Planning for Water in Worcestershire

TECHNICAL RESEARCH PAPER

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worcestershire county council

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This paper has been prepared in partnership with

Severn Trent Water

in partnership with Environment Agency

Contents

1. Introduction

Water is a vital resource. Its management is fundamental to sustainable development. It is a subject area of great importance to planners. The way in which water is managed can determine whether new development, land management water usage, mineral working and waste management have a positive or negative impact on people and the environment. These impacts can manifest in the form of water shortages, flooding, poor water quality, habitat and species loss and insufficient infrastructure capacity. More positively, good planning of water issues can provide us with not only clean and reliable water supplies, but also areas for recreation, habitats for wildlife and flood mitigation. It is essential to identify the water related issues and how they interrelate, so that they may be appropriately considered as an integral part of any objective seeking to deliver sustainable development.

Whether it is directly via its appearance as rivers in the landscape or indirectly such as supplies to irrigate its fertile valleys, defining habitats and land use, or influencing development patterns, water is a key component to the character of the County. The sustainable management of water is an essential issue to be addressed in Worcestershire. Indeed the events of June/July 2007 brought the issue of flooding to national attention, costing the County Council an estimated £9million of which £6 million was estimated for the repairs carried out by the Highways department (Lammas and Alston, 2007). The 'Local climate impact profile for Worcestershire' by Lammas and Alston (2007) reports in more detail on the social, economic and environmental impacts that extreme weather events have had on the County, in particular the June/July floods of 2007.

This paper seeks to bring to the attention of plan makers and decision makers the water issues facing the County over the next 20 years and provide examples of best practice for how we might manage/plan our water resource in the future. This is undertaken via an assessment of the following topic areas:

1. Water quality;
2. Water resources and infrastructure; and
3. Flood risk.

For each issue, the paper will pay particular attention to the effect climate change will potentially have within Worcestershire, as we begin to experience the predicted warmer and drier summers, warmer wetter winters and more extreme weather events.

Purpose

The purpose of this Technical Research Paper is to provide a consistent, strategic approach to the management of water by, identifying the key issues and implications surrounding the management of water in the County so that water related issues can be properly and strategically planned for at an early stage in the plan making process. To this end the paper will help inform all forms of plan making in Worcestershire including:

- Responses to the West Midlands Regional Spatial Strategy (WMRSS) revisions,
- Sustainability Appraisals
- Local Development Documents (LDD's)
- Community Strategies
- Water Cycle Strategies and Surface Water Management Plans
- Water Resources Management Plans

Scope

Water bodies are defined as covering groundwaters, all surface water bodies, including lakes, streams, rivers and artificial waters, such as canals, all of which are within the scope of this paper.

Status

This Technical Research paper forms part of a wider approach to Natural Resource Planning and Management in Worcestershire being led by the County Council. Where linkages to other natural resource matters are identified they are highlighted. This paper has been prepared in close collaboration with the Environment Agency and Severn Trent Water taking into account best practice and policy development from across the UK. As described above the paper is intended to act as a background technical report to help inform policy and strategy preparation but does not itself represent County Council, Environment Agency or Severn Trent Water policy. In many areas it is a distillation of Environment Agency and Severn Trent Water advice from the national level to the Worcestershire scale. In particular it seeks to echo the Environment Agency's Water Resources Strategy 'Developing our Water Resource Strategy for England and Wales, Consultation document' (2007) within a Worcestershire context. However the paper is not comprehensive in its consideration of water related issues and thus does not negate the need to read other relevant Environment Agency, Severn Trent Water or Government advice, references to which are provided in Appendix 1 of this paper.

Audience

This paper is directed at everyone involved in plan making in Worcestershire as well as adjoining authorities that share cross boundary water resources. Its primary focus is with regard to flooding; water quality; economic and built development such as new and existing industrial and housing stock; waste and minerals operations; and opportunities arising for enhancement of biodiversity. While it will have relevance to land management practices such as agriculture and forestry due to their specific water related issues, much of this is beyond any direct influence of the planning system, and they are therefore not a primary consideration of this paper. The Technical Research Paper is structured as follows:

- **Chapter 2** provides the policy context and evidence
- **Chapter 3** describes the key water related issues and challenges we face in Worcestershire
- **Chapter 4** responds to the challenges by setting out options for how they might be addressed in policy documents
- **Chapter 5** sets out monitoring requirements and further work that should be undertaken.

Roles and responsibilities of key players

Responsibility for water related matters, in Worcestershire is divided between a number of different bodies, for example Local Authorities, the Environment Agency, Severn Trent Water etc. Many other agencies and indeed individual landowners also have responsibilities with regards to water. Some of the key players/stakeholders in relation to water quality, water resources and infrastructure and flood risk are described in Appendix 2.

2. Context

a. Policy

National

The two main national policy drivers in relation to water and spatial planning are **PPS 25 Development and Flood risk** and the **Water Framework Directive (WFD).**

The main aims of PPS 25 are: 'Ensuring that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk. Where new development is, exceptionally, necessary in such areas, policy aims to make it safe without increasing flood risk elsewhere and where possible, reducing flood risk overall' (CLG, 2006b, December). Flood Risk Assessments are the main mechanism to address these aims. An assessment is made of the risk to an area or site from flooding, now and in the future, taking account of climate change and the impact that any changes or development will have on flood risk in the area or elsewhere. At local level it may also be used to identify how to manage these changes and ensure that flood risk is not increased (CLG, 2007). Strategic Flood Risk Assessments (SFRA) are undertaken at Local Authority level and should be informed (where available) by Regional Flood Risk Assessments (RFRA) undertaken by the Regional Planning Bodies. SFRA in turn will inform Site Specific Flood Risk Assessment (FRA) of those submitting a planning applications to the Local Authority.

RFRA and SRFA are free standing assessments and the findings should be incorporated or reflected in the Sustainability Appraisal of Regional Spatial Strategies and Local Development Documents. This will ensure that planning strategies will support the Government's objectives for development and flood risk as set out in PPS 25. SFRA is made up of level 1 and level 2 assessments; the level 1 assessment should be detailed enough to allow application of the Sequential Test on the basis of Table D1 of PPS25, inform the Sustainability Appraisal and subsequent plan policies and identify whether application of the Exception Test is likely to be necessary. The principal purpose of a Level 2 SFRA is to facilitate application of the Exception Test (CLG, 2008).

Local Authorities need to use the Sequential Test when allocating land for development, to steer development to areas with the lowest probability of flooding (Flood Zone 1). The sequential test should demonstrate that there exist no areas of lower probability of flooding in which to locate the proposed development. The flood zones refer to the probability of river flooding only. Flood zones 2 and 3 are shown on the Environment Agency's Flood Maps. Zone 1 is all the land that falls outside these two zones. The zones are defined as follows;

- **Zone 1** has a low probability of flooding and comprises of land assessed as having a less than 1 in 1000 annual probability of river flooding in any year (<0.1%).
- **Zone 2** has a medium probability of flooding and is defined as comprising of land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%).

Zones 3a and 3b overleaf

- **Zone 3a** has a high probability of flooding. Land in this zone has a 1 in 100 or greater annual probability of river flooding (>1%) in any year.
- **Zone 3b** Functional floodplain comprises of land where water has to flow or be stored in times of flood.

Where it has not been possible to locate development in zones with a lower probability of flooding, through the Sequential Test, due to large areas of land covered by flood zone 2 and 3, the Exception Test should be applied. The Exception Test provides a method for managing flood risk whilst allowing necessary development to occur.

The Exception Test must demonstrate that the development provides wider sustainability objectives that outweigh the flood risk. When allocating land in spatial plans, determining broad locations for development and infrastructure, or considering applications for development, decision-makers should take into account the vulnerability to flood risk of certain land uses. Highly vulnerable land uses include emergency services and caravans. The Exception Test should not be used to justify vulnerable developments in flood Zones 3a and 3b and should only be applied after the Sequential Test has been applied and it has demonstrated that 'more vulnerable' development and 'essential infrastructure' cannot be located in Zones 1 or 2 and 'highly vulnerable' development cannot be located in Zone 1. Further details on flood zones, appropriate uses, vulnerable and essential development, the sequential test, the exception test and determining planning applications can be found in Appendix D of PPS25. It is worth noting that many of the floods in Worcestershire in 2007 took place in areas outside of designated flood plains, as a result of surface water rather than fluvial flooding.

The Environment Agency is the lead organisation responsible for implementing the **Water Framework Directive (WFD)** and will do so through the production of River Basin Management Plans (RBMP's), one for each of the River Basin Districts in England and Wales. The WFD (2000/60/EC) which came into force in December 2000 and and was put into UK law (transposed) in 2003 is the most substantial piece of EC legistlation to date and is designed to improve the ecological health and prevent further deterioration of the whole water environment (surface and ground water), promote the sutainable use of water, reduce water pollution and ensure a progessive reduction in groundwater pollution. It is based on the strategic catchment level approach of River Basins Districts, across England and Wales. River Basin Management Plans will be produced for each river basin district every six years (http://www.defra.gov.uk/environment/water/wfd/index.htm)

Local Authorities are likely to have a principal role in delivery of the WFD through their own activities and by working in partnership with others. Failure to comply with WFD requirements may lead to the European Commission bringing legal proceedings against the UK. Local Authorities have a general responsibility not to compromise the achievement of UK compliance with EC Directives and will have a responsibilty to ensure the targets set out in the WFD are met. The European Water Framework Directive (WFD) will require that over 30 measures are looked at, grouped into ecological status (this includes biology as well as ‘elements’ like phosphorus and pH) and chemical status (‘priority sub-stances’). When assessing the quality of water bodies WFD will uses a principle of ‘one out, all out’ which means that the poorest individual result will drive the overall classification. WFD monitoring is risk-based, focussed where there is likely to be a problem.

Worcestershire is part of the Severn River Basin District (see map in Appendix 4), which, is the third largest in England and Wales. Through the production of the Severn RBMP the significant water issues facing that catchment are identified in order that they can be considered and addressed as a whole rather than in isolation.

A draft Severn RBMP will be published in December 2008 and it will integrate and streamline those plans and processes related to water and its management by establishing a clear and transparent process of analysis and decision-making (Environment Agency, 2006b). This will be done through the setting of objectives and developing programmes of measures to meet those objectives. The WFD has set a target that all surface and ground waters should aim to reach 'good status' by 2015. Any surface water body which has had substantial changes to its physical character as a result of physical alterations caused by human use, otherwise know as 'heavily modified' water courses, need to reach 'good ecological potential' by 2015.

Both PPS 25 and the WFD highlight the issue of taking account of the impacts arising from climate change upon water quality and water availability. A consideration of climate change within Worcestershire can be found within the County Climate Change Strategy and within the Planning for Climate Change in Worcestershire Technical Research Paper (November 2008).

The Government's Water Strategy for England, Future Water was produced in February 2008 and provides a clear direction for England setting out the long term vision of where Government want the water sector to be by 2030 and some of the steps that will need to be taken to ensure that good clean water is available for people, businesses and nature. The Strategy looks at the water cycle as a whole, from rainfall, drainage through to discharge, treatment and every aspect of water use. In summary they have a vision for sustainable delivery of secure water supplies and an improved and protected water environment.

Catchment Flood Management Plans (CFMPs) are being produced by the Environment Agency with the 'aim of working in partnership with key decision-makers within a river catchment to explore and define long term sustainable policies for flood risk management' (Environment Agency 2008a), setting out a preferred plan of action for sustainable flood risk management over the next 50 to 100 years. Flood risk will vary within different parts of the of the river catchment and as a result different approaches will be needed for different locations. Catchment Flood Management Plans divide the river catchment into a series of policy units. Worcestershire falls under the Severn Catchment Flood Management Plan. It is made up of the following policy units: the Teme, Middle Severn, Kidderminster and Bromsgrove, Redditch, Lower Severn Corridor, Middle Avon. In order to meet the objectives in the Severn CFMP, one of six polices choices is selected for each policy unit, according to the extent, nature and scale of current and future flood risk within different parts of the catchment. Consultation on the draft Severn CFMP finished in July 2008, the final plan is due in Spring 2009.

Under the 2006 **Natural Environment and Rural Communities Act (NERC)** local authorities and water companies now have a legal duty to have regard to biodiversity in carrying out all of their functions.

Additionally PPS1 Delivering Sustainable Development; PPS 11 Regional Spatial Strategies and PPS 23 Planning and Pollution Control all refer to the issues surrounding the sustainable use of water resources. PPS12 highlights the need for Local Planning Authorities in their Core Strategies to address new infrastructure requirements, including who will provide it and when, for the proposed new developments.

The Environment Agency is in the process of developing its 2008 **Water Resources Strategy**. Developing our Water Resource Strategy for England and Wales, Consultation document (2007) sets out a twin track approach to water resource development (demand management alongside new resources). A revised Water Resource Strategy is due in 2008.

Since May 2008 all newly built homes are required to get a rating (from zero to six) under the Code for Sustainable Homes. This may be assessed rating from one to six, or a zero rating, if no assessment has been undertaken. However all social housing developments funded by the Housing Corporation programme 2008 - 2011, other publicly funded housing developments and homes built on Government land have to obtain a Code for Sustainable Homes rating of at least level three. The code assesses the sustainability of new homes against six levels of sustainable design and construction standards, level 6 being the most sustainable. It is the government's aim that by 2016 all new homes will be zero carbon i.e. zero net emissions of carbon dioxide from all energy use in the home. Appendix 3 provides extracts from level 6 of the Code as it relates to water and surface water run off.

Regional

The **West Midlands Regional Spatial Strategy (WMRSS)**, (Jan 2008), provides the overarching planning policy framework for the region, guiding Local Authorities in the preparation of Local Development Documents (LDD's). The WMRSS is undergoing a partial revision. This paper will inform Worcestershire County Council's response to Phases 2 and 3 of the partial revision. The revision should ensure water infrastructure is planned for and look to avoid developing in flood risk areas now and in the future and have regard to changes due to climate change.

RSS Phase Two Revision Preferred Option (December 2007) states:

Para 2.28 'The level of new house building set out in Policy CF3 (Level and distribution of new housing development) is likely to create pressure on water resources supplying the Region. Local planning authorities will need to engage with the Environment Agency and water companies to ensure that water resources and sewage infrastructure will be available to meet the demands of new housing, and that necessary improvements to the water distribution infrastructure are provided. Working towards water neutrality, by utilising the highest practicable water efficiency measures, will help to reduce pressure on resources and minimise impact on European and nationally protected nature conservation sites'.

It goes on to say:

Para 2.29 'The Region faces particular problems in managing the disposal of waste water from buildings. This is due to the location of its major urban areas at the head waters of two major river catchments[1], where flows are of relatively low volume. New development will impose pressure on existing waste water infrastructure. A significant investment in waste water infrastructure, such as sewers and sewage treatment works is likely to be needed to ensure the water environment is protected. Reducing the volume of waste water from both new and existing buildings by water efficiency measures, will help to reduce demand on existing infrastructure. Local Planning Authorities will need to work with the Environment Agency and water companies to develop water cycle strategies to inform their local development documents. The use of sustainable drainage systems will be essential to reduce any adverse effects from development on the water environment, and especially European sites' (WMRA, 2007).

RSS Phase Two Revision Preferred Option, Policy SR3 Sustainable Design and Construction states that Local Planning Authorities should require all new homes to meet or exceed the water conservation standards in level 4 of the Code for Sustainable Homes, that offices meet the BREEAM offices scale, and that other buildings achieve efficiency savings of at least 25%. All large and medium developments are required to use sustainable drainage systems and integrated surface water unless it is not practicable to do so and that opportunities for similar water efficiency standards and sustainable drainage systems should be sought and promoted.

Under the Water Act 2003 Severn Trent Water and other water companies are legally required to prepare **Water Resources Management Plans (WRMP)**. These plans will show how the water company intends to meet projected demands for water over the next 25 years. These now statutory documents have to be produced every five years covering a 25-year period from 2010. The draft Severn Trent Water Resources Plan went out for consultation in May 2008 with the final plan due to be published in Spring 2009. The Strategy aims to address, as part of its long term supply capabilities to meet future demand, the following challenges: future growth in demand as a result of the increased housing numbers in the RSS, climate change impacts, water quality, restoring sustainable abstraction (see Appendix 5) and the impacts of the Water Framework Directive. The Severn Trent supply area for the purpose of water resources planning is split up into six water resource zones, Worcestershire falls into the Severn (WRZ 3) Water Resource Zone.

The strategy for this Zone is based on maximizing use of existing sources through extending the capacity of its strategic grid, increasing water efficiency activities and reducing leakage. In the longer term, a need for more water resources and treatment capacity to maintain the supply / demand balance has been identified.

The **West Midlands Checklist** is an online tool, developed by a steering group comprising of representatives from local authorities, developers, consultants, regional bodies, the voluntary sector and statutory bodies. The checklist is owned by the region under the control of the West Midlands Regional Assembly and

[1] *This issue does not apply to Worcestershire*

Advantage West Midlands on behalf of all the regional partners. Developers, Local Authorities and funding bodies can all make use of the Checklist. With regards to water the Checklist addresses the need for developments to both incorporate flood resilience and to reduce the contribution made to flash flooding. To maximise the availability of harvested rain and grey water for appropriate use on developments, to reduce the demand for fresh water, as well as addressing the wider energy efficiency agenda. Further details on the West Midlands Checklist can be found at http://www.checklistwestmidlands.co.uk/

Local

Currently in place at a local level are **Worcestershire CountyStructure Plan** saved policies CTC 8 Flood Risk and Surface Water Drainage and CTC 9 Impact on Watercourses and Aquifers.

Minerals and Waste Core Strategies are yet to be prepared, but the County Council does have saved **Minerals Local Plan** policies. It is anticipated that water issues will be addressed in both Core Strategies, both generically e.g. avoiding flood risk areas and in detail e.g. addressing leachate from decomposing waste. The assessment of possible impacts upon surface and groundwater flows, water levels and quality will be particularly important in the preparation of the minerals core strategy.

Local Development Frameworks - District Councils' Core Strategies have yet to be adopted and as a result the District Council have saved local plan policies until replaced by Core Strategies. Whilst preparing their Core Strategies Local Authorities will need to take account of the issues in this paper and undertake Water Cycle Strategies, Strategic Flood Risk Assessment (SFRA) and consider the need for Surface Water Management Plan (SWMP). A floodplain management strategy has been produced by Worcester City Council which was incorporated in to its 2004 Local Plan. It was held up as an example of good practice and as a result examples of it have been included in PPS 25 Development and Flood Risk, practice guide.

Catchment Abstraction Management Strategies (CAMS) are produced by the Environment Agency. The first round of CAMS covers a six-year period and identifies through 'resource availability status' locations where water is available; no water is available, is over licensed and/or over abstracted. 'The resource availability status indicates the relative balance between committed and available resources, showing whether licences are likely to be available and highlighting areas where abstraction needs to be reduced' (Environment Agency, 2005).

The four categories of resource availability are defined as follows:

Water Available	Water likely to be available at all flows including low flows. Restrictions may apply.
No Water Available	'No Water Available' for further licensing at low flows although water may be available at higher flows with appropriate restrictions.
Over-licensed	Current actual abstraction is resulting in 'No Water Available' at low flows. If existing licences were used to their full allocation they would have the potential to cause unacceptable environmental impact at low flows. Water may be available at high flows with appropriate restrictions.
Over-abstracted	Existing abstraction is causing unacceptable environmental impact at low flows. Water may still be available at high flows with appropriate restrictions.

Source: Environment Agency, 2008b

There are five Catchment Abstraction Management Strategies that cover the Worcestershire area. They are the Worcestershire Middle Severn CAMS, Severn Vale CAMS, Teme CAMS, Warwickshire Avon CAMS and the Severn Corridor CAMS which as it name suggests encompasses the River Severn Corridor. Appendix 4 shows the coverage of the CAMS. CAMS describe where water is available for further abstraction and where it needs to be reduced in order to conserve aquatic habitats and prevent damage to the environment.

The vision for the Second Edition of the **Sustainable Community Strategy for Worcestershire** is of 'a county with safe, cohesive, healthy and inclusive communities, a strong and diverse economy and a valued and cherished environment'. The Community Strategy is prepared by the Local Strategic Partnership (LSP) with the aim to improve the quality of life of people who visit, work or live in the county. The Sustainable Community Strategy has been broken down in to 6 themes and under the better environment for today and tomorrow theme, the following priority outcome has been devised 'To address issues of water quality, supply, and consumption and land drainage in Worcestershire'.

The **Local Area Agreement (LAA)** for Worcestershire was prepared by the County Council on behalf of the Worcestershire Partnership and negotiated with the Government Office for the West Midlands (GOWM). The LAA covers a three-year period (2008-2011) enabling Government and key partners to deliver the vision of the Sustainable Community Strategy. 'To reduce the risk of flooding (both fluvial and pluvial) throughout the county' is one of the local Improvement targets in the LAA. A key indicator for the LAA is NI 188 Adapting to climate change, and this will address the following key priority 'To improve flood mitigation measures and improve drainage'.

District Community Strategies have recognised the importance of tackling climate change and will therefore need to consider the issues raised in this paper, (see chapter 4) as part of their response during implementation.

Water Cycle Strategies are being encouraged by the Environment Agency to accompany Development Plan Documents. The Water Cycle Strategy will provide a plan and programme for implementation of water services infrastructure. The Water Cycle Strategy will include an assessment of the environment and infrastructure capacity for water supply, sewage disposal, flood risk management and surface water drainage. It also provides an overall estimated cost for the identified solution and of the identified infrastructure improvements required.

The development of **Surface Water Management Plans (SWMP)**, are being encouraged in PPS 25 to be undertaken by Local Planning Authorities to help reduce the impacts of flooding through new developments. PPS 25 good practice guide (2008) states that they have an important role in developing a coordinated strategic approach to managing surface water drainage and reducing flood risk. They could also provide the mechanism with which to integrate the requirements of River Basin Management Plans (RBMP) into planning policies (CLG 2007 and Environment Agency, ND). Recommendation 18 from the Pitt Review (2008) recommended that local SWMP's[2] should provide the basis for managing all local flood risk. The plans should focus on managing flood risk, making efficient use of Sustainable Drainage Systems (SUDS) and safeguarding existing features of the water environment. Further information on SWMP can be found in Water Strategy - Future Water (2008), PPS25 Development and Flood Risk, Practice Guide (2007) and Environment Agency Policy Brief Environmental Infrastructure (ND).

The **Biodiversity Action Plan (BAP)** process is the Government's response to the ratification of the Rio Convention in 1992, and commitment to nature conservation in the UK. The first Worcestershire BAP was produced in 1999. It was revised and re-launched in 2008 with new targets and actions valid to 2017. The Worcestershire BAP consists of 19 Habitat Action Plans (HAP) and 25 Species Action Plans (SAP) setting targets for the conservation of that habitat or species and the actions taken to achieve them. Local Planning Authorities have a key role to play in the delivery of the BAP, through Development Control, land management and their ability to influence and educate residents of the County. Worcestershire Biodiversity Action Plans of direct relevance to this Technical Research Paper are:

- Rivers and Streams HAP
- Fen and Marsh HAP
- Reedbeds HAP
- Lowland Wet Grassland HAP
- Wet Woodland HAP
- Ponds and Lakes HAP
- Canals HAP
- Great Crested Newt
- Otter SAP
- Water Vole SAP
- White-clawed Crayfish SAP
- Twaite and Allis Shad SAP
- Common Club-tail dragonfly SAP
- Black Poplar SAP

This list is not exclusive. Many habitats and species of local and national BAP significance can be found within the wider floodplain environment. Those listed above are most associated with the river corridor landscape. There will be an interim review of many of the wetland related plans in 2009, informed by the draft Severn RBMP.

[2] *Sir Michael Pitt was asked by ministers to conduct an independent review of the flood related emergences which occurred during the summer of 2007. Lessons learned from the 2007 floods, was produced as a response in 2008.*

b. Evidence base

Below is a summary of the key evidence base that was used to inform this paper. Information used to inform this section can be found in the appendices; in particular Appendix 5 'Water related facts and figures'.

Climate change

- Summer rainfall is predicted to decrease and winter rainfall increase. The likelihood of extreme weather events are expected to increase as witnessed during the summer floods of 2007 when the likes of Tenbury, Evesham and Pershore were flooded and many roads made impassable. Approximately 10% of the land area of Worcestershire is at risk of flooding (about 167km2) (Pers Comm, Environment Agency, 2008). A decrease in summer rainfall levels as a result of climate change may lead to an increase in the occurrences of drought episodes with demand for water often peaking during drought periods.

Development

- The WMRSS revision proposes 36,600 homes in Worcestershire during 2006-2026: with Worcester and Redditch being proposed as Settlements of Significant Development. Worcester City is also a growth point. This is likely to put pressure on water resources and wastewater infrastructure. Worcestershire is currently a moderate area for water stress (Environment Agency, 2007b). Development of new water resources, treatment and distribution infrastructure will be required in future to serve the projected housing growth rates (Mott MacDonald, 2007). The CAMS resource availability maps, (Appendix 6) for Worcestershire demonstrate that most of the County has no water availability status meaning that no water is available for further licensing at low flows. Areas that are over abstracted, meaning existing abstraction is causing unacceptable environmental impacts at low flows, can be found in the north of the County running down to the centre. A small area on the southern boundary of the County is over licensed, which means the current actual abstraction is resulting in 'No Water Available' at low flows and if all licences were used to their full allocation they could cause unacceptable damage to the environment during low flow periods. For all of the three scenarios water may still be available for abstraction at high flows with appropriate restrictions. A very small area in the north east of the county has water available although restrictions may still apply. (Environment Agency, 2008b).

Domestic

- People who live in Worcestershire use on average between 130-149 litres of water a day (EA, 2007b). With higher standards of living as customers invest more of their income in their homes and gardens, they increasingly expect to have an uninterrupted water supply that meets all of their needs, regardless of whether those needs might be viewed as "non-essential" by water resource planners.

- Seven (58%) of the large Sewage Treatments Works in the County are either at high or medium risk of putting pressure on sewage treatment infrastructure, if new development occurs (Environment Agency, 2007d).

- In Worcestershire during 2006-2007 just over half the County's water supply (53%) was abstracted from ground water supplies (Pers Comm Severn Trent Water, 2007) The projected housing growth in the WMRSS would put water supply in the Severn Zone into deficit between 2011-2016 and 2019-2024. The size and duration of these deficits could be reduced through water efficiency measures in new and existing developments.

Agriculture/Forestry

- Compared to the amount of water abstracted for public water supply, the amount abstracted for agriculture is low. However, much of the diffuse pollution within water bodies in rural areas is as a result of agriculture and forestry practises (Environment Agency 2007a).

Water Biodiversity

- Rivers, streams and canals can be rich in biodiversity and act as wildlife corridors linking habitats. How we manage watercourses will affect the biodiversity as will climate change in the form of drought, changes in water temperature and extreme weather events such as flooding. Abstraction of water for public water supplies is already having detrimental impacts on biodiversity, lowland wet meadows are already under serious threat. The unsustainable abstraction of groundwater has caused many problems in the North Worcestershire area and as a result a number of these water bodies are supported by compensatory water drawn from groundwater. Without this, some stream reaches would cease to flow and some pools would disappear in periods of low flow. Important wetland habitats in Redditch and Kidderminster have already been lost to development. Damage to habitats can occur as a result physical modification to a watercourse such as canalisation. Fragmentation of habitats can occur when flood control measures are installed resulting in negative biodiversity impact.

Risk based assessment of water bodies

- In Worcestershire, 600km of rivers and streams were assessed to establish if they were at risk of not meeting the WFD objectives in 2015. The biggest risk of not meeting the WFD objectives is from diffuse pollution from Phosphates and Nitrates and overall the majority of watercourses in Worcestershire are at a medium to high risk of not meeting the WFD objectives. *(Environment Agency 2007a).*

3. Water related challenges and issues

An assessment of the evidence base against the existing policy and guidance suggests that the following are the key water issues which need to be addressed by the planning system in Worcestershire:

- Adapting to the challenges of climate change
- Preventing and managing surface ground and fluvial flooding
- Ensuring sufficient water supply
- Ensuring sufficient sewerage capacity (infrastructure)
- Biodiversity enhancement and the role of green infrastructure (wetlands, woodlands etc) in flood management and water cycle
- Improving water efficiency in developments
- Improving water quality

Having identified the key planning related water issues in Worcestershire this next section addresses the challenges associated with planning for water in the future.

Adapting to the challenges of climate change (drought and flooding)

The issues associated with Climate Change remain one of the main reasons to tackle the management of water. There is clear reference to climate change and its impact on flooding in PPS 25 and how it should be addressed. The supplement to PPS1 explains how flood risk and ensuring sufficient water capacity of existing and potential infrastructure needs to be taken into account by plan makers (CLG, 2006d).

The higher climate change resilience/drought tolerance of semi-natural agricultural land (e.g. traditionally managed semi-natural 'old grasslands' as compared to sown agricultural leys) requires further investigation.

The flood amelioration benefits of semi-natural habitats and wild places have been largely overlooked and undervalued in the past. Land that previously absorbed and slowly released rain and floodwater has been replaced with less permeable intensive agricultural land-use and impermeable urban surfaces. As a consequence rain and flood water tends to be quickly diverted into artificial channels and highly modified and constrained watercourses, which have limited capacity to cope with severe rainfall and flood events (Holtan, HN and Kirkpatrick, MH, 1950 and Claxton, M, 2008).

Planning for climate change mitigation and adaptation is difficult due to both the short time horizon for many plans compared to the long term impacts of climate change and the uncertainty surrounding the nature and degree of those impacts.

Preventing and managing Surface, Ground and Fluvial flooding

The Stern Review[3] recognised that the planning system has a vital role to play in managing long term flood risk. The planning system should be used to reduce and avoid flood risk and thus reduce the social, economic and environmental impacts that are caused. Three planning applications were approved contrary to Environment Agency advice on flood risk grounds in Worcestershire in 2005/06; all were minor developments:

- Worcestershire County Council: a minor educational development
- Wychavon District Council: a minor residential development
- Malvern Hills District Council: a minor agricultural development

(Source Pers Comm, Environment Agency, 2008)

Flooding and its impacts are a major challenge to be tackled in Worcestershire. After Herefordshire, Worcestershire has the second highest percentage of total land at risk from flooding in the West Midlands. There are over 9,146 properties at risk of flooding - approx. 4% of the total number of properties. 38% of the 9,146 properties are at significant risk; 30% are at moderate risk; 32% are at low risk. Worcestershire has the 3rd highest number of properties at 'high' risk in the West Midlands (Pers Comm, Environment Agency, 2008).

[3] *The Stern Review (2007) Commission by the then Chancellor of the Exchequer, reporting to both the Chancellor and to the Prime Minister sought to assess the evidence and build understanding of the economics of Climate Change.*

Parts of Worcestershire are particularly prone to river flooding. Many of our towns and villages for example Stourport, Kidderminster, Tenbury, Worcester, Bewdley, Upton, Pershore, Evesham are built on the banks of large rivers with a long history of flooding. Climate change is likely to result in greater frequency of extreme events such as those experienced during 2007 and 2008 becoming more frequent.

PPS 25 highlights that the impact of flooding depends greatly on land use, the higher the population and density of buildings, the greater the potential impact. Essentially flooding from rivers occurs in two situations:

1. A steep catchment and local intense rainfall can lead to a flash flooding event,
2. In those areas with a large and flat catchment, flood levels will rise slowly with the natural floodplain remaining flooded for several days therefore acting at a natural regulator of the water flow (CLG 2006b).

Where water has not been able to soak into the ground as a result of a period of intense rainfall, flooding from the land occurs. Topography and built development will have strong influence on the impact of this form of flooding. Groundwater flooding occurs when the water levels in the ground rise above surface elevations. This is most likely to occur in low lying areas underlain by permeable rock- aquifers. However this is generally unlikely to occur in this County except in very localised areas. Groundwater floods can take weeks to months to disappear (CLG 2006b).

Flooding from sewers occurs when heavy rainfall amounts cannot be accommodated by the sewer as a result of it being of insufficient capacity or blocked by debris. Combined sewers take both surface and wastewater, should flooding occur, floodwater would be contaminated by sewage, which has health impacts.

Flooding can arise from non-natural or artificial sources (such as canal, reservoirs) as a result of the facility being overwhelmed or dam failure (CLG 2006b). The physical modification of watercourses such as canalisation can increase the risks of floods occurring.

What follows is an assessment made by the Local Planning Authorities (LPA) in Worcestershire for the West Midlands Regional Flood Risk Appraisal (2007), to inform the WMRSS as to the perceived risk to flood.

- It is perceived by Wychavon LPA that flood risk is seen as a significant factor for strategic planning in the district, with no developments anticipated in Flood Zone 3 in the next 20 years. Wychavon LPA consider that the following areas are not defended to a satisfactory standard:- Badsey; Beckford; Cleeve Prior; Evesham (Hazel Ave.) Harvington; Honeybourne; Little Comberton; North Littleton; Pinvin; Rous Lench; Stock and Bradley.
- In Redditch flood risk is not seen as a significant factor for strategic planning in the district. No development is anticipated in Flood Zone 3 in the next 20 years. Redditch LPA considered that the following areas are not defended to a satisfactory standard: - Beech Tree Close/Salters Lane, Batchley; Windsor Works; Enfield; Loxley Close & Brooklands Lane, Church Hill; Furze Lane and Winyates Green
- In Bromsgrove flood risk is seen as a significant factor for strategic planning in the district. Possibility of some development on some small sites in Flood Zone 3 in the next 20 years.
- Wyre Forest LPA sees flood risk as a significant factor in Strategic planning for the District. Wyre Forest LPA considers that neither Kidderminster nor Bewdley are defended against flood to a satisfactory standard. It is anticipated that there will be some development in Flood 3 zone in the next 20 years, but this is less than 1% of the total Zone 3 land in the district.
- Flood risk is considered to be a significant factor in strategic planning in Worcester City. No significant development is anticipated in Flood Zone 3 in the next 20 years, although there could be some limited development. Worcester City LPA consider that the following locations are not defended against flooding to a satisfactory standard:- along the River Severn and Teme; along Duck Brook; Laugherne Brook; Barbourne Brook; and Astwood Brook flash flooding from rainstorms at other location.
- In Malvern Hills flood risk is seen as a significant factor for strategic planning in the district. It is anticipated that there will be no development in Flood Zone 3 in the next 20 years. Malvern Hills LPA consider that the following locations are not defend against flooding to a satisfactory standard:- Upton-upon-Severn and the area west of Worcester.

(source: adapted from Faber Maunsell, 2007)

Ensuring sufficient Water Supply

As a result of climate change as well as the warm wetter winters we should expect hotter drier summers. This means that during the summer months the possibility of water shortages increases. Over half of public water supply in Worcestershire is provided by groundwater. Increases in housing numbers as required by the WMRSS and the predicted increase in water usage per person per day, will put further pressure on the amount of water that is available for public water supply and other uses in the County, placing challenges on water providers to provide a clean ready and sustainable supply of water. The Environment Agency report (2007c) West Midlands Regional Spatial Strategy (RSS11- The Impact of Housing Growth on Public Water Supplies)[4] examined the effects the three housing options in the WMRSS Phase 2 revision on public water supplies and for the Severn zone found the following.

- Option 1: the zone goes into small short-lived deficit.
- Option 2: the zone goes into a significant deficit for 6 years in two time periods.
- Option 3: the zone to go into a significant deficit for 10 years in two time periods.
- 8% water efficiency in all new homes only has a small impact on the size and duration of the deficit for all options.
- 25% water efficiency in all new homes has a significant impact on the size and duration of the deficit for all options.
- At the start of the plan period the zone is already in significant deficit. Consequently the zone requires new water resource development to keep the zone in surplus.

Chapter 2 of the draft preferred option for the WMRSS revision has stated that the new level of housing growth (36,600 dwellings in Worcestershire) is likely to create pressure on water resources supplying the Region, particularly in the Severn, Birmingham and South Staffordshire zones. The housing figure in the draft-preferred option relate to a figure between options 2 and 3 of the issues and option stage of the WMRSS revision. The Environment Agency Report (2007c) states that achieving Level 3 for the code for sustainable homes for all new homes could achieve approximately 25% water efficiency targets reducing/delaying the need for new resource developments. Getting existing homes retrofitted and new homes fitted with water efficient measures will be a key factor in reducing the demand on water supply (The RSS Phase Two Revision Preferred Option says all new homes are required to meet or exceed the water conservation standards in level 4 of the Code for Sustainable Homes). Individuals' behaviour needs to change to improve water efficiency in the home and house builders and planners need to ensure that design features are incorporated into new homes. The perceived cost of installing water efficiency measures into homes may limit the uptake.

If new reservoirs are needed to meet a short fall in available water supply then they need to be planned well in advance due to the long lead times for new reservoirs.

[4] *The WMRSS - Phase Two revision, spatial options, for regional housing growth 2001 - 2026 were:*
Option 1 381,000
Option 2 491,200
Option 3 575,000

The long-term solution to remove the risk to the environment from unsustainable abstraction is to review the actual abstractions, allow the natural groundwater level to rise and so restore flows to streams. By reducing these abstractions, alternative supplies have to be found which can be expensive. A short-term option would be discharging compensation water to streams when flows are low. This has happened on the Battlefield Brook and Bow Brook to name but two. The Restoring Sustainable Abstraction Programme (RSA) was set up by the Environment Agency in 1999 with the aim of restoring abstraction licensing assumptions. Table 1.2 in Appendix 5 contains details of the Areas of Restoring Sustainable Abstraction in Worcestershire

Ensuring sufficient sewage capacity (Infrastructure)

Along with housing, associated infrastructure will need to be provided, in this case in the form of adequate wastewater treatment. There is an ageing infrastructure, which will be costly to replace or upgrade if it is not found to be sufficient to cope with the increase in housing numbers as predicted in the WMRSS. In providing infrastructure the Water Framework Directive (WFD) states that this must not cause the water environment to deteriorate.

Seven Sewage Treatment Works in Worcestershire were found to be at medium to high risk of not having sufficient capacity to meet the needs of new housing developments. They were recorded as follows: Alvechurch, Blackminster, Bromsgrove/Fringe Green, Droitwich/Ladywood, Pershore (Tiddesley Wood) , Redditch Priest Bridge, and Worcester (Environment Agency 2007d). The challenge is to ensure that adequate sewage treatment works are in place to cope with the houses that are built.

Phasing the necessary infrastructure ahead of house building is a challenge to be overcome and developers need to demonstrate that adequate capacity exists both on and off site to serve the development and that it will not lead to, or exacerbate existing problems elsewhere.

Biodiversity enhancement and the role of green infrastructure (wetlands, woodlands etc) in flood management and the water cycle

Ensuring people have a sustainable water supply without causing a detrimental impact on the environment is a challenge to be tackled. In the past abstraction licences had little regard to the impact on the environment. Battlefield Brook in Bromsgrove is an example of human activity impacting on a watercourse. Abstraction of water resulted in lowering of the water table, which led to periods of low flow (although this is not the sole cause of low flow problems). Water vole populations in this area have been impacted by abstraction of water and installing concrete channels in the stream in Sanders Park which prevented the population moving up stream.

Local Planning Authorities, Environment Agency and water providers will need to ensure that the targets in the WFD are met.

It will be necessary to ensure that river corridors are in good ecological health to aid the movement of species and that BAP targets and actions are not compromised, through the role Local Planning Authorities take in their development control and land management work. Local Planning Authorities need to influence and educate residents of the county to ensure the BAP targets are met and actions undertaken.

Improving water efficiency in developments

To reach level six of the Code for sustainable homes, usage per person per day will need to be reduced to 80 litres of water per person per day in new homes from the current 130-149 litres of water per day per person we use in Worcestershire (Though the RSS Phase Two Revision Preferred Option says all new homes are required to meet or exceed the water conservation standards in level 4 of the Code for Sustainable Homes). Economic savings may be made by the use of water metering, water recycling, rainwater harvesting and installing items that use less water. The perceived cost of installing the above items can often be greater than the actual cost, preventing their installation into buildings. It may not be sustainable to fit grey water recycling systems into individual homes on a large scale. The maintenance and replacement of these water saving devices at well as SUDS[5] can be a barrier to their installation.

Improving Water quality

Point source pollution is closely controlled but diffuse pollution is an increasing problem (Environment Agency 2007d). Diffuse pollution unlike point source pollution, is harder to trace and therefore harder to control. Pollution of river courses can have environmental, social and economic impacts. Pollution incidents can be very costly to treat, have huge environmental impacts and can prevent the public from using the water body whilst it is polluted.

Pollution to aquifers, which supply the majority of public water supplies, can be extremely costly or impossible to clean up and as a result are very vulnerable to pollution. Diffuse pollution from Phosphates and Nitrates are causing the most problems in Worcestershire's watercourses, with Worcestershire having the highest levels of these pollutants in the West Midlands.

Climate change will lead to hot drier summers, which will lead to a drop in water levels in watercourses and should a pollution incident occur it will be magnified as a result of lower flow levels ability to dilute and remove the pollutant. This will create challenges for those responsible for managing water pollution incidents. Flooding can draw pollutants from urban areas and agricultural land and scour riverbanks contributing to pollution and an increase in sediment in rivers (Environment Agency 2007d) creating further challenges for those managing watercourses.

[5] *Certain forms of SUDS are not appropriate in all circumstances, for example, in areas with high ground water levels or clay soils which do not allow free drainage. SUDS also require regular maintenance to ensure their effectiveness and proposals for their use should include details of long-term maintenance*

4. Opportunities for a way forward

Future water resource use, supply and sewerage and flood risk management are key issues that need to be addressed in the County with regards to the location of existing and future development. It is now largely recognised that as a result of climate change we are to expect milder wetter winters, and hotter drier summers, which in turn is likely to lead to an increase of flooding episodes and water shortages in the County. Couple this with the WMRSS revision growth proposals and Worcester growth point status for increased housing in the County, then it is essential that the issues associated with water are identified and tackled.

Agriculture and its impact on the water environment will be an important issue for the WFD to address through its RBMPs, however it largely falls out of the scope of this paper, due to the limited impact that this paper could be expected to achieve. This is as a result of agricultural practices not needing to apply for planning permissions in many cases, due to Permitted Development rights. However the County Council will encourage sustainable agricultural development. For example the innovative use of water to reduce the impact on the environment.

Water should be used efficiently and where appropriate the use of SUDs, rainwater harvesting and recycling is encouraged. Reservoirs can provide a reliable source of water for irrigation (planning permission may be required dependent on the size of the of the reservoir proposed). Water can be abstracted during high flows for use during the drier growing season. Where an agricultural development does not fall under permitted development rights and planning permission is required the council would encouraged schemes that have added environmental, social and economic benefits.

The County Council will encourage through the work of the Land Drainage Partnership, riparian landowners to accept their responsibilities with maintaining watercourses on their land and seeking appropriate consent before they carry out work which might have an effect on the watercourse.

Water related issues within Worcestershire

This section will look at how issues can be addressed when preparing or responding to documents (WMRSS, Core Strategy, SFRA, SEA, SPD, and Community Strategy) by suggesting best practice examples.
Table 1.0 (on pages 28 & 29) identifies which documents these best practice examples are most applicable for. The full list of the best practice examples can be found in Appendix 7.

Location of development

As detailed in the supplement to PPS1, flood risk and ensuring sufficient water capacity of existing and potential infrastructure needs to be taken into account by plan makers (CLG, 2006d).

Best practice examples:

1. Take note of CAMS strategy and sustainable abstraction
3. Identify new sources of water supply for major developments
4. SUDS - Contribution of SUDS to good sustainable water management through their inclusion in development
8. Locate in areas with little or no risk from flooding or that will add to risk of flooding elsewhere
18. Where development or redevelopment has to take place in floodplains it should have conditions imposed to maximise flood resistance and resilience features

19. Local Authorities to produce Surface Water Management Plans (SWMP) to help reduce the impacts of flooding through new developments

20. Diversion of flood flows away from affected areas

26. For significant growth ensure sufficient water resource capacity exists avoiding areas that already experience or are predicted to experience shortfalls in water supply through over abstraction, drought and climate change

30. Consider the cumulative impacts of development. Not be detrimental to quality, quantity or natural flow of waters systems or its associated biodiversity.

31. All water issues to be considered as part of SA objective/process

34. Targeted promotion of water metering within areas of over abstraction

Sewerage Capacity

When planning for new development it is important that sufficient capacity exists within existing and potential new sewerage systems to accommodate new growth.

This may make it necessary in some circumstances for developers to carry out appropriate studies to ascertain whether the proposed development will lead to overloading of existing water and sewerage infrastructure. Developers will need to liaise with the Water Authority where a capacity problem exists and no improvements are programmed by the water company to agree what improvements are required and how they are to be funded. Appendix 8 contains examples of policy wordings that local planning authorities might want to consider including in their Core Strategies on this subject.

Rather than building new wastewater treatment facilitates it is more likely that that water companies will extend existing facilities. Sustainable water management schemes such as grey water recycling, reedbed systems rainwater harvesting and reducing water consumption can lessen the impacts on sewage treatment works.

Best practice examples:

4. SUDS - Contribution of SUDS to good sustainable water management through their inclusion in development

5. SUDS - Use green infrastructure to regulate water cycle and as part of flood management. Planting of vegetation can reduce surface ground runoff.

6. SUDS - Storm event mitigation. Rainwater capture.

7. SUDS - Discourage the paving over of drive ways and encourage the provision of soakaways, porous paving and green roofs, particularly in large developments having considerable amounts of roof and hard standing areas. Avoid development or impose special measures to prevent groundwater pollution from development sited within groundwater catchment zones

15. Promote the use of 'Checklist West Midlands' to developers

26. For significant growth ensure sufficient water resource capacity exists avoiding areas that already experience or are predicted to experience shortfalls in water supply through over abstraction, drought and climate change

31. All water issues to be considered as part of SA objective/process

40. Flood amelioration benefits can be gained through retaining and appropriately managing old grasslands and other long established habitats and land-cover and incorporating them into new development schemes where possible.

Surface, ground and fluvial flooding

'Floodplains may remain flooded for several days, acting as the natural regulator of the flow. This is a function that the planning system should promote and enhance' (CLG, 2006b).

Water storage should be incorporated into spatial plans and drainage 'pinch points' or barriers should be avoided. Holding water in the upper parts of catchments can reduce downstream flooding (Shaw et al, 2007).

The most effective way to manage flood risk is to reduce exposure to it through climate proofing developments by assessing the risk over the lifetime of the development and locating and designing development accordingly. Local Planning Authorities will need to consider flooding from all sources and use the Sequential test to steer all developments to areas with the lowest probability of flooding, particularly for vulnerable uses. The Exception Test will be applied by Local Planning Authorities in those areas where it is not possible to locate development in zones with a lower probability of flooding through the Sequential Test (CLG, 2006b and Shaw et al, 2007).

Reversion of flood plains to a more natural condition will enable huge improvements to floodwater mitigation, biodiversity enhancement/restoration, recreation value, green tourism opportunities etc within the county. Agri-chemicals associated with arable land-usage could be removed, if this land was not farmed in this way in areas where it was causing a problem - further reducing diffuse pollution, sedimentation of watercourses and soil erosion. Permanent grassland cut for hay or grazed can provide habitats for wildlife, retain ground water, silt/nutrient retention and storage of flood water.

Best practice examples:

4. SUDS - Contribution of SUDS to good sustainable water management through their inclusion in development
5. SUDS - Use green infrastructure to regulate water cycle and as part of flood management. Planting of vegetation can reduce surface ground runoff.
6. SUDS - Storm event mitigation. Rainwater capture.
7. SUDS - Discourage the paving over of drive ways and encourage the provision of soakaways, porous paving and green roofs, particularly in large developments having considerable amounts of roof and hard standing areas. Avoid development or impose special measures to prevent groundwater pollution from development sited within groundwater catchment zones
8. Locate in areas with little or no risk from flooding or that will add to risk of flooding elsewhere.
9. Consider floodplain realignment for existing critical services in flood risk areas
10. Evacuation routes planned in to those developments in flood risk areas
11. Restore minerals sites to areas for flood storage
12. Lower density development and high greenspace requirements in areas at risk of flooding
13. As part of SFRA, develop jointly with neighbouring LPA a local standard for design of developments in flood zones areas, with regard to climate change scenarios.

14. Withdrawing Permitted Development rights in areas of high risk of flooding e.g. paving over front gardens or conversions of ground floors to living accommodation

15. Promote the use of 'Checklist West Midlands' to developers

16. Floodplains should not be developed, allowing them to flood, acting as a natural regulator of flow (Safeguarding land for flooding).

17. New development in existing areas should improve water management/drainage of the area.

18. Where development or redevelopment has to take place in floodplains it should have conditions imposed to maximise flood resistance and resilience features.

19. Local Authorities to produce Surface Water Management Plans (SWMP) to help reduce the impacts of flooding through new developments

20. Diversion of flood flows away from affected areas

21. Diversion of flood flows away from vulnerable areas or constructing a second flow channel

22. Flood attenuation and temporary water storage, including use of greenspace and sacrificial areas (e.g. sport fields and car parks)

23. Widening drains to increase capacity, fitting one way valves in drains to prevent backflows, managing flood pathways and removing pinch points so that heavy rainfall can drain away

24. Retro fitting existing properties that are at risk of flooding or have flooded to cope with further flooding events, such as: using flood resilient materials, raising of floor levels and electrical fittings.

25. Where flooding is a particular problem the LPA should set out its specific approach

28. Creation of biodiversity rich wetlands and restoration of natural wetland function, especially in areas of high risk of surface water flooding.

29. Creation of wet woodlands and the removal of field drains upstream of settlements prone to flooding

31. All water issues to be considered as part of SA objective/process

33. Reduce water consumption - Through installation of grey water recycling and rain water harvesting systems. Code for Sustainable Homes

38. Effects of climate change considered for the design life of buildings/ development (climate proofing developments for flood risk and water supplies)

39. Adopt National Indicator 188 Adapting to climate change

40. Flood amelioration benefits can be gained through retaining and appropriately managing old grasslands and other long established habitats and land-cover and incorporating them into new development schemes where possible.

Sir Michael Pitt was asked by government ministers to conduct an independent review into the 2007 June, July floods. The final report, The Pitt Review: Lessons learned from the 2007 floods, was published in June 2008. Over 90 recommendations were made and the following are of particular relevance to this paper. (Government will be making their response to the report in Autumn 2008).

Recommendation 7:
There should be a presumption against building in high flood risk areas, in accordance with PPS25, including giving consideration to all sources of flood risk, and ensuring that developers make a full contribution to the costs both of building and maintaining any necessary defences.

Recommendation 8:
The operation and effectiveness of PPS25 and the Environment Agency's powers to challenge development should be kept under review and strengthened if and when necessary.

Recommendation 9:
Householders should no longer be able to lay impermeable surfaces as of right on front gardens and the Government should consult on extending this to back gardens and business premises.

Recommendation 10:
The automatic right to connect surface water drainage of new developments to the sewerage system should be removed.

Recommendation 11:
Building Regulations should be revised to ensure that all new or refurbished buildings in high flood-risk areas are flood-resistant or resilient.

Recommendation 12:
All local authorities should extend eligibility for home improvement grants and loans to include flood resistance and resilience products for properties in high flood-risk areas.

Recommendation 13:
Local authorities, in discharging their responsibilities under the Civil Contingencies Act 2004 to promote business continuity, should encourage the take-up of property flood resistance and resilience by businesses.

Recommendation 14:
Local authorities should lead on the management of local flood risk, with the support of the relevant organisations.

Recommendation 15:
Local authorities should positively tackle local problems of flooding by working with all relevant parties, establishing ownership and legal responsibility.

Recommendation 16:
Local authorities should collate and map the main flood risk management and drainage assets (over and underground), including a record of their ownership and condition.

Recommendation 17:
All relevant organisations should have a duty to share information and cooperate with local authorities and the Environment Agency to facilitate the management of flood risk.

Recommendation 18:
Local Surface Water Management Plans, as set out under PPS25 and coordinated by local authorities, should provide the basis for managing all local flood risk.

Recommendation 19:
Local authorities should assess and, if appropriate, enhance their technical capabilities to deliver a wide range of responsibilities in relation to local flood risk management.

Recommendation 27:
Defra, the Environment Agency and Natural England should work with partners to establish a programme through Catchment Flood Management Plans and Shoreline Management Plans to achieve greater working with natural processes.

Recommendation 86:
The Government should publish an action plan to implement the recommendations of this Review, with a Director in Defra overseeing the programme of delivery and issuing regular progress updates.

Water supply/infrastructure

Local Planning Authorities need to recognise that improvements to water distribution infrastructure will be required to provide water supplies to new housing. Demands on the water supply and wastewater infrastructure have to be reduced. Appendix 8 contains examples of policy wordings that local planning authorities might want to consider including in their Core Strategies on this subject.

Best practice examples:

1. Take note of CAMS strategy and sustainable abstraction

2. Prepare Infrastructure Delivery Plans for large developments (e.g. 3,000 to 5,000 homes) to co-ordinate and identify infrastructure needs, planning and delivery (EA, nd).

3. Identify new sources of water supply for major developments

15. Promote the use of 'Checklist West Midlands' to developers

26. For significant growth ensure sufficient water resource capacity exists avoiding areas that already experience or are predicted to experience shortfalls in water supply through over abstraction, drought and climate change

31. All water issues to be considered as part of SA objective/process

32. Reduce water consumption - Xeriscaping- creating landscapes that do not require irrigation.

36. Reduce water consumption - by encouraging the retrofitting of existing properties to install grey water recycling and rainwater harvesting systems. Code for Sustainable Homes

37. Reduce water consumption - encourage the installation of white goods and household facilities that use less water

Biodiversity enhancement and provision of green infrastructure

Local Planning Authorities and developers should look wherever possible to engineer biodiversity gain into development and water management infrastructure retaining features of biodiversity importance and habitats and protect them during construction.

Compensation should be provided through the creation of replacement habitats or other appropriate measures provided when loss to existing habitats is unavoidable.

There is huge potential for habitat creation, particularly in the floodplains where they also offer flood mitigation / storm-water storage potential etc. S106[6] agreements and biodiversity banking for developments that do not have any direct opportunities for biodiversity gain are ways in which to fund these improvements.

The north-south river corridors aid species' movement and need to be in good ecological health to facilitate this.

There are potential positive opportunities in the creation of new ponds for stock watering and irrigation and conservation of water stocks and decreased reliance on piped/mains water, plus habitat creation. This would facilitate increased usage of rainwater rather than unnecessarily treated/piped/pumped water. New development should incorporate permeable ground surfaces in to proposals and regulate surface water from impermeable surfaces.

Green infrastructure is the network of land and water that is made up of green spaces and natural elements, connecting cities, towns and villages. The provision of green infrastructure can have many social, economic and environmental benefits. Some of the benefits include; protecting, restoring and de-fragmenting habitats, supporting species that are threatened by climate change, agricultural intensification and urban sprawl. It provides areas for recreation and also contributes to sustainable management of

[6] *Section 106 agreements are legal agreements between a Planning Authority and a developer, or undertakings offered unilaterally, by a developer, to mitigate any adverse impacts of a development by ensuring that certain extra works are undertaken as part of the planning permission*

water. When Green Infrastructure is in place it can aid improved water quality by reducing sediment runoff / sediment capture, agri-chemical capture and flood prevention, by minimising direct surface runoff/improved rainwater capture in to watercourses and sewerage systems and acting as a flood storage area (Mitchell, R.J., et al, 2007).

Best practice examples:

4. SUDS - Contribution of SUDS to good sustainable water management through their inclusion in development

5. SUDS - Use green infrastructure to regulate water cycle and as part of flood management. Planting of vegetation can reduce surface ground runoff.

6. SUDS - Storm event mitigation. Rainwater capture.

27. Enhancement - Wherever possible engineer biodiversity gain into development and water management infrastructure. S106 and biodiversity banking for developments that do not have any direct opportunities for biodiversity gain. Compensation through the creation of replacement habitats or other appropriate measures provided when loss to existing habitats is unavoidable.

28. Creation of biodiversity rich wetlands and restoration of natural wetland function, especially in areas of high risk of surface water flooding.

29. Creation of wet woodlands and the removal of field drains upstream of settlements prone to flooding

30. Consider the cumulative impacts of development. Not be detrimental to quality, quantity or natural flow of waters systems or its associated biodiversity

31. All water issues to be considered as part of SA objective/process

40. Flood amelioration benefits can be gained through retaining and appropriately managing old grasslands and other long established habitats and land-cover and incorporating them into new development schemes where possible.

Water Quality

Water quality issues need to be tackled to ensure that the targets in the Water Framework Directive are met. Therefore plan makers have to do what they can to improve water quality in order to meet WFD objectives.

Best practice examples:

4. SUDS - Contribution of SUDS to good sustainable water management through their inclusion in development

5. SUDS - Use green infrastructure to regulate water cycle and as part of flood management. Planting of vegetation can reduce surface ground runoff.

6. SUDS - Storm event mitigation. Rainwater capture.

7. SUDS - Discourage the paving over of drive ways and encourage the provision of soakaways, porous paving and green roofs, particularly in large developments having considerable amounts of roof and hard standing areas. Avoid development or impose special measures to prevent groundwater pollution from development sited within groundwater catchment zones.

30. Consider the cumulative impacts of development. Not be detrimental to quality, quantity or natural flow of waters systems or its associated biodiversity

31. All water issues to be considered as part of SA objective/process

Water efficiency in developments

Communities and Local Government and Defra in 2008 will introduce amendments to Building Regulations to set a whole building performance standard for new homes. That will mean to comply with building regulations all new home will have to be built so that water usage can not exceed 125 litres per person per day (CLG and Defra, 2007). This will be the equivalent to level one of the Code for Sustainable Homes. As earlier stated the RSS Phase Two Revision Preferred Option will be looking for all new homes to meet or exceed the water conservation standards in level 4 of the Code for Sustainable Homes.

Local authorities and community strategies should promote the use of the Code for Sustainable homes. Water efficiency measures incorporated into new builds as with the code for sustainable homes can help reduce water consumption (CLG, 2006a, December). The products that we put in our home can also help to reduce water usage, by selecting those that use less water, these can be fitted both into new properties and retro-fitting in existing properties. However retro-fitting in existing properties is largely beyond the scope of this paper. The Severn Trent Water (nd) Your guide to saving water, provides ideas on how homeowners can make water efficiency saving in their homes.

New developments should incorporate water efficiency measures. These can be in the form of grey water recycling, rainwater harvesting systems and installing household items that take less water. Economic savings may be made by the use of water metering, water recycling, rainwater harvesting and installing household items that use less water. Environmental benefits and social benefits through a 'feel good' factor will be achieved, by reducing carbon footprints.

Given that Worcestershire has been categorised under the Catchment Abstraction Management Strategies (p6-7) at low flows as having water resources which are *over licensed, over abstracted* and where *no water is* available, increased housing figures under the WMRSS revision and the forecasted increase in water usage per person will put even more pressure on water supplies in certain areas. Encouraging water efficiency in new developments will aid this situation, dependant on the amount that is achieved (as demonstrated in water supply above)

Best practice examples:

4. SUDS - Contribution of SUDS to good sustainable water management through their inclusion in development
6. SUDS - Storm event mitigation. Rainwater capture.
15. Promote the use of 'Checklist West Midlands' to developers
31. All water issues to be considered as part of SA objective/process
33. Reduce water consumption - Through installation of grey water recycling and rain water harvesting systems. Code for Sustainable Homes
34. Targeted promotion of water metering within areas of over abstraction
35. All new homes to be built to at least level 4 for water of the Code for Sustainable Homes, seeking water neutral development in areas of water stress.
36. Reduce water consumption - by encouraging the retrofitting of existing properties to install grey water recycling and rainwater harvesting systems. Code for Sustainable Homes

37. Reduce water consumption - encourage the installation of white goods and household facilities that use less water

38. Effects of climate change considered for the design life of buildings/ development (climate proofing developments for flood risk and water supplies)

Adapting to climate change

The use of SUDS and in particular green roofs and porous paving to adapt to the effects of climate change through alleviating storm run-off.

There needs to be long term integrated planning for urban flood management. A strategic body needs to lead this planning. Local authority led Surface Water Management Plans (SWMPs) should be developed (EA, 2007f).

Best practice examples:

4. SUDS - Contribution of SUDS to good sustainable water management through their inclusion in development

5. SUDS - Use green infrastructure to regulate water cycle and as part of flood management. Planting of vegetation can reduce surface ground runoff.

6. SUDS - Storm event mitigation. Rainwater capture.

7. SUDS - Discourage the paving over of drive ways and encourage the provision of soakaways, porous paving and green roofs, particularly in large developments having considerable amounts of roof and hard standing areas. Avoid development or impose special measures to prevent groundwater pollution from development sited within groundwater catchment zones.

13. As part of SFRA, develop jointly with neighbouring LPA a local standard for design of developments in flood zones areas, with regard to climate change scenarios.

15. Promote the use of 'Checklist West Midlands' to developers

31. All water issues to be considered as part of SA objective/process.

36. Reduce water consumption - by encouraging the retrofitting of existing properties to install grey water recycling and rainwater harvesting systems. Code for Sustainable Homes

37. Reduce water consumption - encourage the installation of white goods and household facilities that use less water

38. Effects of climate change considered for the design life of buildings/ development (climate proofing developments for flood risk and water supplies)

39. Adopt National Indicator 188 Adapting to climate change.

40. Flood amelioration benefits can be gained through retaining and appropriately managing old grasslands and other long established habitats and land-cover, and incorporating them into new development schemes where possible.

Table 1.0 The County Council and Environment Agency suggest that the issues raised in this paper can be addressed in the preparation of planning policy and through community strategies in the following ways but it does not avoid need for Local Planning Authority to consult with the Environment Agency and Severn Trent Water.

Water related issues within Worcestershire	WM RSS	Sustainabie Community Strategy & Local Area Agreement	Sustainability Appraisal	Local Development Framework								
				Waste Core Strategy	Minerals Core Strategy	Core Strategy				SPD	Area Action Plans	Site Specific Allocations
						SWJC	WF	Red	Brom			
Location of development	3	1	8	1	1	1	1	1	1	1	1	1
	8	4	31	4	4	4	4	4	4	4	4	4
	26	34		8	30	8	8	8	8	8	8	8
	30			30		19	19	19	19	20	18	20
	31					26	26	26	26		20	30
						30	30	30	30	30	30	
						40	40	40	40	40	40	
Sewerage capacity	31	7	31			4	4	4	4	4	4	4
		15				5	5	5	5	5	5	5
						6	6	6	6	6	6	6
						7	7	7	7	7	7	15
						15	15	15	15	15	15	
						26	26	26	26			
Surface, ground and fluvial flooding	8	5	31	4	4	4	4	4	4	4	4	4
	9	6		5	5	5	5	5	5	5	5	5
	11	7		6	6	6	6	6	6	6	6	8
	12	9		8	11	7	7	7	7	8	8	16
	13	23		16	16	8	8	8	8	15	15	19
	14	24		17	17	9	9	9	9	18	16	
	25	38		18	18	10	10	10	10	19	19	
	31	39		20	20	12	12	12	12	22	22	
				33	22	13	13	13	13			
					33	14	14	14	14			
						15	15	15	15			
						16	16	16	16			
						17	17	17	17			
						18	18	18	18			
						19	19	19	19			
						20	20	22	20			
						21	21	25	21			
						22	22	28	22			

KEY: SWJCS - South Worcestershire Joint Core Strategy (Worcester City, Malvern Hills, Wychavon)
WF - Wyre Forest District Council **Red** - Redditch Borough Council **Brom** - Bromsgrove Borough Council

Table 1.0 (continued). The County Council and Environment Agency suggest that the issues raised in this paper can be addressed in the preparation of planning policy and through community strategies in the following ways but it does not avoid need for Local Planning Authority to consult with the Environment Agency and Severn Trent Water.

Water related issues within Worcestershire	WM RSS	Sustainable Community Strategy & Local Area Agreement	Sustainability Appraisal	Local Development Framework								
				Waste Core Strategy	Minerals Core Strategy	Core Strategy				SPD	Area Action Plans	Site Specific Allocations
						SWJC	WF	Red	Brom			
Surface, ground and fluvial flooding						25	25	29	25	40	40	
						28	28	38	28			
						29	29	40	29			
						38	38		38			
						40	40		40			
Water supply/ infrastructure	3	32	31			1	1	1	1	1	1	1
	26	36				2	2	2	2	15	2	2
	31	37				15	15	15	15		15	15
						26	26	26	26			
Biodiversity enhancement and the provision of green infrastructure	31	4	30	4	4	4	4	4	4	4	4	4
		5	31	5	5	5	5	5	5	5	5	5
		6		6	6	6	6	6	6	6	6	6
		27		27	27	27	27	27	27	27	27	27
		28		30	30	30	30	30	30	40	40	
		29				28	28	28	28			
						29	29	29	29			
						40	40	40	40			
Water Quality	30	4	31	4	4	4	4	4	4	5	5	5
	31	5		5	5	5	5	5	5	6	6	6
		6		6	6	6	6	6	6	7	7	7
		7		30	30	7	7	7	7		30	30
						30	30	30	30			
Water efficiency in developments	31	6	31			4	4	4	4	4	4	4
	35	33	33			6	6	6	6	6	6	6
		34				15	15	15	15	15	15	15
		35				33	33	33	33	38		
		36				35	35	35	35			
		37				37	37	37	37			
		38										
Adapting to Climate Change	7	7	31	4	4	4	4	4	4	4	4	4
	31	15		5	5	5	5	5	5	5	5	5
	36	36		6	6	6	6	6	6	6	6	6
	37	37				13	13	13	13	15	15	15
	38	38				15	15	15	15	40	40	
		39				38	38	38	38			
						40	40	40	40			

KEY: **SWJCS** - South Worcestershire Joint Core Strategy (Worcester City, Malvern Hills, Wychavon)
WF - Wyre Forest District Council **Red** - Redditch Borough Council **Brom** - Bromsgrove Borough Council

5. Monitoring and Further Work

Monitoring

As chapter 4 illustrates the implementation of the suggested actions in this paper will principally be via various planning policy documents. These will each in turn be monitored by Local Planning Authorities who will report on progress through their Annual Monitoring Reports (AMR). For each of the water related policies included in the planning documents there will need to have an associated indicator. This may require the development of additional indicators but existing indicators, for which AMR's may use, are already being collated in the County via the Worcestershire Partnership Environment Group's State of the Environment Report *(www.worcestershirepartnership.org.uk/wpeg/soe)* and includes data for Worcestershire on:

- River water quality (chemical).
- River water quality (biological).
- Number of properties at risk of flooding

Information reporting, again via the Local Planning Authority AMR, on the significant sustainability effects forecast in the Sustainability Appraisal but also Strategic Environment Assessments of other plans, will provide data on the water quality and quantity and flooding.

Other existing sources of indicators at a UK and regional scale include Defra's Sustainable Development Indicators in your Pocket 2007; West Midlands Regional Assembly Regional Spatial Strategy Annual Monitoring Report; and Environment Agency's annual State of the Environment in the West Midlands. These include additional indicators although at a national scale only on:

- Total abstractions from non-tidal surface and ground water, leakage losses and Gross Domestic Product
- Domestic water consumption, litres per person per day
- Water Stress - assessments of water availability

Severn Trent Water produces a monitoring report for OFWAT, their economic regulator, on their work programme, which includes baseline information on water supply and investment programme as well as an annual report and sustainability report.

The Local Area Agreement from 2008 onwards will also seek to include indicators relating to the water environment and these will be reported on an annual basis.

As work on the Water Framework Directive progresses there will be developed a detailed monitoring programme to assess progress towards achieving targets.

Further work

As the topic of water planning is a relatively new policy arena for the planning system it is proposed that this paper be reviewed and updated on a regular basis. This will enable suggested actions in the paper to be revised the evidence base improved and the legislative requirements, in particular with regard to implementation of the Water Framework Directive within Worcestershire updated and reported on. Government will be responding to the Pitt Review report in Autumn 2008, the

Environment Agency, draft River Severn River Basin Management Plan is due out in December 2008, Severn Trent, Water Resources Plan is due to be published in Spring 2009. A significant but essential challenge will be to refine the data in the monitoring reports to a Worcestershire and district scale so as to help establish the future evidence base. Future drafts of this paper will attempt to be more location specific.

Examples of areas of work that could be progressed further by Local Planning Authorities and others:

- Review the contents of this paper in 2009, to take account of any newly published water related plans (see previous page).
- Defining and mapping critical infrastructure in relation to flood risk
- Continue to respond to consultations on water related issues.
- Continued working with Severn Trent Water on infrastructure needs in light of the WMRSS.

Appendices

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Appendix 2. Roles and Responsibilities of key players

Organisation	Role and Responsibility	Document
Environment Agency	The Environment Agency has a large number of duties and powers to regulate and manage the water environment. The main duties are as follows: • To maintain or improve any watercourses which are designed as Main Rivers; • To maintain or improve any sea or tidal defences; • To install and operate flood warning equipment; • To control actions by riparian owners and occupiers which might interfere with the free flow of watercourses; and • To supervise internal drainage boards. Environment Agency has statutory responsibility for flood management and defence and manage flood risk to existing properties and assets. They are also responsible for producing River Basin Management Plans under the Water Framework Directive. The Environment Agency can also provide baseline data to inform SFRA.	River Basin Management Plans under the Water Framework Directive. Also provide baseline data to inform SFRA. Catchment Flood Management Plans Catchment Abstraction Management Strategies Water Level Management Plans
Local Authorities and West Midlands Regional Assembly	Planning Regional and local planning authorities are responsible for assessing flood risk as they prepare regional and local development plans, and local planning authorities are responsible for ensuring developers assess flood risk for their development proposals. At the Local Authority level the keys areas include Spatial Planning and Emergency Planning. They have statutory powers to manage flood risk to existing properties and assets. Local Authorities produce Core Strategies and Area Action Plans and Supplementary Planning Documents to make up the Local Development Framework. As part of this Local Authorities are required to carry out Strategic Flood Risk Assessments as documented in PPS25, these can inform and be informed by Sustainability Appraisals. The River Basin Management Plan, produced as required by the WFD, will not be completed until 2009. However Local Authorities need to take account of it now and ensure that achievement of the UK compliance with EC Directives is not comprised. It is expected that this is achieved by Local Authorities engaging in the RBMP process, identifying the relevant water issues, helping to achieve the WFD objectives and including the priorities in the plans they produce. Emergency Planning Produce the County Flood Plan which was developed to facilitate a multi agency response framework which was designed to mitigate the impact of flooding episodes in the future.	LDD WMRSS
Worcester Land Drainage Partnership Members: *Worcestershire County Council, Bromsgrove District Council, Malvern Hills District Council, Redditch Borough Council, Worcester City Council, Wychavon District Council, Wyre Forest District Council, the National Farmers' Union, the Country Landowners' Association, the Environment Agency, Malvern Hills Conservators, Severn Trent Water (invited)*	Following floods in 2007, the lead organisations with responsibility for ensuring the maintenance of water-courses such as streams, ditches, culverts and associated structures have agreed to: • Work together to reduce the likelihood of flooding by promoting and, where appropriate implementing, robust maintenance regimes. • Share and disseminate best practice between responsible bodies. • Make domestic riparian landowners more aware of their rights and responsibilities. • Maintain and improve communication channels between responsible bodies. • Work together to monitor the success of joint working.	

Organisation	Role and Responsibility	Document
Severn Trent Water	STW have statutory duty to provide potable water as well as treating and disposing of it.	Water Resource Management Plans (WRMP)
South Staffordshire Water	South Staffordshire Water has statutory duty to provide potable water and treating.	Water Resource Management Plans (WRMP)
Welsh Water	Welsh Water have statutory duty to provide potable water as well as treating and disposing of it.	Water Resource Management Plans (WRMP)
Internal Drainage Boards (IDBs)	Internal Drainage Boards (IDBs) are independent bodies, created under various statutes to manage land drainage in areas of special drainage need. These areas include not only agricultural land but also large urban areas. Each Board operates within a defined area in which they have permissive powers under the Land Drainage Act 1991 to undertake flood defence works, other than on watercourses that have been designated as 'Main'.	
British Waterways	British Waterways is a public corporation. Managing and more than 2,200 miles (3,540 km) of canals and rivers in England, Scotland and Wales.	
Natural England	Natural England works for people, places and nature, to enhance biodiversity, landscapes and wildlife in rural, urban, coastal and marine areas; promote access, recreation and public well-being; and contribute to the way natural resources are managed so that they can be enjoyed now and in the future.	
Local Strategic Partnership	The Worcestershire Partnership is the Local Strategic Partnership for the county of Worcestershire. A cross-sectoral, multi agency partnership that provides a strategic lead on a wide range of issues that effect the quality of life of Worcestershire residents. There are also Local Strategic Partnerships operating in each District.Their tasks include: • Coordinating Worcestershire's Local Area Agreement Supporting the Worcestershire Partnership Board and Task Groups. • Providing a co-ordinating function between the different elements of the Partnership. • Supporting specific Partnership projects and project managing work comissioned by the Partnership • Preparing, monitoring and implementing the County wide Community Strategy • Producing the Annual Update to the Community Strategy • Promoting the Worcestershire Partnership at events across the County	LAA/Community Strategy

Appendix 3. Code 6 of the Code for Sustainable Homes for water

To meet level 6, homes will have to be designed to use no more than about 80 litres of water per person per day. This could be achieved by fitting such items as:

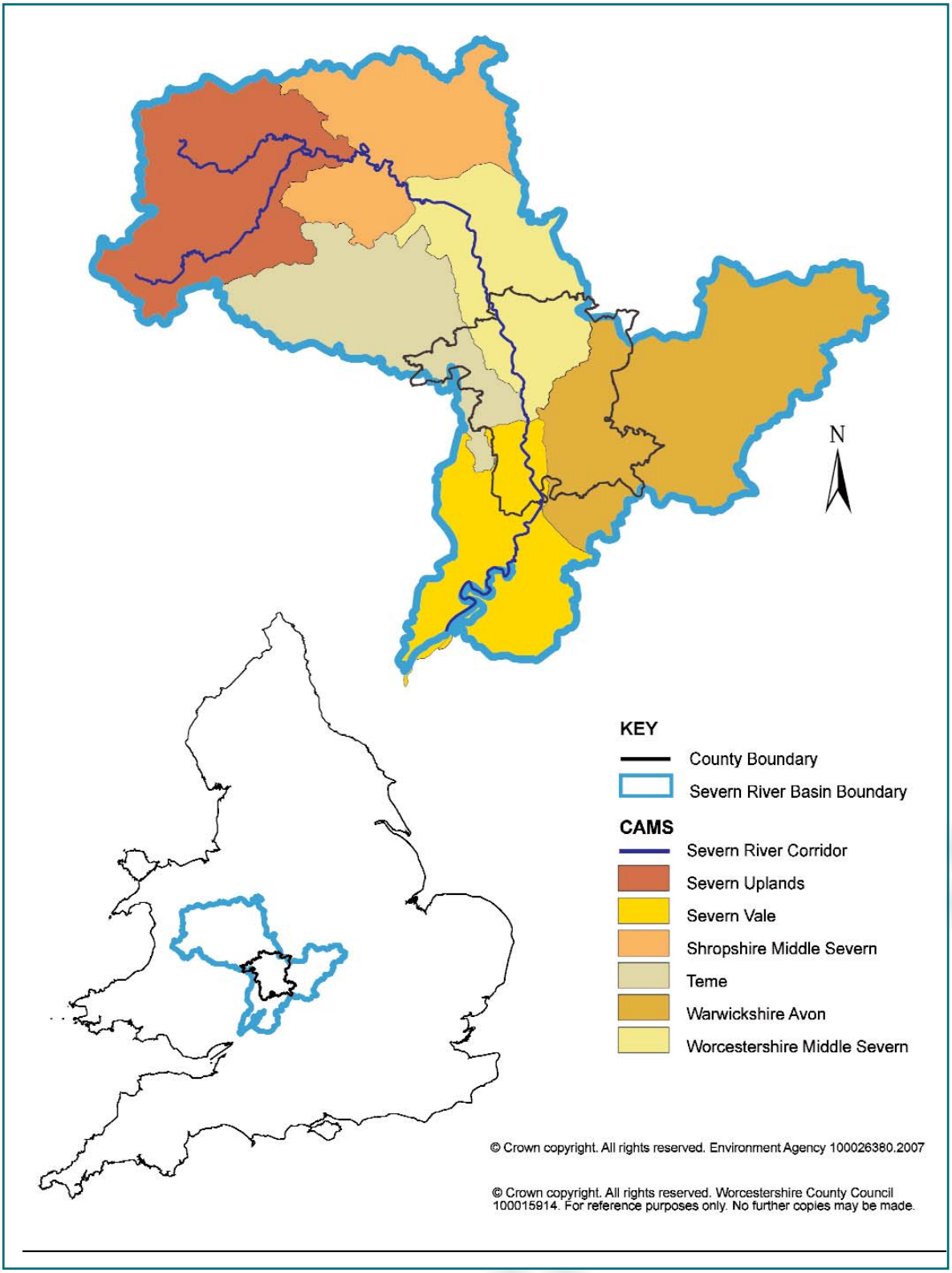
- 6/4 Dual Flush WC;
- Flow Reducing/Aerating taps throughout;
- 6-9 litres per minute shower (note that an average electric shower is about 6/7 liters per minute);
- a smaller, shaped bath - still long enough to lie down in, but less water required to fill it to a level consistent with personal comfort;
- 18 litres maximum volume dishwasher;
- 60 litres maximum volume washing machine.

To achieve the standard would also mean that about 30% of the water requirement of the home is provided from non-potable sources such as rainwater harvesting systems or grey water recycling systems. Other minimum requirements are required for:

- Surface water management - this may mean the provision of soakaways and areas of porous paving;

Source: *Code for Sustainable Homes, 2006a, CLG*

Appendix 4. Coverage of Catchment Abstraction Management Strategy within the Severn River Basin District



Appendix 5. Water related facts and figures

Climate change

- Predicted that by 2020 summer rainfall will have decreased by 12% (Caven, 2004).
- Annual mean precipitation is expected to decrease by less than 13%. (Caven, 2004).
- Extreme weather events such as intense rainfall can collect more pollution from urban areas and agricultural land and scour riverbanks contributing to pollution and an increase in sediment in rivers (Environment Agency 2007d).
- Approximately 10% of the land area of Worcestershire is at risk of flooding (about 167km2). After Herefordshire, Worcestershire has the second highest percentage of total land at risk from flooding in the West Midlands. There are over 9,146 properties at risk of flooding - approx. 4% of the total number of properties. 38% of the 9,146 properties are at significant risk; 30% are at moderate risk; 32% are at low risk. Worcestershire has the 3rd highest number of properties at 'high' risk in the West Midlands (Pers Comm: Environment Agency 2008).
- 3 planning applications were approved contrary to Environment Agency advice on flood risk grounds in Worcestershire in 2005/06; all were minor developments.
  - Worcestershire County Council: a minor educational development
  - Wychavon District Council: a minor residential development
  - Malvern Hills District Council: a minor agricultural development
- The June/ July floods of 2007 affected all districts in the County, albeit to different degrees. This was largely as a result of intense rainfall falling in the County over short periods of time, leading to flash floods and fluvial flooding. Badly hit were the towns of Tenbury, Pershore and Evesham (Lammas and Alston, 2007). Chapter 3 contains a description of flood types that occur in Worcestershire.
- Closure of roads as a result of flooding impacts on the emergency services and has an economic impact when people and products are unable to or are delayed in reaching their destination. Also diversions generally cause increased journey miles and therefore vehicular emissions, plus increase traffic loading along otherwise little-used roads and through settlements.
- Warmer drier summers may reduce flow to rivers, which can create conditions that are favourable for invasive species (Environment Agency, 2007d).
- Predicted that climate change will lead to an increase in the occurrences of heat waves and drought events (Lammas and Alston, 2007)
- As summer months become drier, agriculture in the south of the county will begin to suffer more from the effects of drought (Lammas and Alston, 2007) with demand for water often peaking in drought periods.
- Both drought and flooding can lead to the subsistence of buildings and roads (Lammas and Alston, 2007). The summer floods also revealed the potentiality for slumping of saturated hillside soils (e.g. The Vineyards, nr. Knightwick and the hillside nr. Hamm Castle, Shelsley Beauchamp) and Severn Valley Railway.

- The table 1.1 below shows a correlation between soil disturbance and permeability; demonstrating that the longer soils are left uncultivated the greater will be their infiltration rate. Many semi-natural habitat types, for example woodland, heathland, wetland and species-rich grassland are frequently recognised and offered varying degrees of protection for their biodiversity importance, however Worcestershire also retains a considerable semi-natural 'old grassland' resource that is likely to provide significant protection from flooding (Holtan, HN and Kirkpatrick, MH, 1950 and Claxton, M, 2008).

Table 1.1 Infiltration rates and Land-use type

Land-use type	Infiltration Rate (mm per hr)
Old permanent pasture	60
4-8 year old pasture	36
3-4 year old pasture, lightly grazed	30
Permanent pasture, moderately grazed	24
Hay meadow	17
Permanent pasture, heavily grazed	15
Strip cropped, mixed cover	11
Arable	10
Bare soil, cultivated	95
Bare soil, crusted	60

Source: Holtan, HN and Kirkpatrick, MH, 1950 and Claxton, M, 2008

Development

- The WMRSS revision proposes 36,600 homes in Worcestershire during 2006-2026; Worcester and Redditch are proposed as Settlement of Significant Development. Worcester City is also a growth point. This is likely to put pressure on water resources and wastewater infrastructure.
- 2006 -2007 Worcestershire water supply was 94ML from Groundwater, 73 ML from Surface water (51 ML Strensham, 21ML Trimpley, 2ML Mythe) with an additional ML from Frankly Reservoir 11 (Pers Comm Severn Trent Water)
- Taking account of actual and forecasted demand for water, the existing and forecast water availability and population growth, Worcestershire is a moderate area for water stress (Environment Agency 2007b)
- Limited headroom for sustainable supply of water from the River Severn and aquifers in the north west of the County (Environment Agency 2007c).
- Worcestershire resource availability for surface water and/or surface water combined with groundwater is demonstrated in the CAMS diagrams in Appendix 6. It demonstrates that the County faces areas with no water availability, areas that are over licensed and areas that are over abstracted.
- Transferring large amounts of water from areas of surplus to those in deficit is possible, however it can be extremely expensive to do. Severn Trent Water operates a Strategic Water Grid that links approximately 2/3 of its area, by linking up water treatment works on the River Severn to Coventry where water from the East Midlands meets. The Environment Agency's 2007 consultation paper, 'Developing our Water Resources Strategy for England and Wales' states that water resources should be shared locally between companies and sectors. STW and South Staffordshire Water have the ability to share water resources (Pers Comm Severn Trent, 2007).

- It can take between 20-25 years to plan and build for a reservoir, approximately 10 years for a new river abstraction, 2 to 3 years for a new ground water abstraction site and over 5 years for large waste water infrastructure (Environment Agency, 2007c, Pers Comm Severn Trent)
- Sewerage infrastructure was unable to deal with the floods in June/July 2007.
- Development of new water resources, treatment and distribution infrastructure will be required in future to serve the projected housing growth rates (Mott MacDonald, 2007).
- The Restoring Sustainable Abstraction Programme identifies sites where unsustainable abstraction could be having an impact on the environment. The programme investigates the sites and then identifies potential options that are appraised to implement a solution to remove the risk of potential future damage to the environment (Environment Agency, 2007b) Table 1.2 contains details of the Restoring Sustainable Abstraction Programme in Worcestershire.

Table 1.2 Areas of Restoring Sustainable Abstraction

Site name	NGR
Bow Brook	SO940570
Hewell Park Lake	SP100690
Battlefield Brook	SO94870270582
Blakedown Valley (including Hurcott and Podmore)	SO 854 779
AMP 4 Investigation Sites **Site name**	**NGR**
Hoo Brook	SO8345874728
SSSI Investigation **Site name**	**NGR**
Ashmoor Common	SO854464
Bittell Reservoirs	SP018750
Ipsley Alders Marsh	SP078676
Hartlebury Common and Ditch	SO 824 707
Puxton and Stourvale Marsh	SO 828 777
Shrawley Wood	SO 808 660
Habitats Directive Sites **Site name**	**NGR**
Severn Estuary	ST480830
Severn Estuary (Upper)	SO720068
New Sites **Site name**	**NGR**
Kingsford Brook, Wolverley	SO8294679320

Source: Pers Comm: Environment Agency, 2007

Domestic

- We have much less water per person in England and Wales than most Mediterranean countries, due to population densities and the increasing demand for water. Average water usage per person in England and Wales is 151 litres of water a day. People who live in Worcestershire used on average between 130-149 litre of water a day (EA, 2007b).
- In 2002 the majority of water abstracted in the Severn Catchment area was for public water supplies at just over 72%. Industry abstracted 12% of the total volume of water abstracted in that year. In Worcestershire during 2006-2007 53% of the County's water supply (94Ml) was abstracted from ground water supplies (Severn Trent water, pc).
- There are 138 sewage works in the county. The biggest are Worcester and Kidderminster which serve the population equivalent of just over 100,000 people. 7 Sewage Treatments Works (Alvechurch, Blackminster, Bromsgrove/Fringe Green, Droitwich/Ladywood, Pershore (Tiddesley Wood), Redditch Priest Bridge, and Worcester (serving over 10,000 people) are either at high or medium risk of putting pressure on sewage treatment infrastructure, if new development occurs (Environment Agency, 2007d)
- Within the Severn Trent Water's Severn zone there is a 40Ml/d headroom deficit, (about 6%). New water supply infrastructure outlined within Severn Trent's 2004 Water Resource Management Plan will provide additional water resources. However, additional projected housing growth included in the WMRSS would bring the area back into deficit at points between 2011-2016 and 2019-2024, although precise figures are not available. 25% water efficiency measures, as could be achieved by all new housing meeting Level 3 of the Code for Sustainable Homes, would reduce the size and duration of those deficits and possibly delaying and reducing the requirements for additional water resource developments. (Environment Agency, 2007c).
- New development can lead to the creation of large impermeable surfaces that drain into piped draining systems. Natural infiltration into the ground is therefore inhibited, with the corresponding reduction in ground water and surface water recharge (Faber Maunsell (2007).

Agriculture/Forestry

- Soil moisture will decrease annually by between 12% and 23%, up until 2080 when it is expected to decrease by between 22% and 42%. Dryer soil will call for higher levels of irrigation (Caven, 2004) or a switch to less 'thirsty' crop/forage types.

- The amount of water abstracted for agriculture purposes is low, when compared to the amounts abstracted for public water supply. However abstraction levels for agriculture are often at the highest during the summer months when water levels are naturally (or generally) lower (Environment Agency, 2007b).
- Agriculture and forestry practises are responsible for much of the diffuse pollution in rural areas. This pollution can be made worse where compaction and capping of the soil occurs leading to increase runoff from fields and increasing the possibility of flooding (Environment Agency 2007a).
- Insensitive felling techniques - particularly large machine-clear felling, exposes large expanses of un-vegetated soil to erosion/soil run-off, often for several years - a problem that is particularly acute on steep slopes
- The production of biofuels as a fuel source to combat the effects of climate change is an issue that is addressed through the County Councils Draft technical research paper on Planning for renewable energy, as part of its overall approach to Natural Resource Planning and Management in Worcestershire. A requirement of this energy type is a substantial amount of water. This could put pressure on those areas already under water stress and the abstraction of water could have environmental impacts. This issue will need to be addressed through the above paper.

Water Biodiversity

- Otter, water vole, white-clawed crayfish, Twaite and Allis Shad, common club-tail, black popular and Ribbon-Leaved Water Plantain (Westwood) are protected species within Worcestershire.
- Many of Worcestershire's open water bodies have ornithological importance.
- The Severn and Avon rivers are important to the Club tailed Dragonfly (a BAP priority species) and of many streams and ponds to dragonflies in general.
- The watercourses around Bromsgrove provide important habitats for water voles.
- An increase in the abstraction from surface and/or groundwater could lead to a permanent reduction in the height of water table and the drying out of wetlands (Faber Maunsell (2007).
- Surface water run-off from new developments/roads, could lead to the pollution and eutrophication of water bodies (Faber Maunsell 2007).
- The increase in flooding will result in a loss of protected habitats (Faber Maunsell (2007).
- Increased housing development pressure is leading to the loss of semi-natural as well as man-made wildlife habitats, particularly around expanding urban areas i.e. brownfield sites, wetland areas (Faber Maunsell (2007). This is the case in Kidderminster and Redditch, where important wetlands have been built on, and are under threat from further development (Pers Comm County Council, 2008).

- Groundwater Resource depletion due to public water abstraction over a long time scale has contributed to unfavourable condition of designated SSSIs in the Kidderminster area.
- Retaining existing water bodies within new developments has become more accepted in recent years; however the importance of retaining sufficient surrounding terrestrial habitat or an undeveloped buffer zone is frequently overlooked. However, there is also an increased pressure to create pools in wet areas for boating and fishing lakes, with the subsequent loss of semi-natural fen and marsh habitat (Faber Maunsell 2007 and Pers Comm County Council, 2008).
- New development can lead to the decline and drying out of wetland habitats such as fen and marsh, reedbeds and open water habitat, as a result of the increased abstraction for public water supplies (Mitchell, R.J. et al, 2007).
- Lowland wet meadows are already under serious threat from drainage and their condition is likely to deteriorate further with increased water evapo-transpiration and abstraction during warmer, drier summers. Low water tables are detrimental to important bird populations, which are already in serious decline in these habitats (Mitchell, R.J. et al, 2007).
- Fragmentation of habitats can occur as a result of the installation artificial structures such as impoundments and flood control measure, to regulate water flow (Mitchell, R.J. et al, 2007).

Risk based assessment of water bodies

- In Worcestershire, 600km of rivers and streams were assessed to establish if they were at risk of not meeting the WFD objectives in 2015. The table 1.3 below demonstrates the percentage or Worcestershire's watercourses, which have a medium to high risk of not reaching the WFD for each water management issue effecting Worcestershire. The table demonstrates that the biggest risk of not meeting the WFD objectives is from diffuse pollution from Phosphates and Nitrates. Overall the majority of watercourses in Worcestershire are at a medium to high risk of not meeting the WFD objectives. *(Environment Agency 2007a).*

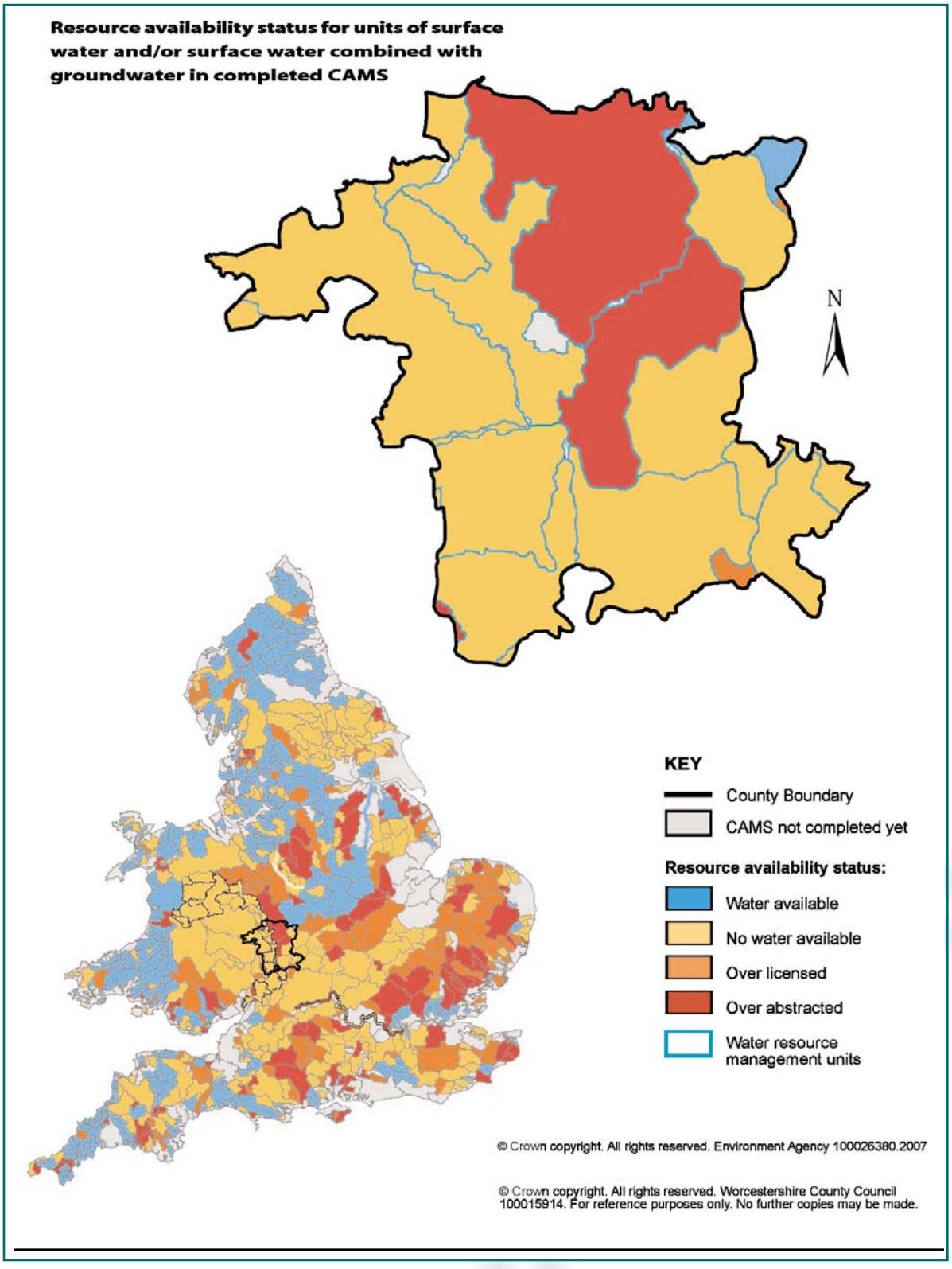
Table 1.3 Percentage of Worcestershire' rivers in each risk category for different pressures

Pressure	% of water bodies 'at risk' *(High risk)* or 'probably at risk' *(Moderate risk)*
Diffuse Phosphates (P)	89.3%
Diffuse Nitrates (N)	84%
Diffuse pesticides and sheep dip	68.8%
Physical or morphological alteration	67.8%
Sediment delivery	66.2%
Point source nutrients	56.0%
Alien species	48.2%
Diffuse source urban discharges	41.2%
Point source sanitary determinands	35.9%

Source: Environment Agency (WFD Characterisation data)

- The introduction of alien species is particularly problematic along the Severn River Basin District.
- Areas of the River Severn have problems with pollution from sheep dip. And the Teme from nutrients.
- Unsustainable groundwater abstraction has created problems at Battlefield Brook in Bromsgrove. This has resulted in low flow rates which have impacted on wildlife including water voles. Battlefield Brook is one of a number of RSA programme across the County. A full list can be found in Table 1.2.
- Physical modification to the Severn RBD could mean that over 55% of its river length and 74% of its lakes will fail the WFD objectives. Some of these will be designated as either 'artificial' or 'heavily' modified, which will mean that they have less stringent requirements to meet.

Appendix 6. CAMS resource availability



Appendix 7. Best Practice Examples

Pages 19-27 documents all the 'Best practice examples' by sub sect areas, below is the full list from 1-40.

Best practice examples:

1. Take note of CAMS strategy and sustainable abstraction.
2. Prepare Infrastructure Delivery Plans for large developments (e.g. 3,000 to 5,000 homes) to co-ordinate and identify infrastructure needs, planning and delivery (EA, nd).
3. Identify new sources of water supply for major developments.
4. SUDS - Contribution of SUDS to good sustainable water management through their inclusion in development.
5. SUDS -Use green infrastructure to regulate water cycle and as part of flood management. Planting of vegetation can reduce surface ground runoff.
6. SUDS -Storm event mitigation. Rainwater capture.
7. SUDS- Discourage the paving over of drive ways and encourage the provision of soakaways, porous paving and green roofs, particularly in large developments having considerable amounts of roof and hard standing areas. Avoid development or impose special measures to prevent groundwater pollution from development sited within groundwater catchment zones.
8. Locate in areas with little or no risk from flooding or that will add to risk of flooding elsewhere.
9. Consider floodplain realignment for existing critical services in flood risk areas.
10. Evacuation routes planned in to those developments in flood risk areas
11. Restore minerals sites to areas for flood storage.
12. Lower density development and high greenspace requirements in areas at risk of flooding.
13. As part of SFRA, develop jointly with neighbouring LPA a local standard for design of developments in flood zones areas, with regard to climate change scenarios.
14. Withdrawing Permitted Development rights in areas of high risk of flooding e.g. paving over front gardens or conversions of ground floors to living accommodation.
15. Promote the use of 'Checklist West Midlands' to developers.
16. Floodplains should not be developed, allowing them to flood, acting as a natural regulator of flow (Safeguarding land for flooding).
17. New development in existing areas should improve water management/drainage of the area.
18. Where development or redevelopment has to take place in floodplains it should have conditions imposed to maximise flood resistance and resilience features.
19. Local Authorities to produce Surface Water Management Plans (SWMP) to help reduce the impacts of flooding through new developments.
20. Diversion of flood flows away from affected areas.
21. Diversion of flood flows away from vulnerable areas or constructing a second flow channel.
22. Flood attenuation and temporary water storage, including use of greenspace and sacrificial areas (e.g. sport fields and car parks).

23. Widening drains to increase capacity, fitting one way valves in drains to prevent backflows, managing flood pathways and removing pinch points so that heavy rainfall can drain away.

24. Retro fitting existing properties that are at risk of flooding or have flooded to cope with further flooding events, such as: using flood resilient materials, raising of floor levels and electrical fittings.

25. Where flooding is a particular problem the LPA should set out its specific approach.

26. For significant growth ensure sufficient water resource capacity exists avoiding areas that already experience or are predicted to experience shortfalls in water supply through over abstraction, drought and climate change.

27. Enhancement - Wherever possible engineer biodiversity gain into development and water management infrastructure. S106 and biodiversity banking for developments that do not have any direct opportunities for biodiversity gain. Compensation through the creation of replacement habitats or other appropriate measures provided when loss to existing habitats is unavoidable.

28. Creation of biodiversity rich wetlands and restoration of natural wetland function, especially in areas of high risk of surface water flooding.

29. Creation of wet woodlands and the removal of field drains upstream of settlements prone to flooding.

30. Consider the cumulative impacts of development. Not be detrimental to quality, quantity or natural flow of waters systems or its associated biodiversity.

31. All water issues to be considered as part of SA objective/process.

32. Reduce water consumption - Xeriscaping- creating landscapes that do not require irrigation.

33. Reduce water consumption -Through installation of grey water recycling and rainwater harvesting systems. Code for Sustainable Homes.

34. Targeted promotion of water metering within areas of over abstraction.

35. All new homes to be built to at least level 4 for water of the Code for Sustainable Homes, seeking water neutral development in areas of water stress.

36. Reduce water consumption - by encouraging the retrofitting of existing properties to install grey water recycling and rainwater harvesting systems. Code for Sustainable Homes.

37. Reduce water consumption - encourage the installation of white goods and household facilities that use less water.

38. Effects of climate change considered for the design life of buildings/ development (climate proofing developments for flood risk and water supplies).

39. Adopt National Indicator 188 Adapting to climate change.

40. Flood amelioration benefits can be gained through retaining and appropriately managing old grasslands and other long established habitats and land-cover and incorporating them into new development schemes where possible.

Appendix 8. Suggested Policy Wording

Please see below, examples of policy wordings that could be adapted and included in Local Planning Authorities' Core Strategies, regarding the provision water and sewerage infrastructure capacity and development.

Planning permission will only be granted for developments which increase the demand for off-site water and sewerage infrastructure where:

1. it has been demonstrated that sufficient capacity already exists; or
2. it has been agreed in advance of the submission of any planning application that extra capacity can be provided in time to serve the development which will ensure that the environment and the amenities of local residents are not adversely affected.

The development or expansion of water supply or waste water facilities will normally be permitted, either where needed to serve existing or proposed development in accordance with the provisions of the LDF, or in the interests of long term water supply and waste water management.

Appendix 9. Glossary of terms

AAP..... Area Action Plans
AMP.....Asset Management Plans
BAP..... Biodiversity Action Plan
Brom..... Bromsgrove
CAMS..... Catchment Abstraction Management Strategies
CFMP..... Catchment Flood Management Plan
CLG..... Communities and Local Government
EA..... Environment Agency
FRA..... Flood Risk Assessment
HAP..... Habitat Action Plan
IDBs..... Internal Drainage Boards
LA..... Local Authority
LAA..... Local Area Agreement
LDD..... Local Development Document
LPA.....Local Planning Authority
LSP.....Local Strategic Partnership
NERC..... Natural Environment and Rural Communities Act
ODPM..... Office of the Deputy Prime Minister
Ofwat..... Water Services Regulation Authority
PPS..... Planning Policy Statement
RBMP..... River Basin Management Plan
Redd..... Redditch
RFRA..... Regional Flood Risk Appraisal
RSS..... Regional Spatial Strategy
SA..... Sustainability Appraisal
SCS..... Sustainable Communities Strategies
SAC.....Special Area for Conservation
SAP..... Species Action Plan
SEA..... Strategic Environmental Assessment
SFRA..... Strategic Flood Risk Assessment
SPD..... Supplementary Planning Document
SSSI..... Site of Special Scientific Interest
SUDS..... Sustainable Drainage Systems
SWJC.....South Worcestershire Joint Core Strategy (*Worcester City, Wychavon, Malvern Hills)*
SWMP.....Surface Water Management Plan
WF.....Wyre Forest
WFD..... Water Framework Directive
WMRA.....West Midlands Regional Assembly
WMRSS.....West Midlands Regional Spatial Strategy
WPA..... Waste Planning Authority
WRMP.....Water Resources Management Plan

এই দলিলটি বুঝতে আপনার সাহায্যের দরকার হলে দয়া করে এই নম্বরে ফোন করুন: 01905 25121

اگر آپ کو اس دستاویز سے متعلق مدد درکار ہو تو براہ مہربانی 01905 25121 پر فون کریں۔

如果你在明白這份文件方面需要幫助的話，請致電 01905 25121。

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Jeżeli potrzebujesz pomocy w zrozumieniu tego dokumentu, zadzwoń pod nr tel.: 01905 25121

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