Canal	Surface water transfer	Total uses
Wider environment	6	4			10
Navigation	1	1	7		9
Recreation	1	2			3
Drinking water supply	34	79			113
Power generation	13	10			23
Water resources (strategic transfers)	8			1	9
Water resources (impoundment releases)	23	12			35

Specified uses for designation	River	Lake	Canal	Surface water transfer	Total uses
Flood protection	35	4			39
Land drainage	12				12
Urbanisation	22	1			23
Other human sustainable development	2	1			3

Table 5. Designated uses of artificial and heavily modified water bodies, coastal and estuarine waters

Specified uses for designation	Estuary	Coastal	Total uses
Flood protection	5	1	6
Navigation	6	1	7
Coastal protection	3	4	7
Shell fisheries	2	2	4

Supporting information
For more information on the designation review that has taken place you can access the document 'Revised HMWB designations and proposed designations of new water bodies' on the Environment Agency sharefile site.

4.2 Assessing the current state of the water environment

4.2.1 Protected areas

Protected Areas are parts of the environment that have been designated as requiring special protection under Community legislation for the protection of their surface water and groundwater or for the protection of habitats and species directly depending on water. Natural Resources Wales has routine monitoring programmes in place for assessing compliance for Bathing Waters, Habitats and Drinking Water Protected Areas, and under Water Framework Directive for Shellfish and Freshwater Fish Protected Areas.

4.2.2 Water body status monitoring networks

A network of monitoring sites is used to establish the actual condition of all water body types within each river basin district in terms of their ecology, water chemistry, flow and groundwater level.

For rivers and lakes a network of monitoring sites is used to classify all water bodies according to the priority pressures acting on the environment. In coastal and estuarine waters our operational programme is focussed on the priority pressures, hydromorphology, nutrients and chemicals. A smaller network of surveillance sites is used across all surface waters to provide information on long-term natural and anthropogenic trends.

For groundwater two monitoring networks are used to provide classifications. A groundwater quality monitoring network meets the surveillance and operational monitoring

requirements for chemical status and trend assessment, and a groundwater level monitoring network is used to meet the requirements of quantitative status assessment.

Supporting information
You can find maps showing the monitoring networks for each river basin district on Water Watch Wales

4.2.3. Assessment of water body status

The Water Framework Directive requires the status of water bodies to be assessed and this assessment is created by classifying data from the monitoring network. For a particular point in time a classification will show us whether the quality of the environment is good, or where it may need improvement.

Classification is just one part of the evidence base that helps to focus efforts on those water bodies where a difference needs to be made. Additional information is sometimes required to assess whether a classification result is really indicative of an environmental problem; this is known as a weight of evidence approach. Additional evidence may also indicate where problems exist that are not apparent through classification results alone. Natural Resources Wales's weight of evidence approach to assessing environmental problems is described in more detail in section (4.2.4).

For surface waters there are two separate classifications for water bodies, ecological and chemical. For a water body to be in overall 'good' status both ecological and chemical status must be at least 'good'.

For groundwater there are two separate classifications for groundwater bodies; chemical status and quantitative status. Each must be reported in addition to the overall groundwater body status. For a groundwater body to be at good status overall both chemical status and quantitative status must be good. In addition to assessing status, there is also a requirement to identify and report where the quality of groundwater is deteriorating as a result of pollution and which may lead to a future deterioration in status.

i. Ecological status

Ecological classification comprises:

- The condition of biological elements, for example fish
- Concentrations of supporting physico-chemical elements, for example the oxygen or ammonia levels
- Concentrations of specific pollutants, for example copper.
- And for high status, largely undisturbed hydromorphology

The decision tree below illustrates the criteria used to determine the different ecological status classes.

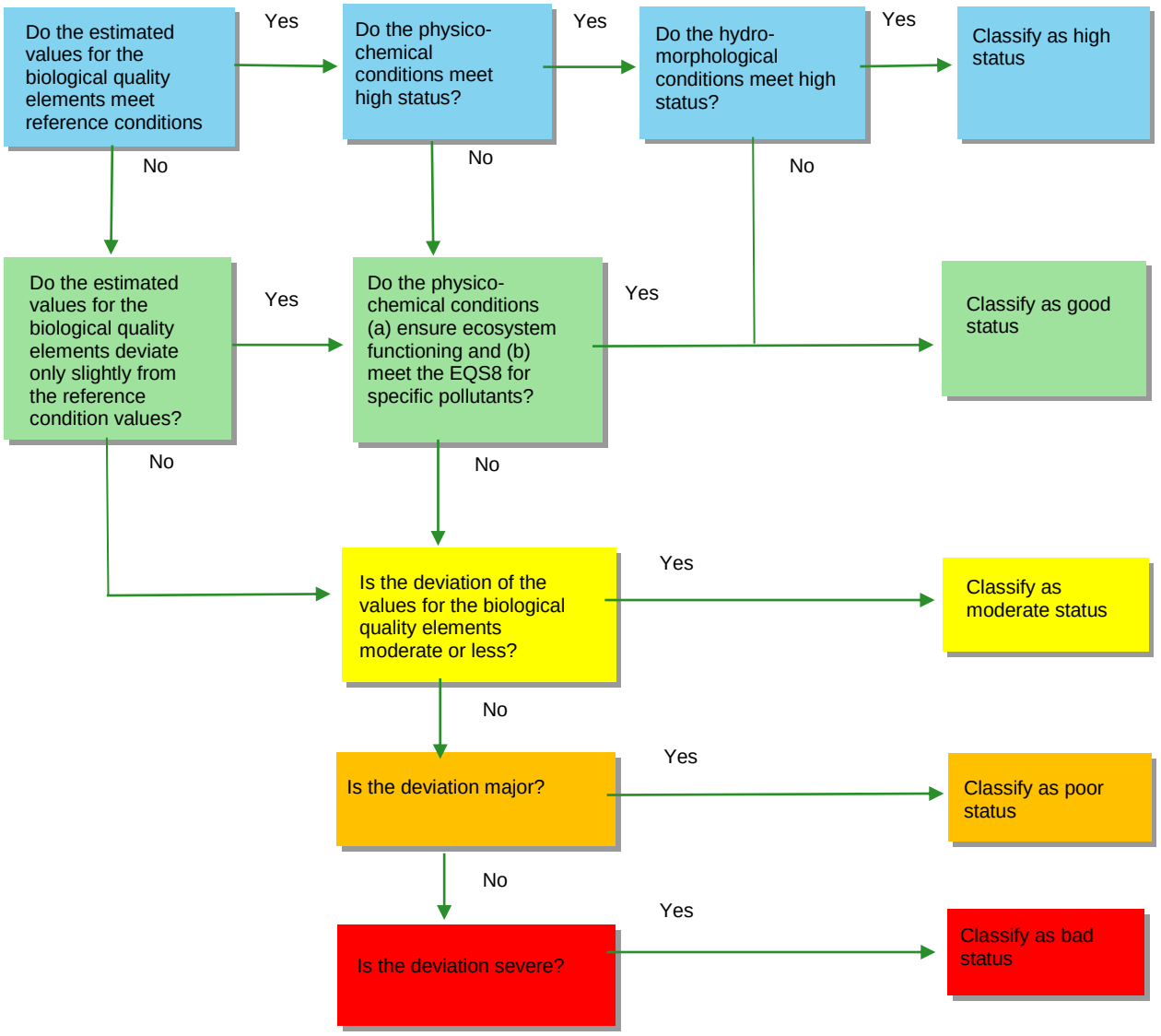
Ecological status is recorded on the scale of high, good, moderate, poor or bad. 'High' denotes largely undisturbed conditions and the other classes represent increasing deviation from this 'reference condition'. The classification of ecological status for the water body, and the confidence in this, is determined by the worst scoring quality element.

Only biological elements are currently recorded on the full scale, high to bad. Supporting physico-chemical elements are not reported below moderate status. However, the UK Technical Advisory Group (the UK-wide collaboration to develop best practice) has produced standards that distinguish between moderate, poor and bad for physico-chemical

elements. Natural Resources Wales uses this information as part of our evidence base as well.

Hydromorphological elements (hydrology and morphology) are considered to be supporting elements of ecological status and are recorded either as supporting or failing to support good ecological status. Hydromorphological elements are used to define high

Figure 4. Ecological status, classification decision tree



ii. Surface water chemical status

Chemical status is assessed by compliance with environmental standards for chemicals that are listed in the Environmental Quality Standards Directive. Chemical status is recorded as either good or fail. The chemical status classification, including certainty, for the water body is determined by the worst scoring chemical.

Assessment of chemical status is based either on monitoring data from within the water body or, where this is not available, by a modelled risk assessment based upon the nine chemicals considered to pose the highest risk in the UK where there is sufficient data to suitably model levels in the environment. Natural Resources Wales is carrying out additional monitoring to improve certainty in relation to the environmental models used.

iii. Groundwater status - chemical and quantitative

The achievement of good status in groundwater involves meeting a series of conditions which are defined in the Water Framework Directive (2000/60/EC) and Groundwater (Daughter) Directive (2006/118/EC). In order to assess whether these conditions are being met, a series of tests has been designed for each of the quality elements defining good (chemical and quantitative) groundwater status.

There are five chemical and four quantitative tests. Each test is applied independently and the results combined to give an overall assessment of groundwater body chemical and quantitative status. The worst case classification from the relevant chemical status tests is reported as the overall chemical status for the groundwater body and the worst case classification of the quantitative tests reported as the overall quantitative status for the groundwater body. The worst result of these two is reported as the overall groundwater body status. Groundwaters are classified as either at good or poor status.

iv. Groundwater trend assessment

For groundwater bodies that have been identified as being at risk of failing to meet their environmental objectives for groundwater quality, there is a requirement to identify any significant and sustained upward trends in pollutant concentrations. A significant trend is one that could lead to a groundwater body failing to meet its environmental objectives before 2021 (the end of two river basin cycles) if measures are not put in place to reverse the trend.

v. Ecological potential

For water bodies that have been designated as heavily modified or artificial, Natural Resources Wales must classify according to their ecological potential rather than status. UKTAG have adopted the ‘mitigation measures approach’ for classifying heavily modified and artificial water bodies.

This approach first assesses whether actions to mitigate the impact of physical modification are in place to the extent that could reasonably be expected. If this mitigation is in place, then the water body may be classified as achieving good or better ecological potential. If this level of mitigation is not in place, then the water body will be classed as moderate or worse ecological potential.

There may be instances where it is considered inappropriate to implement a mitigation measure if it can be demonstrated that doing so is likely to have a significant adverse impact on the designated use of the water body. If so then that mitigation measures is excluded from the classification process and is not required to be in place for a good ecological potential (GEP) to be reached. Guidelines for significance are assessed individually for each designated use as it is recognised that they will vary between sectors.

Before a classification of overall ecological potential can be produces the second step is for the results of the mitigation measures assessment to be cross-checked with data from biological and physico-chemical assessments.

Where Natural Resources Wales have data for biological quality elements that show signs of impact from pressures other than hydromorphological alterations (for example if the diatom or phytoplankton status is poor because of nutrient pressures) the ecological potential will be changed. To reflect this other pressure the water body will be reported as ‘poor ecological potential’. This also applies where we have data for physico-chemical quality elements. As with diatoms, these are capable of picking up impacts beyond the hydromorphological pressure and must be also be reflected in the overall ecological potential result.

Where the flow conditions do not support good status (for example, due to over abstraction) it is necessary to over-ride the mitigation measures assessment so that the results of the biological surveys dictate the overall ecological potential. Doing this avoids misrepresenting the potential of a water body where, despite all mitigation measures being taken to address the physical pressures, the wildlife is suffering because of an abstraction upstream.

Finally, Natural Resources Wales may sometimes find that a water body has been designated as heavily modified yet the biological elements sensitive to hydromorphological pressures are at good status. Where this is the case we will review the biological evidence and where there is high confidence in the longevity of the ecological status the heavily modified water body designation will be recommended for removal.

Supporting information
Method statements giving greater detail on the classification of surface waters and groundwaters can be found on the Environment Agency sharefile site.

The latest assessments of status for water bodies in Wales can be found on Water Watch Wales,

4.2.4. Considering wider evidence of an environmental problem

As noted earlier, classification is just one part of the evidence available on the state of the water environment and additional information is sometimes required to assess whether a classification result is really indicative of an environmental problem in a water body.

For surface waters the certainty that an element or water body is at less than good status is expressed using the three categories of very certain, quite certain and uncertain. These definitions are based on statistical certainty from analysis of the monitoring data used to derive the classification results (very certain ≥95%, quite certain ≥75% <95%, uncertain >50% <75%).

The level of certainty we need to have that an element really is at less than good status will be influenced by the actions required to resolve the environmental problem. If costly or targeted regulatory measures are required then a high degree of certainty that there is a problem is usually required to justify the action. However for some low cost, voluntary type measures action may be justified where there is much less certainty in the classification result.

Classification and statistical certainty derived from operational monitoring may be unable, on their own, to provide the certainty needed to justify the actions that may be required, particularly if the failure is caused by pollution from diffuse or intermittent sources. In these cases additional evidence is used to make a pragmatic, qualitative judgement of the certainty that there is a problem to solve, based on a weight of evidence approach. This additional evidence could come from, for example, pollution incident or investigative monitoring data.

The classification results provide part of that weight of evidence but it is important to note that the additional weight of evidence approach to improve certainty that there is, or is not, a problem to solve does not over-ride the formal classification result.

i. Weight-of-evidence assessments for nutrients and eutrophication

For the impacts of nutrients on biological status, relevant classification results have been combined with wider weight of evidence within ‘eutrophication assessments’. These

assessments do not affect classification, which is done element by element, but are used in the targeting of measures for nutrients.

The nutrient standards used for Water Framework Directive classifications are based on an understanding of the links between nutrients and the biological impacts associated with eutrophication. However, there is uncertainty in the ability to use this knowledge to predict the impacts in particular water bodies; exceeding the Water Framework Directive nutrient standard alone is considered insufficient to judge the risk of impacts on the biology. Therefore, in accordance with Defra and Welsh Government guidance on river basin planning, Natural Resources Wales uses a weight-of-evidence approach in targeting and prioritising control measures.

Phosporous element failures where there are no corroborating biology classification failures will still be acknowledged in the river basin management plan, but may be targeted as a lower priority than those with relevant supporting biology failures.

Wider evidence of eutrophication, for example from investigations, is also taken into account, where appropriate and available, to increase certainty. This assessment of certainty of eutrophication does not affect the classification result but informs decisions on subsequent actions as described above, with high certainty being required if costly targeted regulatory measures would be needed to address the problem. This approach provides a link between standards, classification, investigations and measures.

Natural Resources Wales has developed draft eutrophication assessments for water bodies at risk from nutrients for rivers, lakes, estuaries and coastal waters. These combine the latest classification results with wider evidence in a structured way to make best use of all relevant evidence in identifying whether there is a problem to solve in a given water body.

Monitoring data from 2013 will be incorporated into this analysis later in 2014 and this will help to finalise the water body assessments in time to adjust proposed measures for nutrients in the updated river basin management plans in 2015. The measures proposed for phosphorus in the draft plan do not take account of the latest assessments of eutrophication, so this adjustment step will be important, particularly in targeting expensive regulatory measures such as phosphorus reduction at sewage treatment works.

If you have data or evidence of eutrophication that could help to refine these assessments then please contact your local Natural Resources Wales office.

4.3 Changes since first cycle (new building blocks)

Water body status classifications are based on a set of ‘building blocks’. These building blocks are:

- The water body and monitoring networks.
- The designation of artificial and heavily modified water bodies.
- The standards and boundaries used in assessment.
- The tools used to derive classification results for individual elements from monitoring data.

A number of significant methodological changes are being introduced for the second cycle of river basin management planning:

- Updated standards are being used to determine good status for nutrients and some chemical substances. These new standards were developed as part of a UK-wide collaboration and have been widely consulted upon.

- A second generation of biological classification tools will ensure biological classifications are better at reflecting local conditions.
- The size and shape of some water bodies have changed so that they become more logical management units.
- The process to designate heavily modified water bodies has been improved.

The table below shows the number of surface water bodies in Wales for the second cycle of river basin management planning (note that 'rivers' includes canals, surface water transfers and SSSI ditches).

Table 6. Second cycle numbers of water bodies

Number of water bodies	Natural	Artificial	Heavily Modified	Total
River*	**619**	**14**	**91**	**724**
Lake	**29**	**3**	**92**	**124**
Coastal	**17**		**6**	**23**
Estuarine	**17**		**14**	**31**
Total	**682**	**17**	**203**	**902**

All of these changes have been introduced now so that the consultation on the draft updated river basin management plans can be based on the best possible information.

Later in 2014 a new river monitoring network will be introduced with better coverage of biological surveys and an emphasis on fixed sampling locations, which will make it easier to identify and report environmental improvement.

For 2013, 2014 and 2015 Natural Resources Wales will produce two sets of Water Framework Directive classification results:

- Old Building Blocks (OBB): these results are based on the same methodologies that produced the classification results reported in the current river basin management plans. They are used to assess progress against the objectives set in the current plans, including improvements in the quality of water bodies, as well as check for any potential deterioration against the 2009 baseline.
- New Building Blocks (NBB): these results contain the changes outlined above. This will be the first step in developing the baseline for the updated river basin management plans, and will inform investigations and help determine appropriate measures and objectives.

These changes will make a difference to the number of water bodies reported as being in high, good, moderate, poor and bad ecological status.

Supporting information
You can find information on the changes to water bodies in Wales on Water Watch Wales

4.4 Challenges

4.4.1 Significant water management issues (stage 2)

In 2013 Natural Resources Wales consulted on what were considered to be the most important issues that challenge the current and potential future uses and benefits of the

water environment in each river basin district. These significant water management issues are described in the draft updated river basin management plan consultation documents as follows:

- **Changes to the natural flow and level of water** – taking too much water from rivers, canals, lakes and groundwater, means less water flowing and altering water levels can affect habitats.
- **Negative effects of non-native invasive species** – the effect on the health of the natural environment of plants and animals from outside the UK introduced to UK waters.
- **Physical modifications** – changes made by people to rivers, lakes and estuaries, for example flood defences and weirs, and changes to the natural river channels for land drainage and navigation. These modifications alter natural flow levels, may cause excessive build-up of sediment, and the loss of habitats.
- **Pollution from mines** – contaminated water draining from mines, most of which are now abandoned.
- **Pollution from rural areas** – the effects of poor agricultural practice and rural land management on the water environment (also known as 'diffuse rural pollution').
- **Pollution from towns, cities and transport –** rainwater running over hard surfaces and carrying pollutants into waters, chemicals from contaminated land, and sewage from houses ‘misconnected’ to surface water drains rather than sewers (also known as ‘diffuse urban pollution).
- **Pollution from waste water** – waste water can contain large amounts of nutrients (such as phosphorus and nitrates), ammonia, faecal bacteria and other damaging substances.

Some of the issues described above are relate to a single pressure and others are more complex and involve a range of different pressures. Pressures can come from one or more sources (activities). These include:

- Phosphorus, nitrates and faecal bacteria largely originate from livestock manures and human sewage.
- Surface run-off can be contaminated by fine sediment that has both direct and indirect impacts on the condition of the receiving environment. Direct impacts include alteration of the physical characteristics of river channels leading to impacts on the habitat and to ‘muddy floods’. Indirect impacts occur because the sediment acts as a vehicle for the transfer of other pollutants, such as phosphorus, nitrate, pesticides and faecal bacteria to water.
- A wide range of chemicals used in everyday life, some of which can adversely affect the environment, enter watercourses from point sources (factory and sewage treatment work effluents) as well as diffuse sources, for example road run-off.
- Sewage treatment works and storm overflows are also important point sources of phosphorus, nitrate, faecal bacteria and sanitary pollution.

Table 7. Significant water management issues, by pressure and activity/source

significant water management issues – pressure based	Significant water management issues – activity/source based							
		Changes to the natural flow and level of water	Negative effects of non-native invasive species	Physical modification	Pollution from mines	Pollution from rural areas	Pollution from towns, cities and transport	Pollution from waste water
	Abstraction and flow	✓						
	Chemicals				✓	✓	✓	✓
	Faecal contamination and sanitary pollutants					✓	✓	✓
	Fine sediment			✓	✓	✓	✓	✓
	Invasive non-native species		✓					
	Nitrates					✓	✓	✓
	Phosphorus and freshwater eutrophication					✓	✓	✓
	Physical modifications			✓				

The sections below provide more information on the individual pressures that have significant impacts on the water environment.

Supporting information

If you would like more detailed information about any of the significant water management issues below then a technical summary is available on the Environment Agency sharefile site

i. Abstraction and flow

Taking too much water from rivers, canals, lakes and groundwater causes problems for wildlife .

Abstraction is the removal of water, permanently or temporarily, from the water environment such as rivers, lakes, wetlands, canals, reservoirs or from groundwater. Water is abstracted to meet a wide range of uses throughout Wales. The effect abstraction has on the environment depends on the amount and timing of the abstraction and the location and amount of water that may be returned after it has been used. Taking too much water from rivers and groundwater may result in lower flows and reduced water levels, which may not support a healthy ecology, affecting wildlife and the look of a river, as well as impacting on other water users.

In the short term, the current actions being taken to restore sustainable abstraction are reducing the impact on some rivers. In the future, population growth and development are likely to require more water to be abstracted. A changing climate may affect both the demand for water and the natural resource present in rivers and groundwater in future. If abstraction continues at current rates (or increases) and natural water resources become depleted due to climate change, the existing impacts of abstraction on rivers, lakes, wetlands and estuaries will be magnified. Although Wales is often viewed as being wet, there are some parts of Wales that do not have any reliable new supplies of water available from rivers and groundwater to meet these future requirements.

We need to ensure there is no deterioration in the ecological condition of rivers due to abstraction. Taking a proportionate approach to managing abstraction and flow pressures can ensure sustainable supplies of water for the public, businesses and agriculture, while making sure rivers and other wetlands support a good ecology.

ii. Chemicals

Toxic and hazardous substances that enter the water environment and can damage wildlife and people and contaminate sources of drinking water.

A vast range of chemicals are used every day, both at home and at work, some of which can adversely affect the environment. These chemicals can enter the environment by many diverse routes, ranging from emissions from industry and sewage treatment works to runoff from roads or farms. Many of these chemicals come from using products in homes, hotels, restaurants and offices and get into the water environment via sewage treatment works. Other sources of chemicals include industry and agriculture. For some substances, as well as current emissions from industry and sewage treatment works, there are significant legacy issues. Some substances are already widespread in the environment as a result of past use which has contaminated land and sediment. Some of these substances can accumulate in the food chain and may adhere strongly to sediment. In addition, historic industrial activity such as mining has led to significant emissions of metals from under the ground into the water environment.

Some chemicals can threaten the long-term sustainability of drinking water sources and lead to increased costs of treatment. They may also hinder the transfer of water from areas with abundant supplies to those where supplies are scarce.

There are major challenges to achieving objectives for some designated chemicals under the Water Framework Directive. For example brominated flame retardants were banned in 2006 but are still present in many home furnishings like sofas and still end up in the water environment. For some common persistent toxic substances that can accumulate in the environment, the majority of waters may be at risk of not meeting Environmental Quality Standards (EQS), which are set to protect the environment.

iii. Faecal contamination and sanitary pollutants

Contamination with faecal matter is an important factor to consider when protecting people's health. Sanitary pollutants can have direct toxic effects on wildlife or cause damage by reducing the amount of oxygen in the water.

Faecal bacteria affect public health and so it is important to control the amount in the environment. Sewage effluent and runoff from animal manure are the largest sources of faecal organisms. Climate predictions suggest that there is likely to be increased contamination from farmland and urban runoff due to compacted soils and /or less frequent but intense summer rainfall events. These events may also cause an increased frequency of combined sewer overflows and sewage treatment plant flooding.

Faecal bacteria in the water at coastal and freshwater beaches can affect people using these waters, particularly while swimming. Faecal bacteria can accumulate in shellfish, which means that shellfish harvested for consumption have to be treated to make sure that they do not pose a risk to human health. If too many faecal bacteria reach rivers and groundwater used for drinking water, the supplies must be treated to make sure they are fit for consumption. Compliance with bacterial standards has improved significantly since the 1990s in designated bathing waters.

Ammonia, dissolved oxygen and biochemical oxygen demand (BOD) (sanitary pollutants) are indicators of the organic pollution of the water environment. Ammonia is toxic and can kill or be otherwise harmful to aquatic wildlife like fish. The higher the biochemical oxygen demand, the greater the potential from organic pollution to cause a drop in dissolved oxygen which can cause stress or, in extreme cases, kill aquatic life. Sewage effluent is the largest source of sanitary pollutants. Although a small number of estuaries and coastal waters have problems from reduced amounts of dissolved oxygen, sanitary pollutants are generally an issue for rivers. Compliance with ammonia and dissolved oxygen standards has improved during the last 20 years, primarily due to investment by water companies. Regulation and improved farming practices have also contributed to improving compliance with ammonia, BOD and dissolved oxygen standards.

Small, private drinking water supplies from groundwater can be at particular risk of bacterial pollution. We are working with the Drinking Water Inspectorate and Local Authorities to see how we can manage the need for purification treatment at private supplies.

iv. Fine sediment

Fine sediment can smother plants, fish eggs and invertebrates in rivers and lakes and also move other pollutants from land into water. Fine sediment can also increase flood risk and cause problems for drinking water supplies, for example by colouring the water.

Too much fine sediment causes a range of problems, from damaging wildlife to increasing the costs of treating drinking water, and increased risk of flooding from silted up drains. Sediment has direct impacts (smothering plants, fish eggs and freshwater invertebrates) and indirect impacts, carrying other pollutants like nutrients, chemicals and faecal contamination into the water environment. Reducing the amount of fine sediment not only reduces the direct impacts of sediment but also brings wider benefits, including reducing the risk of flooding. Fine sediment results from soil erosion, soil compaction (which increases surface water run-off) and the erosion of riverbanks and road verges.

Climate predictions indicate that there is likely to be increased contamination from sediments from farmland and farm premises and from urban environments. This will be due to washout from compacted soils and from urban environments after first-flush

releases during intense rainfall events. Changing crop types and seasonal patterns of agriculture, such as increased winter cropping, will also affect sediment runoff. Research suggests there will be higher sediment loads to lakes and higher up stream systems which may affect fish spawning grounds.

v. Invasive non-native species INNS)

These Plants or animals originating outside the UK that are introduced and subsequently have negative effects on the health of the water environment and native plants and animals.

They are a direct threat to the ecological objectives we want to achieve through the Water Framework Directive. INNS are also considered to be the next biggest threat to biodiversity worldwide after habitat loss and destruction.

The total annual cost of INNS to the Welsh economy is currently estimated at over £125 million with indirect costs estimated to be much more. These costs comprise control and eradication work and the additional operational management costs arising from INNS impacts which include structural damage, blocking intakes and pipes and production losses because of their presence for example.

The pressure and risks from INNS is increasing because of the continuing spread of established species and the likelihood of others being introduced because of increasing international trade and travel. Climate change may also increase the survival, proliferation and spread of these species further. We therefore need to develop and implement measures to reduce this pressure, the risks INNS pose to water body ecological status and to also minimise the risk of undermining all the other associated Water Framework Directive improvement actions we are looking to undertake.

vi. Nitrates

Too much of this nutrient can put drinking water supplies at risk, increasing treatment costs. It can also cause algae and plants to grow excessively, particularly in marine habitats.

The main source of nitrates in our surface and ground waters are agriculture (the largest source) and sewage and, to a lesser extent, industrial effluents.

In 2009 31% (11 out of 36) of groundwater bodies were classified as being at poor status, with nitrate implicated in one of these. In 2013 45% (17 of 38) were classified as being poor status and nitrate was implicated in six of these.

Around 2% of the land area of Wales is designated as Nitrate Vulnerable Zones (NVZs) under the Nitrates Directive because fresh surface or ground waters have elevated nitrate concentrations. The Nitrates Directive aims to manage nitrate pollution from agriculture in the context of the 50 mg/l nitrate threshold for drinking water resource protection.

Eutrophication is when there is too much nutrient in waters, causing algae and plants to grow excessively. This affects the quality of the water and how it can be used, as well as damaging the local wildlife. Nitrogen is the main nutrient involved in eutrophication of estuaries and coastal waters, one of the main issues for these waters. Recent science indicates that nitrogen may also play a role in eutrophication of freshwaters, particularly lakes. Increased temperatures and lower water levels under a changing climate are likely to exacerbate this.

Concentrations of nitrate in surface waters have been gradually declining since peaking in the early 2000s. In groundwater there are indications that concentrations in many locations

are declining, but in some places, due to the very slow movement of water through the ground, peak levels of nitrate have not yet occurred.

vii. Phosphorus and freshwater eutrophication

Too much of this nutrient causes algae and plants to grow excessively. This affects the quality of the water and how it is used, as well as damaging the local ecology.

The main sources of phosphorus in our freshwaters are sewage effluent and agricultural drainage. There are several sources of phosphorus within sewage, notably human metabolic wastes, food additives, detergents and the dosing of drinking waters with phosphorus to control lead levels.

Concentrations of phosphorus in Welsh rivers have been falling since 1990, supported by major reductions in phosphorus inputs from sewage treatment works through investment by the water industry to meet EC directives. However, despite this progress, phosphorus remains a common cause of water quality failures in Wales, with 10% of monitored rivers, 25% of monitored lake water bodies and 14% of monitored canal water bodies currently exceeding the phosphorus standard for good status. Population growth will increase the amount of phosphorus entering sewage treatment works in some areas which, without intervention, may slow or reverse improvements. As for Nitrates, climate change may exacerbate the future extent and severity of eutrophication problems.

viii. Physical modification

Many water bodies exhibit manmade changes to their natural habitat. These modifications can alter natural flows, cause excessive build up of sediment, increase erosion and reduce the diversity of habitats, thus potentially reducing the quality and quantity of habitat for fish, invertebrates and plants.

Plants, invertebrates and fish are affected by the flows and physical characteristics of the water environment. These hydrological and morphological features are collectively known as the water body's hydromorphology. Aquatic wildlife can be constrained if the quantity and quality of water flows is altered, and if habitat quality is reduced. Modifications such as straightening river channels, building weirs and reinforcing banks with concrete can constrain and stabilise the physical nature of water bodies, reducing the development and diversity of physical habitats. This, in turn, tends to reduce the number and diversity of animals and plants present. The way land is managed can also adversely affect habitats, for example by changing the amount of sediment that washes off both agricultural land and urban areas.

Many of the rivers, lakes and coasts of Wales have been modified to provide benefits to people such as land drainage, reduced flood risk to communities, water storage for public water supply, recreation or improved channels for navigation. In many cases these benefits and uses are still vitally important and need to be retained, whilst also reducing their potentially deleterious impacts on flows and habitats, and subsequently on aquatic wildlife.

There is significant uncertainty about future trends for physical modifications but recent assessments indicate that some pressures will increase in response to climate and population changes. Deterioration in the ecological condition of some rivers by 2030 is forecast unless further action is taken to mitigate the impacts of, and control the development of modifications.

4.4.2. Issues affecting protected areas

Protected areas are a priority for action. The same pressures that lead to water bodies not being in good status frequently also lead to protected areas not meeting their objectives.

i. Drinking Water Protected Areas

There are currently 67 surface water DrWPAs in Wales and Natural Resources Wales is proposing to designate a further 77 lakes. All ground waters that are used to provide drinking water are designated DrWPAs. The main issues in surface water DrWPAs are pesticides, 47% are at risk of failure of pesticide standards. 33% are at risk for colour, usually from organic compounds found in upland areas and a smaller number are at risk from eutrophication as a result of excess nutrients.

ii. Economically Significant Species

There are 22 designated shellfish protected areas in Wales. In 2013, 100% complied with mandatory water quality standards and 41% complied with the guideline microbial standard. Microbial pollution of shellfish waters originates from multiple point and diffuse sources including combined sewer overflows (CSOs), emergency overflows, urban surface water runoff and rural losses from 'natural' (wildlife), farm livestock and human sources. The proportions of these multiple sources of microbial pollution vary from site to site, and in response to weather patterns. Identifying the source of microbial pollution can be very difficult.

iii. Recreational Waters (Bathing Waters)

In 2013, 89 of 100 bathing waters met the highest current standard (guideline). Only one failed the Directive's current mandatory minimum standard. New standards will apply to bathing waters from 2015 and projections suggest that around 5 bathing waters will be at risk of failure at the end of the 2015 bathing season. The most significant sources of pollution affecting bathing water compliance are from sewage works or combined sewer overflows (CSOs); faeces from grazing animals; urban run-off which contains dog and bird faeces; or from birds and animals on the beach (e.g. seagulls, pigeons, dogs, horses and donkeys). The proportions of these multiple sources of microbial pollution vary from site to site, and in response to weather patterns. Identifying the source of microbial pollution can be very difficult..

iv. Nutrient Sensitive Areas (UWWTD)

Under the UWWTD two estuarine and coastal waterbodies are designated as either sensitive areas eutrophic or polluted waters eutrophic. Natural resources Wales has been working with the water industry for many years to identify and review the measures that are needed to maintain and improve these protected areas. Measures include improving treatment at sewage treatment works (for example to control levels of nutrients or bacteria), reducing the spill frequency of permitted intermittent discharges and installation of event duration monitoring to better understand the impact that intermittent discharges are having on the environment. Recently, the water industry has also been identifying innovative measures such as the use of catchment schemes to reduce loadings of diffuse pollutants to help look after protected areas. However it can take 10 to 20 years for the marine environment to respond at the biological level.

v. Nutrient Sensitive Areas (Nitrate Vulnerable Zones)

Four lakes are designated as N-eutrophic waters, where nitrates from agriculture contribute to the ecological problems associated with excessive algal and plant growth. Agriculture accounts for some of the nitrate entering surface water and ground waters in Wales, with significant variation between and within catchments.

There have been widespread but modest improvements in river nitrate levels, but for groundwater the picture is more mixed. In some water bodies there are improvements but in others there is continued deterioration as nitrate continues its journey to deeper aquifers.

vi. Natura 2000 Protected Areas

There are 42 out of 122 N2K and Ramsar sites where there is a need to have a Diffuse Water Pollution Plan, chiefly to address catchment-wide agricultural pollution. A quarter of water related pressures on N2K sites come from diffuse water pollution from agriculture, mainly nutrient enrichment and sediment

Supporting information

For more detailed information on the management and restoration of all protected sites and their features contact regional Natural Resources Wales conservation officers through general enquiries on our website

4.4.3 Assessing risk

i. General approach to assessing risk

Article 5 of the Water Framework Directive requires Member States to identify pressures acting on each water body. This can mean any pressure that on its own, or in combination with other pressures, may promote current or future risk of failing to achieve the environmental objectives of the Directive. The methodology for each risk assessment was tailored to the pressure but in general it was an assessment of the scale of the pressure and the sensitivity of the water body.

Risk assessments produced for the current river basin management plans have been reviewed. Where new data and information were available the risk assessments have been updated. The table below shows where updated risk assessments are available and the environmental objectives to which they relate.

Table 8. Significant water management issues - risk assessments

Risk Assessment	Environmental Objective						
	Good ecological status			No deterioration			
Year	2015	2021	2027	2015	2021	2027	2050
Chemicals & metals	✓						
Eutrophication	✓						
Phosphorus	✓						
FIOs						✓	✓
Sanitary pollutants					✓		
Sediment	✓						
Abstraction & Flow			✓			✓	
Physical modification							
Groundwater Chemical	✓	✓	✓	✓	✓	✓	
Groundwater Quantitative	✓	✓	✓	✓	✓	✓	

Risk Assessment	Environmental Objective						
Invasive non-Native Species				✓	✓	✓	✓
Acidification (Wales)						✓	

The current risk of failing to achieve good ecological status or the risk of deterioration in status by 2015 can be informed by classification (monitoring) results and also a current understanding of pressures and water body sensitivity. The projections of risk beyond 2015 are more reliant on forecasts of changes to activities and pressures such as changes in population size, land use and climate.

Each updated risk assessment shown in the previous table followed a four step process:

1. Describing the "driving forces" such as land use, urban development, industry, agriculture and other activities which lead to pressures, without regard to their actual impacts.
2. Identifying activities or changes in activities that may result in a significant pressure (that is, one that presents a risk of failing to meet Water Framework Directive objectives) on a water body and considering the magnitude of that pressure.
3. Considering the susceptibility of the water body to impact that might result from the pressure.
4. Evaluating the likelihood of failing to meet the objective.

The work involved in assessing whether a body is at risk of failing to achieve its environmental objectives was proportionate to the difficulties involved in making that judgement. Where information was available (for example data, modelling outputs, expert judgement) an estimation of the magnitude of the pressure could be made. Where no information was available it was not possible to specifically represent a pressure. The confidence associated with each risk assessment was variable and attributable to the level of understanding, availability of information and the geographical scale at which information was available, for example local data provides greater confidence for a water body than regional or national data.

ii. Using risk assessments

The Water Framework Directive requires risk characterisation information to be used to optimise the design of the monitoring programmes (Article 8) and the programmes of measures (Article 11). Many aspects of catchment scale planning will, in part, be informed by the water body risk assessments.

- To report projected future risk of deterioration and risk to status objectives with associated reasons for risk and apportionment of sources of risk.
- To help inform whether failure to achieve an objective is due to an environmental problem.
- To inform classification as part of a consideration of the weight of evidence.
- To inform design of the monitoring programme, input into designing future investigations and programmes of measures.
- To inform strategic environmental planning to future proof actions and measures and maximise cost effectiveness and benefits into the future.

The outputs from the updated risk assessments will also be reported to the Commission.

Supporting information
Risk assessment method statements and maps showing risk assessment results are available on the Environment Agency sharefile site

4.4.4 Reasons for not achieving good status and reasons for deterioration

Where an element is classified as being at less than good status an assessment is needed of the actions that could be taken to improve the status to good. In order to identify appropriate actions it is first necessary to understand the cause of the failure. The cause is recorded using a defined set of reasons. Where a biological element, for example fish or invertebrates, is at less than good status the pressure, for example ammonia or sediments, causing the failure is also identified.

In addition to identifying the pressure responsible for not achieving good status we also identify the type and source of the problem. This consists of three pieces or tiers of information.

- Tier 1 = significant water management issue, for example ‘diffuse source’, ‘point source’ or ‘physical modification’.
- Tier 2 = more detailed activity or source, for example ‘arable field’, ‘sewage discharge (continuous)’ or ‘flood protection structures’.
- Tier 3 = sector, for example ‘agriculture and rural land management’, ‘water industry’ or ‘Natural Resources Wales’.

If more than one reason for not achieving good status is identified for a failing element (or for a pressure affecting a biological element) then the source apportionment of each reason is also recorded. For example, if there are two sources of ammonia, a diffuse source and a point source, then the relative contribution of each source to the overall ammonia problem is recorded.
A level of certainty (suspected, probable or confirmed) is also assigned to each reason for not achieving good status, based on a weight of evidence approach:

- Suspected
  - There is some information that points to a possible reason for not achieving good status.
  - Further investigations are required before site specific measures can be identified.
  - Part of the source-pathway-receptor linkage is missing, for example a probable source and receptor has been identified but the pathway is not established.
- Probable
  - There is reasonable evidence that points to the reason for not achieving good status.
  - Further investigations are required before site specific regulatory or expensive measures can be considered.
  - The source-pathway-receptor linkage has been established with reasonable certainty. There is reasonable evidence which generally give a consistent (that is, not contradictory) picture.
- Confirmed
  - There is compelling evidence for the reason for not achieving good status. The available evidence should demonstrate cause and effect in a way that would be compelling to all stakeholders.
  - No further investigations into the reasons for not achieving good status are required before site specific regulatory or expensive measures can be justified.

- The source-pathway-receptor linkage has been established. There is good evidence which gives a consistent (that is, not contradictory) picture.

Defining the problem in this way supports the appraisal of appropriate actions or measures to address the problem. The source apportionment information informs the targeting of effort and the analysis of the costs and benefits of any actions. The same approach is used for recording reasons for deterioration where a change in status class is detected.

As a result of the programme of investigations carried out since 2009, the certainty associated with the reasons for failure data has improved, as shown in the table below.

Table 9. Investigation since 2009

	Number of records	Percentages	
2009			
Unknown	687	45.8	73.2
Suspected	411	27.4	
Confirmed	400	26.7	26.7
Total	1498		
2010			
Unknown	621	41.5	64.2
Suspected	340	22.7	
Probable	160	10.7	35.8
Confirmed	375	25.1	
Total	1496		
2011			
Unknown	480	30.9	55.5
Suspected	382	24.6	
Probable	273	17.6	44.5
Confirmed	418	26.9	
Total	1553		
2012			
Unknown	404	26.1	47.7
Suspected	334	21.6	
Probable	290	18.7	52.3
Confirmed	520	33.6	
Total	1548		
2013			
Unknown	89	5.7.6	24
Suspected	288	18.3	
Probable	437	27.8	76
Confirmed	758	48.2	
Total	1572		

Supporting information
You can find the reasons for not achieving good data for water bodies in Wales on Water Watch Wales

5. Identifying measures and objectives

Summary of this section
This section sets out the overall process for determining water body measures and objectives, including the role of economic assessment

Topics covered
Process for identifying status objectives, measures, economic assessment, water body status objectives

The river basin management planning process is about using our evidence base to develop a programme of measures and understanding what this means in terms of achieving Water Framework Directive objectives within the planning timeframe. In line with guidance from government we have set objectives and identified measures for every water body. This information can be accessed at Water Watch Wales and a detailed description of our approach is provided below. Further information is available on request.

5.1 The environmental objectives of the Water Framework Directive.

The environmental objectives of Water Framework Directive are set out in Article 4 and for this update to the river basin management plans can be summarised as:

- prevent deterioration in Water Framework Directive status

For surface waters:

- achieve good ecological status/potential by 2021
- achieve good chemical status by 2021

For groundwaters:

- achieve good quantitative & chemical status by 2021

For protected areas:

- achieve the objectives specified in the Directive under which they were established by 2021. For water dependent Natura 2000 sites we will aim to achieve conservation objectives, achieving good status by 2021 is a milestone towards this objective.

Water Framework Directive also allows for alternative objectives (i.e. an extended deadline or less stringent objective) to be set where certain conditions are met. We must provide justifications within the RBMP. These are set out in Paragraphs 4.4 and 4.5 of the Directive. We can extend a deadline where:

- the scale of improvements required can only be achieved in phases exceeding the timescale, for reasons of technical feasibility
- natural conditions do not allow timely improvement in the status of a water body (can extend beyond 2027)
- completing the improvements within the timescale would be disproportionately expensive

Where appropriate we can set a less stringent objective (i.e. less than good) where measures are:

- technically infeasible, or
- disproportionately expensive

When applying a less stringent objective we must still aim for the highest status possible.

5.2 How we have identified local (water body) measures

For the purpose of developing this update to the RBMP we have aimed to develop a single integrated programme of measures that aims to meet Water Framework Directive objectives by 2021. Our evidence base for developing the programme of measures is made up of the following key datasets:

- conclusions from the first cycle Water Framework Directive investigations programme – May 2014
- for Natura 2000 sites – a summary of current actions from the Outcome 21 (actions) database mapped to Water Framework Directive water bodies using GIS – June 2014
- for marine Natura 2000 sites a summary of actions collated as part of the Priority Improvement Plans - July 2014
- water company actions identified in the draft National Environment Programme (July 2014), including actions and investigations to achieve good status, and bathing water and drinking water protected area objectives.
- existing NVZ designations – July 2014
- For shellfish waters measures have been proposed which will aim to improve Shellfish Waters in order to endeavour to observe the guideline standard.

We have summarised the actions identified in each of these datasets under a number of high level measures categories (Table 10), and used GIS to map these to Water Framework Directive water bodies. Where possible we have integrated actions from different programmes/data sets under specific categories, but in some cases this was not possible and there is partial overlap between actions in two or more categories (e.g. acidification restoration and address air pollution). For marine Natura 2000 sites measures required to manage risk have been integrated.

Our work to integrate actions across programmes is continuing. There are a number of issues that will be resolved before the River Basin Management Plans are presented to Ministers in September 2015, including:

- full integration of information from the LIFE+ programme
- review of links between Water Framework Directive water bodies and Natura 2000 features

Within this consultation measures are divided into two groups. Local measures as described above are the actions that need to be implemented locally, specific to a water body or part of a river basin district. National measures are actions that apply to the whole of Wales, or the United Kingdom. In general these set the legislative, policy or strategic approach for implementation. Examples include a national ban on using a particular chemical or a national strategy for prioritising and funding the remediation of abandoned mines. New national measures have been identified by Natural Resources Wales, working with Welsh Government and the Environment Agency and are presented in the river basin management plans.

The full set of local and national measures is available on Water Watch Wales.

Table 10. Local water body measures categories.

Measure category	Summary of available options
Acidification restoration	Emissions controls and upland restoration: blocking drainage, restoring blanket bog, within forestry plantation blocking forest drains and establishing native trees within the riparian zone, liming options. Some overlap with "address air pollution".
Address air pollution	Emissions controls to reduce nitrogen and acidic deposition. Some overlap with "acidification restoration".
Address point source pollution	Investigate and reduce pollution from point sources. Overlaps with "reduce pollution from sewage discharges" and "other waste water discharges".
Appropriate coastal process and sediment management	Measures to protect and restore integrity of dune systems
Complete first cycle investigation	All ongoing Water Framework Directive investigations from first cycle programme.
Drainage and water level management	Investigate and implement changes to land drainage regimes and structures to restore water levels.
Dredging and silt management	Includes reducing siltation at source through land management, and implementing sustainable dredging and silt disposal regimes.
Improve fish passage and habitat	Remove or modify barriers to fish passage
Improve flows and water levels	Reduce impacts of regulated flows and abstractions, restore more natural flow regimes, implement options to improve water levels, such as water efficiency and recycling measures, alternative sources and supplies.
Manage invasive non-native species	Eradication and/or management of invasive non-native species both aquatic (e.g. American signal crayfish) and those that impact the water environment indirectly (e.g. Japanese knotweed on river banks)
Mine water and contaminated land remediation	Coal and metal mine, and contaminated land remediation - including passive and active mine water treatment, capping of spoil, removal of wastes to landfill, and channel diversion
Mitigate impacts of flood and coastal defences	Reduce impacts of flood defence structures and operations - improve connectivity, habitat, and morphology by implementing options through capital and maintenance programmes, such as soft engineering, opening culverts, upgrading tidal flaps, changing dredging and vegetation management. Includes the national habitat creation programme to address coastal squeeze.
Mitigate impacts of shipping, navigation and dredging	Assess and implement options for adapting dredging regimes and reducing the impacts of physical modifications.

Measure category	Summary of available options
Mitigate impacts of water resource impoundments	Assess and implement options for improving fish passage and habitat.
New investigation	Includes investigations for all new failures, deterioration, and drinking water protected areas.
Other sustainable land and marine management practices	Includes measures to mitigate impacts from construction and maintenance of infrastructure, including within military training sites.
Reduce impacts from other physical modifications	Improve connectivity, habitat and morphology through soft engineering and restoration techniques.
Reduce pollution from other waste water discharges	Reduce pollution from other (non-sewage) point sources, both regulated and unregulated. Investigate and implement basic pollution prevention measures, including advice and guidance, such as correct handling and storage of chemicals and waste, and management of trade effluent, and regulation.
Reduce pollution from septic tanks	Target actions to maintain septic tanks correctly, relocate/replace tanks where necessary
Reduce pollution from sewage discharges	Reduce pollution from continuous and intermittent discharges, includes additional treatment at sewage treatment works (e.g. phosphate stripping), investigating and tackling sewer blockages, and implementing sustainable drainage to reduce surface water drainage to sewers.
Specific habitat and feature works	Restoration and/or conservation of specific habitat and features, including natural (e.g. caves, geological outcrops) and human structures (e.g. bridges, ruins).
Sustainable access and recreation management	Reduce the impacts of erosion, disturbance and damage from both water-based and terrestrial access, including tackling illegal off-roading.
Sustainable aggregate extraction	Reduce and mitigate impacts of extraction industries
Sustainable agricultural practices	Implement basic and additional measures such as correct management of slurry, silage, fuel oil, and agricultural chemicals; clean and dirty water separation; nutrient management planning; buffer strips and riparian fencing; cover crops and soil management. For Natura 2000 sites measures include changes to grazing regimes and scrub management. For NVZs comply with storage and spreading regulations.
Sustainable marine development	Includes off-shore energy developments, such as oil and gas exploration and tidal energy.
Sustainable fisheries management	Includes measures for both freshwater and marine fisheries to reduce and mitigate impacts
Sustainable woodland and forestry management	Restore the riparian zone, disconnect forest drains, use forestry and woodland to reduce diffuse

Measure category	Summary of available options
	pollution.
Tackle misconnections and urban diffuse pollution	Investigate and solve misconnections to surface water drains (at residential and commercial properties) and implement sustainable drainage schemes (SuDS) to reduce diffuse pollution.
Waste management	Includes appropriate management of spoil and sludge, illegal fly-tipping and litter

5.3 Setting water body objectives

We have worked with Welsh Government to develop our approach to setting water body objectives:

- Every water body must have a Water Framework Directive objective. For all surface waters we will set objectives for ecological status/potential and chemical status. For groundwaters we will set objectives for quantitative and chemical status.
- The default objective for all water bodies is good overall status by 2021, that is for surface waters - achieve good ecological status/potential & good chemical status by 2021; for groundwaters - achieve good quantitative & chemical status by 2021.
- We will propose alternative objectives only where we are confident that default objectives are not appropriate.
- We will only use disproportionately expensive as a justification for an alternative objective where we believe that costs appreciably exceed benefits (i.e. the benefit cost ratio is < 0.5). We will not consider affordability in the draft RBMP. Affordability will be a decision taken by the Minister following the consultation.
- We will ensure that any proposed alternative objectives do not conflict with preventing deterioration or objectives for protected areas designated under other European legislation. We will not use disproportionate cost or technical infeasibility to set alternative objectives in or upstream of freshwater Natura 2000 sites (e.g. in undesignated tributaries of the River Dee Natura 2000 site), or where there is a significant geographic overlap with a marine Natura 2000 site, and inter-dependence between Water Framework Directive elements and protected features and species.
- For water dependent Natura 2000 sites we will aim to achieve conservation objectives, achieving good status by 2021 is a milestone towards this objective.
- Where an alternative objective is applied we will set the objective as maintain current status by 2021. We will not forecast partial improvements. We will use the consultation to identify what improvements are feasible and cost-beneficial.
- If no alternative objective is proposed, we will assume that good overall status is achievable by 2021.
- The 2013 Water Framework Directive Classification (New Building Blocks) is the baseline for the process.

Welsh Government have published joint guidance with Defra to Natural Resources Wales and the Environment Agency outlining the principles that we should adopt in developing the update to the River Basin Management Plans.

5.4 Screening for alternative objectives

In order to manage the complexity of objective setting, and make best use of resources, we have taken a phased approach. In the first phase we screened water bodies for the potential of an alternative objective, and in the second phase we used local evidence to ensure any proposed alternative objectives are robust and justified. There were three screening processes:

- Disproportionate cost
- Technically infeasible
- Natural conditions

5.4.1 Screening for disproportionate cost

In order to identify the water bodies which it might be least cost-effective to deliver to good overall status a broad-based cost-benefit analysis (CBA) was undertaken. To make effective use of resources, this was not intended as a definitive analysis but one which used 'averaged', indicative costs together with more detailed information gathered from Natural Resources Wales local teams and the Environment Agency's National Water Environment Benefits Survey (for England and Wales).

The primary purpose of using CBA was to identify where we believe good overall status by 2021 is most likely to be disproportionately costly at the water body scale. With regard to these 'disproportionate costs', draft alternative objectives were only set where it seems likely that net present costs appreciably exceed net present benefits and local expert knowledge supported this judgement (in line with European guidance on alternative objectives – document 20). The critical Benefit Cost Ratio (BCR) threshold was set at 0.5 – where costs seem likely to outweigh the benefits by a factor of 2:1. For completeness, the process was run on all water bodies. In the case of protected areas and heavily modified water bodies alternative objectives were not set on the basis of disproportionate cost.

Estimating the costs

Indicative costs were applied to the water body measures required to achieve good overall status by 2021. Where more specific and detailed costs were available (e.g. for water company and minewater schemes) Natural Resources Wales utilised this information and sought to clarify accuracy with local expert knowledge.

The table below shows the measures and indicative costs applied per water body, along with a summary explanation of how these costs have been estimated.

Table 11. Measures and indicative costs

Measure	Data source & assumptions	Indicative cost per water body (discounted value)
Target sustainable agricultural interventions	Estimate of targeted improvements to riparian management, based on review of river walk data. Unit cost for fencing = £15k per km fence both banks. Assumed 15 year fence replacement.	Costs vary according to river water body length: <10km = £50k; >10km = £100k Typical value = £140k
Improve fish passage	Estimate of implementing a single large barrier removal or non-technical fish pass.	£100k
Minewater	Estimate based on EA costs for Force	Varies but discounted

Measure	Data source & assumptions	Indicative cost per water body (discounted value)
scheme	Crag scheme, further informed by local expert knowledge.	valuation was around £1.9 million. Some water bodies required more than one scheme. Typical value = £2.4m
Tackle misconnections	Based on information from the Swansea Bay 'Clear Streams' project. Costs are employee remuneration for a targeted campaign over a 2 year period.	Typical value = £130k
Reduce pollution from septic tanks	Estimated as similar to misconnections work (above). Costs are employee remuneration for a targeted campaign over a 2 year period.	Typical value = £130k
Mitigate impacts of flood and coastal defences	Estimates based on local mitigation measures investigations. All costs assumed to be capital expenditure.	Typical value = £1.7m
Reduce pollution from sewage treatment	Based on costs provided by water companies. Some water bodies require more than one scheme. Asset renewal assumptions based on split between asset types.	Typical value = £3m
Target sustainable woodland and forestry management	Estimate of improving riparian management costs based on unit costs per km length of river water body.	Typical value = £188k.
Acidification restoration	Data extrapolated from the Plynlimon project and based on unit costs per km.	Typical value = £45k.

In the main these are the most common interventions that are required. Most attention was given to those where capital outlay is highest – flood defences, sewage treatment works and metal mine remediation. In contrast, many of the smaller scale interventions were left as indicative values. Some lower cost interventions were modelled at a multiple of a unit cost per length of water body. Furthermore, where possible, costs were broken down into capital expenditure and annual operational expenditure and asset lifespans estimated. In some cases this required an apportioning of asset replacement based on the mix of assets.

Examples of interventions that were not costed specifically are:

- basic regulatory measures (e.g. the cost of meeting existing requirements)
- no deterioration measures
- protected area measures – except for shellfish waters
- investigations (ongoing and new)

- contaminated land remediation
- interventions to resolve urban diffuse and industrial estate pollution
- heavily modified flows and impoundment mitigation measures
- non-heavily modified flood and land drainage interventions
- navigation mitigation measures
- invasive species management
- mitigation of other physical modifications (non-heavily modified)

Not all failures are fully understood and, therefore, it was impossible to estimate the costs of remediation in circumstances where for example investigations are still ongoing or required.

Estimating the benefits

The benefits side of the CBA was focused entirely around valuations of water environments from the National Water Environment Benefits Survey (NWEBS). NWEBS is a stated preference survey examining how people value the water environment. When undertaken (and, more recently, updated) it produced estimates of the non-market benefits generated from improving the ecological quality of all water body types (rivers, lakes, estuaries and coastal waters). This has allowed Natural Resources Wales to quantify the benefits of improving overall quality from, say, Moderate to Good or Poor to Good in different catchment areas. The divergence between valuations in different catchments is driven essentially by population density.

Benefits were estimated on the basis of improving the whole water body length or area to good overall status.

Discounting

Discounting converts future values into net current values. This is necessary because the recent is valued more than the future for a number of reasons, including:

- Pure time preference: the simple fact that people prefer to have things now rather than in the future;
- The risk of something catastrophic happening at some point over the period in question;
- The assumption of ever-increasing future consumption.

Monetary values for costs and benefits were discounted over a 40 year period in accordance with the HM Treasury Green Book framework and factors were applied to both the costs side and the benefits side using a 3.5% rate of discount for the first 30 years and 3.0% thereafter.

Local expert knowledge

Costs and benefits were ‘sense-checked’ by local teams. The focus was on higher cost interventions – for example, the likelihood that a minewater remediation scheme would deliver good overall status; and on identifying additional down or upstream benefits within the catchment.

Results

A small number of water bodies with BCRs lower than 0.5 were identified (see Table 12). In all cases this was the result of a high capital cost intervention (sewage treatment works or minewater remediation) being required. Lower cost interventions such as agriculture/forestry management and fish passage improvement tended to be highly effective in BCR terms and, therefore, where there were no high capital cost interventions in a water body, interventions tended to indicate a very high social return to investment.

It was important for Natural Resources Wales to critically assess confidence in the results. Generally, the results for rivers seem reliable. However, whilst Natural Resources Wales followed the standard Environment Agency methodology with regard to lakes, we do not believe that the results are robust.

First, we applied the same modelled costs to lakes as for river water bodies. However, we believe that it is likely there may be some additional costs to achieving Water Framework Directive objectives in a lake environment, because of their ecological sensitivity. Second (and more importantly), we believe that NWEBS may not accurately be representing the potential benefits of getting lakes to good overall status. A much higher proportion of lake water bodies fell initially within the disproportionately costly zone when compared to river water bodies, this suggests that there was some sort of mismatch between the area-based valuation of the former and the length-based valuation of the latter. Therefore we believe that the potential benefits of raising the standard of lakes is undervalued in the survey.

The CBA has also provided the basis for estimating the costs and benefits of the programme of measures across Wales and has allowed us to model a number of different scenarios in order to support this consultation.

Table 12. Water bodies in Wales where we have proposed good overall status by 2021 is disproportionately costly.

Water body ID	Short name	River Basin District	Main cost drivers
GB110063041590	Melindwr	Western Wales	Minewater, sewage treatment and other
GB110063041630	Bow Street Brook	Western Wales	Minewater
GB109054044720	Afon Cerist	Severn	Minewater and other
GB109057027080	Nant Dowlais	Severn	Sewage treatment and other

5.4.2 Screening for technical infeasibility

Nationally we reviewed all ecological and chemical failures, and groundwater equivalents. This broad assessment which does not take into account the affordability of measures indicated there are three circumstances where we are likely to have the evidence to apply an alternative objective on the basis of technical infeasibility:

- Ecological failures driven by metals (e.g. copper and zinc) where local expert knowledge has identified the failure is caused by widespread and complex diffuse and point source legacy issues (i.e. historic mine workings), and no solution is likely due to technical or practical constraints.
- Chemical failures driven by ubiquitous and persistent chemicals where local expert knowledge cannot identify a main source (e.g. poly-aromatic hydrocarbons are a product of combustion) or where the failure is due to legacy of past use (e.g. TBT use on boats is now banned, but the substance is persistent in estuary sediments).

  New failures in transitional and coastal water bodies where the requirement for investigation before identification and implementation of measures means meeting the deadline of 2021 is likely to be infeasible.

Table 13. Water bodies in Wales where we have proposed good overall status by 2021 is technically infeasible

Water body ID	Short name	River Basin District	Reason for technical infeasibility
GB681010360000	Holyhead Bay	Western Wales	New failure
GB41002G200500	Tywi, Taf and Gwendraeths	Western Wales	Minewater
GB41002G200600	Carmarthen Carboniferous Coal Measures	Western Wales	Coal minewaters
GB41002G201000	Swansea Carboniferous Coal Measures	Western Wales	Coal minewaters
GB41002G203000	Conwy	Western Wales	Minewater
GB41002G203200	Meirionydd	Western Wales	Minewater
GB41002G203300	Teifi and Coastal Ceredigion	Western Wales	Minewater
GB41002G204400	Ynys Mon Secondary	Western Wales	Minewater
GB41002G204600	Llyn & Eryri	Western Wales	Minewater
GB41002G205000	North Ceredigion Rheidol Area	Western Wales	Minewater
GB110059025710	Nant y Fendrod	Western Wales	Ubiquitous and persistent chemicals
GB110059032100	Lliw	Western Wales	Ubiquitous and persistent chemicals
GB110059032180	Tawe - Twrch to tidal limit	Western Wales	Ubiquitous and persistent chemicals
GB110060029080	Gwili - Duad to Tywi	Western Wales	Ubiquitous and persistent chemicals
GB110060036284	Taf -Gronw to estuary	Western Wales	Ubiquitous and persistent chemicals
GB110064048390	Dyfi - tidal limit to Afon Twymyn	Western Wales	Ubiquitous and persistent chemicals
GB110065053660	Dwyfawr - lower	Western Wales	Ubiquitous and persistent chemicals
GB511006115200	Nyfer	Western Wales	Ubiquitous and persistent chemicals
GB521010207600	Alaw	Western Wales	New failure
GB541005900900	Tawe	Western Wales	New failure
GB40902G201900	SE Valleys Carboniferous Coal	Severn	Coal minewaters

Water body ID	Short name	River Basin District	Reason for technical infeasibility
	Measures		
GB40902G205100	Wye Uplands Lower Palaeozoic	Severn	Minewater
GB40902G205300	Severn Uplands - Lower Palaeozoic	Severn	Minewater
GB109056026910	Ebbw R - Ebbw Fach to Maes-glas	Severn	Ubiquitous and persistent chemicals
GB109056032911	Afon Lwyd - below Mon and Brecon Canal	Severn	Ubiquitous and persistent chemicals
GB109057027260	Ely - Nant Clun to Allot Gardens	Severn	Ubiquitous and persistent chemicals
GB109057027270	Taff - Rhondda to Castle Street	Severn	Ubiquitous and persistent chemicals
GB109057027280	Rhymney - Nant Cylla to Chapel Wood	Severn	Ubiquitous and persistent chemicals
GB41102G204800	Dee Carboniferous Coal Measures	Dee	Minewater
GB111067051690	Clywedog - Gwenfro to Black Brook	Dee	Minewater

5.4.3 Screening for natural conditions

Nationally we reviewed all ecological and chemical failures, and groundwater equivalents. This broad assessment concluded that we will only apply natural conditions as a justification where acidification is the cause of failure. It is our view that there is sufficient national evidence that measures to reduce emissions are proving effective and that recovery is occurring, though this will generally take longer than 2021.

There are also a small number of water bodies where local expert knowledge concludes that the Water Framework Directive classification is incorrect, and that a pH failure is actually the natural conditions of the water body. These instances will require further investigation.

Table 14. Water bodies in Wales where we have proposed good overall status by 2021 is not achievable because of natural conditions

Water body ID	Short name	River Basin District	Reason for natural conditions
GB31033974	Llyn Cwmffynnon	Western Wales	Acidification
GB31034249	Llyn Cwm Dulyn	Western Wales	Acidification
GB31034319	Llyn Llagi	Western Wales	Acidification
GB31034400	Llyn Conwy	Western Wales	Acidification
GB31034511	Llynnau Gamallt	Western Wales	Acidification

Water body ID	Short name	River Basin District	Reason for natural conditions
GB31035180	Llyn Cwm Bychan	Western Wales	Acidification
GB31035426	Llyn Hywel	Western Wales	Acidification
GB31035561	Llyn Bodlyn	Western Wales	Acidification
GB31035578	Llyn Cwm Mynach	Western Wales	Acidification
GB31036267	Llyn Cau	Western Wales	Acidification
GB110060036360	Doethie - Pysgotwr Fawr to Tywi	Western Wales	Acidification
GB110060036380	Tywi - Llyn Brianne to Doethie	Western Wales	Acidification
GB110060036390	Pysgotwr Fawr - headwaters to Doethie	Western Wales	Acidification
GB110060036400	Doethie - headwaters to Pysgotwr Fawr	Western Wales	Acidification
GB110060041350	Camddwr - headwaters to Llyn Brianne	Western Wales	Acidification
GB110060041360	Tywi - headwaters to Llyn Brianne	Western Wales	Acidification
GB110062043470	Berwyn/Brennig - headwaters to Teifi	Western Wales	Acidification
GB110062043501	Teifi - Fflur to Brennig	Western Wales	Acidification
GB110063041560	Mynach - headwaters to Rheidol	Western Wales	Acidification
GB110063041640	Rheidol - Llechwedd-mawr to Castell	Western Wales	Acidification
GB110063041650	Llechwedd Mawr – headwaters to Nant y Moch	Western Wales	Acidification
GB110063041660	Hengwm - headwaters to Nant y Moch	Western Wales	Acidification
GB110063041670	Cwmnewydion - headwaters to Ystwyth	Western Wales	Acidification
GB110064043610	Einion	Western Wales	Acidification
GB110064048570	Dulas North	Western	Acidification

Water body ID	Short name	River Basin District	Reason for natural conditions
		Wales	
GB110064048720	Gamlan	Western Wales	Acidification
GB110065053630	Cynfal	Western Wales	Background conditions
GB110065053950	Colwyn	Western Wales	Background conditions
GB30938240	Llyn Fyrddon Fawr	Severn	Acidification
GB30938282	Llyn Cerrigllwydion Isaf	Severn	Acidification
GB109055036760	Irfon - Afon Gwesyn to Cledan	Severn	Acidification
GB109055041910	Irfon - source to Afon Gwesyn	Severn	Acidification
GB109055042210	Rhiwnant - source to Afon Claerwen	Severn	Acidification
GB109055042230	Afon Claerwen - Afon Arban to Caban-coch	Severn	Acidification
GB109055042240	Afon Arban - source to Afon Claerwen	Severn	Acidification
GB109055042260	Afon Elan - Caban-coch to River Wye	Severn	Acidification
GB109055042290	Afon Claerwen - source to Afon Arban	Severn	Acidification
GB109055042300	Afon Elan - source to Pont ar Elan	Severn	Acidification
GB109055042330	Wye - Afon Tarenig to Afon Bidno	Severn	Acidification
GB109055042340	Afon Bidno - source to River Wye	Severn	Acidification
GB109055042350	Afon Tarenig - source to River Wye	Severn	Acidification
GB109055042360	Wye - source to Afon Tarenig	Severn	Acidification
GB111067051760	Alwen - above Afon Brenig	Dee	Acidification
GB111067051850	Lliw	Dee	Acidification
GB111067051950	Tryweryn - Llyn Celyn to Llyn Treweryn	Dee	Background conditions
GB111067052030	Gelyn	Dee	Acidification

5.4.4 Setting the overall water body objective

The outputs from these three processes have been combined. Where an alternative objective has been proposed, we have set the current status as the 2021 status. We have not forecast any potential partial improvements.

We want to use this consultation to agree our priorities with stakeholders up to 2021 (and as far as possible 2027), which could include improvements to water bodies where an alternative objective has been proposed.

Affordability is a decision which will be taken by Ministers following the consultation. This will largely determine the overall ambition for the river basin management plans in Wales in terms of funding measures through national mechanisms.

Following the consultation and decision on affordability we will forecast probable water body improvements by 2021, including partial improvements (i.e. less than good overall status)

5.5 Economic appraisal

The CBA method provided the basis for estimating the total costs and benefits of the programme of measures for water bodies in Wales. As described in the CBA method not all measures were costed, therefore in order not to under-estimate the overall programme, total costs were multiplied by an additional factor of 20%. It should also be noted that potentially benefits have been under-estimated in our model. Where no cost data was available for measures to improve a water body no benefits have been calculated.

For the Dee and Severn (which are cross-border) we have worked with the Environment Agency to integrate our economic information at the river basin district scale.

We have developed four scenarios to help explain and describe the outcomes that are achievable by 2021; the overall costs and benefits; apportionment of costs across the types of intervention and relative cost-effectiveness. The four scenarios represent different levels of ambition as follows:

- **A** Long term aspiration. Achieve no deterioration, protected areas objectives and good overall status in all water bodies, except those where alternative objectives are appropriate.
- **B** Statutory objectives. Achieve no deterioration and protected areas objectives. That is target all water bodies linked to Natura 2000 sites to achieve good overall status.
- **C** Short term opportunities. Target improvements to good overall status by 2021 where Natural Resources Wales has a reasonable level of evidence that a short term outcome is achievable.
- **D** Possible outcomes. Target improvements to good overall status by 2021 in water bodies where there is a greater certainty of funding and delivery through existing mechanisms (for example water company, Coal Authority and Natural Resources Wales forestry programmes).

These scenarios do not consider:

- the affordability of measures in line with Welsh Government's guidance.
- the effectiveness of mechanisms to deliver measures. For example, measures to improve riparian habitat are largely voluntary, and reliant on uptake by individual landowners within a catchment.
- any predicted improvements from local programmes of work already underway or planned to happen.

- Scenarios C and D, if delivered in isolation would not meet the statutory objectives of the Water framework Directive, but are presented as examples of different approaches to setting a level of ambition

5.5.1 Outcomes under scenarios A, B, C and D

Each scenario will deliver a different scale of environmental improvement and hence requires a different level of investment. The overall results for water bodies within the political boundary of Wales are presented below.

gure 5. Number of water bodies which would be improved to good status or potential by 2021 under each scenario.

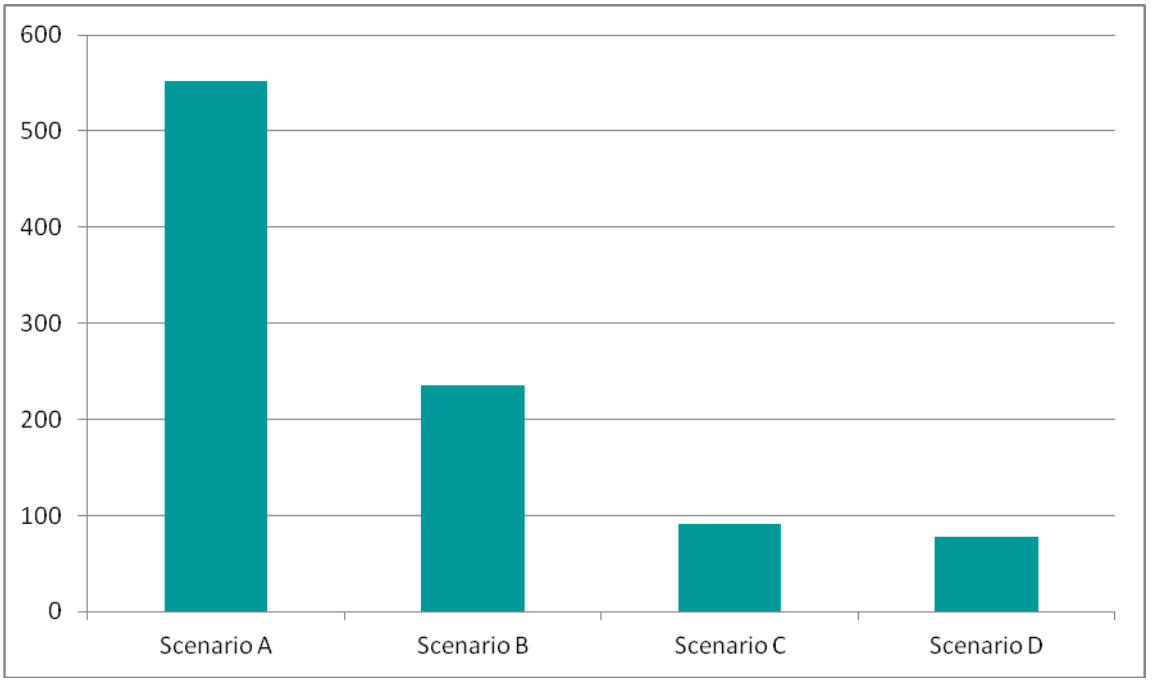


Figure 6. 2013 overall status compared to the outcome of scenario A.

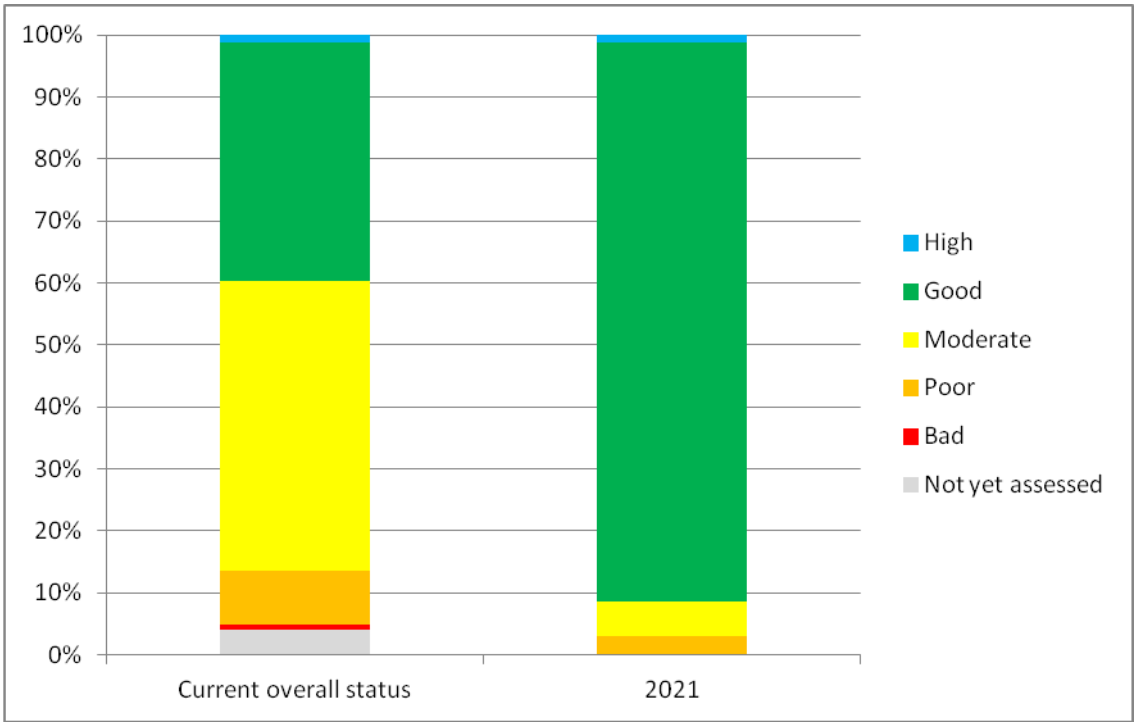

100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Current overall status
2021
High
Good
Moderate
Poor
Bad
Not yet assessed

Figure 7. Apportionment of the total costs across sectors under each scenario.

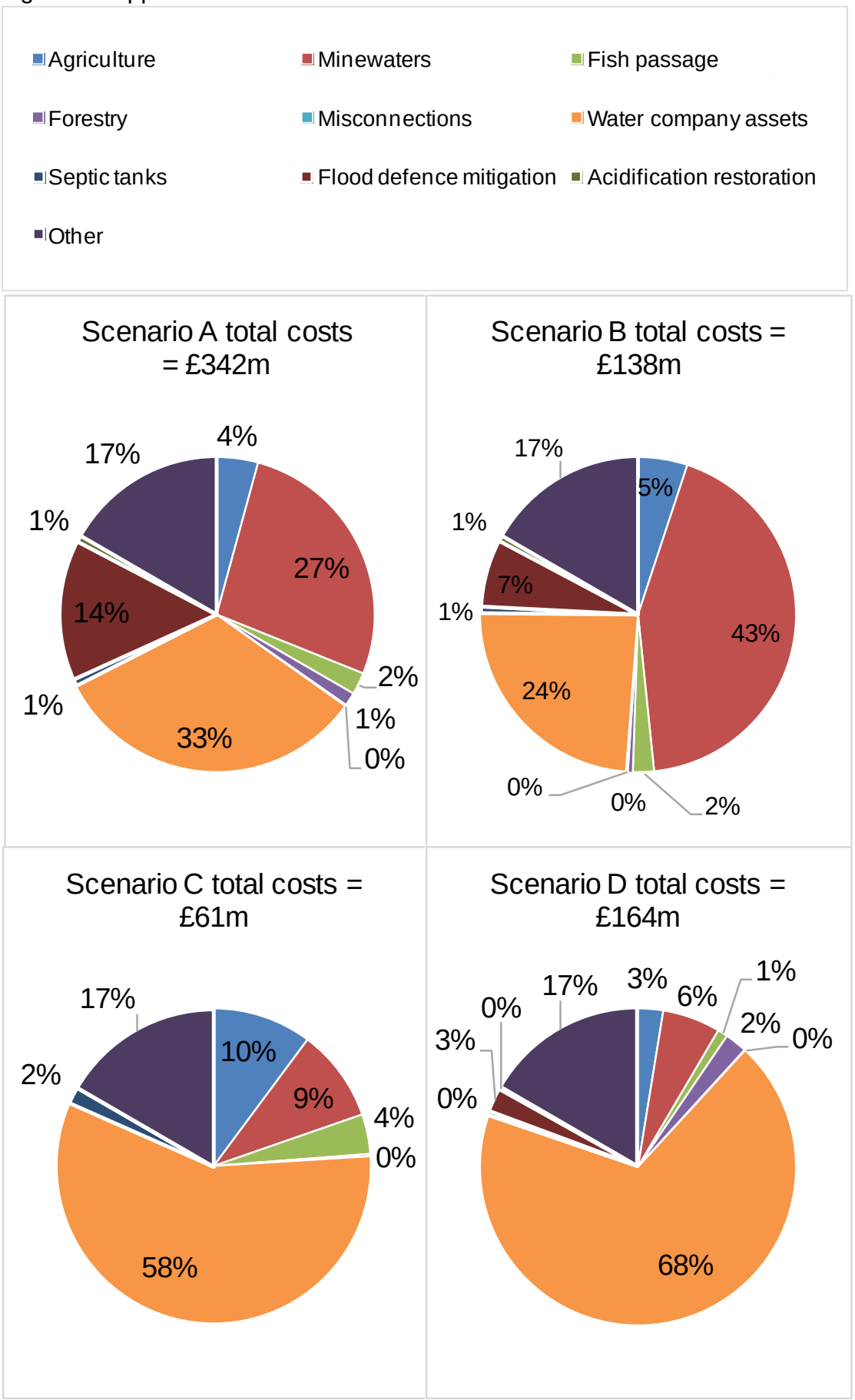


Figure 8. Net present value (NPV) of each scenario *(figure corrected 20 October 2014)*

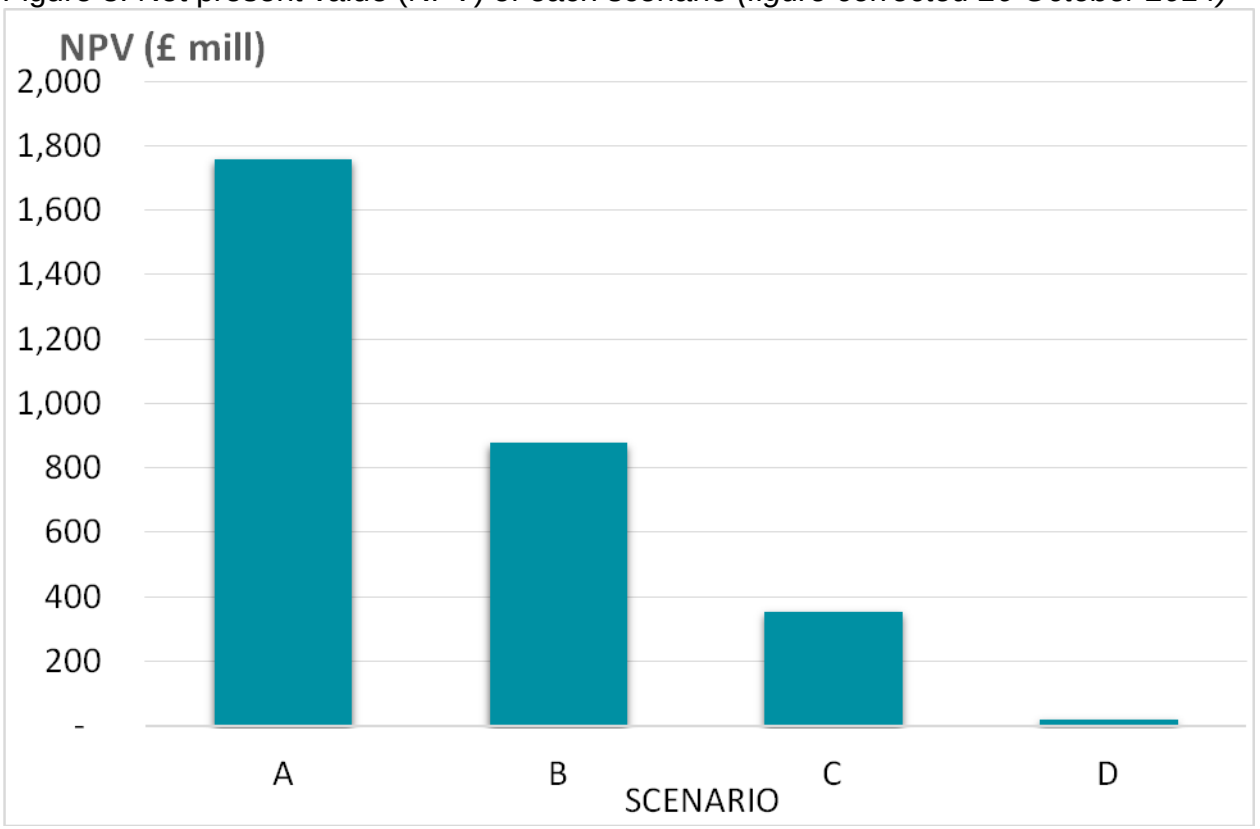
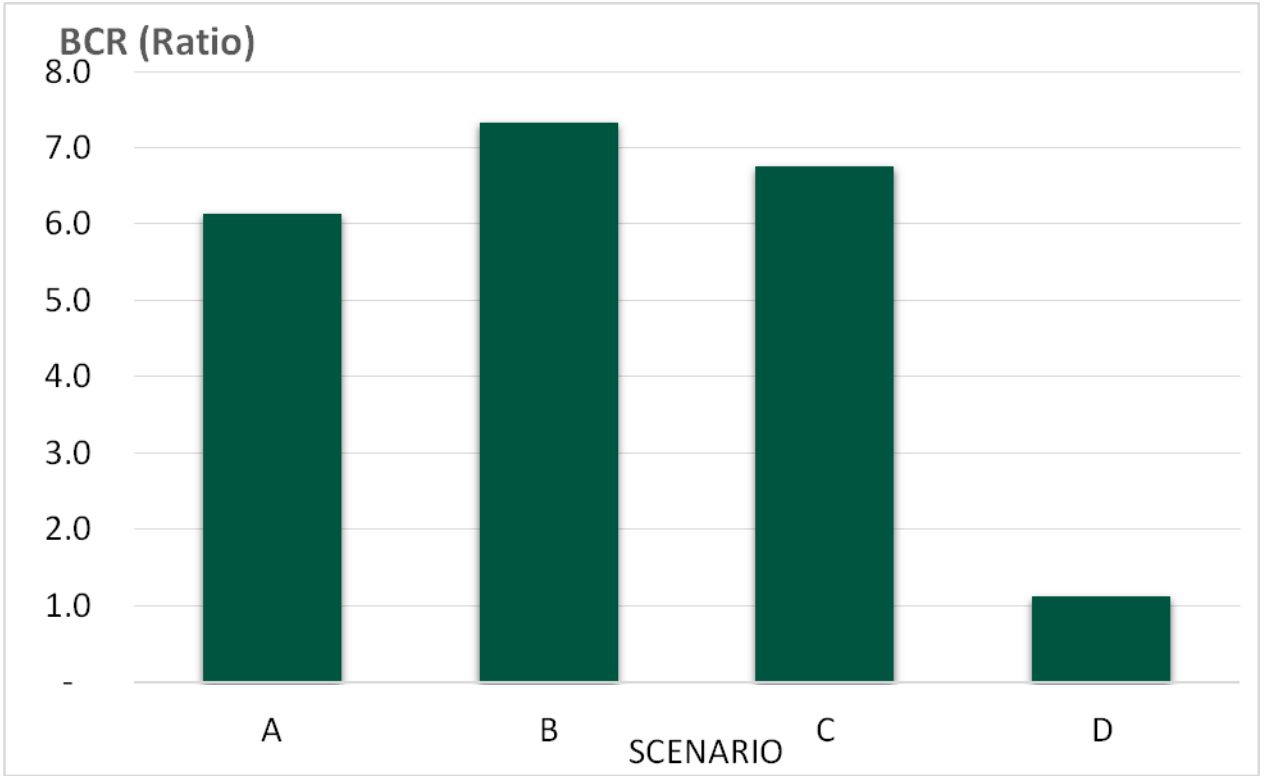


Figure 9. Benefit to cost ratio (BCR) of each scenario.



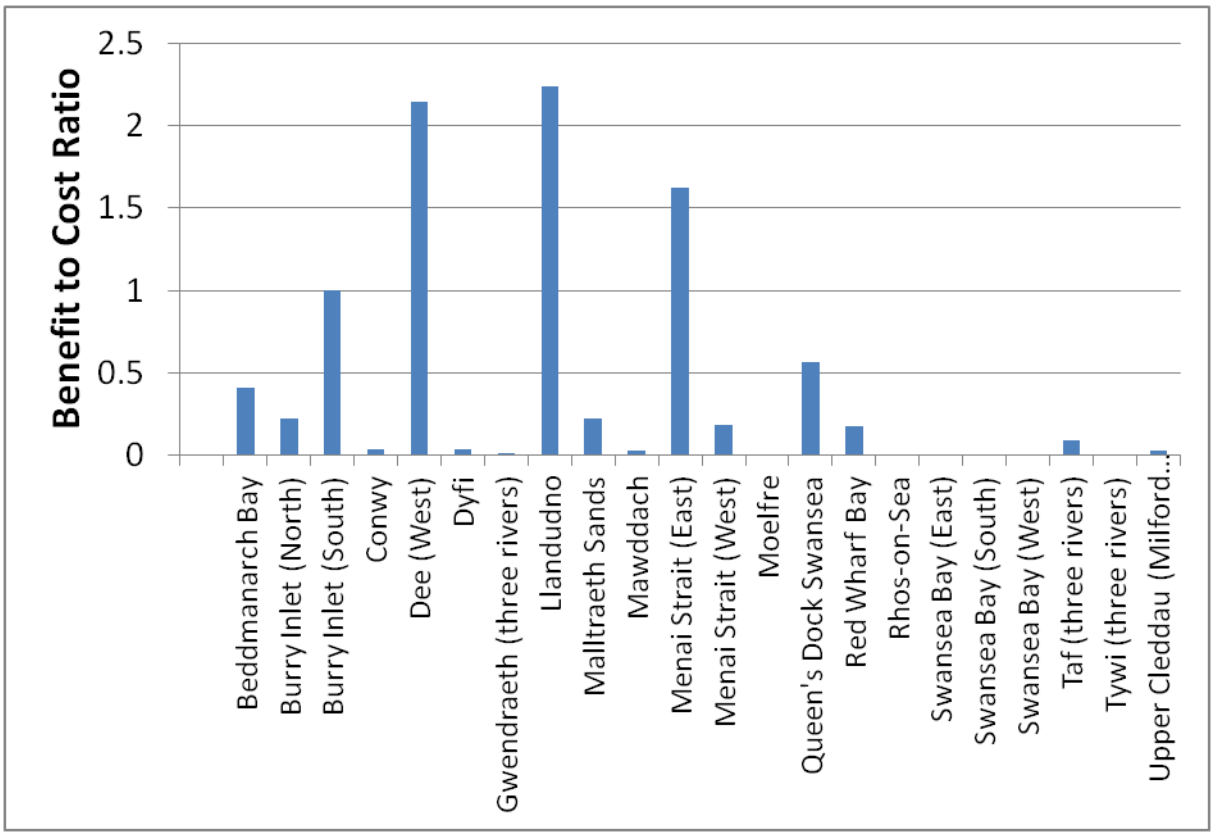
5.6 Further information for protected areas - shellfish waters

The detailed cost benefit methodology is available on request. Costs of improvement to combined sewer overflows have been provided by Dwyr Cymru to aid the analysis. It is highlighted here that costs of agricultural measures have not been included as discussion within Natural Resources Wales suggested that impact from agriculture to Shellfish Waters is primarily caused by incidents/spills and Natural Resources Wales has the regulations and responsibility to address these. This is consistent with the approach taken for cost benefit analsysis for other WFD measures. These agricultural measures will have to be taken in order for some of the Shellfish Waters to achieve objectives. The value of the shellfish industry within each protected areas has been gathered from a variety of sources. It is also highlighted that the cost benefit outcomes are significantly sensitive to the additional benefit that the shellfish industry would gain at Class A. However, information to justify those benefits is not currently available and this is a weakness in the assessment which we would welcome stakeholder information to refine.

The preliminary analysis is shown in the figure below. This demonstrates that the following Shellfish Water Protected Areas will be prioritised for further assessment: Burry Inlet (South), Dee (West), Llandudno, Menai Strait (East) and Queens Dock Swansea. These shellfisheries represent 90% of the Shellfish production in Wales.

Results of preliminary analysis of benefit to cost ratio of meeting objectives of Shellfish Water Protected Areas (Figure 10).

Figure 10 Benefit cost ratio for each shellfish water



5.7 Next steps – developing our ambition and programme of measures

The overall ambition of the updated river basin management plan depends upon a number of factors including (amongst other things):

- funding levels from both public and private budgets;
- commitment to delivery;
- availability of delivery mechanisms.

The four scenarios which have been modelled illustrate the challenges we face in terms of developing an affordable, cost-beneficial programme of measures which delivers sustainable improvements to our water environment.

The scenarios show that protecting and improving our water environment is, in general, cost-beneficial and can deliver *significant* benefits. However, *how* and *what* interventions are prioritised will determine the strength of benefits returned from investment. In terms of using funds efficiently we should aim ideally for the most cost-beneficial programme of measures that is affordable. This means prioritising those measures with the highest Benefit-Cost Ratios (BCR) where practical. In reality, some of the most economically efficient measures have greater uncertainty over effectiveness. For example changing land management practice is relatively cheap but requires the commitment of many individuals to make a difference. Where that commitment is gained the benefits are considerable.

During this consultation we will continue to work with you to develop an effective programme of measures, and agree a realistic but ambitious set of priorities for the second cycle. Those priorities will be reflected in an updated river basin management plan presented to Welsh Government ministers in September 2015. Ministers will make a decision on affordability and overall ambition which will be published in the updated River Basin Management Plan in December 2015.

Natura 2000

A fundamental and new approach to capturing the prioritised, costed measures for water dependent Natura 2000 sites in Wales is through the development and publication of Prioritised Improvement Plans (PIPs), to contribute to maintenance and restoration of favourable condition.

The PIPs are being produced as part of a European Commission funded LIFE+ project. The LIFE Natura 2000 Programme is developing a new strategic approach to managing all of Wales' Natura 2000 sites, enabling Natural Resources Wales and partners to plan how to target their efforts. On cross-border sites a single plan will be produced in collaboration with Natural England.

The PIPs will contain actions required for all habitats and species on all Natura 2000 sites, including measures identified to address risks/threats that have been identified as likely to cause an adverse impact to a site feature in the near future.

The LIFE Natura 2000 Programme will also produce thematic action plans looking at known cross-cutting (and often national) issues and risks impacting Natura 2000 features, including: diffuse water pollution, hydromorphological modifications, marine litter, invasive species and pathogens, flood and coastal erosion risk management, sustainable fisheries, access and recreation, and air pollution.

During 2015, we will integrate evidence and information from the LIFE Natura 2000 Programme and river basin management plans, in order that the updated river basin management plans presented to Welsh Government ministers in September 2015 are based on our most current evidence base.

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Supporting information

Further information on the LIFE Natura 2000 Programme is available on the Natural Resources Wales website. We aim to publish PIPs during the consultation period.

Shellfish waters

For shellfish waters measures have been proposed which will aim to improve Shellfish Waters in order to endeavour to observe the guideline standard. Natural Resources Wales would like those with an interest in shellfish waters to comment on these proposed measures. In future, measures to endeavour to observe the guideline standard will be proportionate to benefits gained by achieving relevant objectives (see section 5.6).

6. Summary of Engagement

Summary of this section
This section looks at the engagement work we have done including public access to information, consultations and forward look

An important principle of the Water Framework Directive is the engagement and involvement of a wide range of partners and stakeholders. As a first step to raise awareness and help secure this, stakeholders and the public need access to the information for the updated plans.

In order to gain a more detailed insight into the views of stakeholders on the river basin management plans, there have been a number of consultations on specific aspects, this is also required by the Directive. This has helped Natural Resources Wales develop proposals as we update the river basin management plans The outcomes from these consultations are summarised in this section.

Producing the river basin management plans has benefitted from the active involvement of many stakeholders in the planning process and will be critical for the implementation and delivery over the coming years. This includes the input of the River Basin District Liaison Panels and those who recently attend the management catchment workshops held across Wales.

In the cross border catchments, Natural Resources Wales is committed to working with the Environment Agency, Natural England and our partners in England.

6.1 Public access to information

Information has been made available to stakeholder and the general public through the following;

Natural Resources Wales Website

Technical water body level information on objectives, classification status and identified risks as presented in the draft.

A river basin management web page includes:

- Background documentation used in River Basin District Liaison Panel meetings and the minutes of meetings.
- Information about river basin districts and guidance for key sectors.
- All consultation documents and supporting information posted on the website, including the management catchment summaries.
- Publication of responses to consultations
- Access to the mail boxes for the Dee and Western Wales River Basin Districts to facilitate responses.
- Contact details for Natural Resources Wales staff involved in river basin management.
- For the Severn River Basin District, details of where the updated River Basin Management Plan for the Severn can be accessed and contact details for the Environment Agency.

Water Watch Wales

Water Watch Wales is an interactive spatial web based tool that provides supporting information and data to assist partners. It enables the user to navigate to their area of interest and review the available information about that specific area. A user's guide for Water Watch Wales is included in the Management Catchment Summary documents which are available on our web site.

Other methods of communication

- Direct electronic mail outs
- Presentation
- Public Notes
- Fact Sheets/Briefings
- Social Media
- Living Waters for Wales External Update and Case Studies

6.2 Consultations

To date there have been two formal consultations leading up to the updated river basin management plans and 14 management catchment workshops. These include:

Working Together: 22 June 2012 to 22 December 2012

We sought views on how stakeholders could work together to contribute to the updated river basin management plans

From the Working Together consultation you told us:

- you want to be involved in your local area and on specific issues that are important to you.
- we need to engage with a wider audience – not just the usual organisations.
- you want liaison panels to be more active in the planning process.
- we need to make it easier for people to be involved – by using language appropriate to the audience we are talking to, and improving our information and the way it is made accessible.
- For Western Wales – number of management catchments increased from 5 to 9.

The consultation was published on the website. It was promoted at meetings and workshops including the Wales Biodiversity Partnership Conference and a conference run by the Welsh Local Government Association. We also raised awareness and obtained feedback from meetings for each sector that were held by others.

We also highlighted the consultation across 400 organisations and individuals. Use was made of social media and social networking sites such as Linkedin, Wales Small Business Forum and Local Authority network. Local papers (Western Mail and Liverpool Daily Post) with a combined coverage of over 50,000 people were also used.

The Liaison Panels provided support and contributed to the development of the consultation at River Basin District panel meetings and promoted the consultation through their networks.

Across Wales 80 responses were received and included those from individuals and different types of groups and organisations.

Challenges and Choices: 22 June 2013 to 22 December 2013

We sought views on the significant issues for the water environment, the best ways to tackle them and what the priorities should be.

This was accompanied by a strategic environmental assessment scoping document that we asked for views on whether we have focussed on the key environmental effects and if there any additional information that we should take into account.

The Challenges and Choices consultation documents for the Dee and Western Wales were published on our website and the Severn on the Environment Agency's website; hard copies were also available on request.

The consultation was promoted at meetings and workshops including the Water Health Partnership annual conference, the Royal Welsh Show, Abstraction Reform Workshop and local events such as the Pembrokeshire Agricultural Show and the Big Dee Day.

The consultation was promoted across 522 organisations and individuals using email and through social media tweeting to over 4,000 twitter followers. Local papers with a combined coverage of over 50,000 people were also used. This included the Western Mail and Liverpool Daily Post. Internally we promoted the consultation Natural Resources Wales staff through Yr Wythnos, our internal weekly newsletter.

Natural Resources Wales were supported by the liaison panels. They contributed to the development of the consultation document at River Basin District panel meetings and promoted the consultation through their networks. For example, the National Farming Union Cymru included a news article in Farming Wales which is received by 8,000 farmers and landowners across Wales.

Across Wales 50 individuals and 54 different types of organisations responded to the Challenges and Choices consultation. A copy of the responses are included in the 'Supporting Evidence – Responses to the Challenges and Choices Consultation' document and are available on our website.

Management Catchment Workshops December 2013 and March 2014

A series of workshops were held across Wales. These have been key to our on-going engagement and have helped provide essential local knowledge. The information gathered will be used in the management catchment summaries that support the updated river basin management plans and are available on our website.

6.3 Forward Look 2014-2015

As part of the ongoing engagement to help develop the plans, Natural Resources Wales is developing a schedule of engagement so that we can track all activities associated with the updated river basin management plans. We will make use of existing networks by asking partners, organisations and groups to provide dates and details of their meetings so that we can identify all opportunities where we can raise awareness of the consultation.

7. Glossary

The following list aims to provide brief explanations of many of the words, phrases and acronyms relating to river basin management.

Term	Explanation
Agri-environment scheme	Land management schemes that aim to combat climate change, improve water management, and maintain and enhance biodiversity at both a farm and landscape level.
Alien species	Non-native species. Many species of plants and animals have been introduced to this country since Roman times. Several of these non-native species are invasive and have been causing serious problems to the aquatic and riverine ecology and environment. Problems include detrimental effects on our native species, deoxygenation of water causing fish mortalities, blocking of rivers and drainage channels, predation and competition with our native species, and in some cases pose health risks to the public or livestock.
Alternative objectives	In certain circumstances (set out in Article 4.4 and 4.5 of the Water Framework Directive) Member States may deviate from achieving the default objectives (e.g. good status by 2015). Objectives which are different from the default objectives are referred to in this river basin management plan as alternative objectives. The types of alternative objective are: - an extended deadline, e.g. achieving good ecological status by 2027; - a less stringent objective, e.g. achieving moderate ecological status by 2015; - different objectives for heavily modified or artificial water bodies, e.g. good ecological potential.
Angiosperms	The flowering plants. In transitional and coastal waters they include sea grasses and the flowering plants found in salt marshes.
Aquifer	A subsurface layer or layers of rock or other geological strata of sufficient porosity and permeability to allow either a significant flow of groundwater or the abstraction of significant quantities of groundwater.
Artificial Water Body	A man-made surface water body, rather than a modified natural water body, which supports important aquatic ecosystems. It includes canals, some docks and some man-made reservoirs.
Asset Management Plan	See Periodic Review.
Bathing Waters Directive	European Community legislation – (76/160/European Economic Community (EEC) which requires Member States to take all necessary actions to ensure identified bathing waters meet certain quality standards prescribed for the protection of the

	environment and public health. The new Bathing Waters Directive (2006/7/EC) will repeal the original Bathing Water Directive by end of 2014 at the latest.
Biodiversity Action Plan	The UK Biodiversity Action Plan describes the biological resources of the UK and provides plans for their conservation. Action plans exist for the most threatened species and habitats. Local plans have also been produced (LBAPs).
Biological element	A collective term for a particular characteristic group of animals or plants present in an aquatic ecosystem (for example phytoplankton; benthic invertebrates; phytobenthos; macrophytes; macroalgae; phytobenthos; angiosperms; fish).
Biological indicators	A parameter that can be monitored to estimate the value of a biological quality element. Indicators may include the presence or absence of a particularly sensitive species.
Biological quality element	A characteristic or property of a biological element that is specifically listed in Annex V of the Water Framework Directive for the definition of the ecological status of a water body (for example composition of invertebrates; abundance of angiosperms; age structure of fish).
Catchment	The area from which precipitation contributes to the flow from a borehole spring, river or lake. For rivers and lakes this includes tributaries and the areas they drain.
Catchment Abstraction Management Strategies	These are developed for the management of water resources at a local level. They provide information on water resources and licensing practice to allow the needs of abstractors, other water users and the aquatic environment to be considered in consultation with the local community and interested parties.
Catchment Flood Management Plans	These are strategic planning tools through which the Environment Agency seeks to work with other important decision-makers within a catchment to identify and agree policies for sustainable flood risk management.
Catchment modelling techniques	Methods used to describe and/or predict characteristics of a catchment. Traditionally, these have focused on natural processes or movement of pollutants but they can also include other factors such as demographic, social and economic characteristics.
Characterisation (of water bodies)	A two-stage assessment of water bodies under the Water Framework Directive. Stage 1 identifies water bodies and describes their natural characteristics. Stage 2 assesses the pressures and impacts from human activities on the water environment. The assessment identifies those water bodies that are at risk of not achieving the environmental objectives set out in the Water Framework Directive. The results are used to prioritise both environmental monitoring and further investigations to identify those water bodies where improvement action is required.

Chemical Status (surface waters)	The classification status for the surface water body. This is assessed by compliance with the environmental standards for chemicals that are listed in the Environmental Quality Standards Directive 2008/105/EC, which include priority substances, priority hazardous substances and eight other pollutants carried over from the Dangerous Substance Daughter Directives. Chemical status is recorded as good or fail. The chemical status classification for the water body, and the confidence in this (high or low), is determined by the worst test result.
Chemical Status (groundwater)	An expression of the overall quality of the groundwater body. The classification status for a groundwater body against the environmental criteria set out in the Water Framework Directive and the Groundwater Directive (2006/118/EC), as set out in Common Implementation Strategy (CIS) guidance document No 18. All five of the component tests for chemical status must be assessed as good or poor and the overall chemical status and the confidence in this (high or low) is determined by the worst test result.
Classification	Method for distinguishing the environmental condition or "status" of water bodies and putting them into one category or another.
Coastal Forums	Organisations formed to look at the long-term issues facing coastal areas to promote a sustainable approach to the management, use and development of the coastal zone.
Co-deliverer	Agencies and institutions with statutory powers or who have it in their power to deliver actions needed to implement River Basin Management Plans.
Common Agricultural Policy	A policy that regulates farming activities across the European Union, providing direct subsidies to farmers and land managers. A small part of these funds support rural development actions that mainly relate to agricultural activities, as well as forestry and environmental improvements on farmland.
Common Implementation Strategy (CIS)	This strategy was agreed by the European Commission, Member States and Norway in 2001. The aim of the strategy is to provide support in the implementation of the Water Framework Directive and its daughter directives, by developing a common understanding and guidance on key elements of the Directives.
Competent Authority	An authority or authorities identified under Article 3(2) or 3(3) of the Water Framework Directive. The Competent Authority will be responsible for the application of the rules of the Directive within each river basin district lying within its territory.
Conservation Objective	Under the Habitats Directive: it is the target for the species and/ or habitats for which a site is designated, for it to contribute to maintaining or reaching Favourable Conservation Status (see below) at the biogeographical level.
Cost effective	In the context of the Water Framework Directive, it describes the least cost option for meeting an objective. For example, where there are a number of potential actions that could be

	implemented to achieve Good Ecological Status for a water body, Cost Effectiveness Analysis is used to compare each of the options and identify which option delivers the objective for the least overall cost.
Cross compliance	A form of conditionality by which, farmers in receipt of public subsidies are required to comply with all legislation affecting their businesses, including European Union environmental legislation. The requirements of Cross compliance are: i) an obligation to maintain agricultural land in Good Agricultural and Environmental Conditions and ii) an obligation to comply with specified Statutory Management Requirements according to European Union legislation, for example the Nitrates Directive, Groundwater Directive.
Delineation (of water bodies)	Identifying the type and defining the boundary of a water body for rivers, lakes, Transitional and Coastal waters and groundwater under the Water Framework Directive.
Diffuse pollution	Pollution resulting from scattering or dispersed sources that are collectively significant but to which effects are difficult to attribute individually.
Disproportionate cost	The determination of disproportionate cost requires a decision making procedure that assesses whether the benefits of meeting good status in a water body are outweighed by the costs.
Drinking Water Protected Areas	Bodies of water that are used or could be used in the future for the abstraction of water intended for human consumption.
Ecological continuum	The persistence of the ecological structure and functioning of aquatic ecosystems over time and space.
Ecological potential	The status of a heavily modified or artificial water body measured against the maximum ecological quality it could achieve given the constraints imposed upon it by those heavily modified or artificial characteristics necessary for its use. There are five ecological potential classes for Heavily Modified Water Bodies/Artificial Water Bodies (maximum, good, moderate, poor and bad).
Ecological status	Ecological status applies to surface water bodies and is based on the following quality elements: biological quality, general chemical and physico-chemical quality, water quality with respect to specific pollutants (synthetic and non-synthetic), and hydromorphological quality. There are five classes of ecological status (high, good, moderate, poor or bad). Ecological status and chemical status together define the overall surface water status of a water
Ecosystem	Ecosystems are communities of living organisms (including everything from microrganisms, through fungi, plants, animals to people), their non-living surroundings (rocks, soils, air, sea, water etc.), and all the interactions that take place between them. Human activities are part of ecosystems and can have a strong influence on them.

Ecosystem Services	Ecosystems are communities of living organisms (including everything from microrganisms, through fungi, plants, animals to people), their non-living surroundings (rocks, soils, air, sea, water etc.), and all the interactions that take place between them. Human activities are part of ecosystems and can have a strong influence on them. Ecosystem services are defined as “the benefits that people obtain from ecosystems““ They can be divided into 4 categories: • **Supporting system and services** necessary for the production of all other ecosystem services, such as soil formation, nutrients cycling and primary production. • **Provisioning services** such as crops, fish, timber • **Regulating services** such as water purification, biological control mechanisms, carbon sequestration, pollination of commercially valuable crops etc • **Cultural services** providing a source of aesthetic spiritual, religious, recreational or scientific enrichment.
Economic Advisory Stakeholder Group	A group to coordinate the work going forward in England and Wales in relation to the economic analysis required by the Water Framework Directive.
Environment Agency	Environment Agency of England
Estuarine	For our purposes by estuarine we mean transitional (see definition).
Exemptions	The environmental objectives of the Water Framework Directive are set out in Article 4. These include the general objective of aiming to achieve good status in all water bodies by 2015 and the principle of preventing any further deterioration in status. There are also a number of exemptions to the general objectives that allow for less stringent objectives, extension of deadline beyond 2015 or the implementation of new projects. Common to all these exemptions are strict conditions that must be met and a justification must be included in the river basin management plan. The conditions and process in which the exemptions can be applied are set out in Article 4.4, 4.5, 4.6 and 4.7.
Eutrophication	The enrichment of waters by inorganic plant nutrients that results in increased production of algae and/or other aquatic plants, which can affect the quality of the water and disturb the balance of organisms present within it.

Favourable Conservation Status	The Conservation Status is the result of influences which include the present state of the habitat, together with current environmental and human influences (both positive and negative), that may influence its long-term survival. Favourable Conservation Status will typically be achieved when populations, ranges, and extents are stable or increasing, and when structures and functions necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future.
Fisheries Action Plans	Fisheries Action Plans are local plans developed in partnership between the Environment Agency and local angling and fisheries groups, with input from conservation and other interest groups. Fisheries Action Plans cover canal and still water fisheries as well as rivers. They may cover a wide range of issues from fish habitat, through to angling promotion and land management. Each Fisheries Action Plan is different and reflects the concerns and priorities of local angling and fisheries interests.
Floods Directive	The purpose of the European Union Directive on flooding (2007/60/EC) is to establish a framework for the assessment and management of flood risks aiming at the reduction of the adverse consequences on human health, the environment, cultural heritage and economic activity associated with floods in the Community. It requires member states to undertake flood risk assessments, flood risk mapping and produce flood risk management plans. The Directive was published in early November 2007 and must be transposed into United Kingdom law by 26 November 2009.
Good chemical status (surface waters)	Means that concentrations of chemicals in the water body do not exceed the environmental standards specified in the Environmental Quality Standards Directive 2008/105/EC. These chemicals include Priority Substances, Priority Hazardous Substances and eight other pollutants carried over from the Dangerous Substance Daughter Directives.
Good chemical status (groundwater)	See chemical status (groundwater). Means the concentrations of pollutants in the groundwater body do not exceed the criteria set out in Article 3 of the Groundwater Daughter Directive (2006/118/EC).
Good ecological potential	Those surface waters which are identified as Heavily Modified Water Bodies and Artificial Water Bodies must achieve 'good ecological potential' (good potential is a recognition that changes to morphology may make good ecological status very difficult to meet). In the first cycle of river basin planning good potential may be defined in relation to the mitigation measures required to achieve it.
Good ecological status	The objective for a surface water body to have biological, structural and chemical characteristics similar to those expected under nearly undisturbed conditions.

Good quantitative status (groundwater)	See quantitative status (groundwater). Means the level of groundwater in the groundwater body meets the criteria set out in Annex V (2.1.2) of the Water Framework Directive.
Good status	Is a term meaning the status achieved by a surface water body when both the ecological status and its chemical status are at least good or, for groundwater, when both its quantitative status and chemical status are at good status.
Groundwater	All water which is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil.
Habitat Action Plans	See “Biodiversity Action Plans” above.
Hazardous substances	Substances or groups of substances that are toxic, persistent and liable to bioaccumulate, and other substances or groups of substances which give rise to an equivalent level of concern.
Heavily Modified Water Body	A surface water body that does not achieve good ecological status because of substantial changes to its physical character resulting from physical alterations caused by human use, and which has been designated, in accordance with criteria specified in the Water Framework Directive, as ‘heavily modified’.
High ecological status	Is a state, in a surface water body, where the values of the hydromorphological, physico-chemical, and biological quality elements correspond to conditions undisturbed by anthropogenic activities.
Hydromorphology	Describes the hydrological and geomorphological processes and attributes of surface water bodies. For example for rivers, hydromorphology describes the form and function of the channel as well as its connectivity (up and downstream and with groundwater) and flow regime, which defines its ability to allow migration of aquatic organisms and maintain natural continuity of sediment transport through the fluvial system. The Water Framework Directive requires surface waters to be managed in such a way as to safeguard their hydrology and geomorphology so that ecology is protected.
Impact assessment	A tool to enable the Environment Agency to weigh and present the evidence on the positive and negative effects of a plan. For example information on the estimated cost and benefit of proposing actual measures.
Integrated Coastal Zone Management	A voluntary system to manage the complex range of activities in the coastal zone with sustainability and stakeholder involvement at its core. It is a process that brings together all those involved in the development, management and use of the coast within a framework that helps the integration of their interests and responsibilities. The objective is to establish sustainable levels of economic and social activity in coastal areas while protecting the coastal environment.
Integrated River Basin and Coastal Management	A process whereby all pressures in a catchment are assessed and action undertaken in an integrated, proportionate and efficient way. A range of stakeholders are involved in the setting of priorities and their ultimate delivery.

Liaison Panels	A panel consisting of around 15 representatives of strategic co-deliverers including bodies with statutory powers and others who will need to put measures into action for the River Basin District. The panel represents all key interests within the River Basin District and is the primary focus for engagement at the River Basin District level.
Macroalgae	Multicellular algae such as seaweed.
Macrophyte	Larger plants, typically including flowering plants, mosses and larger algae but not including single-celled phytoplankton or diatoms.
Management Catchment	The River Basin Districts are divided into a number of management catchments. Across Wales there are 14 management catchments across three Districts.
Marine Bill	A bill to ensure greater protection of marine resources and to deliver sustainable development in the marine and coastal environment by addressing both the use and protection of marine resources.
UK Marine Monitoring and Assessment Group	Group comprising government departments, agencies and government research institutions. They co-ordinate a United Kingdom programme of estuarine and coastal monitoring designed to satisfy a number of requirements including trend monitoring for the Oslo and Paris Convention, compliance with European Commission Directives and international conventions, local needs and for research and development.
Measure	This term is used in the Water Framework Directive and domestic legislation. It means an action which will be taken on the ground to help achieve Water Framework Directive objectives.
Mechanisms	The policy, legal and financial tools which are used to bring about actions (measures). Mechanisms include for example: legislation, economic instruments; codes of good practice; negotiated agreements; promotion of water efficiency; educational projects; research; development and demonstration projects.
Misconnections	Misconnections of foul sewage into surface water drains are a significant source of urban diffuse pollution in those areas where a separate drainage system is used. Misconnections happen when domestic plumbing has been connected into surface water drains instead of the foul sewer. This means untreated dirty water goes directly into rivers/waterways without receiving treatment.
Morphology	Describes the physical form and condition of a surface water body, for example the width, depth and perimeter of a river channel, the structure and condition of the riverbed and bank.
National Assembly for Wales	The National Assembly for Wales consists of 60 Members elected throughout Wales. The Assembly has delegated many of its powers to the First Minister, who leads the Welsh Assembly Government. The Assembly decides on its priorities and allocates the funds made available to it from the Treasury. Within its powers, the Assembly develops and implements

	policies that reflect the particular needs of the people of Wales.
Natura 2000 sites	Protected Areas established for the protection of habitats or species under the Birds Directive (79/409/EEC) (Special Protection Areas) and the Habitats Directive (92/43/EEC) (Special Areas of Conservation).
Natural England	The government-funded body whose purpose is to promote the conservation of England's wildlife and natural features. The previously existing organisations English Nature, the Countryside Agency and Rural Development Service were merged to form Natural England.
Natural Resources Wales	Natural Resources Wales for Wales
Nitrate Vulnerable Zone	The land draining to waters that contain, or are likely to contain, 50 mg/l of nitrate, or waters that are eutrophic or likely to become so. Within these zones an action programme under the Nitrates Directive is put in place which farmers have to observe to reduce nitrate pollution.
No deterioration (in water body status)	None of the quality elements used in the classification of water body status deteriorates to the extent that the overall status is reduced.
Non-hazardous pollutant	Any substance that is not a hazardous substance but is liable to cause pollution in significant quantities.
Non-native species	See Alien species.
Objective (surface waters)	Three different status objectives for each water body. These are: • Overall status objective • Ecological status or potential objective; and • Chemical status objective These are always accompanied by a date by when the objective will be achieved. Ecological status (or potential) objectives will be derived from the predicted outcomes for the biological elements and physico-chemical elements, plus any reasons for not achieving good ecological status (or potential) by 2015. Chemical status objectives will be derived from the predicted outcomes for the chemical elements plus any reasons for not achieving good chemical status by 2015. Overall status objectives will be derived from the ecological status and chemical status objectives.
Objective (groundwater)	There are three status objectives for each groundwater body: • Overall status objective; • Quantitative status objective; and • Chemical status objective. These are always accompanied by a date by when the objective will be achieved. Overall status objectives will be derived from the quantitative status and chemical status objectives

	In addition to status objectives there are also additional environmental objectives: to prevent deterioration of status, to prevent or limit the inputs of pollutants to groundwater and to reverse any significant and sustained upward trends in pollutant concentrations.
Office of Water Services	The economic regulator for the water and sewerage industry in England and Wales. Office of Water Services has been renamed the Water Services Regulation Authority.
Oslo and Paris Convention	The 1992 Oslo and Paris Convention is the current instrument guiding international cooperation on the protection of the marine environment of the North-East Atlantic. It combined and up-dated the 1972 Oslo Convention on dumping waste at sea and the 1974 Paris Convention on land-based sources of marine pollution. The work under the convention is managed by the Oslo and Paris Commission, made up of representatives from the Governments of the 15 Contracting Parties and the European Commission.
Periodic Review	This is the process, carried out every five years by the Water Services Regulation Authority, to assess the strategic plans for water company spending and investment. The plans include environmental improvements. The investment will often affect water customer charges and incorporates company business plans (called Asset Management Plans).
Phytobenthos	Bottom-dwelling multi-cellular and unicellular aquatic plants such as some species of diatom.
Phytoplankton	Unicellular algae and cyanobacteria, both solitary and colonial that live, at least for part of their lifecycle, in the water column.
Point source pollution	Pollution arising from an identifiable and localised area, structure or facility, such as a discharge pipe or landfill.
Pollutant	Any substance liable to cause pollution.
Pollution	The direct or indirect introduction, as a result of human activity, of substances or heat into the air, water or land which: (i) may be harmful to human health or the quality of aquatic ecosystems or terrestrial ecosystems directly depending on aquatic ecosystems; (ii) result in damage to material property; or (iii) impair or interfere with amenities and other legitimate uses of the environment.
Predicted outcome	The future status of a quality element or water body based on groups of practical and justified measures and the date when this status will be achieved.
Pressures	Human activities such as abstraction, effluent discharges or engineering works that have the potential to have adverse effects on the water environment.
Priority substances	A pollutant, or group of pollutants, presenting a significant risk to or via the aquatic (surface water) environment that has been identified at Community level under Article 16 of the Water Framework Directive. They include ‘priority hazardous substances’.

Programme of Measures	A Programme of Measures, as used in the Water Framework Directive, is a group of actions designed to improve the environment in a river basin district and meet the objectives of the Directive. For the purpose of the updated River Basin Management Plans this will include new and existing measures.
Protected Areas	Areas that have been designated as requiring special protection under European Community legislation for the protection of their surface water and groundwater or for the protection of habitats and species. In this plan, only water-dependant habitats and species are considered.
Quality element	A feature of an aquatic (surface water) ecosystem that can be described as a number for the purposes of calculating an ecological quality ratio, such as the concentration of a pollutant; the number of species of a type of plant.
Quantitative status (groundwater)	An expression of the degree to which a body of groundwater is affected by direct and indirect abstractions. The classification status for a groundwater body against the environmental criteria set out in the Water Framework Directive and as set out in Common Implementation Strategy Guidance Document No 18. All four of the component tests for quantitative status must be assessed as good or poor and the overall quantitative status and the confidence in this (high or low) is determined by the worst test result.
Ramsar site	A wetland area designated for its conservation value under The 1971 Convention on Wetlands of International Importance, especially as Waterfowl Habitat. The Ramsar Convention seeks to promote the conservation of listed wetlands and their wise use.
Reference conditions	The benchmark against which the condition can be measured and reported in the relevant classification scheme. For waters not designated as heavily modified or artificial, the reference conditions are synonymous with the high ecological status class. For waters designated as heavily modified or artificial, they are synonymous with the maximum ecological potential class, unless the site is designated as a Natura 2000 site.
Regional Spatial Strategies	These are frameworks in England controlling development across an area or region (for example for tourism, planning, waste, minerals, energy).
Risk	The likelihood of an outcome (usually negative) to a water body or the environment, or the potential impact of a pressure on a water body.
Risk assessment	The analysis that predicts the likelihood that a water body is at significant risk of failing to achieve one or more of the Water Framework Directive objectives.
Risk category	The numerical or descriptive category assigned to water bodies that have been risk assessed, in order to make the risk-based prioritisation of water bodies for action under the Water Framework Directive more manageable.

River basin	A river basin is the area of land from which all surface run-off and spring water flows through a sequence of streams, lakes and rivers into the sea at a single river mouth, estuary or delta. It comprises one or more individual catchments.
River Basin District	A river basin or several river basins, together with associated coastal waters. Each basin is divided into a number of management catchments.
River Basin Management	The management and associated planning process that underpins implementation and operation of the Water Framework Directive. It is both an overarching process in terms of existing processes and also defines new sub-processes such as those for hydromorphology. The river basin management plans are plans for river basin management.
River Basin Management Plan	For each River Basin District, the Water Framework Directive requires a River Basin Management Plan to be published. These are plans that set out the environmental objectives for all the water bodies within the River Basin District and how they will be achieved. The plans will be based upon a detailed analysis of the pressures on the water bodies and an assessment of their impacts. The plans must be reviewed and updated every six years.
River Quality Objective	A River Quality Objective is an agreed strategic target, expressed in terms of River Ecosystem Standards, which is used as the planning base for all activities affecting the water quality of a stretch of water. A River Quality Objective is the level of water quality that a river should achieve in order to be suitable for its agreed uses.
Safeguard zone	A catchment or other defined zone around a point where the water is abstracted for potable use and where actions may be taken to protect raw water quality and prevent deterioration, so minimising the need for purification treatment. For groundwater they are likely to be based on source protection zones under the Environment Agency's Groundwater Protection Policy.
Saturation zone	Subsurface rock or other geological strata within which the pore spaces between the particles of rock or other strata, and the cracks in those strata are filled with water and for which a water table may be determined.
Shellfish Water Protected Area	An area of estuarine or coastal water designated under Annex IV of the WFD for the protection of significant aquatic species.
Significant and sustained upward trend	A statistically significant trend in pollutant concentrations in groundwater that could lead to a future failure of one or more of the environmental objectives for groundwater unless it is reversed.
Site of Special Scientific Interest	An area of land notified under the Wildlife and Countryside Act 1981 by the appropriate nature conservation body (Natural Resources Wales in Wales) as being of special interest by virtue of its flora and fauna, geological or physiogeographical features.
Source Protection Zone	A zone around a well, borehole or spring where groundwater is abstracted for human consumption (for example drinking water

	or food production), as defined under the Agency's Groundwater Protection Policy (GP3). Zone 1 (SPZ1) is the area closest to the abstraction, representing the highest risk to the source. Zones 2 and 3 are progressively larger. Risk-based Policies to prevent pollution are applied within these zones.
Special Area of Conservation	Natura 2000 sites that are designated under the Habitats Directive.
Special Protection Area	Natura 2000 sites that are designated under the Birds Directive.
Specific Pollutant	A substance considered as being discharged to the aquatic environment in significant quantities at the national level and for which Environmental Quality Standards have been established. As part of the ecological classification criteria, and in places where these pollutants are monitored, these standards must be met, in order for a surface water body to be classified as good ecological status.
Stakeholder	Individuals or groups that are or could become interested in, involved in or affected by our policies and activities. Our stakeholders include regulators, statutory bodies, professional organisations, local organisations and members of the public.
Stakeholder forum	A group of interested parties to guide and advice on river basin planning and management. This forum is led by Welsh Government.
Strategic Environmental Assessment Directive (2001/42/EC)	European environmental legislation which requires an 'environmental assessment' to be carried out for certain plans and programmes whose formal preparation began after 21 July 2004 (or are prepared but not adopted or submitted by a legislative procedure by 21 July 2006), and which are considered likely to have significant effects on the environment. The term "Strategic Environmental Assessment" is used in United Kingdom guidance to mean an environmental assessment under this Directive.
Summary of Significant Water Management Issues	This is a report referred to as 'Challenges and Choices' on each River Basin District that highlights significant water management issues in that River Basin District which will need to be addressed to achieve environmental objectives under the Water Framework Directive.
Supplementary Plans	Plans additional to the River Basin Management Plan which contain additional detail to that within the River Basin Management Plan but which fits wholly within its strategic principles and policies. Supplementary Plans do not cover issues outside the remit of the Water Framework Directive.
Sustainable Drainage Systems	A system of management practices and control structures designed to drain surface water in a more sustainable fashion than some conventional techniques.
Technical feasibility	Is determined through the assessment of whether the implementation of a measure or programme of measures, designed to achieve the Water Framework Directive objectives, is technically possible either at the national and local level and includes the consideration of uncertainty as well as

	environmental and socio economic feasibility. Technical feasibility depends upon the availability of a technical solution and information on the cause of the problem and hence the identification of the solution.
Toolkit of Measures	A variety of measures which consist of actions that when implemented can help deliver Water Framework Directive objectives. These may include basic measures (the minimum set of measures that must be available) and supplementary measures.
Transitional water	A Water Framework Directive term for waters that are intermediate between fresh and marine water. Transitional waters include estuaries and saline lagoons.
Typology	The means by which the Water Framework Directive requires surface water bodies to be differentiated according to their physical and physico-chemical characteristics.
Water body	A manageable unit of surface water, being the whole (or part) of a stream, river or canal, lake or reservoir, transitional water (estuary) or stretch of coastal water. A 'body of groundwater' is a distinct volume of groundwater within an aquifer or aquifers.
Water Framework Directive	European Union legislation – Water Framework Directive (2000/60/EC) – establishing a framework for European Community action in the field of water policy.
Water Framework Directive objectives	The objectives set out in Article 4 of the Water Framework Directive together with objectives set out in paragraphs 2 and 3 of Article 7 of the Directive and which are required to be met.
Water Level Management Plans	Water Level Management Plans provide a means by which water level requirements for a range of activities including agriculture, flood defence and conservation can be balanced and integrated.
Water Protection Zones	Areas designated by the Secretary of State, within which activities polluting the water environment can be restricted or forbidden. Water Protection Zones can be designated at any scale (sub-catchment, catchment or a larger area) and restrictions are enforced to combat point and/or diffuse sources of water pollution, over and above other existing statutory powers.
Water Services	All services which provide, for households, public institutions or any economic activity: (a) abstraction, impoundment, storage, treatment and distribution of surface water or groundwater; and (b) waste water collection and treatment facilities which subsequently discharge into surface water.
Water table	The upper limit of the saturation zone.
Water use	Water Services together with any other human activity identified as having a significant impact upon the status of water.

Water Watch Wales	An interactive spatial web-based tool that provides supporting information and data layers which can assist partners to deliver actions.
Weight of evidence	A weight of evidence approach integrates results or evidence from several data sources, weighted appropriately, to make risk based decisions.
Welsh Assembly Government	The devolved government in Wales.
Welsh Technical Advice Notes	*Planning Policy Wales* (2002) sets out the land use planning policies of the Welsh Assembly Government (the Assembly Government). It is supplemented by a series of topic based Technical Advice Notes (Wales). Technical Advice Notes may be material to decisions on individual planning applications and will be taken into account by the National Assembly for Wales and planning inspectors in the determination of called-in planning applications and appeals.

Abbreviations

AMP	Asset Management Plan
AWB	Artificial Water Bodies
BGS	British Geological Survey
BOD	Biological outcomes database
BPA	British Ports Association
CAMS	Catchment Abstraction Management Strategy
CAP	Common Agricultural Policy
CEA	Cost Effective Analysis
CEFAS	Centre for the Environment, Fisheries and Aquaculture Science
CFMPs	Catchment Flood Management Plans
CIS	Common Implementation Strategy
CO	Conservation Objective
DCLG	Department of Communities and Local Government
Defra	Department for Environment, Food and Rural Affairs
DrWPA	Drinking Water Protected Area
EASG	Economic Advisory Stakeholder Group
EC	European Community/Commission
EU	European Union
FAPs	Fisheries Action Plans
FCRM	Flood and Coastal Risk Management
FCS	Favourable Conservation Status
FRS	Fisheries Research Services
GAEC	Good Agricultural and Environmental Conditions
GEP	Good Ecological Potential
GP3	“Groundwater Protection: Policy and Practice” documents
GQA	General Quality Assessment
GWD	Groundwater Directive (2006/118/EC).
HMWB	Heavily Modified Water Bodies
IA	Impact assessment (formerly regulatory impact assessment)

ICZM	Integrated Coastal Zone Management
IRBCM	Integrated River Basin Catchment Management
JNCC	Joint Nature Conservation Committee
MMO	Marine Management Organisation
NAW	National Assembly for Wales
NGO	Non-governmental organisation
NVZ	Nitrate Vulnerable Zone
ODPM	Office of the Deputy Prime Minister
Ofwat	Water Services Regulation Authority
OSPAR	Oslo and Paris Convention
pCEA	Preliminary cost effective analysis
PoMs	Programme of Measures
PR09	Periodic Review in 2009
PR14	Periodic Review in 2014
PSA	Public Service Agreement
RBC	River Basin Characterisation
RBD	River Basin District
RBMP	River Basin Management Plan
RIA	Regulatory Impact Assessment
RQO	River Quality Objective
SAC	Special Area of Conservation
SAPs	Salmon Action Plans
SEAD	Strategic Environmental Assessment Directive
SFP	Single Farm Payment
SMP	Shoreline Management Plan
SNIFFER	Scotland and Northern Ireland Forum for Environmental Research
SoS	Secretary of State
SPA	Special Protection Area
SPZ	Source Protection Zone
SSSI	Site of Special Scientific Interest
SSWMI	Summary of Significant Water Management Issues
SWPA	Shellfish Water Protected Area
SUDS	Sustainable Drainage Systems
TANs	Technical Advice Notes
TRaC	Transitional and Coastal
UKCIP	United Kingdom Climate Impacts Programme
UKMPG	United Kingdom Major Ports Group
UKTAG	United Kingdom Technical Advisory Group
UKWIR	United Kingdom Water Industry Research
WFD	Water Framework Directive
WLMPs	Water Level Management Plans
WPZs	Water Protection Zones

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