



Riverside tales

**Lessons for water management
reform from three English rivers**



**HSBC
Climate
Partnership**

Contents

- 1 Executive summary
- 3 Introduction
- 4 Unsustainable abstraction
 - the problem of taking too much
- 8 The iconic chalk stream
 - the Itchen
- 15 The Cinderella rivers
 - the Mimram and the Beane
- 23 Over the hill and far away
 - the upper Kennet
- 27 What can we learn?
 - barriers to reducing damaging abstraction
- 32 Moving forward
 - a new approach to restoring sustainable abstraction



WWF is working on freshwater issues in the UK to:

- **Safeguard the natural world** by protecting our native ecosystems
- **Change the way we live**, so we waste less water
- **Tackle climate change** by promoting water management measures that will help our rivers cope with a climate change.

Executive summary

WWF's *Rivers on the Edge* programme campaigns to raise awareness of the impact on nature from taking too much water from our rivers. We're working to develop solutions to help reduce waste and protect our rivers now, and in the face of climate change. In 2009, a number of key plans were finalised that will impact on how water is managed for years to come: the 2009 Periodic Review of Water Company prices; the Water Framework Directive River Basin Management Plans; and the 25 year Water Resource Management Plans.

This report focuses on the impact of these plans on unique chalk streams under stress – the Itchen, the upper Kennet and the tributaries of the upper Lee (the Mimram and the Beane). We look at the outcomes for each to understand whether government, regulator and water company plans will restore and protect these important rivers for people and nature. On the basis of the assessment of the decisions made through these planning processes, we develop conclusions and lessons for future reform.

There was some significant progress in 2009. Ofwat's water efficiency target has meant that – for the first time – all water companies have an obligation to deliver water efficiency, bringing it into the boardroom of every company. Six companies are also planning large scale water efficiency retrofit projects, meaning thousands of new homes will be more water efficient by 2015. There are plans for more water meters (to increase the proportion of households metered from 37% to 50% by 2015) and, for the first time, Ofwat's Final Determination has meant that proposed demand measures outweigh development of new supply¹.

The Environment Agency's *Restoring Sustainable Abstraction* scheme has made progress with a number of investigations into the environmental impact of abstraction across the country; there has been agreement to fund a number of reductions in abstraction licences for Habitats Directive sites (including the River Itchen) through water bills. The Cave² and Walker³ reviews, arising from the government's *Future Water* strategy⁴, recommended that the abstraction licensing regime should reflect the scarcity value of water.

But progress has not gone far enough, and opportunities continue to be missed. The situation facing rivers across the country is serious: ecosystems in a third of river catchments are under threat because abstraction and licence levels are too high. With climate change projected to have significant impacts on natural river flows, and population growth likely to cause significant rise in demand, the future doesn't look bright for our rivers unless we grab all available opportunities. A number of key opportunities to protect freshwater ecosystems were missed in 2009. For example:

- Plans for water efficiency fell short – annual water efficiency plans expect to save the equivalent of just 0.34% of total water supplied to households. A significant number of water company Water Resource Management Plans do not aim to meet the government's target of 130 litres per person per day by 2030.
- Plans for tackling leakage stagnated. Ofwat has allowed companies to reduce leakage by about 2%, despite the fact that total leakage is about 3,000 million litres every day. This is equivalent to the Environment Agency's estimate of the amount that is needed to restore sustainable levels of abstraction across the country.
- Metering is not being rolled out fast enough, and a number of water company plans for enhanced metering schemes were not approved by Ofwat, even in catchments that are significantly water scarce.
- The Water Framework Directive River Basin Management Plans do not contain clear measures and timetables to address abstraction on catchments not protected by the Habitats Directive, even when the river is failing to meet 'good ecological status' as a result of over-abstraction. Clear measures and timeframes for resolving the problem of over-abstraction have not been provided, including the absence of a time-bound mechanism for implementing licence changes on the Kennet, Mimram and Beane, despite the problem having been acknowledged years – and even decades – ago.
- The mismatch of historical water licences with Ofwat's assessments of water availability creates a perverse signal in the water and housing planning sectors. Historical abstraction licences help create an illusion of 'water surplus', even when current abstraction is significantly affecting ecology on the ground. Historical licence amounts rather than current conditions have been used when creating water and housing plans, creating a fallacy whereby more homes are planned and measures to reduce demand for water are not judged to be cost-beneficial for areas already identified as under significant water stress.
- In the main, water companies tend to maintain the supply-demand balance in traditional, 'comfortable' ways. We have seen limited use of creative solutions to address unsustainable abstraction, for example through demand reduction and optimisation of water resource networks.

The Itchen – the iconic chalk stream – can be held up as the success story of our three case studies. Because it is protected under the Habitats Directive, the Environment Agency, Ofwat and water company have worked to ensure that solutions to unsustainable abstraction – including demand management – will be implemented. The other rivers are not so lucky. The Mimram and Beane are not deemed to be of national importance, which has meant that – despite the long recognised problems – funding has not been approved to reduce abstraction. Alarming, because the historical, over-inflated licences remain in place (creating an illusion that sufficient water is available), demand measures that could reduce pressure from abstraction have also not been approved, while plans for new housing have been given the green light. The Kennet faces a similar situation, despite the water company investing locally in water efficiency measures.

Under the current ‘rules of the game’ no single player – Ofwat, the Environment Agency, water companies – can be held fully accountable for the current lack of progress. The game itself – the framework for how we manage water resources in England and Wales – needs to be changed. We need new thinking about how to address current problems, in order to develop policy, regulatory and business frameworks that are flexible enough to meet today’s challenges and adapt as the climate changes. Our current systems are rigid and the tools are blunt; modern water management must be responsive, innovative in delivery and use multiple instruments to deliver ‘low regret’ outcomes. Above all, we need clear commitment to address unsustainable abstraction, remove barriers and develop new approaches. We cannot expect companies to make more sustainable decisions if there are systemic disincentives to them doing so; we cannot expect the public to pay for solutions unless they are aware of the problems; water companies cannot expect their customers to act to save water unless the companies are fully convinced about the benefits of water efficiency.

WWF is calling for all damaging abstraction licences to be amended or revoked by 2020. In all likelihood, a range of options, and considerable innovation, will be needed to address unsustainable abstraction. We believe this may enable solutions to be developed at lower cost than currently envisaged. On the basis of our review of our three river catchments, we have been able to make some wider conclusions about the way water is managed and hope to start new thinking about both the problem and solutions:

1. Reducing unsustainable abstraction will require stronger leadership and a considerable increase in transparency.

- In the context of overlapping regulatory mandates, strong leadership is now required from the government.
- Water companies and their representative bodies have the responsibility and opportunity to play a far stronger role in taking a lead on addressing unsustainable abstraction.
- The water resource management process requires a considerable increase in transparency from all parties, including Ofwat, the Environment Agency and water companies.

2. There is an urgent need for incentives to manage water resources sustainably, creating market-based mechanisms to complement existing regulatory approaches.

- A rapid move to universal metering now needs to be secured.
- Scarcity charges on abstraction where *and when* water is scarce should be introduced.
- With appropriate safeguards, barriers to trading and sharing water between companies should be removed.
- Many of these incentive-based objectives could be delivered most efficiently through the introduction of the linked scarcity charge and reverse auction process contemplated by the Cave Review.

3. The mismatch between Ofwat and company assessments of water resource availability and the Environment Agency’s assessment of over-abstraction must be reconciled, as it is currently driving bizarre regulatory outcomes.

- Ofwat, advised by the Environment Agency, needs to develop a methodology for assessing water resource availability that reflects scarcity.
- This methodology should be used when planning new developments and housing, as well as when planning for water resources.

4. More sophisticated and innovative responses to periods of below average rainfall could lead to low-cost solutions to over-abstraction.

- More flexible mechanisms (with multiple trigger points) need to be developed for responding to periods of below average water availability, and rewarding these through the regulatory regime.
- Consideration should be given to distinguishing between normal year and below-average year abstraction volumes in water licences.

5. We must stimulate and maximise opportunities available through demand management.

- A stronger commitment to demand management as an option from both water companies and Ofwat is required, in particular focused in water-stressed areas.
- Sustainable, economic level of leakage calculations should include benefits from reduced abstraction in water scarce catchments.
- We need a much better understanding of water consumption, looking beyond the average in order to target interventions in places where they can be most effective.

6. Despite important progress, a review of some approaches is required to enable the Restoring Sustainable Abstraction programme to meet its objectives.

- There is a need for government, regulators, statutory agencies such as Natural England and, potentially, private sector bodies to come together to agree on an approach for dealing with uncertainty in the assessment of impacts of over-abstraction.
- The government should provide a clear timeframe for the implementation and delivery of the RSA programme, with clarity on compensation funds.

Introduction

WWF's *Rivers on the Edge*

Our rivers are special places. So much more than a flow of water between two banks, they give life to the landscapes through which they wind. Wildlife flourishes in the water and across the plain. And people rely on the water that they provide.

Yet the UK's rivers, much beloved by millions across the nation, are under threat. In 2009, WWF launched *Rivers on the Edge*, a project that aims to restore and protect rivers, particularly against threats of over-abstraction posed by current water use, a changing climate and rising population. We're doing this by raising awareness of the impact of taking too much water from our rivers, and helping to reduce the amount of water that people waste.

Rivers on the Edge focuses on chalk streams – the Itchen, the upper Kennet and the tributaries of the upper Lee (the Mimram and the Beane). These are unique ecosystems, all under stress because people are taking too much water from the natural environment.

In 2009, decisions were taken and plans were made that will affect the amount of water we need and how we manage it for years to come. Ultimately, this will affect the health of some of our most precious native ecosystems. Key events included:

- Under the PR09 process, Ofwat and the water companies agreed on business plans that determine what the companies will do for the next five years.
- Defra, the Environment Agency and the water companies agreed on Water Resource Management Plans that set the agenda for water supply and demand for the next 25 years.
- Defra and the Environment Agency, with their partners, published River Basin Management Plans to show how they will improve ecological quality of rivers to meet the requirements of the Water Framework Directive.
- The Environment Agency published a Water Resources Strategy, with Regional Action Plans.
- Regional and local government decided on housing strategies and economic development plans that will significantly impact on demand for water over the next two decades.

This report

This report focuses on our *Rivers on the Edge* chalk streams as a lens through which to evaluate the outcomes of these plans. We present each river in turn to assess what the plans will mean for them, whether policy making is delivering much-needed outcomes, and whether the decisions made will result in positive change for these rivers. On the basis of this assessment, we review some of the current barriers to the restoration and protection of water flows in our rivers, and suggest recommendations and reforms that can contribute to these barriers being overcome in the future.

A note on information

Trying to understand the outcomes of 2009's various policy and planning processes has been one of the key objectives of WWF's *Rivers on the Edge* programme. Water planning processes in England are complex, with many players; the drivers of particular decisions are not always immediately obvious. We believed that trying to understand what has happened, and why, on three particular rivers would help us to understand the broader picture more clearly.

We hope, in this report, that we have been able to achieve this objective. In seeking to understand the decision-making process we have, however, encountered significant difficulties in trying to access the information necessary to enable us to come to this understanding. Whilst this last price review has allowed unprecedented access to water company proposals, it has been difficult to understand exactly what these will mean in specific areas. It has also been extremely difficult to understand the reasoning behind Ofwat's decisions and how these will influence the implementation of company plans. At the time of writing, and despite using provisions under Freedom of Information legislation, we have not been able to access all information required to fully understand the basis for decisions made under the periodic review. However, we would like to thank Veolia Water Central in particular, for providing all information as requested, which has allowed a much greater understanding of the situation on the upper Lee. In addition to this, we have struggled to obtain background data that lies behind some of the Environment Agency's assessments.

In this review, we have attempted to draw conclusions based on the information that we have been able to obtain. However, on occasion, the picture remains unclear. In the case that this has resulted in errors on our part, we ask readers to bring them to our attention. At the same time, WWF believes that a significant effort is required by regulators and companies to increase the availability and transparency of information relating to the water resources decision-making process.



Right: the river Itchen

Unsustainable abstraction – the problem of taking too much



All the water we use – which flows freely from taps in our homes, schools and businesses – is taken from the natural environment. Whether we abstract the water directly from rivers, the underground chalk aquifer or reservoirs (which are filled from rivers), the action of taking water means that there is less in the natural environment. And less for our precious native plants and animals that need it to survive.

In our last *Rivers on the Edge* report⁵, we explained the threats that abstraction poses to our native rivers and chalk streams, and why the rivers are worth protecting. Water stress or water scarcity – where we are simply taking too much water from the natural environment – is a big issue in the UK today. Yet it's one that many of us are unaware of. The Environment Agency has shown that one third of river catchments, predominantly in the south and east of the country, are over-abstracted or over-licensed, to the extent that we are risking significant damage to ecosystems⁶. And, while the focus on water resources is often on the south and east of England where threats to public water availability are greatest, seasonal water stress in dry years can lead to significant impacts on ecosystems in the west and north of England, and in Wales.

In England and Wales, the amount of water we can take from the environment, and how it is allocated, is regulated by the Environment Agency. Nearly all water abstractors need to have a licence, which specifies the amount they can take and the conditions under which they can take it. Most licences were issued in the 1960s and only those issued since 2001 have an expiry date. In many cases these licences are not fit for purpose as the amount that can be taken bears no relation to the impact on the environment. The Environment Agency suggests that the overall 'cap' on water abstraction in England and Wales is too

Above: the river Beane at Whitehall

high; even though actual abstraction is 50-60% of the licensed amount, it already results in between 1,100 and 3,300 million litres more per day being taken than the environment can sustain⁷. This means that to move to sustainable limits of abstraction today, we would have to reduce demand for water by 5-15%⁸ or develop an equivalent volume of alternative, non-damaging supplies. By way of comparison, Defra's *Future Water* target of 130 litres per person per day would represent a reduction of 12.5% from the current national average of 150 litres per person per day.

Water licences or water rights are like property rights. The Water Act 2003 contains provisions to enable current licence holders to seek compensation for any amendments to reduce the amount of water they can take. At face value, moving to sustainable levels of abstraction by taking away and compensating a high number of abstraction licences seems an expensive – and to some, an insurmountable – problem.

However, all is as not as it first seems. The problems arising from over-abstraction are variable in time and place. River flows are naturally variable, higher when the weather is wetter and lower when it's dry. When we have a good amount of rainfall – or in the case of chalk streams, when we've had a wet winter and water has soaked into the underground chalk – the majority of our rivers have healthy flows, despite current levels of abstraction.

Under the right (wet) conditions, we seem to have enough water for people and wildlife. However, in months when rainfall is low, and people use higher amounts of water in gardens or to otherwise enjoy the sunshine, the amount of water in rivers is low, and demand is at its highest. The combination of low water levels and peak amounts of abstraction can cause significant damage with rivers drying out completely, or flows dropping to levels so low that whole parts of the ecosystem can die. And while an ecosystem can sometimes recover if these are one-off events, if there is a prolonged drought (dry summer followed by dry winter) or dry conditions are repeated in consecutive years, we risk killing ecosystems off indefinitely. Over-abstraction is not a problem that we face in all places all of the time. Instead, considerable damage can occur in certain places at specific times. As such, any responses we make to protect river ecosystems should be flexible and adaptive.

So, what can be done to reduce damage from abstraction? There are a range of potential solutions. Traditionally, the water industry has preferred to engineer a way out of the problem, for example by:

- relocating the abstraction to somewhere that will be less damaging, for example, moving it downstream where flows are often higher and ecosystems are thought to be less sensitive;
- relocating the abstraction to another river catchment, water resource zone, or a reservoir where abstraction is not so damaging;
- increasing water storage by building reservoirs or, less commonly, pumping water back into watertight underground aquifers in a process known as aquifer-storage-recovery;
- pumping water from underground aquifers into the river to augment low flows; or
- making more localised use of treated sewage effluent.

These options have considerable advantages to a water resources manager. They are reliable: water managers can guarantee they'll have a secure water supply. They are within their comfort zone: managers are typically engineers and have historically used these methods. They are in the company's 'realm of control': they don't have to rely on others, such as the public, to play a part. And, the current regulatory system provides incentives to support these approaches – for instance, companies are, in effect, rewarded for building capital assets, such as pipes and reservoirs. However, they are expensive. The government estimates that developing new abstractions costs between £1.5 million and £7 million to provide one mega litre of water per day⁹.

Engineered solutions can also move the problem from one place to another. This is particularly a problem in south-east England, where there are a high number of over-abstracted or over-licensed catchments (for example, over 50% in the Environment Agency's Southern region), and fewer periods of flood flows in rivers.

Other options to reduce damaging abstraction include:

- Reducing leakage in network and customer supply pipes across the water resource zone.
- Installing water meters – WWF's *Waste not, want not* report¹⁰ showed that meters and appropriate pricing tariffs can help to reduce water use by up to 15%.
- Helping customers become water efficient by providing a service to retrofit homes with water saving devices and endeavouring to change behaviour.
- Helping customers reduce water use at peak times through targeted and effective communications about water scarcity and the use of restrictions, such as hose pipe bans.
- Improving the water resource network by increasing interconnectivity, and choosing alternative sources of water in times when vulnerable sources are under stress.
- Increasing aquifer recharge, for example through improved land management practices or sustainable drainage systems (SUDS).

The potential of many of these demand-side measures remains to be fully harnessed.

One alternative engineering-based approach to over-abstraction is to narrow the channel of over-abstracted rivers to stimulate higher water flows, and this has been proposed by the Environment Agency as an option through the Water Framework Directive River Basin Management Plans. In some localised cases, for example where natural channels have been artificially over-widened as a result of historical land-use practices, there may be cause for such approaches. However, as a systematic response to the problems of over-abstraction, we are strongly opposed to such an approach. The UK government's *Sustainable Development Strategy* is based on the principle of "living within environmental limits"¹¹. This means ensuring that our patterns of resource use do not damage our natural ecosystems. A response to over-abstraction that engineers reductions in river width constitutes entirely the opposite of this approach – altering and diminishing ecosystems so that they fit within our current resource use patterns, rather than the other way round.

In the following case studies we look at three river systems to see how the latest round of planning has addressed over-abstraction. We intend these to start new ways of thinking and debate on both the problem and solutions.



What do water companies say about environmental impacts and water supply to customers?

In 2010, WWF conducted a website survey of 12 water companies in water-stressed areas to find out what they say to customers about abstraction. There was a big difference between the companies with regards to the tone, content and availability of information, with selected examples of good practice. However, given the extent of these issues, information on the impacts of over-abstraction on the environment was notable by its absence.

Impact of water use – Surprisingly, most companies offer very little information about the impact that water supply can have on the environment. Most have ‘environment’ sections on their websites, which generally contain information about water quality and conservation projects (such as where there are Sites of Special Scientific Interest (SSSIs) on company-owned land). There were some ‘exemplar’ companies that include information about the link between water supply and the environment. For example: *“If we abstract too much water for public water supplies, we may risk damaging the water environment.”* Portsmouth Water

Some name local rivers impacted by water supply. For example: *“Schemes are currently operating on rivers in our area that are at risk from low flow and over-abstraction. This includes Rivers Misbourne, Beane, Ver and Hiz.”* Veolia Water Central

However, statements are not always in the most publicly-accessible language. For example: *“Our operational and development activities linked with water management and usage can potentially impact on biodiversity.”* Thames Water

Water efficiency – All companies have good ‘how to’ water efficiency information, but motivational information is often limited or absent. No company talks about abstraction pressure on rivers and the natural environment as a reason to be water efficient. Instead, they talk about water as a “precious resource”, and suggest that water efficiency is “good” to reduce demand, save energy or money and “help the environment”.

Abstraction investigations – Despite the wealth of investigations that companies have done on low flows and abstraction, very few talk about this work. One mentions that *“studies are underway to identify changes to abstraction regimes to prevent biodiversity damage”*, but provides no additional details. Some include information in downloadable corporate documents such as Water Resource Management Plans and ‘Community and Environment’ reports. Wessex Water was an ‘exemplar’ company, with a ‘low flows’ webpage, reports available for download and a specific low flows email address.

The Environment Agency's strategy for addressing unsustainable abstraction – CAMS, RSA and compensation

Catchment Abstraction Management Strategies (CAMS) set out the Environment Agency's plans to manage abstraction and identify available resources and areas where there may be environmental problems linked to over-abstraction. CAMS are publicly available and consistently applied across the country. The first round of CAMS was completed in 2008. The CAMS methodology has recently been refined to enable better links to the Water Framework Directive, including the development of more sophisticated Environmental Flow Indicators (EFIs) based on river habitat type and season. The EFIs show a sustainable level of variance from natural flow levels. For example, the EFI for chalk headwaters allows a 10% reduction in flow during the lowest flow periods (Q95). Actual levels of flow are then compared with the EFI¹⁶. In 2009, 80% of catchments complied with EFIs during low-flow periods. Over the same time, 3% of catchments showed actual river flows 'significantly' below the EFI, defined by the Environment Agency as actual flows at least 25% below the level needed by the environment¹⁷. Unlike previous assessments, this method of reporting accounts for actual abstractions and river levels, rather than licensed amounts, including unused licences. The second round of CAMS is planned to be completed by 2012.

Restoring Sustainable Abstraction (RSA) is the Environment Agency programme that aims to revoke environmentally-damaging licences. It focuses on sites identified through CAMS as over-abstracted, to investigate whether certain abstractions are causing problems to the ecology. If licences are confirmed as damaging, the Environment Agency works with the licence holder to identify alternative options, propose amendments, negotiate compensation, and ultimately, implement changes. Investigations into public water supply licences are funded through water company business plans. The cost of replacing or compensating for any amended or revoked licences is funded differently, as is explained below. Sites are prioritised according to the need to meet requirements of European Directives, UK law and other environmental and local concerns. In 2009, the RSA scheme included 651 sites across England and Wales (including all 309 sites protected under the Habitats Directive, 121 SSSIs and 214 other sites, such as sites of local importance)¹⁸. RSA sites could comprise abstractions across whole river catchments or could mean a particular abstraction site. It is not clear what proportion of over-abstracted catchments are addressed through RSA, and whether there are plans to extend it beyond the current selection of sites.

The Environment Agency estimates implementation of licence changes arising from the RSA programme will cost £448 million for currently identified sites¹⁹. All changes to public water supply licences necessary under the Habitats Directive will be funded through the water company planning process (estimated to total £352 million). Other licence revocations are to be funded via Environment Agency compensation (£67.7 million will be needed to compensate public water supply licences alone). This compensation fund is generated by a levy applied to all abstraction licences, which varies by Environment Agency region. For example, in 2009-10 water companies in the Thames region pay this levy (the environmental improvement unit charge or EIUC) at £1.24 per 1,000 m³ water abstracted, which will accrue

£1.2 million to the fund. The EIUC is planned to increase year on year until 2015 to raise the required level of compensation (e.g. £29.9 million in the Thames region) to compensate all damaging licences. Environment Agency regions will then be able to prioritise allocation of the fund²⁰.

There is still some uncertainty about how the compensation fund will work in practice. This led some water companies to apply to Ofwat to approve spending for schemes instead under PR09. It's not clear when funds will be available, how funding will be prioritised within the Environment Agency region and whether the EIUC will increase as planned after 2009-10. It also remains unclear whether the fund will be able to compensate costs associated with:

- Developing alternatives to make good any deficits arising from licence changes in a water resource zone.
- Developing alternatives to make good the total amount of licence reduction (regardless of whether the resource zone is in surplus or deficit).
- Capital costs and/or operational costs.
- The value of assets (such as pumps and pipes) associated with the licence, if it is to be revoked.
- Demand side schemes (installation and/or maintenance) and/or supply side schemes.

Freshwater, abstraction and climate change

Climate change is projected to have significant impacts on patterns of precipitation, run-off and, therefore, the flows of water in rivers. Providing ongoing security of supply and safeguarding ecosystems in the face of these threats will represent one of the most important climate adaptation challenges that we face in England. The potential impacts of climate change will both accentuate the threats to freshwater ecosystems outlined in this report and increase the importance of introducing the outlined solutions.

Due to uncertainties in the modelling, detailed projections of future impacts of climate change on local weather patterns are hard to produce with accuracy. Nevertheless, current projections for the UK indicate significant negative impacts on the flows of water in rivers in England as a result of summers that are on average 10-20% drier¹². Projected wetter winters are unlikely to offset these decreases, in particular as increased intensity of rainfall may reduce the extent of groundwater recharge. As a consequence, average river flows in summer could drop by 50-80% in some parts of the country by the 2050s¹³.

This problem may be exacerbated by increased demand for water in response to rising temperatures, precisely when water is scarcer. Latest data suggests that some of these trends may already be evident, with rainfall appearing to have decreased in summer and increased in winter¹⁴.

These impacts will significantly exacerbate the current pressures on water availability for our rivers, and require us to design responses now. The central importance of this issue is reflected in the choice by the government of the level of over-abstraction of rivers as the key indicator of our climate adaptation success as part of the latest set of strategic Public Service Agreements¹⁵. The need to respond to climate change runs right through the issues and the solutions that are discussed in this report.

The iconic chalk stream – the Itchen



The Itchen – the iconic chalk stream – is protected under the Habitats Directive as an internationally important area of conservation. It is home to many protected and increasingly rare native species, including the white-clawed crayfish, the southern damselfly and the Atlantic salmon. It has also been the key source of the region's water supply, providing water to 300,000 homes in Winchester, Southampton and surrounding areas.

Because of requirements under the Habitats Directive, the Environment Agency has conducted a review of abstraction licences, concluding that amendments are needed to protect river ecosystems at times of naturally low flows. In the 2009 price review, again as a response to the Habitats Directive, Ofwat approved funding for Southern Water to develop ways to allow it to reduce abstraction on the Itchen and meet requirements of new licence conditions. As well as looking to develop new supply, Southern Water has invested in demand management: it plans to increase the proportion of households with water meters to 92% over the next five years, reduce leakage and help specific households become more water efficient. Because of the driver of the Habitats Directive, the Itchen can be held up as the success story of our three case studies – the regulatory process seems to be working to deliver benefits for the river. However, even here there are steps that could be taken to ensure that we protect this special ecosystem while ensuring no adverse effects to neighbouring catchments.

The Itchen is often thought of as the iconic chalk stream. Its crystal clear waters spring from the chalk hills in the South Downs National Park, before journeying for 30 miles or so down to join the sea at Southampton. This river has helped to shape the landscape since Roman times. It has been a hub for navigation, transportation and industry. It is thought the Itchen carried the cathedral stones to Winchester in the 11th century, only to threaten to destroy it in 1906 when its waters seeped into the foundations. Water meadows were dug out along the banks and, for 300 years to the early 20th century, were a popular way of farming – the cool clear waters protecting green shoots from early frosts and providing nutrients to the earth. Sixteen watermills were once working the length of the river²¹, with some noted in the Domesday Book. The Itchen is the centre of the British watercress industry – today, lorries have replaced the steam trains that once ran on the Watercress Line to take the peppery stems to market.

The Itchen, particularly in its upper stretches, is a showcase for English natural landscapes. In 1910, when President Roosevelt asked to be taken to the best place in England to watch birds, he was taken to the Itchen. Today, it is designated under the European Habitats Directive as a Special Area of Conservation (SAC) by virtue of the international significance of its chalkstream ecology (there are only 22 river SACs across England²²). It is characterised by floating mats of water crowfoot. Other important and endangered species that call the Itchen home include:

- white-clawed crayfish: one of England's remaining native populations is nestled at the top of the Itchen);
- otter: these protected creatures have been reintroduced – thanks to the work of the Hampshire Wildlife Trust;
- bittern: one of Britain's rarest birds has been spotted from the mill at Ovington);
- Atlantic salmon: one of WWF's global priority species for protection finds its way upstream to spawn; and
- southern damselfly: endangered or on the edge of extinction in parts of Europe, it is in decline across Britain, but it can be found in the water meadows hatched alongside the Itchen).

The Itchen and us: the story of water supply and demand

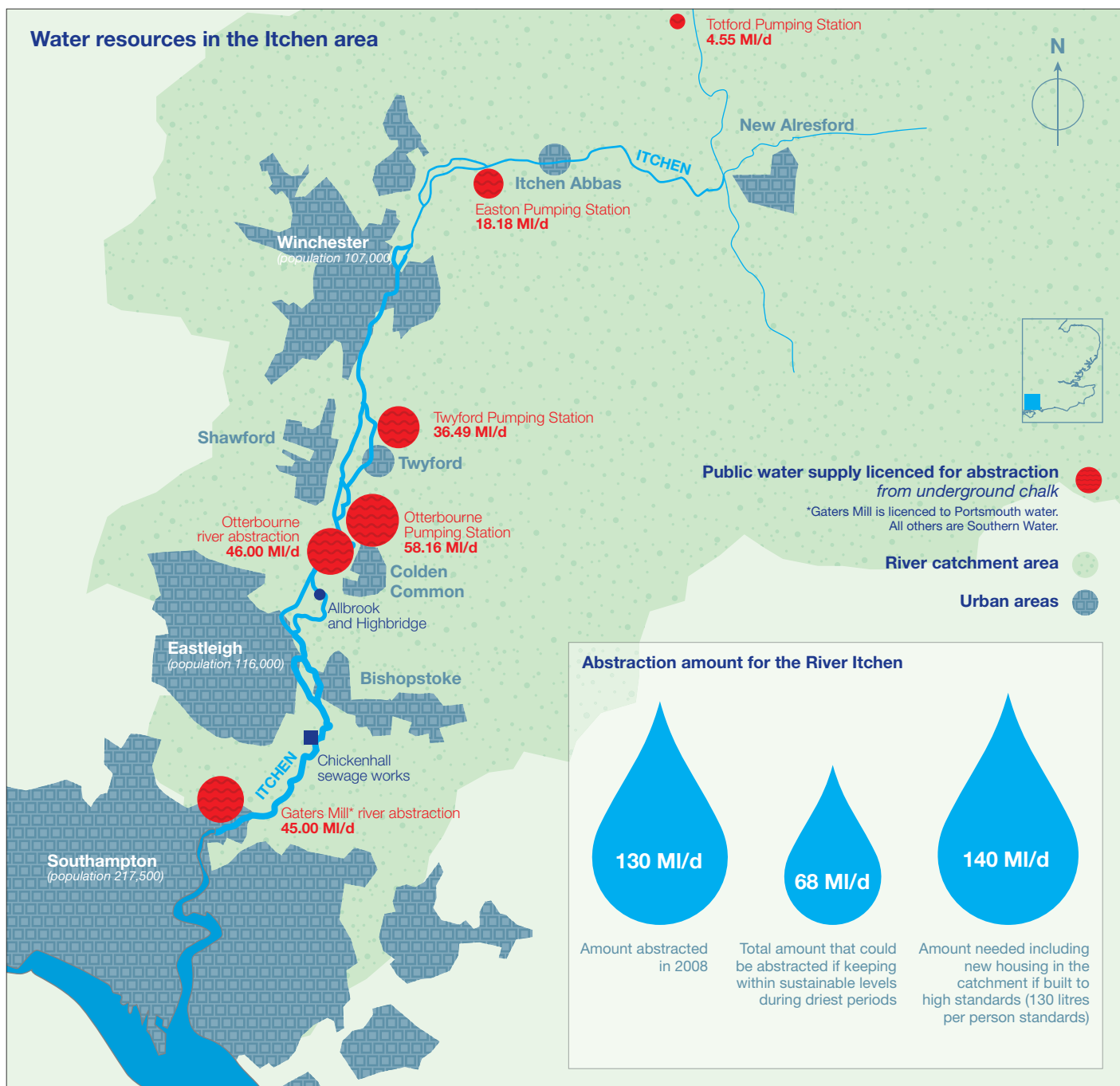
The Itchen has been used for public water supply for a long time. Originally, abstractions took place at Manns Bridge, but in the late 1880s new wells were constructed at Otterbourne. These works formed part of the Southampton Corporation Waterworks. The water was drawn from the ground using steam pumps. Although these pumps have long gone there is still an example of these at the Edwardian pumping station at Twyford; Southern Water continues to pump water from the borehole today, over 100 years after it was first sunk into the chalk. The abstraction point at Otterbourne takes water from the river itself and has been in operation for decades. The historical infrastructure is one reason why the Itchen is such a significant source of water for the region. It supports towns and cities within the river catchment and transports water to surrounding areas. Two other water companies abstract water from the Itchen for public supply, South East Water and Portsmouth Water.

In total, 217 million litres per day (ML/d) are licensed for public supply in the Itchen catchment, although to date these licences have never been used to their maximum allowance. After it is used in public supply, the majority of the water is returned to the river at Chickenhall sewage works, close to the tidal limit. Public water supply represents 24% of total abstraction volume licensed within the catchment. Other main abstractors include watercress farming (licensed 99 ML/d) and fish farming (licensed 184 ML/d). While these sectors are high abstractors, in effect they have almost no impact on water quantity in the river as the water is returned to the river close to where it was abstracted.

In 2008, annual abstraction from the Itchen for public supply averaged at 130 ML/d. The Itchen is in Southern Water's Hampshire South Water resource zone. Abstraction to meet peak demand can be higher. For example, across the Southern Water region, demand in the peak week is estimated to be around 11% higher than in the average week²³. Leakage (losses from the distribution system and customer supply pipes) was 15%. It is estimated that the Itchen supplies about 300,000 households with water (which is equivalent to the cities of Winchester and Southampton and the town of Eastleigh).



Right: White-clawed crayfish
Opposite: the river Itchen



The Itchen is a key source of water to supply the urban corridor of south Hampshire (broadly defined as Southampton north to Winchester and east to Portsmouth), an area earmarked for significant housing growth. The South East Plan²⁴, produced by the Government Office of the South East, proposes 80,000 new homes by 2026 (although there have been recommendations to reduce the amount of house building to 73,000 due to the current economic climate, with the remainder to be released after 2016 if circumstances require it). The local planning authorities are required to allocate sufficient land to facilitate the delivery of additional dwellings. They have joined together to form Partnership for Urban South Hampshire (PUSH) to coordinate this. In the Itchen area, there are plans for over 30,000 new dwellings (16,300 in Southampton, 7,080 in Eastleigh and 6,740 in and around Winchester). PUSH has recommended that all Local Development Frameworks in the area aim for all new homes to be built to the Code for Sustainable Homes level 3, with higher targets after

2012²⁵. If the 105 litres per person per day target for level 3 homes is achieved (and maintained), the additional homes would create an additional demand of 8 million litres per day in the Itchen area.

Because of the significant pressures facing water resources in Hampshire, the importance of rivers like the Itchen, and the increasing need for cross-sector working, the Hampshire Water Partnership was formed. It consists of water companies, local government (borough and county), PUSH, the Environment Agency and other interested parties (including voluntary groups). It aims to raise the profile of water, gain a better understanding of the related environmental, planning and management issues, and work towards sustainable solutions²⁶. To date, the group has been successful in holding an annual water festival to champion water in the county.



Climate change impacts on the Itchen

Climate change may pose additional threats to rivers, including warmer, wetter winters; warmer, drier summers; and more frequent and more severe extreme events (such as droughts, intense rainfall and heatwaves). Changing precipitation patterns could also influence groundwater recharge, and this is likely to be important for groundwater-fed chalk streams such as the Itchen. Recent work for the Environment Agency on the River Itchen groundwater model suggests that recharge could be reduced by 6% by the 2030s, with corresponding reductions in river flows of up to 10%³². A groundwater model produced by Southampton University suggested that by the 2080s the Itchen perennial head could move 5km downstream for dry year scenarios (generated using UKCIP 02 data³³).

A broader study of climate impacts on the Itchen undertaken for WWF combined historical river flows and current levels of abstraction with different climate change scenarios for the 2020s. It showed that to maintain current river levels, current volumes of abstraction would need to be reduced by 60 MI/d under a medium climate change scenario. Under a high climate change and current abstraction scenario, ecological limits could be approached with increasing frequency by the 2020s, with significant implications both for the natural environment and for public water supply.

The impact of water abstraction on the Itchen

Over-abstraction has long been noted as an issue affecting the lower stretch of the Itchen. The Environment Agency's CAMS (2006) has designated the River Itchen as "over abstracted" because of the impacts on the lower stretch of the river (albeit some of the upper reaches have "water available")²⁷. In the lower river, below Otterbourne, CAMS showed that during the lowest flow periods (Q95), historical abstraction was resulting in river flows 21.8 MI/d less than the sustainable level²⁸. Average annual abstraction on the lower river is only about half that allowed by the current licences: if the full licence was taken, flows would not meet sustainable levels for much longer periods, and the deficit between environmental and actual flow levels during the lowest flow periods (Q95) would be much greater.

The River Itchen Sustainability Study²⁹ looked at the effects of abstraction on the ecology of the river. It used a 'building block' approach, assessing the amount of water needed for particular species. Radio-tracking records of salmon suggested that during low flow conditions, water levels below Otterbourne were dropping to the extent that they caused problems for the fish to swim upstream to spawn (although the limited number of fish tracked undermined confidence in the data). It concluded that while the Itchen seems to be in a generally healthy state, during times when flows would be naturally lower, abstraction can exacerbate the impacts of low flows. As a result, the Environment Agency has focused efforts on preserving flows during low flow periods (such as droughts) and not allowing flows to fall to a level where ecological damage may occur.

To meet the requirements of the Habitats Directive, the Environment Agency undertook a review of consents to assess the impact of abstractions on the River Itchen SAC. The Environment Agency studied the number of invertebrates ('bugs' such as freshwater shrimp and mayflies) found in the river at different river flow levels, in six different places³⁰. This data had been regularly collected since the late 1980s, and can be considered as representative of longer-term flow conditions, as there were periods of persistent drought (1988-1992), widespread autumn flooding (2000-01), record-breaking heatwaves (2003) and flash floods (2007) within the monitoring period. The general approach is based on the premise that river flows directly impact on the health of the invertebrate populations (through respiration, feeding and habitat availability): more water = more bugs. They used two approaches to scientifically examine the evidence:

- Statistical analysis that plotted the health of the invertebrate population against the long-term average summer low flows (Q95). This approach found a strong relationship between the two variables and showed the minimum amount of flow that is needed to meet minimum environmental standards (i.e. the amount of water needed to sustain an acceptable population of bugs).
- Statistical analysis that clustered the invertebrate data into different populations. This showed that there were significant changes in populations at different flow levels. Below certain flow thresholds, certain populations of bugs (e.g. freshwater shrimp) were much fewer in number or not found at all.



Assessing target flows on the Itchen. Will the new licence conditions deliver for the environment?

How much river flow is needed to ensure healthy freshwater ecosystems? This is a question that has exercised environmental managers for decades and one that is being made even harder to answer by the prospect of climate change. Nonetheless, it is critical to balancing the water demands of society with the needs of the environment.

WWF commissioned an independent study to look at the Environment Agency's *Review of Consents*³⁵ on the River Itchen. The study examined the methodology and key scientific findings which resulted in the three target flows. It also looked at the management decisions taken to transfer the scientific findings into abstraction licence conditions.

Our study confirmed that the Environment Agency's scientific evidence base is robust. It also confirmed the importance of the 237 MI/d 'invertebrate' flow threshold in the lower river, below which there were much fewer populations of mayfly and freshwater shrimp. These 'bugs' are important as they are towards the bottom of the food chain – without them the integrity of the whole ecosystem is at risk. Our study used a statistical model including summer and winter flows; we found that an annual summer Q95 target flow of 237 MI/d would realise environmental objectives in 10 out of 11 years.

However, the Environment Agency's target – annual summer Q95 should not fall below 237 MI/d more than once every five to six years – cannot be tested in real time (as compliance can only be judged retrospectively). This means that it cannot be set as a licence condition (as the Environment Agency needs to ensure that the licence is being complied with at all times). The Environment Agency used the lower 95% confidence limit of the 'invertebrate' flow threshold to determine its 'hands-off flow' target, which it set as a licence condition (198 MI/d at Allbrook and Highbridge). Our study looked at historical flow data and found that in previous years where the annual summer Q95 flow has remained above the 'invertebrate' target of 237 MI/d,

minimum flows did not drop below 224 MI/d. The historical records also showed that, at times when healthy bug populations were observed throughout the entire length of the river, minimum flows recorded at Allbrook and Highbridge were 289 MI/d. In fact, river flows as low of 198 MI/d have only been recorded during the severe drought of 1976, for which there are no invertebrate records. This drought was much more extreme than a once in five or six year event. (The 1990 drought saw flows drop to as low as 223 MI/d and there were observed adverse impacts on the ecosystem.) Therefore, it is uncertain whether the Environment Agency's 'hands-off flow' target of 198 MI/d will ensure that the ecosystems is protected, particularly if we experience droughts over consecutive seasons or years.

Over coming decades it is likely that climate change will modify river flows by shifting towards hotter, drier summers and milder, wetter winters. These changes could reshape the annual regime of chalk aquifer recharge and hence flows in the Itchen. Climate modelling³⁶ suggests that beyond the 2040s there is a growing chance that the Environment Agency's target flows would not protect the wider ecosystem in a significant proportion of years.

Our study questioned whether the 'hands off flow' target of 198 MI/d is sufficient to meet environmental objectives for the Itchen, and suggests that this should be revised upwards to at least 224 MI/d. Our study also concluded that a long-term view should be taken with regard to monitoring the changing ecological status of the river, and to reviewing the allocation of water among different uses. The licence amendments made today cannot be the end of the story – we need to make sure that there are mechanisms in place to review and amend licences on a systematic basis. This will help ensure that our rivers, and the way we manage water, can adapt as the climate changes. The WWF study is available in full at wwf.org.uk/riversontheedge

Using these thresholds, a warning band was established for the river. Above the band, the river bugs are healthy; within the band there is heightened risk of damage to the bug populations; and below the band there is high risk that the bugs could be damaged long term, or die off completely³¹. From this, the Environment Agency was able to set a minimum flow level for the river at different points. This was translated into three targets to meet minimum flows at Allbrook and Highbridge (near the Otterbourne abstraction point), premised on the assumption that achieving target flows downstream will result in environmental objectives being met upstream:

1. Long-term average summer Q95 flows should not fall below 262 MI/d.
2. At any one time, river flow should not fall below 198 MI/d (a 'hands-off flow' target).
3. The annual summer Q95 should not fall below 237 MI/d more than once every five or six years.

With these targets the Environment Agency aims to preserve the current situation by ensuring that flows do not fall below the critical threshold more frequently than has been observed in the past. The targets have resulted in a need to modify four public water supply licences imposing restrictions on the volume of water that can be taken during summer months (June to September), as well as a 'hands-off flow' (stopping all abstraction) when flows fall below 198 MI/d. The Environment Agency will also continue to monitor the river to see how it responds to these licence changes to see if they ultimately deliver the environmental objectives.

The licence amendments will have a significant impact on public water supply within the whole of Southern Water's western area. The amendments will result in the Hampshire South water resource zone moving from a current 'surplus' into 'deficit', with knock-on effects to adjacent water resource zones (as, at times of low river flows, water would be needed to transfer across to supply the Itchen area).

The Environment Agency has notified the water companies of its intention to amend the licences, and Southern Water accommodated this in its final Water Resource Management Plan. Based on its water resources modelling, Southern Water estimated that this 'hands-off flow' condition would result in a significant reduction in deployable output – on average 104 MI/d. Although the condition is likely to come into force only once every 20 years, Security of Supply regulations, overseen by Ofwat, mean that Southern Water must find the full amount from alternative sources. In other words, this additional resource (or an equivalent reduction in demand) must be available on a permanent basis, although it is likely only to be required in one in 20 years. Availability of new resources within the Hampshire South resource zone is severely constrained (all the surface and groundwater units are classed as "over abstracted"). Southern Water proposed a range of options to make up the deficit in its revised Water Resource Management Plan:

- universal metering throughout the area by 2015;
- optimisation of transfers across water resource zones (between Hampshire South, the Isle of Wight and Western resource zones);
- refurbishment of a number of existing groundwater sources (three in Hampshire and two on the Isle of Wight);
- using the Candover/Arle augmentation scheme (using pumped groundwater to support low river flows);
- a pipeline to transfer water from the river Test at Testwood to Otterbourne; and
- water efficiency and leakage reduction.

Portsmouth Water's abstraction at Gaters Mill, though not directly affected by the licence changes, could be prejudiced if Southern Water diverts wastewater discharge from Chickenhall sewage work (which is above Gaters Mill) to compensate for the reductions in its licences at Twyford and Otterbourne. Because of this, Southern Water has signed a Memorandum of Understanding with Ofwat, the Environment Agency, Natural England and Portsmouth Water, to set out the roles and responsibilities of each party and the schemes that would need to be implemented before the Lower Itchen abstraction licences would be changed. A number of investigations are planned, and alternative sources will be developed over the next five years.

Right: the river Itchen through Winchester
Opposite: the river Itchen at Itchen Stoke Mill



Did 2009 deliver for the Itchen?

Southern Water included investment of £80 million in its 2010-2015 business plan to 'make good' the loss of resource arising from the Itchen licence amendments. This included proposals for universal metering, and investigations and development of a transfer from the river Test. As the licence reductions are driven by the Habitats Directive, Ofwat approved this investment. It is anticipated that the new licence conditions will come into force, and provide some protection for the Itchen in times of low flows, by 2016.

Southern Water included a policy of universally metering all unmeasured customers by 2015. Ofwat accepted a "*substantial increase in metering is part of the best value solution to restore and maintain security of supply but, at very high levels, the costs may outweigh the benefits*". They therefore allowed for meter penetration of 92% of properties. This means that Southern Water will install compulsory meters in almost half a million properties, including those within the Hampshire South resource zone, by 2015, with significant benefits in terms of reduction in water consumption. Southern Water anticipates that the phased metering programme will reduce demand across the region from current levels by 2.5% (average year; 4% for peak weeks) by 2015.

In its revised Water Resource Management Plan, Southern Water aims to reduce per capita consumption in a dry year to 128 litres per day by 2030 (i.e. lower than Defra's *Future Water* aspiration for a normal year, across England and Wales as a whole). Its universal metering programme, supported by a package of communications, seasonal tariffs, fixing supply pipe leaks and targeted water efficiency advice, will contribute to this reduction in demand. Ofwat approved plans for Southern Water to reduce leakage from 83 MI/d to 77 MI/d across the region and meet its base service water efficiency target (amounting to 1 MI/d per year) by 2015. It seems that Southern Water has taken an integrated approach to balancing supply and demand, proposing a package of measures including both demand (leakage, metering, water efficiency) and supply solutions to address over-abstraction on the Itchen as well as delivering its longer-term water resource plan.

The Habitats Directive has driven environmental improvements in the Itchen catchment and beyond. The licence amendments have been a long time coming, and actual implementation is still some years off. It remains to be seen whether these changes are sufficient in the long term, as climate change could bring significant changes to the Itchen and its ecosystems. In the face of climate change, likely to bring changes to natural variation in river flows, it is important that decisions taken about licences today can be reviewed in future.

The licence reductions have also helped make the case for the universal metering programme approved by Ofwat. Southern Water has shown real leadership and innovation to demonstrate the benefits of metering, with a plan which "*represents the least-cost environmentally sustainable solution*". Its plans for delivering the integrated metering programme – one of the largest seen in the UK – look exciting and pioneering. WWF is looking forward to working with Southern Water to support the project, which will bring some real environmental benefits across the region and for the Itchen (reduced consumption in Hampshire South will mean less water is needed from the river). Southern Water also has an ambitious target to reduce water consumption over the next 20 years. Metering will only play one part, and we hope that the company will embark on large-scale water efficiency in the next business planning period.

Immediate steps to protect the Itchen:

- **The Environment Agency should review whether the proposed licence amendments will provide sufficient protection of environmental flows, in the light of WWF's recent independent study.**
- **The Environment Agency should set out the timetable for implementing licence amendments so that they are in place by 2015, ensuring no adverse effects to neighbouring river catchments.**
- **Local councils and community groups should support Southern Water's metering programme and help communicate the benefits in order to maximise demand reduction.**
- **Local councils must commit to recognise the abstraction problems on the Itchen and surrounding rivers and introduce 'water neutral' planning policies to ensure that there is no net increase in water use arising from new development.**
- **All parties should work together to maximise the opportunity for water efficiency by raising awareness and integrating water and energy retrofit schemes.**



The Cinderella rivers – the Mimram and the Beane



The Mimram and Beane, chalk stream tributaries of the Lee, are small rivers. While they provide important havens for wildlife locally, they are not deemed to be of national importance. This, combined with the fact that the underground chalk is the source of the water supply for neighbouring towns, is their downfall.

Both rivers are significantly over-abstracted at high and low flows, a problem that has long been acknowledged by the Environment Agency (which has published related studies for over 20 years). However, because the abstraction changes are not required under 'statutory drivers', funding has not been approved by Ofwat to allow the water company to develop alternatives and reduce abstraction on the rivers. Alarming, because the historical, over-inflated licences remain in place (creating an illusion that sufficient water is available), demand measures that could reduce pressure from abstraction have also not been approved, while plans for new housing have been given the green light. In 2010, the future doesn't look bright for the rivers. There is an urgent need for all the different stakeholders to work with the community to develop joined up solutions that can be implemented soon.

The Mimram and the Beane rise from the Hertfordshire chalk before winding their way, for 12 miles or so, to meet the river Lee in Hertford. These small rivers, although important locally, can be thought of as 'Cinderella' rivers: their fate goes largely unrecognised and they do not have the same levels of protection as rivers such as the Itchen.

The people of Hertfordshire have had a long relationship with the Mimram and the Beane. They have come to depend on the rivers as sources of water, industry and recreation for generations. On the Mimram, records stretch back to Anglo-Saxon times, when it was known as the river Memorán. It was once harnessed for industry: the Fulling Mill, upstream of Welwyn, was recorded in the Domesday Book, and milling took place on the site up to 20th century. A 1700 account refers to a mill close to the source of today's river at Whitwell. In 1894, the Mimram was described as rising in abundant springs to form a wide stream of crystal clear water flowing over a gravel bottom. And before the Second World War it was the "jewel in the Hertfordshire countryside", a rival to the Itchen for fishing³⁷. The Beane also has a long history – records show a watermill at the top of the river at Walkern in 1700³⁸, where today ancient watercress beds can be found. A 1930s diary refers to the author catching a 7lb trout on the Beane and rowing up the river to Horseshoe Falls. In the 1950s the waters of the Mimram and the Beane were increasingly harnessed to supply the burgeoning towns of Welwyn Garden City and Stevenage with water. Some contemporary accounts suggest river levels fell noticeably with the onset of abstraction for public water supply; milling and local watercress farming ceased; and good fishing virtually disappeared³⁹.

The Mimram and the Beane chalk streams – with their number of springs and high groundwater level – provide a mixture of habitats in which birds, plants and animals can thrive. As well as the streams themselves, the chalk streams create marsh, fen, meadows, ponds, lakes, and wet grasslands and woodlands. There are a number of places on the rivers that are special for wildlife. For example, the Beane near Watton is home to a colony of water voles. At Panshanger Park, the Mimram supports alder-rich woodland. And at Tewinbury, the Mimram is a haven for wildlife (it has been designated as a SSSI⁴⁰). Over 20 species of birds visit each year including grey wagtail, kingfisher, reed

bunting, little egret, snipe, woodcock, water rail, moorhen, coot and ducks. Water crowfoot blooms on the river and, on the banks and over the wetted meadows, a heady bouquet of flowers and plants can be found – southern marsh orchid, golden saxifrage, butterburr, marsh pennywort, lady's smock, ragged robin, meadow sweet, marsh marigold and several sedge species, through which grass snakes and slow worms can slither. Fish stocks are lower than they once were (which keeps the otters from settling), but brown trout, bullheads, sticklebacks and stoneloach can be found in the Mimram⁴¹.

These rivers are important to local people for fishing, walking, wildlife watching and other recreational activities. There are a number of fishing clubs active on each river, and the Mimram supports watercress and fish farms. A 2001 survey found that people had significant willingness to pay to improve the Mimram⁴². While this was linked to how close to the river people lived, households up to 120km away still saw the value in improving it. The feeling was shared between people who directly enjoyed the river and those that didn't. Local action groups have formed to campaign to restore and protect the two rivers, working alongside other community groups and the local Wildlife Trust. There have been calls to reduce levels of abstraction on these rivers for 20 years⁴³. The 2006 drought which dried the Mimram through Welwyn Garden City resulted in public outcries to media and to MPs⁴⁴.

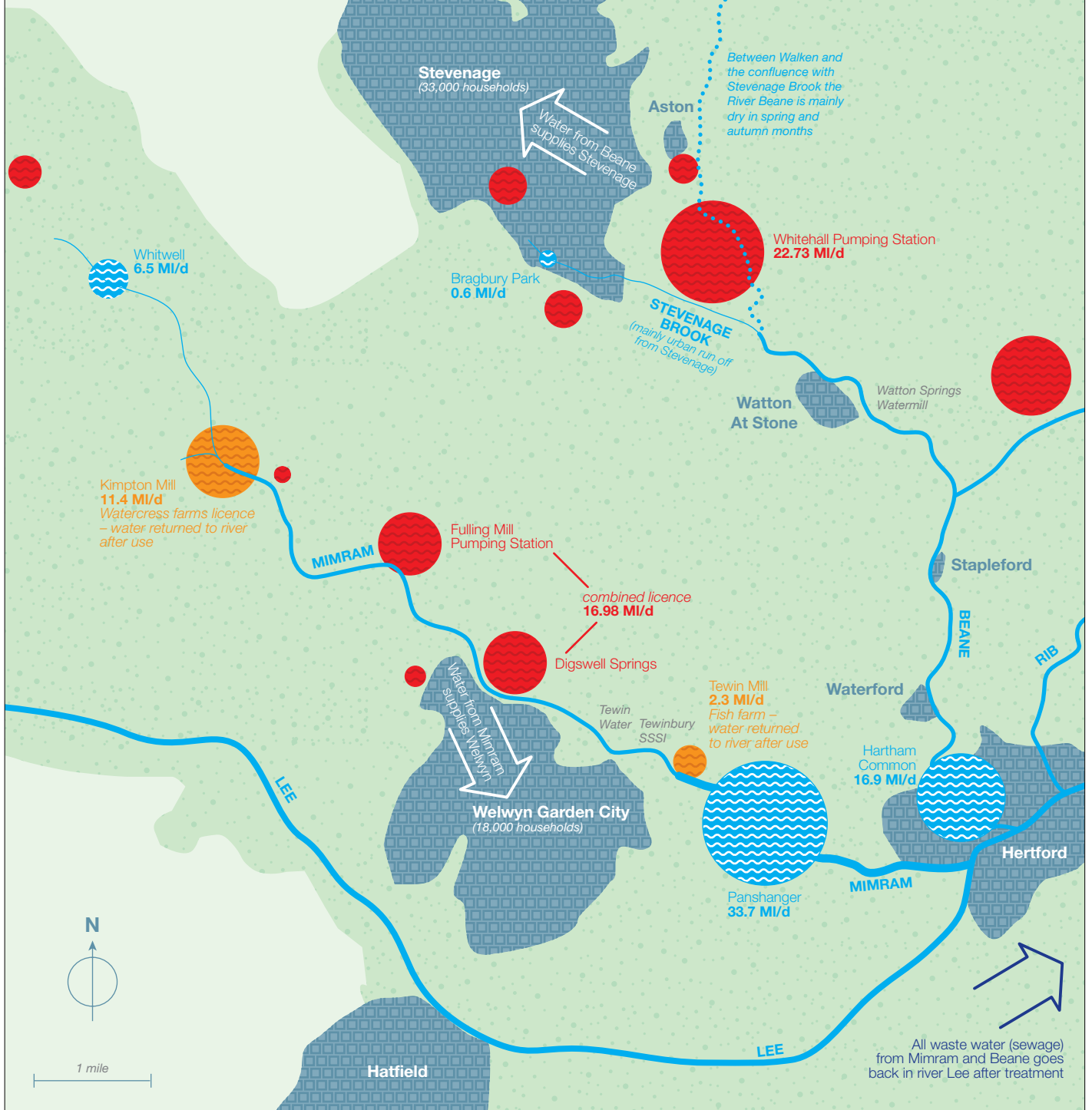
WWF's *Thames Vulnerability Assessment*⁴⁵ suggested that flows for the upper Lee could be reduced by as much as 17% during the summer months under medium climate change scenarios, compared to historical averages. Increased heavy rainfall events could also reduce groundwater recharge.



Right: the river Beane

Rivers Mimram and Beane

-  **Public water supply licenced for abstraction from underground chalk**
-  **Non-public use licenced for abstraction Over 1MI/d**
-  **River flow level**
Recorded summer 2008
-  **River catchment area**
-  **Urban areas**



Water supply and demand on the Mimram and Beane

Today, the Mimram and the Beane are important sources of public water supply, managed by Veolia Water Central (formerly Three Valleys Water). On the Beane, on average a total of 42 million litres of water are pumped every day from the underground chalk for public supply, primarily to Stevenage (from licences totalling 49 million litres per day). On the Mimram, average daily abstraction amounts to 14 million litres (licences allow up to 21 million litres per day). During peak weeks, actual abstraction can be over 20 million litres per day, the majority of which is used to supply Welwyn Garden City and surrounding areas⁴⁶. The majority of this water is lost from the rivers, as the treated sewage is returned to the Lee, downstream near Hoddesdon. Sewage treatment is managed by Thames Water.

The Mimram and the Beane comprise part of Veolia Water's Northern water resource zone, which is currently judged as being in surplus (i.e. water that the company is licensed to supply is greater than current demand), partly due to increased investment in supply after the 2006 drought. The majority of supply is met from local boreholes as well as from Grafham Water (to the east, managed by Anglian Water). Currently, average consumption is around 18% higher than the national average, at 177 litres per person per day. Some 41% of households in this zone have a water meter (on average, people in metered households in the zone use 35 litres per person per day less than those in non-metered households, who consume 190 l/d). Leakage in the zone is also higher than the national average, at 116 litres per property per day⁴⁷. On this basis, it can be estimated that the Mimram and Beane supply up to 150,000 households with water.

Demand for water from the Mimram and the Beane is likely to continue to increase due to increasing housing development. The East of England Plan sets the agenda for new housing and has designated the area as a "key centre for development and change". This translates into growth in housing and water demand. Within the upper Lee area this includes 15,000 new homes in and around Stevenage and 10,000 new homes in the Welwyn–Hatfield area. A further 37,700 homes are planned for the surrounding area (Harlow, Broxbourne, Epping Forest and east and north Hertfordshire). Even if they are built to high standards (e.g. the Code for Sustainable Homes level 3), the increase could mean an additional 6.5 Ml/d is required for Stevenage and Welwyn–Hatfield alone.

Impact of water use on the rivers

Over-abstraction on the Mimram and the Beane is a long-recognised problem; one on which many organisations have been working for a long time. In the early 1990s, the National Rivers Authority recognised the Mimram as one of the 10 worst-affected rivers in the region⁴⁸. It concluded that abstractions in the upper Lee catchment were not in balance with ecology, and that solutions would need to be implemented by 2010⁴⁹. In 1999, a network of nine monitoring boreholes was developed to better understand the groundwater of the area.

There is ongoing debate around the drying-out of chalk streams. One argument is that the reaches that dry out are natural 'winterbournes'. There is very strong anecdotal evidence that this is not the case for the Mimram and the Beane⁵⁰. In the past, the flows at the top of the Mimram at Whitwell and the Beane at Walkern were able to support water mills. Yet today, the top of the rivers are now dry in summer.

New housing thirst for water

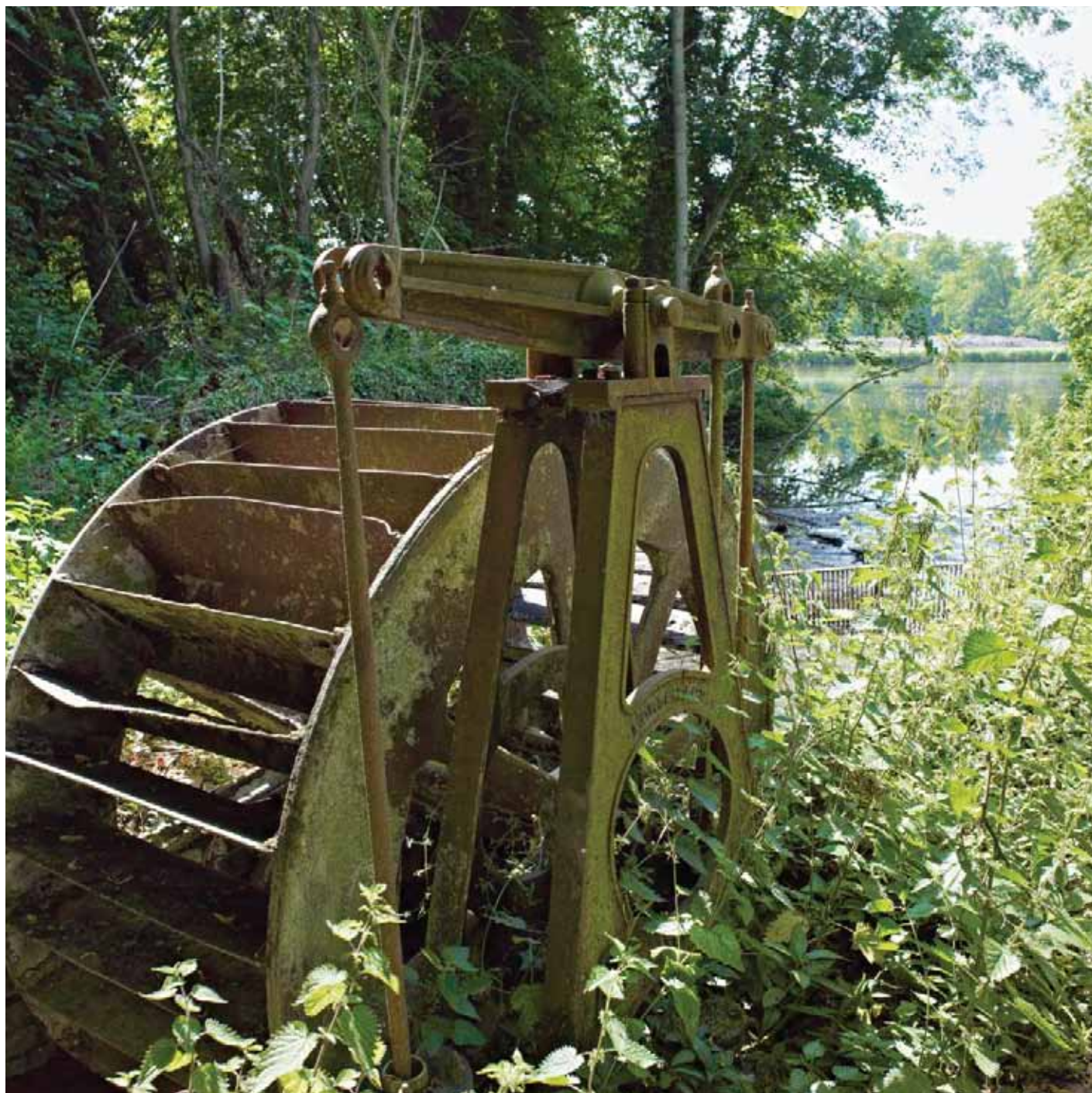
National forecasts suggest that the population will rise significantly over the next 40 years, and household size will get smaller. This means thousands of new homes. And increased water consumption not just from the increased numbers of people, but also due to the increased consumption by individuals living in smaller households. Regional government sets the agenda for development of new housing. It has Regional Spatial Strategies (RSS) to plan for housing growth and to cascade policy from the national and regional level to local authorities. RSS, such as the East of England Plan, identify targets for growth and development. Local authorities include these targets in their statutory Local Development Frameworks (LDFs) and are responsible for delivering town planning on a local level.

As part of the evidence base for the LDFs, local authorities are required to complete a Water Cycle Study to set out the water and wastewater infrastructure, among other measures, that will need to be in place to achieve their growth targets. The Environment Agency and water companies are consulted on these to ensure, respectively, that increased demand will not damage the environment and can be met. The problem at the moment is that these decisions consider licensed amounts only and do not respect what is actually happening on the rivers.

The Buildings Regulations have also been modified to include a minimum standard for water use – 125l/person/day (excluding outside use), with which all new homes will need to comply. Local authorities are responsible for ensuring that builders meet such

standards. The Code for Sustainable Homes includes a guide for potable water consumption, whether for inside or outside use: 120l/person/day (levels 1-2), 105 litres (level 3) and 80 litres (levels 4-5). All new buildings built with public money must comply with level 3. While very welcome, these design standards alone do not guarantee that the actual consumption will be this low, as people can behave differently, and change fittings, etc. Education and engagement are required if levels are to be achieved and sustained. In the end it is people, not homes, who use water; and for water efficiency to work effectively, people need to be water-wise.





The major pumping station on the Beane at Whitehall abstracts up to 22.7 MI/d, causing the middle section of the river to be heavily depleted. The river is regularly dry above Watton at Stone (some five miles from the source), and often the dry stretches of river extend for long periods and distances. In summer months, the lower river is heavily supported by urban water run-off from Stevenage Brook. The major pumping stations on the Mimram are at Fulling Mill and Digswell (with a combined licence of 16.98 MI/d, which is time limited to 2015⁵¹). The river above Digswell has been subject to periodic low-flow periods. Stretches of the river dried up in 1997, 1998, 2000 and 2006, with disastrous effects to the biodiversity (e.g. loss of trout and water vole populations in 1998).

The Environment Agency's CAMS in 2006 assessed the Mimram and the Beane to be '*over-abstracted with insufficient flows to meet the environmental need at all times, even at times of high flows*'⁵². It found that, for the Beane, licensed abstraction (from the chalk) was equivalent to 96% of the lowest naturalised flow volume (Q95) (equivalent to 76% is actually abstracted). Abstraction results in a large deficit (-26.7 MI/d) between the resulting river levels and what the environment needs. On the upper Mimram, licensed and actual abstraction (from the chalk) is equivalent to 100% of the naturalised Q95 flows, with a deficit of -4.4 MI/d. In other words, water equivalent to the total natural river is abstracted for 5% of time in an average year.

Over 10 years ago the Environment Agency presented a case for amending the Whitehall abstraction licence on the Beane, which was accepted by the government. Despite this, the changes have yet to be implemented. Today, the Environment Agency is attempting to take action on the Mimram and the Beane through its Restoring Sustainable Abstraction programme. Through this process, it has determined that groundwater abstraction at Fulling Mill pumping station is having a detrimental impact on the Mimram⁵³ and the groundwater abstraction at Whitehall pumping station is having a detrimental impact on the Beane⁵⁴. Environment Agency cost-benefit analysis of a range of options to reduce abstraction found that the benefits outweighed the costs by an order of magnitude⁵⁵. Following these investigations, in 2008, the Environment Agency advised Veolia Water Central that the Fulling Mill licences will be revoked and the Whitehall licence reduced to 15 MI/d (a reduction of 65% from the current licence)⁵⁶.

It is estimated that these licence amendments will lead to a loss of deployable output totalling 14.83 MI/d (annual average). Veolia Water states that this loss of resource would need to be made up from other sources in order to meet existing water demand. The Environment Agency and Veolia Water Central are currently exploring solutions. Initial options focused on relocating the boreholes downstream but these were considered unsuitable because of land constraints and potential impacts of a downstream Beane abstraction on the Mimram (and vice versa). It now seems that supplies from outside the catchment are the favoured solution.

Did 2009 deliver for the Mimram and the Beane?

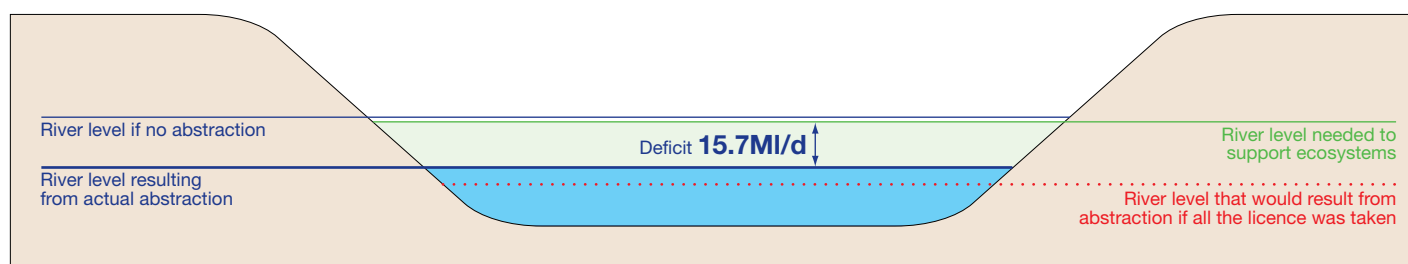
Veolia Water Central included the reductions in abstraction on the Mimram and the Beane in its revised Water Resource Management Plan (WRMP), assuming them to come into effect from 2015-16. It estimated the cost of developing alternative sources of supply – a new pipeline to transfer water from Grafham Water to Stevenage – at £1.53m in capital costs and £0.8m per year for additional operating costs⁵⁷. This equates to £100,000 per mega litre in capital costs and £54,000 per annum per mega litre in additional revenue costs. However, as the reductions are not driven by a statutory target (the rivers aren't protected by the Habitats Directive), Ofwat did not approve the expenditure in the 2009 Final Determination.

The Environment Agency has since confirmed that it hopes to fund reductions through its EIUC scheme. However, while the Environment Agency continues to work with Veolia to identify its preferred solution, it is unable to confirm when sufficient funds will be available or provide a definite timeline for implementation.

The Thames River Basin Management Plan shows the Mimram to be of 'poor' ecological status now, moving to 'moderate' status by 2015 and the Beane as 'moderate' now with no improvement by 2015⁵⁸. The Water Framework Directive (WFD) requires all water bodies to be at 'good' ecological status by 2015, subject to a few tightly-defined exemptions. The Environment Agency cites its own "low confidence that abstraction is adversely affecting ecology" and a "significant risk that there will be either no or low benefits from taking remedial action to improve flows" to justify why it is not putting in remedial measures to restore flows by 2015 on the Mimram and the Beane respectively. This seems directly at odds with the previous conclusions the Environment Agency has drawn, and the fact that it has previously notified the water company of its intention to revoke and amend particular licences. Instead of actions, the Environment Agency plans further investigations. The conclusions of the WFD River Basin Management Planning process and the Restoring Sustainable Abstraction programme appear to be at odds with each other.

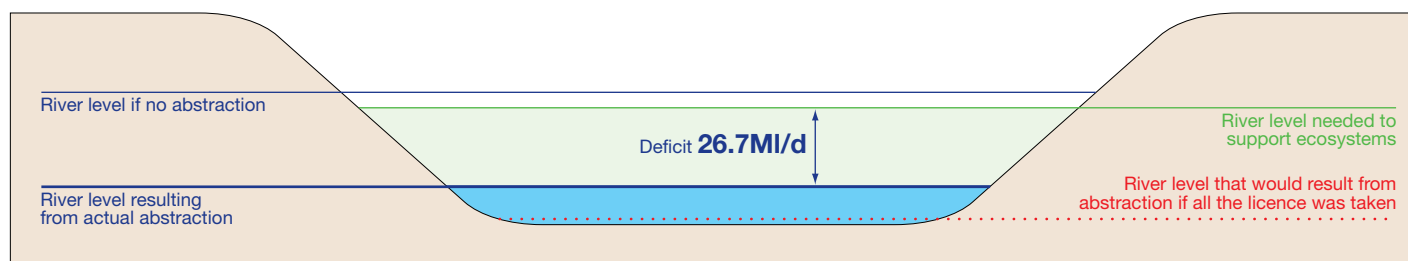
Lower Mimram river levels during driest periods

Welwyn to confluence with the Lee at Q95 – flow level which is exceeded 95% of the time. Taken from Environment Agency CAMS, 2006.



River Beane levels during driest periods

Source to confluence of the Lee at Q95 – flow level which is exceeded 95% of the time. Taken from Environment Agency CAMS, 2006.



The Thames River Basin Management Plan also states that measures to “*promote efficient and sustainable water use in catchments subject to significant abstraction pressures [...] are either already in place or will be put in place under this RBMP*”⁵⁹. As we shall see below, this is not the case for the Mimram or the Beane.

In its draft Water Resource Management Plan, Veolia Water Central included plans for its Northern Water resource zone to:

- increase the proportion of metered households from current 41% to 71% by 2020 and 89% by 2030;
- reduce leakage from current level of 116 litres per property per day to 93 litres by 2020 and to 78 litres by 2030; and
- reduce average consumption from current 178 litres per person per day to 168 litres by 2020 and to 162 litres per person per day by 2030.

In its revised Water Resource Management Plan⁶⁰, Veolia Central also estimated high costs for water efficiency, with the Average Incremental Social Cost (AISC) of water efficiency options ranging from 493 to 33,392 p/m³. This compares to an AISC range of -12.7 to 84.3 p/m³ for water efficiency schemes in the *Waterwise Evidence Base for Large Scale Water Efficiency Retrofit*⁶¹. As such, it didn't include any water efficiency options in its 'preferred list' of water management options. However, it does include water meters in its 'preferred list' and plans to reduce consumption using these.

On this basis, Veolia Central proposed a total investment of £47.2 million for demand-side measures across its whole region in its 2010-15 draft business plan. A significant proportion of this was to fund a £24.4 million metering programme, alongside a limited water efficiency programme to meet Ofwat's 1 litre per property per day target. In its final determination, Ofwat approved investment of just £8.8 million. Ofwat's decision was made largely because the proposed measures were not “*deemed to be the best economic options for addressing supply-demand balance shortfalls*”. Ofwat also declined additional price increases to fund work to meet the water efficiency target, expecting all companies to meet this target in ongoing operational costs.

WWF has attempted to learn more about the reasons behind this decision, but we have encountered difficulties in accessing detailed information. On the basis of the information that we have been able to obtain, this decision by Ofwat seems to have been based on a number of factors in particular: judgements over the acceptability of Veolia's business case for demand measures; and the assessment of water resource availability, which is based on the licences that are currently held by Veolia (and does not take into account the Environment Agency's assessment of water scarcity). This results in a situation where the existence of available capacity in current (damaging) abstraction licences means that measures to address demand cannot be made to seem economically beneficial and used to reduce the potential for environmental damage.

The result of this means that there will be a limited efforts to reduce demand across the whole Veolia Central region over the next five years: a significant reduction in the planned number of meters; limited water efficiency improvements (an average of 1 litre per property per day, each year); and maintenance of existing levels of leakage (at 185 Ml/d across the region). Although Veolia maintains that this will not impact on the overall Water Resource Management Plan by 2030, it will mean that demand is unlikely to fall (and could even increase) in the short term. For the Mimram and Beane, the demand measures planned are likely to be insignificant in terms of reducing the pressure on abstraction. None of the measures proposed are even guaranteed to occur in the Mimram and Beane area – activities are likely to be focused in particular areas, not applied equally across the region, or in areas of particular environmental need.

Local housing development plans cite reduction in current water consumption as essential to progressing development. Even though the East of England Plan “*aim[s] to incorporate high water efficient standards in new development, reduce leakage rates and increase the efficiency of existing buildings*”, this does not seem to be happening on the ground. There is therefore a mismatch between the aspirations of the housing development plans and what will actually be delivered in the local area. Once again, because of the headroom in the current (damaging) licences, the area is assessed as being in 'surplus' (as well as being classed as water scarce, and over-abstacted), so the driving water-related constraint is cited as being sewerage capacity, not water supply. Both the Rye Meads Water Cycle Strategy and Local Development Framework, which cover the Mimram and Beane area, do not flag water supply as an overriding issue. On paper, there seems to be plenty of water for new buildings, even if, in practice, this will have disastrous effects on our already over-stressed rivers.



Left: a dry river Mimram (summer 2007)

The Environment Agency's Water Resource Action Plan for the Thames region includes measures for the next five years to target its water efficiency advice to licence holders in the upper Lee. It also includes long-term (> 25 years) measures to resolve unsustainable abstraction and investigate the effect reducing licence limits could have on water resources across the region through the RSA programme.

After 20 years of studies, reports and campaigning, no solution seems to be in sight for the Mimram and the Beane. This is incredibly frustrating for local communities who have been campaigning for action for years, not to maintain the status quo but actually restore these desperate rivers. The situation has already deteriorated (for example actual abstraction at the Whitehall pumping station has increased by almost 20% over the last 15 years, even though the Environment Agency has long acknowledged the need to reduce the licence). It cannot be allowed to deteriorate further.

Decisions made in 2009 completely failed to amend the damaging licences or reduce the demand for water. In 2010, the future doesn't look bright for the rivers. There is an urgent need for all the different stakeholders – the Environment Agency, water companies, local councils and regional government – to work with the community to develop joined up solutions.

Immediate steps to protect the Beane and the Mimram:

- **The Environment Agency must commit to implement the Fulling Mill and Whitehall licence amendments by 2015. It should agree a binding plan with Veolia Water Central to set out key actions needed in order to ensure alternative solutions can be developed in time. This must include clarity on funding for alternative supply and how demand measures will contribute to the solution. Such a plan should be publicly available. With increased confidence that compensation will be forthcoming within a set time period, Veolia should commit to manage resources to minimise impacts on Mimram and Beane until solutions are implemented.**
- **Veolia Water Central should target demand measures, such as water efficiency, in the most water scarce areas.**
- **Local councils must commit to recognise the significant over-abstraction problem on the Beane and the Mimram and work with Veolia and the Environment Agency to ensure new housing will not add to the pressure.**
- **Community groups should focus efforts on raising awareness of the value of the rivers and champion water saving in the local area.**
- **All parties should sign up to a 'Community Charter' to pledge to reduce water use when river levels get low, developing an integrated communications plan to spread the water-saving message at key times.**



Over the hill and far away – the upper Kennet



The upper Kennet, a tributary of the Thames, provides water for the town of Swindon, across the Wiltshire downs. The water, taken from beneath the most sensitive upper reaches of the chalk stream, is not returned to the catchment, so it is effectively lost to the river.

Despite the Environment Agency and Thames Water agreeing that a reduction in abstraction is needed on the upper river, funding has not been secured through the price review process to allow implementation to take place. Related to this, reduced levels of leakage and enhanced levels of metering have not been deemed economically beneficial. It seems that there will be limited progress to reduce the impact of abstraction on the river until the Environment Agency is able to confirm funding through its compensation fund.

The River Kennet springs from chalk in the Marlborough downs and flows eastwards through an *Area of Outstanding Natural Beauty* for around 40 miles, before entering the River Thames at Reading. The upper Kennet is designated a SSSI in recognition of its outstanding plant and animal communities, including priority species such as the water vole, water crowfoot, river lamprey and brown trout. There are a number of local community groups that care about the river, including Action for the River Kennet (ARK) a group set up by volunteers that has been campaigning and working to improve the health of the river for 20 years.

The upper Kennet – water supply and demand

The upper part of the river Kennet (above Hungerford) is part of Thames Water's Swindon and Oxfordshire water resource zone. Water is abstracted from the chalk beneath the river catchment at pumping stations in Axford, near Marlborough and near the headwaters of the river Og (a tributary of the upper Kennet). Thames Water holds licences to abstract up to 35 million litres of water per day from the upper Kennet for public water supply. Average daily abstraction is about 55% of the licence limits. There are also significant Wessex Water abstractions from the chalk close to the catchment boundary (although models of the groundwater suggest that the majority of these do not affect the Kennet). There are also a very small number of abstractions for farm and private water supplies in the upper Kennet (less than 1% of the historic abstraction value).

Of the water abstracted from the upper Kennet, 85% is supplied to south Swindon and 15% to areas around Marlborough and Ramsbury. It is estimated that the Kennet supplies 40,000 households with water. The water exported to Swindon is not returned to the Kennet Valley as wastewater. This means that the majority of water abstracted is lost to the catchment. Consumption in the Swindon and Oxfordshire water resource zone is estimated to be 160 litres per person per day and around 37% of households have a water meter. Under dry year, peak demand conditions the Swindon and Oxfordshire water resource zone is in deficit (meaning that Thames Water cannot ensure security of supply without imposing restrictions). Thames Water is developing alternative resources at Gatehampton to resolve this (funding was approved in Ofwat's Final Determination).



Impacts of abstraction on the upper Kennet

There is strong anecdotal evidence to suggest that the upper Kennet is severely affected by abstraction. ARK was founded in 1990 because the local community had started to become concerned about low flows and water quality in the upper reaches of the river. ARK conducted interviews in the early 1990s with local farmers and riparian owners, which confirmed general perceptions that river levels were lower (for example, residents of Ogbourne St George recollected swimming in the river in places where now, you could walk across without getting your feet wet). The anecdotal evidence suggests that the perennial head of the Kennet has moved about five miles downstream, from Swallowhead Springs to Marlborough, with substantial changes to the frequency and size of winterbourne flows (although this is not supported by Environment Agency data). Groundwater levels at Axford show an observed fall between 1970 and 1980, during which time abstraction increased significantly⁶².

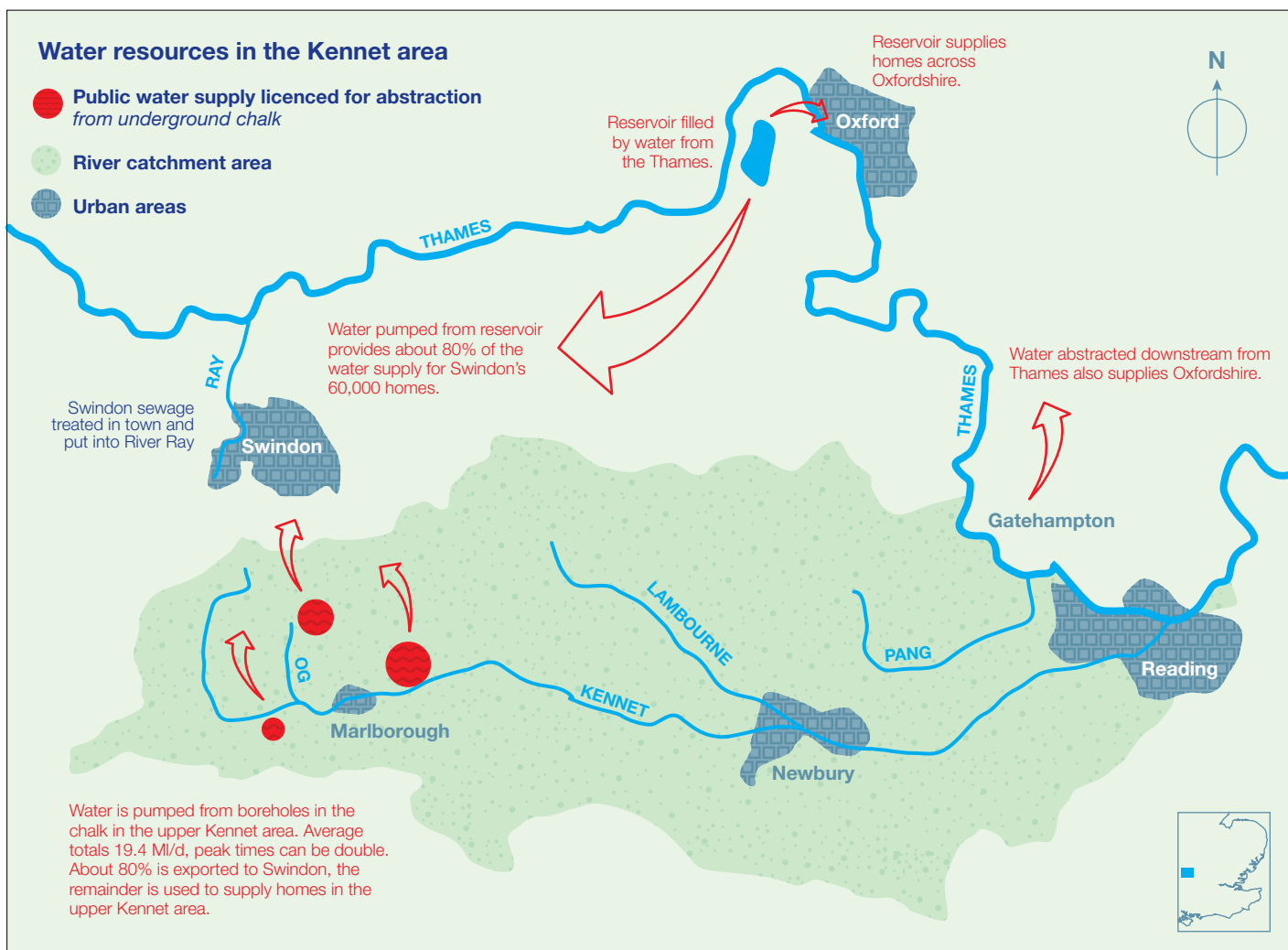
The Axford abstraction has had two recent licence variations: increased in 1998 (from a maximum daily abstraction of 13.1 MI/d to 20.5 MI/d) and reduced in 2008 (back to 13.1 MI/d peak and 11.1 MI/d daily average)⁶³. Subsequent investigations were conducted into the impact of abstraction at Axford on the River Kennet. It concluded that abstraction was contributing to low flows but, due to the complex nature of the systems, it was difficult to demonstrate specific evidence of direct adverse impact on the environment. The investigation found that abstraction of ground water led to a net depletion of river flow downstream: summer flows reduced by 10-14% on average and even more during low flow or drought periods (35- 40% estimated during the early 1990s drought and 20% estimated during 2003).

The assessment of the impact on ecology focused on water crowfoot, which requires swift-flowing water over clean gravel. It suggested that the impact of the Axford abstraction upon flow could have an adverse effect on water crowfoot growth during individual low flow years, and that there would be a potential benefit to its growth by reducing abstraction at times of low flow. The study referred to case studies that suggested that the ecology would benefit if net consumptive abstraction was capped at 3 MI/d (currently, the average daily consumptive abstraction from Axford is approximately 9.4 MI/d).

As a result, in order to be sufficiently precautionary, the Environment Agency and Thames Water agreed that the licence at Axford should be reduced further to 6MI/d (average and peak). However, as of the time of writing in 2010, the Environment Agency has not officially notified Thames Water of its intention to amend the licence under powers of the Water Act.

The impact of the abstraction point on the upper Og is also under investigation. A report is due in spring 2010. There are also abstractions from the chalk near Clatford and Marlborough, equivalent to 40% of the historical dry weather flows. The Environment Agency's Catchment Abstraction Management Strategy classes the Kennet between Hungerford and Marlborough as "over abstracted", with a flow deficit at Q95 of 8.1 MI/d⁶⁴.

The river Kennet



Did 2009 deliver for the Kennet?

Thames Water has proposed a solution to 'make good' any reduction in deployable output arising from the Axford licence amendments: developing a pipeline connecting north and south Swindon in order to be able to supply south Swindon with water from Farmoor reservoir. It estimates that developing the pipeline will cost £8-10 million. Thames Water included this solution in its Water Resources Management Plan and submitted a request to Ofwat to fund it via the price review process. As the upper Kennet is not protected by the Habitats Directive, Ofwat refused the expenditure and advised that funding would have to be secured through the Environment Agency's compensation scheme. Thames Water is currently awaiting a significant amount (in the region of £17 million) from the Environment Agency, to compensate the company for a scheme to address over-abstraction on the river Darrent for which Thames has already paid. Thames Water is cautious about developing the solution at Axford until compensation has been made available for the work on the Darrent. However, Thames and the Environment Agency are continuing to work together to agree upon final option selection for Axford.

Thames Water's Water Resource Management Plan aims to reduce demand in the Swindon and Oxfordshire resource zone to 134 litres per person per day by 2030 (close to Defra's target of 130 litres). It also plans to increase the proportion of metered households to 90% by 2030. On the basis of this long-term plan,

Thames Water proposed an integrated demand management programme in their 2010-2015 business plan⁶⁵, including plans for leakage reduction (by 4% across the Thames Water region) and more water meters (to increase proportion of households with meters across the region from 28% in 2010 to 41% by 2015).

However, Ofwat's Final Determination did not approve spend for a significant metering and leakage programme across the Thames Water region, even though Thames had placed emphasis on this in its Strategic Direction Statement. Again, we have attempted to understand the reasons behind this decision. We understand that Thames' enhanced leakage and metering programmes were not judged to be beneficial because, as with the upper Lee, there was judged to be no current deficit on the basis of the licences currently held by Thames Water. In addition, Thames Water's business case for these measures included scenarios for climate change, which created a supply-demand deficit. Ofwat's view was that, as the latest climate change projections had not been published in time for the company planning process, companies should not include climate change scenarios in their supply-balance modelling. Instead, it introduced a 'notified item' (essentially a mini price review intervention) for companies to be able to put forward a new business case in the period 2010-2015. As a result of the price review, Thames Water will see the proportion of metered households across their region rise to just 37% and leakage remain at current levels by 2015.

Thames Water was one of only six companies across the country that were approved funding for enhanced water efficiency programmes, anticipating demand savings of up to 5 Ml/d across its region. Thames planned to maximise efficiencies by delivering this alongside the large-scale metering programme. At first, it seemed that the water efficiency programme may be prejudiced by Ofwat's final price determination, as the metering was not approved. However, Thames Water is now planning to work in partnership with a number of London local authorities to 'piggy back' on planned energy retrofits, delivering its water efficiency programme at a much reduced cost. This could see thousands of homes across London becoming more water efficient by 2015, and represents a positive example of the type of innovation that can be achieved.

Thames Water is also working with WWF and Waterwise on a partnership project to deliver large scale water efficiency in Swindon. *Save Water Swindon* will launch in 2010 and aims to raise awareness of the benefits of saving water, help residents change behaviour and deliver free water efficiency retrofits to a significant number of homes across the town. It is intended to measure water savings on a district basis, develop a new approach to delivery that can be replicated elsewhere and increase confidence that water efficiency can reduce demand.

The Thames River Basin Management Plan includes some broad measures to address abstraction where it is affecting achievement of 'good ecological status' across the region. WWF is working with the local Environment Agency, ARK and other stakeholders

to develop a Kennet Catchment Plan, supplementary to the River Basin Management Plan, which sets out specific actions to achieve good ecological status. Key measures to address abstraction will include:

- implementing the changes to the Axford licence (and developing alternative solutions) by 2015; and
- completing investigations on the Og by 2010, and developing options to implement solutions if appropriate.

The Kennet Catchment Plan will be completed by the end of summer 2010.

Immediate action that can protect the Kennet

- **The Environment Agency should set out a timetable for funding the Axford abstraction and issue a notification to amend the licence under the Water Act.**
- **The Environment Agency and Thames Water should sign up to a binding agreement to ensure that alternative solutions for Axford can be developed by 2015. This must include clarity on funding and steps to minimise use.**
- **The Kennet Catchment Plan should be completed and used to drive action on abstraction.**
- **Local councils should introduce 'water neutral' planning policies to ensure new development does not result in a net increase in water demand.**
- **Community groups should focus on raising awareness of the value of the rivers and champion water saving in the local area.**



What can we learn? Barriers to reducing damaging abstraction



This story of three English rivers tells us that, while progress is being made in some areas, there remain significant problems with the current water planning framework. Most noticeably, there is considerable contradiction and confusion between the different elements of the water planning system.

For example, the price review process and Water Resource Management Plans are not always aligned – in the Kennet and the Upper Lee, the water companies included measures consistent with their long-term water resource plans in their business plans, only for these to be rejected by Ofwat. Similarly, there are contradictions between the Water Framework Directive River Basin Management plans and both the Restoring Sustainable Abstraction programme and water company business plans (in the context of the absence of demand-based measures in water scarce areas and with respect to the available evidence of problems). There is conflict between the Restoring Sustainable Abstraction programme and plans for new housing. And there is a contradiction between the aspirations for metering and water efficiency that were centre-pieces of the Government's *Future Water* strategy and the absence of progress towards these in both the price review and water resource management planning processes.

In this chapter, we examine some of the deeper problems that seem to be driving these contradictions, pointing to some of the barriers that need to be overcome in any future reforms.

The 'surplus water' catch-22

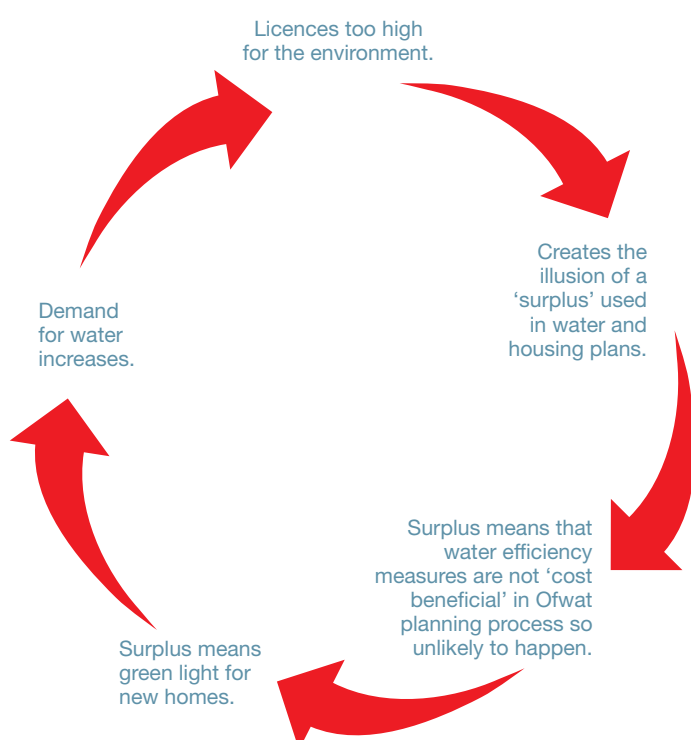
One of the most perverse aspects of the current water planning framework is the absence of approval by Ofwat for proposed water demand measures in areas that have been judged by the Environment Agency to be over-abstracted, often very significantly. Why is this? Our understanding is that this is in part driven by a 'catch-22' in current water management policy. The Environment Agency's CAMS process has identified those areas that are currently over-licensed or over-abstracted. However, in deciding on which water company demand measures to approve, Ofwat bases its assessment of resource availability not on the CAMS process, but instead on the total amount of *licensed* abstraction held by water companies. No account is taken in this assessment of whether these licences are sustainable or not.

This results in the bizarre outcome that, in some cases, resource availability assessments view regions as being in 'surplus' even though the Environment Agency's CAMS process judges these same regions as being over-abstracted. In these circumstances, Ofwat limits approval for demand management measures, as it judges that there is no economic justification in these areas deemed to be in water 'surplus'.

This barrier, we believe, lies in part behind the decisions by Ofwat not to approve some of the water demand measures proposed by Veolia Water and Thames Water for approval through the price review.

This catch-22 not only impacts on water planning processes, but also on housing development planning. Through the housing planning process, judgements of water availability are made not on the basis of the Environment Agency's CAMS assessment, but on the basis of licensed water amounts. Once again, this results in the assessment being made that there is available water for housing expansion in areas that have already been judged by the CAMS process as being over-abstracted. The catch-22 is potentially significantly more serious in the housing context: while demand management measures can always be introduced through the next price review, once new housing has been constructed in over-abstracted areas, this is more or less permanent.

Water licence Catch 22



Making the case for metering

The government's *Future Water* strategy⁶⁶, and the subsequent Walker review, have highlighted the benefits of charging by water meter and recommended a new approach to deliver 80% metering in England by 2020⁶⁷. Despite this, Ofwat's latest price review will see metering across the country increase from 37% in 2010 to 50% in 2015. There is a notable difference for our three rivers. For the upper Lee and the Kennet, Ofwat declined elements of Veolia Water and Thames' proposed metering programme. In the Itchen, on the other hand, approval has been given for plans to move to increase the proportion of households with meters to 92%.

Given the decisions elsewhere, Ofwat's approval for Southern Water's near-universal metering programme may be a surprise. On our analysis, it seems that there were a number of reasons why Southern's plans made the grade. These can provide some guidance to further metering roll-out elsewhere in the country.

- **Leadership and culture** – Top managers at Southern Water recognised the benefits of universal metering and made an early decision that it was core to deliver its business plan. This drove progress in a number of areas. Southern included a commitment to full metering in its Strategic Direction Statement (SDS)⁶⁸. Ofwat recognised this in its final determination: "We have allowed a significant part of your metering programme to achieve near universal metering by 2015 and improve your leakage, which were key elements of your strategic direction statement."⁶⁹
- **Innovation to drive down costs** – Once committed, Southern has invested time in finding ways to drive down the costs of metering in order to demonstrate it was the most cost-effective way to deliver its water resources plan. It investigated new ways of delivering metering (such as automated meter recognition, outsourcing, billing and tariffs) to reduce procurement and operational costs and maximise efficiencies.
- **Developing a robust business case** – It seems that Southern decided to find a way to make the business case for metering. In cost-benefit analysis, the company compared universal metering with other scenarios (such as the continued rate of opt-in metering) to show that it would be far more efficient in the long term to do it now, in one hit, rather than little by little. It also designed the metering programme to maximise other benefits, building opportunities to enhance leakage reduction and water efficiency on the back of the metering programme.
- **Deficit** – The abstraction licence reductions on the Itchen tipped the surplus/deficit balance for the Hampshire South resource zone. Significantly, the fact that the Itchen is a Habitats Directive designated river has meant that funding has been made available to fund alternatives to enable the licence changes to be implemented.
- **Engaging with customers** – Southern realised that a metering programme offered opportunities for it to enhance engagement with customers, with benefits for its brand, reputation and increasing customer awareness of what the company does, and how and why to save water.

Why are companies not delivering more water efficiency schemes?

The final water company plans approved under PR09 included only a limited quantity of water efficiency schemes: in Ofwat's final determination, savings from water efficiency represented just 0.34% of total household water supply⁷⁰. On the face of it, this is surprising, as reducing the amount of water that is wasted would seem the most obvious way of reducing damaging abstraction from rivers. In part, this may be because water efficiency falls outside the comfort zone and skill set of the traditional water resources engineer. In addition, we believe that three main barriers exist to the wider uptake of water efficiency schemes by water companies:

i. Low confidence from companies about the effectiveness of demand management measures

Lowering water consumption could reduce the amount of water taken from the environment. Reducing leaks, installing water meters and water efficiency schemes have been shown to reduce demand. Currently, they are not widely used as ways to reduce damaging abstractions, largely owing to low water company confidence that these measures can deliver secure supplies.

In terms of confidence in maintaining security of supply, water resource managers appear to have a hierarchy of options:

1. building alternative supply infrastructure
2. fixing leakage
3. installing water meters and retrofitting homes
4. changing behaviour (including hosepipe bans and communication campaigns)

Water efficiency – particularly behaviour-based interventions – carries uncertainty in the short term (how much can they save?) and the long term (will investment now still deliver in 20 years?). This 'confidence' hierarchy is at odds with an environmental hierarchy, which would seek to reduce waste and consumption (with benefits for saving water and energy), before building new supplies.

Phase 2 of Waterwise's *Evidence Base for Large Scale Water Efficiency in Homes*⁷¹ sought to address low confidence in the data. It shows that water company retrofit schemes consistently achieve savings of 20-30 litres per property per day (for example by converting toilets to dual flush; replacing showerheads; and fitting tap inserts), with a high level of repeatability. However, there was a wide variation in the cost per litre saved (£1 to £22 per litre per property per day) and in the comparison between actual and theoretical savings. Such variation (and associated uncertainty when trying to replicate) can be summarised as relating to:

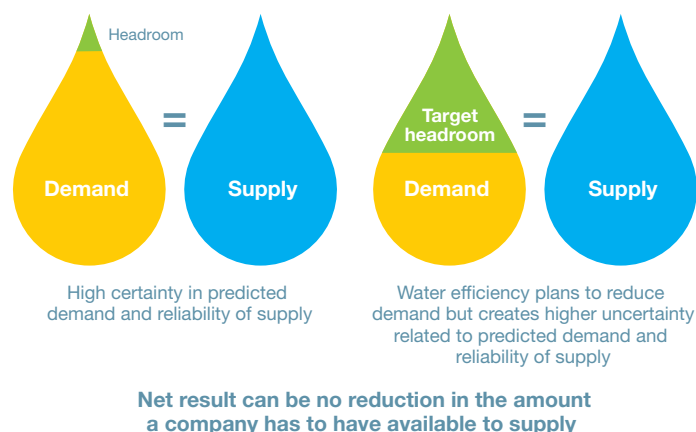
- **Delivery** – the way schemes are delivered and managed, including: the type of products used (for example, the varying cost and speed of installation); who is delivering (the water company alone, as a standalone project or part of metering, or in partnership with social housing providers, community organisations or government); how they are delivered to customers (e.g. a plumber 'visit and fix' vs. self fitting; convenience of participating; opt in vs. opt out; level of communications support).
- **Context** – including: season, water scarcity (time and place), socio-demographics of target audience, 'community spirit', proportion of households that are metered, water history (past leaks and floods), housing stock.
- **Behaviour** – including: participation rates, awareness of the issue/project, pro-environmental attitudes, whether people remove fittings, population churn, current water use, roles in the household and community.

These factors contribute to a large number of variables, which all impact on the level of certainty about potential effectiveness of water efficiency. It makes it difficult to compare 'identical' projects and leads to a feeling that *it won't work the same in my area*. However, the invaluable evidence that Waterwise has provided can be used to help companies develop their own programmes, making water efficiency work *for them* and building their confidence that it can deliver real water savings.

ii. Assessing 'headroom' and deployable output

The way water companies use 'target headroom' to manage uncertainty and risk has implications for whether water efficiency measures can actually contribute to a reduction to the total supply needed, and thereby be incorporated in company business plans. Target headroom is a safety margin used by companies to cover uncertainties in their estimates. Basically, the amount of water a company needs to have available for supply must equal total demand plus target headroom. An assessment of the uncertainty related to the effectiveness of water efficiency measures is added to the required target headroom. The higher the uncertainty in the amount of savings from water efficiency measures, the larger the target headroom and the less the net benefit of the savings produced by the water efficiency measure. This can mean that, in company plans, any anticipated reduction in demand delivered by water efficiency measures is offset to some degree by a need to meet a larger target headroom.

Water efficiency and uncertainty



iii. CAPEX vs. OPEX

Despite Ofwat's new "revenue correction mechanism" (that seeks to ensure companies are not penalised through revenue loss if customers reduce demand), the regulatory system effectively penalises investment in demand reduction. Currently, water companies are rewarded for increases in capital expenditure (CAPEX), as this increases the capital base against which companies are allowed to generate revenues (and hence profits). On the other hand, demand management expenditure is generally classified as operational expenditure (OPEX) and companies are penalised if this is too high. Many demand management measures do not result in an increase in the capital value of companies that is used to assess allowable profits.

The current regulatory system therefore rewards companies for investing in new water infrastructure such as reservoirs as opposed to investing in measures to reduce demand. This problem is now well recognised by Ofwat, among others. The Walker review noted this, and recommended that Ofwat should calculate water efficiency expenditure separate to overall operational efficiency and use the 'true', future value of water to inform cost-benefit analyses and investment decisions in order to remove some of the current perverse incentives.

Optimising supply networks for sustainability

At the moment, water companies optimise their water supply networks on the principle of least total cost, which they are required to do by Ofwat under the current regulatory system. This means that the preferred water abstractions are those that cost the least to operate, to treat water and deliver it where it's needed.

However, this practice takes no account of the environmental value of water. This can mean that during dry periods, water can be pumped from where it is most needed by the environment when alternative sources of supply are readily available, albeit at a somewhat higher (monetary) cost. Environmental protection is provided only through the limits and conditions specified in the abstraction licence. For example, under the current regulatory framework, Thames Water is effectively rewarded to meet demand by abstracting more from the relatively cheap sources of water in the chalk aquifers that feed the Kennet headwaters, even though these are fragile and important environments. With the right incentives in place, the water company would be encouraged to reduce abstraction from the Kennet headwaters, when the river needs it most, and consider alternative ways of optimising supply networks to reduce this abstraction. This may not require investment in the development of new sources, but simply a different mechanism for managing alternative existing sources of water within current supply networks.

Balancing precaution and risk: how much certainty do we need?

Due to the complex nature of the science, it is can be difficult to demonstrate a clear, causal link between abstraction and declining ecology. Freshwater ecosystems have a range of interacting variables that can impact their health, including water chemistry, temperature, flow velocity and morphology, and it can be difficult to isolate the effects of each. In many cases, correlations between flow levels and ecosystems can only be seen when ecosystems have been pushed to breaking point and damage has occurred.

It can be harder still to determine the precise impacts of groundwater abstractions on groundwater fed rivers. Abstraction of water from an aquifer results in a 'cone of depression' lowering the water table around the abstraction point. It is not always clear how far the cone of depression extends and how it can impact on river flows. Conservation of mass suggests that abstraction of ground water leads inevitably to reduction in river flows springing from the aquifer – where else does the water go? But groundwater systems are difficult to model – they often cover areas much larger than the river catchment and the network of underground fissures and joints in the rock make it hard to simulate and predict water flows and levels in different places. This issue has proved important in the rivers considered here:

- Despite a collaborative effort, it was not possible to develop a credible simulation of river flows and groundwater levels for the Mimram, during and following prolonged drought periods⁷².
- An investigation into the Axford abstraction on the river Kennet concluded that there was sufficient certainty that the groundwater abstraction was resulting in lower river flows downstream. It also concluded that there was evidence that species, such as water crowfoot, decline in relation to low river flows. However, it could not show that abstraction was directly impacting the ecology⁷³.
- Even when there is a wealth of good historical data (such as the invertebrate records on the river Itchen), it has not been possible to identify straightforward thresholds at which abstraction impacts on ecology.

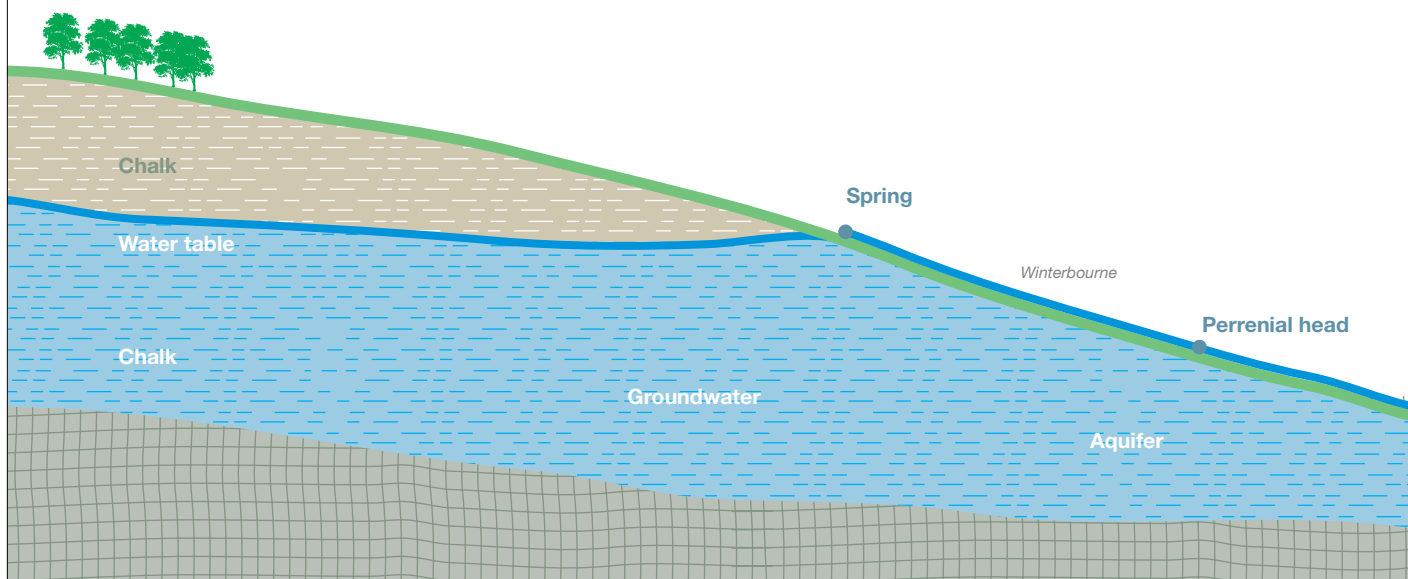
Because of the costs associated with fixing the problem, and difficulties establishing that abstraction is impacting ecology with very high levels of certainty, the Environment Agency seeks to "balance precaution and risk". However, in practice, this approach leads to a need to prove that abstraction is causing damage before any action is taken (not abstractors proving that they are not causing damage, as is the case in most other aspects of environmental impact assessment and management).

The Water Framework Directive River Basin Management Plans include measures to reduce abstraction licences on rivers protected by the Habitats Directive, because the legislation enshrines the precautionary principle. However, few significant measures to reduce abstraction licences have been included for any other rivers. For some of these rivers, the Environment Agency will be conducting more investigations to establish higher levels of certainty that abstraction is impacting on ecology before funding reductions. However, is the science even able to give us such high levels of certainty? If it is, do we have enough data to establish the relationships on all rivers? Do we have to wait until rivers are damaged – perhaps beyond repair – before we act?

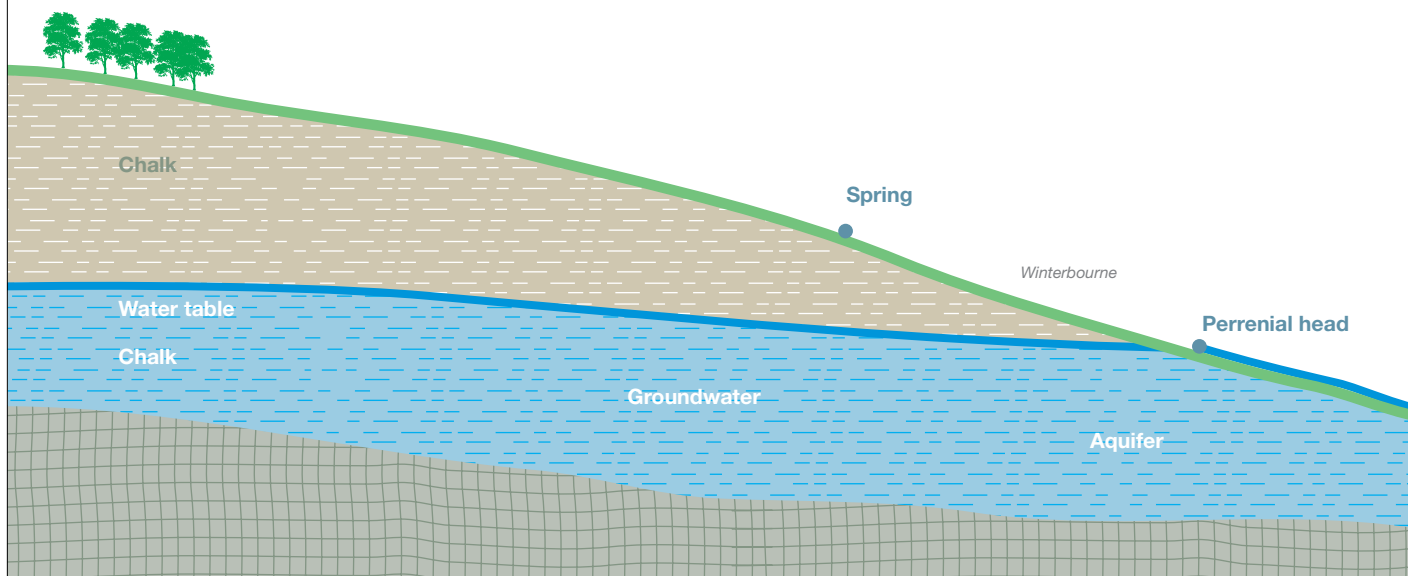
WWF is a science-based organisation and we understand that limited resources must be used where they can have most effect. However, we do not think current levels of uncertainty provide sufficient reason for inaction. We're calling for 'low regret' measures – such as demand management – to be used immediately. We also advocate a risk-based approach to ending unsustainable abstraction, learning from water resource and flood risk managers.

Uncertainty over future environmental flow requirements is now creating planning difficulties for water resource planners in companies. For example, the uncertainty is making the 25-year water resource planning process in effect redundant in many areas as companies have no clarity on what may or may not be permissible levels of abstraction. In addition, the current moves to promote competition, trading and transfers between companies may change the balance of costs and benefits associated with the treatment of uncertainty. As has been recognised by Ofwat: *"Over-licensing and over-abstraction in some areas are key barriers to reform and liberalisation of the water licence market."*⁷⁴ If the inability to develop sufficient certainty to resolve outstanding issues of over-abstraction holds this process up, the costs to consumers in terms of the forgone benefits of reform may be considerable. Taken together, the benefits of a more pragmatic approach may therefore outweigh the costs.

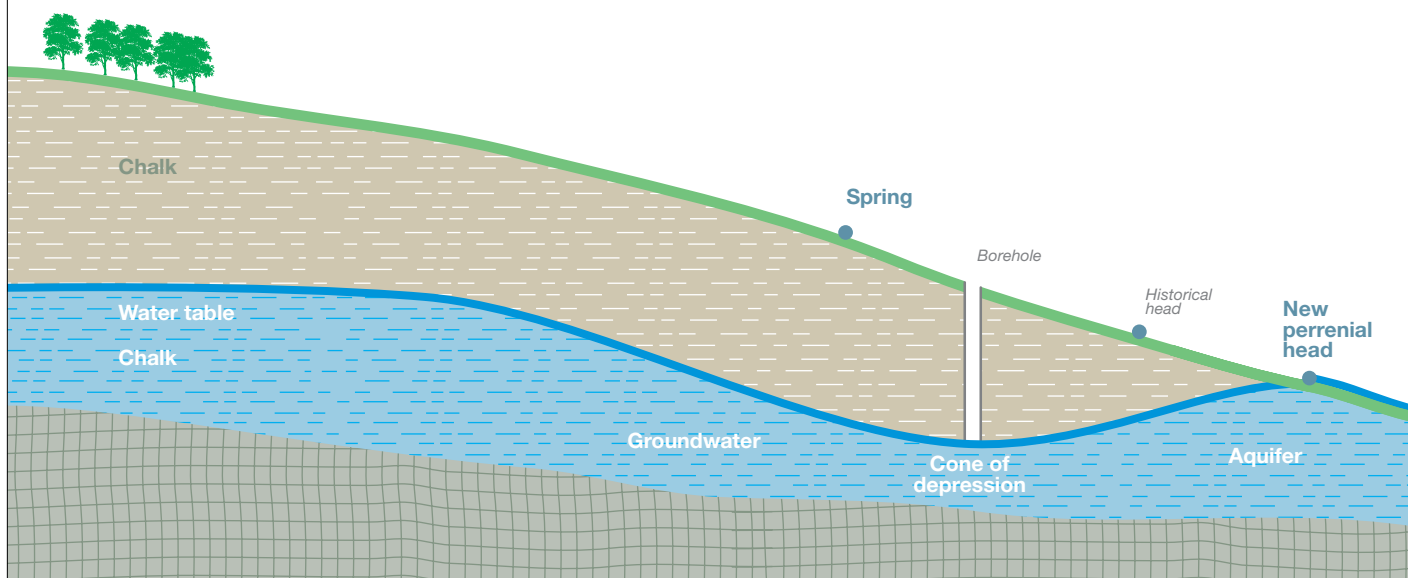
Chalk stream in winter



Chalk stream in summer



Chalk stream with abstraction



Moving forward – a new approach to restoring sustainable abstraction



Addressing the historic legacy of unsustainable abstraction licenses is necessary to achieve sustainable levels of abstraction. However, the focus on the legal and financial issues that surround this has, perhaps, taken attention away from some of the broader mechanisms and approaches that could support a move to sustainable abstraction.

The current approach to abstraction in England and Wales can at times be characterised as – *licences are regulated by the Environment Agency and thus cannot be damaging the environment; if they were then the Environment Agency would revoke or amend them*. This approach is very blunt and could only be appropriate if there weren't additional barriers such as limited compensation funding acting on the Environment Agency's decision. Moreover, climate change will pose challenges for the future that will require us to remain flexible as circumstances and conditions adapt.

Modern water resources planning and regulation must be more flexible and responsive in order to address historical problems, build resilience into future ones, and attempt to identify efficient and low-cost solutions. The Mimram, Beane and Kennet case studies show that the current all or nothing regulatory approach is not protecting today's environment. It is also failing to stimulate or provide incentives for innovation and much-needed alternative solutions that are necessary if we are to continue providing reliable water resources as the climate changes and the population rises.

Revoking damaging licences, reallocating water rights and amending the historical licence system are essential. But moving to sustainable levels of abstraction requires additional tools. We believe that very significant opportunities exist that would enable problems of over-abstraction to be addressed in ways that could reduce the cost and increase the efficiency of the current attempts to reduce damaging abstraction. Below, we set out six key areas where we believe that reform is required, balanced across all of the different participants in the water resources sector in both the government and the private sector.

1. Leadership and clarity

Because of the many agencies and bodies involved, current attempts to resolve problems of over-abstraction can result in a situation in which responsibility is shuffled in a circle from one body to another, from private sector to regulators and back again.

1.1 In the context of overlapping regulatory mandates, strong leadership is now required from the government.

As the ministry responsible for both Ofwat and the Environment Agency, Defra is uniquely placed to provide this leadership, a clear sense of direction, and clarity over the vision and process for reducing unsustainable abstraction. Both major political parties are proposing policy reviews of the water sector and this provides an opportunity for the government to provide the necessary leadership and clarity. A strong government lead is also needed to raise public awareness about water scarcity and the need to conserve water and open a debate on acceptable levels of service and willingness to pay to meet environmental needs in a changing climate.

1.2 Water companies and their representative bodies have the responsibility and opportunity to play a far stronger role in taking a lead on addressing unsustainable abstraction.

Across many sectors of the global economy, the private sector is now taking the lead in identifying sustainable practice and driving solutions. In this context, the current approach of some water companies to problems of unsustainable abstraction appears increasingly anachronistic: rather than simply waiting to be told what to do by the regulators, companies should now be taking a strong, public lead in identifying problems and developing solutions that will enable the emergence of a sustainable industry. At the very least companies should make a public commitment to address the impacts of abstraction, making the impacts of water use clear to customers.

1.3 The water resource and business plan processes require a considerable increase in transparency from all parties, including Ofwat, the Environment Agency and water companies.

Through the *Rivers on the Edge* project, WWF has repeatedly encountered barriers to obtaining the information that is necessary to understand clearly what decisions are being made, and on what basis.

2. Replacing perverse incentives with incentives for sustainability

Companies must be given better incentives to manage water resources sustainably. There are significant opportunities to supplement and reform the current framework in order to remove existing, perverse incentives and reward companies that invest in creative and innovative ways to reduce their impact on the environment.

A key challenge of meeting sustainable levels of abstraction is complexity – in terms of the nature of environmental impacts and the range of potential solutions available. Water companies are the organisations with the information and capacity to develop the best solutions provided that they are provided with the strong incentives to do so. Development of the most efficient and least-cost solutions requires creativity and innovation, which seem to be positively stifled by the current, largely regulatory, approach. While there must always be a role for regulation as the foundation on which environmental protection is based, we strongly believe that this can be supplemented by market-based approaches across the industry, and through customers.

2.1 A rapid move to universal metering now is needed.

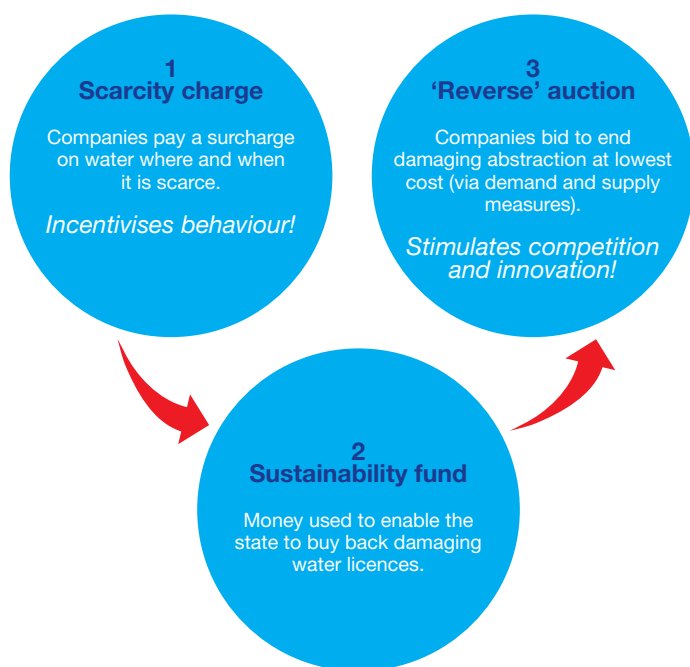
Without water meters, customers do not have any incentive to conserve water. A lack of metering precludes a good understanding of current patterns of household consumption beyond simply average consumption. It also hinders the development of a number of innovations such as seasonal tariffs related to water stress and targeted approaches to water efficiency to reduce consumption in the highest-using households. The government now needs to ensure that barriers to this are removed.

2.2 Scarcity charges on abstraction where and when water is scarce should be introduced. At the moment, companies face the same costs of abstraction, wherever and whenever water is abstracted. A well-designed scarcity charge set at a level sufficient to drive behaviour change has a crucial role to play: the more effectively these charges can be applied and tied to the state of the water environment, the greater the potential efficiency of solutions – hence the lower the overall cost. A scarcity charge could be levied on abstractions where and when water is scarce or judged as damaging. In many water bodies, damage is not done throughout the year, but at particular times, which is why a temporal element is central to the scarcity charge. Ideally, the charge would be linked to the real-time state of the water body, with charges increasing during periods of low flows or lower water availability. This would create clear incentives for companies to manage their water supplies and optimise supply networks to minimise impacts on the environment. Scarcity charges on ‘sleeper’ or unused licences in water scarce areas could also be considered.

2.3 The current regulatory incentives in favour of capital expenditure need to be addressed. We believe that this issue is very well recognised in reviews being undertaken by Walker, Ofwat and others at the time of writing. It is clearly important that a workable solution to this issue is identified and implemented ahead of the next price review.

2.4 With appropriate safeguards in place, barriers to trading and sharing water between companies should be removed. Greater sharing of water (and trading of water licences) between companies could be one opportunity to move towards more sustainable levels of abstraction. However, trading on its own will not be sufficient to solve all the problems. There are a number of environmental concerns which must first be addressed before this proceeds too rapidly, including the removal of ‘sleeper’ licences, ensuring current water resource assessments reflect water scarcity and appropriate environmental scrutiny of water sharing arrangements.

2.5 Many of these objectives could be delivered most effectively through the introduction of a linked scarcity charge and reverse auction process. In seeking to achieve these incentive-based approaches, WWF has developed and promoted a mechanism for restoring sustainable abstraction using market-based incentives, drawing in part on innovative practices in the USA and Australia. Under this approach, a scarcity charge would be introduced on abstractions where and when water is scarce or damaging. The revenues generated from this charge would be used to develop a sustainability fund, which would be used to buy back (compensate) damaging licences through a ‘reverse auction’ process. Under such an approach, abstractors would offer to cease or give up damaging abstraction licences in return for a payment, with payments going to those with the lowest bids. In this way, companies would compete with each other to develop the most innovative, low-cost solutions to ending damaging abstraction. Innovation would be rewarded, while those companies bidding too high would continue to pay scarcity charges on unsustainable licences. This model is indicated in the figure below:



We believe that there are a number of advantages to such an approach: it would be in total revenue neutral to the water industry, with revenues raised through the scarcity charge recycled back in the form of compensation payments; it creates strong economic incentives for sustainable abstraction, while rewarding and stimulating innovation in the industry; and it would reveal important information about the true costs facing the industry. This broad approach has received support both in the Cave Review, and from Ofwat.

Any such market-based scheme would need to be underpinned and supported by regulatory approaches, providing a cut-off timetable for the resolution of unsustainable licences and, at the same time, giving incentives to companies to enter the process rather than hoard licences.

3. Removing the Water Surplus Catch-22

As noted previously, there is a current mismatch between the resource availability assessments made by the water companies and the water scarcity assessments made by the Environment Agency. This leads to a bizarre outcome where Ofwat declines company proposals for demand reduction measures in areas deemed by to be heavily over-abstracted, on the basis that surplus water is in fact available in these areas. This issue is characteristic of an approach to over-abstraction that is focused heavily on licences, to the exclusion of a broader range of approaches.

3.1 Ofwat and the Environment Agency must develop a methodology for assessing resource availability that reflects scarcity. This is an important interim solution until a fully sustainable abstraction and licensing regime is in place. Options include linking water resource planning to the Environment Agency's CAMS process or moderating the least-cost criterion to further demand measures in water scarce areas regardless of whether a supply 'surplus' or 'deficit' exists.

3.2 Plans for new developments and new housing should recognise the actual situation regarding water scarcity (not historical licences). Assessments for new housing and their water resource needs should be made using a methodology that reflects water scarcity. Plans for new housing should not be approved in catchments where current levels of abstraction is risking damage to the ecology. In other areas, councils should introduce 'water neutral' policies to ensure that new housing does not result in a net increase in demand. Given the extended time horizon for housing planning, future assessments of resource availability under climate change should also be factored into these assessments.

4. Developing a flexible response to periods of lower water availability

In some contexts, water scarcity impacts on freshwater ecosystems are perennial. For example, the Mimram and the Beane are characterised by consistent problems of over-abstraction. However, in many cases, problems of low flows occur not in all years but only in periods with below average rainfall. In the case of the Itchen, changes to the water supply approach have been driven largely (as we understand it) by the need to respond to low-flow episodes anticipated with a frequency of once every 20 years. Such periodic rather than perennial problems are also characteristic of the rain-fed systems of the west and north of the country.

Managing environmental impact of abstraction is, therefore, often about managing periods of less than average water availability. There remain significant opportunities for improvements in the way in which this is currently done:

- The ways in which companies currently assess 'deployable output' and the relationship to periods of low-flow vary considerably. It is unclear the extent to which assessments of deployable output are able to distinguish between measures to address average water use, and measures to address water supply in below average years.
- Incentives and a culture remains for companies to offer high 'levels of service', for example the avoidance of hosepipe bans, rather than incorporate such flexibility within a sustainable approach to water management.
- There remains limited contingency planning for addressing periods of below average water availability beyond the current blunt tool of drought orders.

In many countries globally, water management and allocation planning is increasingly developing formal plans and approaches that distinguish between normal years and periods of below average water availability. Among other benefits, such an approach will be crucial to responding to future climate variability.

4.1 More sophisticated mechanisms that can respond to periods of below average water availability are needed and should be rewarded through the regulatory regime.

This requires actions by all parties: Ofwat, the Environment Agency, and water companies. Options include: the development of more sophisticated early warning systems; a tiered set of response plans that can be incrementally introduced (with multiple trigger points); and recognition and rewards for using periodic demand management measures in assessments of deployable output. Companies currently undertake sophisticated modelling exercises to assess future security of supply under a range of management options; similar exercises could be undertaken to assess impacts on environmental flows under a variety of future management options. One of the great merits of a scarcity charge (based on real-time resource availability) linked to a reverse auction process would be to provide an incentive and reward mechanism that would support the development of such innovations and approaches.

4.2 Abstraction licence volumes should distinguish between normal year and dry year volumes. This would underpin the protection of important freshwater ecosystems in most years, while providing security of supply for customers under conditions of unusual water stress: for example, lower volumes of water might be permitted to be abstracted under low availability conditions in some systems. Alternatively, some water sources could be made available only under these conditions. Such an approach to licensing is increasingly common in many countries.

5. Focusing on demand reduction

Given the multiple benefits of demand reduction, a redoubled effort is required to understand and address existing barriers and constraints on the broader take-up of these options. The question should not be whether water efficiency can deliver, but how to make it deliver. Changing consumer behaviour is complex, but there has been significant progress in other sectors. To change consumer behaviour on water, we need strong leadership from joined-up government, incentives for companies to lead and innovate, and infrastructure, services and behaviour change campaigns all designed to maximise public engagement and reduce demand. Companies need to convince themselves that water efficiency works: they will have a hard job convincing the public to save water if they do not believe in it themselves.

5.1 A stronger commitment to demand management from water companies and Ofwat is required, in particular focused on stressed areas. Demand measures should comprise part of all solutions to revoke or amend licences. The amount companies are required to meet via demand measures could be calculated by aiming to drive demand down to 130 litres per person per day in these areas. The funding for demand schemes should be prioritised, either by making it available through the water company planning process (by moderating the least cost/best value economic condition) or the Environment Agency's compensation scheme, and implemented immediately.

5.2 Sustainable, economic level of leakage calculations should include benefits from reduced abstraction in water-scarce catchments. Leakage targets should be set at a level that will encourage the public to believe that their efforts to save water are being matched by those made by water companies.

5.3 Commitments to water efficiency must be made by key stakeholders. Communities should develop a 'charter' whereby all parties pledge to work to reduce water consumption at key times. This should involve community groups and local businesses, as well as water companies, councils and the Environment Agency.

6. Clarifying the RSA process

The existing Restoring Sustainable Abstraction process being delivered by the Environment Agency remains central to any reformed approach to addressing unsustainable abstraction. Any sustainable solution will ultimately require a process by which water licences are reconciled and aligned with sustainable availability (albeit that we advocate a process based on scarcity pricing and a reverse auction as a supplement to the current regulatory approach, as well as consideration of more flexible licence conditions).

While the current monitoring programmes are making an important contribution to identifying where abstractions are a problem, the stumbling block remains implementing changes to existing licences. Addressing this requires both some amendments to the approach being adopted by the Environment Agency, accompanied by commitment from the government to identifying funding for the programme.

6.1 There is a need for government, regulators, statutory agencies such as Natural England and, potentially, private sector bodies to come together to agree on an approach for dealing with uncertainty in the assessment of impacts of over-abstraction. The Environment Agency, supported by Ofwat, should develop a risk-based approach to identifying licences that require amendment. A number of other steps to encourage flexibility into the system could also be promoted, including an increase in the transparency of the process, and sharing data and provisional findings with companies and local authorities and other stakeholders. Efforts could be made to improve the extent to which information is available to the public. An interim step could be included in the process of formally agreeing with the water company to reduce abstraction within a legally-binding time frame.

6.2 The government should provide a clear timeframe for the implementation and delivery of the RSA programme. This requires decisions to remove uncertainty about what schemes will be funded, through which mechanisms and by when. Key milestones and timetables for RSA projects should be made publically available and include in the Water Framework Directive River Basin Management Plans.

Acknowledgements

This report was written by Rose Timlett and Tom Le Quesne at WWF. We would like to thank all the people who helped contribute, in the form of research, useful observations, conversations and provision of data, including:

Colin Fenn

Victoria Ashton, Dene Marshallsey and Simon Gorden-Walker of Artesia

Professor Rob Wilby

Kerrina de Souza

Dave Simpson, Andrew Bott and the River Beane Restoration Association

Tony Last, Tony Langford, Robin Cole and the Friends of the Mimram

John Lawson, Charlotte Hitchmough and Action for the River Kennet

Waterwise

Hampshire and Isle of Wight Wildlife Trust

Veolia Water Central

Thames Water

Southern Water

Roger Harrison

Natural England

Environment Agency – in particular the Solent and South Downs, Thames North East and Thames West teams

Ofwat

Published April 2010 by WWF-UK.

Any reproduction in full or in part of this publication must mention the title and credit WWF-UK as the copyright owner.

© Text 2010 WWF-UK. All rights reserved.

A company limited by guarantee registered in England number 4016725.

Charity registration in England number 1081247 and registration in Scotland number SC039593.

Panda symbol © 1986 WWF – World Wide Fund for Nature (formerly World Wildlife Fund).
© WWF registered trademark.

Photography

Jiri Rezac/WWF-UK: pages 3, 6, 13, 18, 21, 23, 24, 26, 27, back cover.

Olaf Willoughby/WWF-UK: pages 4, 15, 16, 19, 22.

Dennis Bright: front cover, inside front cover, pages 8, 11, 12, 14, 32.

Andy Sands: page 9

No photographs in this publication may be reproduced without prior authorisation.

Design and production

Mark Noad Design

WWF-UK
Panda House
Weyside Park
Godalming
Surrey GU7 1XR
UK

+44 (0)1483 426444

wwf.org.uk

Glossary

Abstraction

Taking water from the natural environment (e.g. from rivers and underground aquifers).

Catchment Abstraction Management Strategies (CAMs)

These are drawn up periodically by the Environment Agency for rivers across the country. They identify the amount of water remaining available for abstraction, and those cases where abstraction needs to be reduced.

Deployable output

The maximum demand that can be met over the course of a year from the available water resources during drought conditions.

Environmental Flow Indicator (EFI)

A target flow developed by the Environment Agency that shows the sustainable level of variance from natural flow levels and therefore, sustainable levels of abstraction. Actual levels of flow (impacted by abstraction) can then be compared with the EFI.

EU Habitats Directive

A European Directive of 1992 that safeguards the most precious natural environments across Europe.

EU Water Framework Directive

The most significant piece of European water legislation to date. It requires EU governments to introduce measures to ensure that water bodies across Europe achieve 'good ecological status'. The first implementation plans were published in December 2009.

Flow deficit

The amount by which historical flows (due to abstraction) are below the flow level needed by the environment (the EFI).

Hands-off flow

A flow target below which all abstractions must cease.

Headroom

A safety margin that water companies use in water resource planning to allow for uncertainty in supply and demand, in order to ensure that companies maintain Security of Supply.

LIFE scores

A method of measuring the health of macro-invertebrate populations at differing river flows.

Megalitre (Ml)

1 megalitre equals 1,000,000 litres. Abstraction amounts and river flows are commonly represented in terms of megalitres per day (Ml/d).

Over-abstracted

Where the existing amount of abstraction risks damaging the natural environment during low-flow periods.

Over-licensed

Where there is a risk of damaging the natural environment during low-flow periods if the full licensed amount were abstracted.

Perennial head

The upper-most point of a river, below which flows are observed all year round.

Price Review

Ofwat review of water company business plans conducted every five years. Ofwat approve company spending and investment plans relate to monies raised through customer bills. The price review for company plans for the period 2010 to 2015 ended in November 2009 (also known as 'PR09' or the 'periodic review').

Q95

The level above which flows are observed 95% of the time (i.e. the level that the river reaches for the lowest 5% of the year), typically observed in summer months.

River Basin Management Plans

These need to be produced every six years by the Environment Agency, setting out how they will achieve the objectives of the EU Water Framework Directive. A Plan is produced for each of the 11 river basin districts in England and Wales.

Restoring Sustainable Abstraction (RSA)

An Environment Agency programme that aims to review and, if deemed necessary, amend or revoke environmentally-damaging abstraction licences.

Security of Supply

Ofwat regulation which requires companies to ensure that supply meets demand to a prescribed level of service (without applying restrictions to customers such as hosepipe bans). Ofwat assesses company compliance with a 'security of supply index' which reflects companies' abilities to meet target headroom.

Special Areas of Conservation (SACs)

These are areas which have been given special protection under the European Union's Habitats Directive. They provide increased protection to a variety of wild animals, plants and habitats and are a vital part of global efforts to conserve the world's biodiversity.

Target headroom

The amount of headroom a company needs to ensure that it can meet Security of Supply. Achieving target headroom means a company can meet its defined level of service, while a target headroom deficit means that the company is increasingly likely to apply restrictions during a dry year.

Water Resource Management Plans

Statutory documents that the water companies are required to produce to show how they plan to manage water resources for the next 25 years. The companies consulted on draft plans before submitting them to Defra for approval in 2009

Notes

- 1 Ofwat. 2009. Final Determination of water company prices 2010-2015. Page 51. Available at: http://www.ofwat.gov.uk/pricereview/pr09phase3/det_pr09_finalfull.pdf
- 2 Defra. 2009. Cave review of competition and innovation in water markets. Available at: <http://www.defra.gov.uk/environment/quality/water/industry/cavereview/>
- 3 Defra. 2009. Independent review of charging for household water and sewage services. Available at: <http://www.defra.gov.uk/environment/quality/water/industry/walkerreview/>
- 4 Defra. 2008. Future water. Available at: <http://www.official-documents.gov.uk/document/cm73/7319/7319.pdf>
- 5 WWF. 2009. Rivers on the Edge. Available at: http://assets.wwf.org.uk/downloads/rivers_on_the_edge.pdf
- 6 Environment Agency, Natural England, WWF-UK, 2009. Joint submission on the environmental issues of unsustainable abstraction. Available at: http://assets.wwf.org.uk/downloads/joint_submission_to_cave_final_170209.pdf
- 7 Aldrick, J. 2010. Water Resource Management – a regulators perspective. Proceedings of the Managing River Flows for Salmonids Conference, January 2010, York. Available at: www.coastms.co.uk/conferences/426
- 8 Based on total water demand in 2008 (source: Environment Agency, 2009. Water Resource Strategy for England and Wales. p 21).
- 9 Environment Agency, 2009. Thames River Basin Management Plan. Available at: <http://wfdconsultation.environment-agency.gov.uk/wfdcms/en/thames/Intro.aspx>
- 10 WWF. 2007. Waste not want not. Sustainable water tariffs. Available at: http://www.wwf.org.uk/filelibrary/pdf/water_tariffs_report01.pdf
- 11 HM Government. 2005. Securing the future. Available at: <http://www.defra.gov.uk/sustainable/government/publications/uk-strategy/index.htm>
- 12 UK Climate Projections, 2009 The climate of the UK and recent trends Revised edition, January 2009
- 13 Environment Agency (2008) Climate Change and River Flows in the 2050s. Science Report SC070079/SS1
- 14 UK Climate Projections, 2009 The climate of the UK and recent trends Revised edition, January 2009
- 15 HM Treasury, 2007. PSA Delivery Agreement 27: Lead the global effort to avoid dangerous climate change. Available at: www.hm-treasury.gov.uk/d/pbr_csr07_psa27.pdf
- 16 Tanner, K., 2010. CAMS and RAM. Proceedings of the Managing River Flows for Salmonids Conference, January 2010, York. Available at: www.coastms.co.uk/conferences/426
- 17 Defra, 2009. Autumn Performance Report 2009. Available at: www.defra.gov.uk/corporate/about/how/dep/depdocs/apr2009.pdf
- 18 Environment Agency, Natural England, WWF-UK, 2009. Joint submission on the environmental issues of unsustainable abstraction. Available at: http://assets.wwf.org.uk/downloads/joint_submission_to_cave_final_170209.pdf
- 19 Environment Agency, Natural England, WWF-UK, 2009. Joint submission on the environmental issues of unsustainable abstraction. Available at: http://assets.wwf.org.uk/downloads/joint_submission_to_cave_final_170209.pdf
- 20 Environment Agency, 2009. Scheme of Abstraction Charges. Environment Agency, 2007. Water resources abstraction charges, 3rd consultation.
- 21 Hampshire Mills website. Available at: www.hampshiremills.org/listed%20mills.htm
- 22 JNCC website – SAC Interest Features. Available at: www.jncc.gov.uk/ProtectedSites/SACselection/SAC_habitats.asp
- 23 Southern Water. 2009. Revised Water Resource Management Plan.
- 24 Government Office for the South East. 2009. The South East Plan. Available at: <http://www.gos.gov.uk/gose/planning/regionalPlanning/815640/>
- 25 Available at: www.push.gov.uk/pdf/Official%20Documents/080318/Reports/pjc-080318-r03-abi.pdf
- 26 Hampshire County Council website. Hampshire Partnership Networks. Available at: www3.hants.gov.uk/hampshire-senate/senate-partnerships.htm
- 27 Environment Agency, 2006. Test and Itchen CAMS. Available at: <http://www.environment-agency.gov.uk/research/planning/33446.aspx>
- 28 Environment Agency, 2006. Test and Itchen CAMS technical report.
- 29 Available at: <http://www.riveritchensustainability.org.uk/>
- 30 Exley, K. P. 2003. Macro-invertebrate habitat and community status of the River Itchen. Report to RISS. Exley, K. P. 2006. River Itchen macro-invertebrate community relationship to river flow changes. Environment Agency report.
- 31 Atkins, 2007. River Itchen SAC Review of Consents Water Resources Stage 4 Project Site Action Plan: Appendix B – Development of a Stage 4 Target Flow Regime. Report to the Environment Agency.
- 32 Entec, 2008. Groundwater modelling scenarios for chalk and sandstone for the 2020s and 2030s. Report to the Environment Agency.
- 33 Bright, L., Buckley, J., Ogilvie, J. and Wright, T. 2009. Water Resources Use and Development in Hampshire: Current and Future issues. University of Southampton report.
- 34 Wilby, R. 2008. Briefing note on long term water balance and management issues on the River Itchen. Summary available at: http://assets.wwf.org.uk/downloads/case_study_itchen_final.pdf
- 35 Environment Agency 2008. Review of Consents Stage 4 Site Action Plan for the River Itchen (CD-ROM)
- 36 Wilby, R. 2008. Briefing note on long term water balance and management issues on the River Itchen. Summary available at: http://assets.wwf.org.uk/downloads/case_study_itchen_final.pdf
- 37 Garland, J.H.N. 2000. A review of historical references to the River Mimram.
- 38 Chauncy, H. 1700 (reprinted 1975). History of Hertfordshire.
- 39 Garland, J.H.N. 2000. A review of historical references to the River Mimram.
- 40 Found to be "unfavourable recovering" in February 2010. Available at: www.sssi.naturalengland.org.uk/Special/sssi/sssi_details.cfm?sssi_id=1001827
- 41 Cole, R. 2010. Wildlife and bird records on the Mimram at Tewinbury kept by the voluntary warden. Personal correspondence.
- 42 Jacobs Gibb. 2002. Summary of River Mimram Public Preference Study – Stakeholder Feedback.
- 43 E.g. Herts and Middlesex Wildlife Trust, 1992. Wildlife Matters Autumn / Winter.
- 44 E.g. www.shapps.com/forum/index.php?topic=724.0
- 45 WWF. 2008. Thames Vulnerability Report Technical Summary. Available at: wwf.org.uk/what_we_do/working_with_business/?2070/Thames-Basin-Vulnerability-Report
- 46 Abstraction data supplied by the Environment Agency, February 2010. Average abstraction is for 2008.
- 47 Three Valleys Water. 2008. Draft Water Resource Management Plan.
- 48 Environment Agency, 2000. NEWStream, issue 1.
- 49 NRA Thames Region. 1994. Upper Lea Catchment Management Plan. Consultation Report Summary.
- 50 Entec, 2005. River Mimram and Upper Lee Groundwater Model and Water Resources Sustainability Study. Report to the Environment Agency, Thames Region. Available at: www.environment-agency.gov.uk/research/library/consultations/80677.aspx
- 51 Environment Agency, 2006. Upper Lee CAMS. Available at: http://publications.environment-agency.gov.uk/pdf/GETH0506BKWP-e-e.pdf?lang=_e
- 52 Entec, 2005. River Mimram and Upper Lee Groundwater Model and Water Resources Sustainability Study. Report to the Environment Agency, Thames Region.
- 53 Environment Agency, 1998. River Beane Alleviation of Low Flow Phase 2 Studies. Environment Agency Thames Region.
- 54 Entec, 2005. River Mimram and Upper Lee Groundwater Model and Water Resources Sustainability Study. Report to the Environment Agency, Thames Region.
- 55 Letter to Three Valleys Water, reference 080829/SR.
- 56 Three Valleys Water. 2009. Final Business Plan December 2009.
- 57 Environment Agency, 2009. Thames River Basin Management Plan. Available at: <http://wfdconsultation.environment-agency.gov.uk/wfdcms/en/thames/Intro.aspx> (Mimram (from Welwyn to Lee) GB106038033270 and Mimram (St Pauls Walden to Welwyn) GB106038033460) Beane (from Roe Green to confluence with Stevenage Brook) GB106038040110
- 58 Environment Agency, 2009. Thames River Basin Management Plan. Annex E. page 54. Available at: <http://wfdconsultation.environment-agency.gov.uk/wfdcms/en/thames/Intro.aspx>
- 59 Veolia Water Central. 2009. Revised Water Resources Management Plan. Available at: <https://central.veoliawater.co.uk/our-future-plans.aspx>
- 60 Waterwise. 2010. Evidence Base for Large Scale Water Efficiency Retrofit. Phase 2. Interim Report. Available at: www.waterwise.org.uk/reducing_water_wastage_in_the_uk/research/the_evidence_base.html
- 61 WWF and Natural England. 2008. Impact of over abstraction on the river Kennet. Available at: http://assets.wwf.org.uk/downloads/case_study_kennet_final.pdf
- 62 Kennet abstraction figures taken from the draft Kennet Catchment Plan (March 2010) produced by WWF, the Environment Agency and ARK.
- 63 Environment Agency. 2004. Kennet and Pang CAMS.
- 64 Thames Water. 2009. Final Business Plan Submission for the 2009 Price Review. Available at: <http://www.thameswater.co.uk/cps/rde/xbcr/corp/business-plan-part-a-april-09.pdf>
- 65 Defra. 2008. Future water. Available at: <http://www.official-documents.gov.uk/document/cm73/7319/7319.pdf>
- 66 Defra. 2009. The Independent Review of Charging for Household Water and Sewerage Services. Available at: <http://www.defra.gov.uk/environment/quality/water/industry/walkerreview/>
- 67 Southern Water. 2007. Strategic Direction Statement. Available at: www.southernwater.co.uk/pdf/aboutUs/Southern%20Water%20Services%20Brochure%2007.pdf
- 68 Ofwat, 2009. Final determination: Setting price limits for 2010-15. Supplementary report for Southern Water Services Limited. (Version for Regulators). Page 3.
- 69 Water efficiency savings for all water companies = 26 Ml/d (source: Ofwat. 2009. Final Determination.) Household water supply 7756 Ml/d (source: Defra, 2008. Future Water).
- 70 Waterwise, 2010. Evidence Base for Large Scale Water Efficiency in Homes: Phase 2 Interim Report. Available at: www.waterwise.org.uk/reducing_water_wastage_in_the_uk/research/the_evidence_base.html
- 71 Entec, 2005. River Mimram and Upper Lee Groundwater Model and Water Resources Sustainability Study. Report to the Environment Agency, Thames Region.
- 72 WWF and Natural England, 2009. WWF-UK Case Study: the impact of over abstraction on the River Kennet. Available at: http://assets.wwf.org.uk/downloads/case_study_kennet_final.pdf
- 73 WWF, Waterwise and Ofwat. 2008. Joint response to the Cave Review, August 2008. Available at: http://assets.wwf.org.uk/downloads/wwf_ofwat_waterwise_cave.pdf

With a global network covering more than 100 countries and with nearly 50 years of conservation work behind us, WWF is one of the most experienced environmental organisations actively contributing to delivering successful freshwater projects and programmes around the world.

WWF is grateful for HSBC's support of this report and initiative through the global HSBC Climate Partnership. Formed in 2007, the HSBC Climate Partnership brings together HSBC, The Climate Group, Earthwatch Institute, Smithsonian Tropical Research Institute and WWF to reduce the impacts of climate change on people, water, forests and cities.

For more information visit www.hsbc.com/climatepartnership



wwf.org.uk/riversontheedge

Above: the river Itchen through Winchester
Front cover: the river Itchen at Itchen Stoke Mill



The mission of WWF is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature, by:

- conserving the world's biological diversity
- ensuring that the use of renewable natural resources is sustainable
- reducing pollution and wasteful consumption