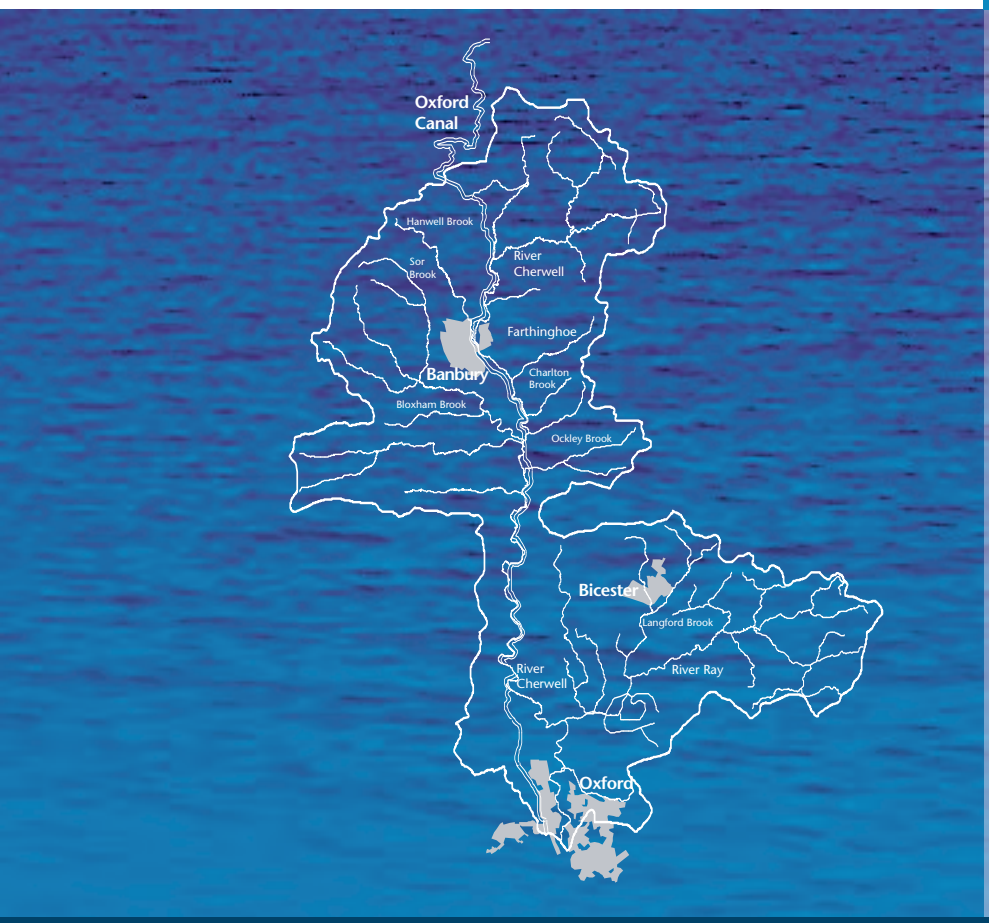

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The Cherwell Catchment Abstraction Management Strategy

Final Strategy Document
July 2005

Environment Agency

www.environment-agency.gov.uk/cams

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Our work includes tackling flooding and pollution incidents, reducing industry's impacts on the environment, cleaning up rivers, coastal waters and contaminated land, and improving wildlife habitats.

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Contents

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VISION FOR THE CAMS AREA

To manage existing pressures on water resources within the catchment and to protect the flow requirements of the river environment whilst considering the needs of existing and future abstractors.

Introduction

Catchment Abstraction Management Strategies (CAMS) are strategies for management of water resources at a local level. They will make more information on water resources and licensing practice publicly available and allow the balance between the needs of abstractors, other water users and the aquatic environment to be considered in consultation with the local community and interested parties.

CAMS are also the mechanism for managing time-limited licences by determining whether they should be renewed and, if so, on what terms.

Managing Water Abstraction: The Catchment Abstraction Management Strategy Process is the national document that supports the development of CAMS at a local level. It sets out the national policy and the regulatory framework within which CAMS operate, describes the process of developing CAMS and provides information on the structure and content of CAMS documents. This Catchment Abstraction Management Strategy should be read in conjunction with *Managing Water Abstraction*.

The Cherwell Catchment Abstraction Management Strategy sets out the abstraction licensing strategy for managing water resources over the next few years. The strategy will undergo a review in 2008 – 2010 to take account of changes to the water resource availability in the catchment.

The Cherwell catchment is just one of ten non-tidal tributary rivers which form part of the larger River Thames basin. Therefore the water availability in the Cherwell catchment will have an impact on the downstream River Thames, and any management policy in the Cherwell must take account of the licensing policies within the Thames basin. The Thames Corridor CAMS was completed in June 2004 and contains information on water resources availability and licensing policy for the River Thames. Copies of completed CAMS documents are available on request.

A technical document for the Cherwell CAMS has been produced which provides the detailed technical information on which the development of the strategy has been based. If you wish to receive this document on CD-ROM, please contact us at the Thames Region, West Area address. A hard-copy version of the document is also available for viewing at the same office.

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The timetable for other CAMS being produced in our Thames Region, West Area office is as follows:

Kennet & Pang	completed May 2004
Vale of White Horse	due to be completed March 2006
Thame & South Chilterns	due to be completed March 2007
Cotwolds	due to be completed October 2007

River Cherwell downstream of Enslow

Consultation on the Cherwell CAMS

Consultation is an integral part of the CAMS process. It is important because it ensures that the CAMS process is as transparent as possible and gives everyone the opportunity to get involved. To let us manage water resources in the catchment effectively and sustainably, it is important that as much information as possible is collated on water needs and uses.

Comments and suggestions have been gathered during the early stages of development of this strategy through pre-consultation activities. These were:

- Awareness-raising leaflet
- CAMS Stakeholder Group

The leaflet was distributed in July 2002. Its aim was to raise awareness of the development of the CAMS in the local area and it also invited anyone with an interest to send in written comments, providing information, views and suggestions.

Over 650 leaflets were distributed to various organisations and interest groups, including abstractors, farmers and conservation groups. 12 per cent responded requesting the consultation document once published. Issues raised centred on seven themes:

- River ecology
- Low flows (particularly through Banbury)
- Water quality
- Changes to the abstraction licensing system (including time-limiting)
- Interactions between the Oxford Canal and the River Cherwell
- Wetland creation/restoration and conservation (water dependent sites)
- Flooding.

A stakeholder group was set up for the Cherwell CAMS. The role of the stakeholder group was to represent the key interests in the catchment and to help identify issues of local significance, provide views on proposals and to consider the likely implications of different strategy options. The members of the Cherwell CAMS Stakeholder Group and the interests that they represented are as follows:

Bruce Tremayne	Chair
Simon Jones / Adam Comerford	Navigation / Recreation
Neil Lambert	Conservation
Steve Tuck	Water Companies
Vaughan Lewis	Fisheries/Angling
Peter Browne	Landowners
Tony Brummell	Local Authorities
John Archer	Farming / Agriculture

There was also a formal consultation on the Cherwell CAMS through a consultation document, distributed in December 2004. The responses received were analysed and taken into account as the strategy was finalised. This CAMS document now sets out the final strategy that has been determined for the Cherwell CAMS area.

3

The CAMS area

The Cherwell CAMS area covers the whole length of the river and its tributaries, to the confluence with the River Thames at New Hinksey in Oxford, an area of 943 km^2. The geology is predominantly clay, with some limestone exposed on the valley sides. The Cotswolds form a western boundary, an Area of Outstanding Natural Beauty (AONB). The predominant land use is agriculture.

The Oxford Canal runs from Birmingham to the Thames just west of Oxford and runs parallel with the River Cherwell. There are a number of inter-connections between the river and canal. Banbury and Bicester are two large towns in the catchment, both growing rapidly. A map of the Cherwell CAMS area is in **Figure 1**.

3.1 Hydrology

The River Cherwell rises at Charwelton in Northamptonshire. As it flows southwards it is joined by a number of smaller tributaries, such as Ashby Brook, Sor Brook and the Deddington Brook. At Islip, the River Ray joins the Cherwell, and the Bayswater Brook flows in shortly before the confluence with the Thames at New Hinksey, South Oxford.

The River Ray is the largest tributary of the Cherwell. It rises near Quainton, flowing 32 km southwest to its confluence with the Cherwell at Islip.

Confluence of the River Cherwell with the Thames at Oxford

3.2 Geology and hydrogeology

The catchment comprises sequences of clays, shales, limestones and sandstones laid down in the Jurassic period. The oldest sediments are in the north of the catchment and the youngest in the south. Clays dominate the catchment, so flows in rivers are mainly from direct runoff and not from groundwater.

The Great and Inferior Oolites have sufficient thickness and are extensive enough across the country to be classed as major aquifers. However, in this catchment, the extent of these aquifers is very limited; although the aquifer can yield significant volumes through fracture flow, there are no large groundwater abstractions from the Oolites.

The other limestone and sandstone layers in the remaining formations are minor aquifers. These layers are often thin and not laterally extensive so groundwater resources are limited and the groundwater reaches the surface through springs.

3.3 Hydrometry

There are eleven rainfall gauging sites, six river flow gauging stations and three flood monitoring level sites in the catchment which provide data for the River Cherwell, River Ray and the Sor Brook.

Most of the river gauging stations, water level monitoring sites and four rain gauges are connected to the Regional Telemetry System which allows up-to-the-minute information to be gathered by computers at our offices. The Flood Warning team use this data to issue timely flood warnings.

Other organisations also measure rainfall and flows in the catchment and share this data with us.

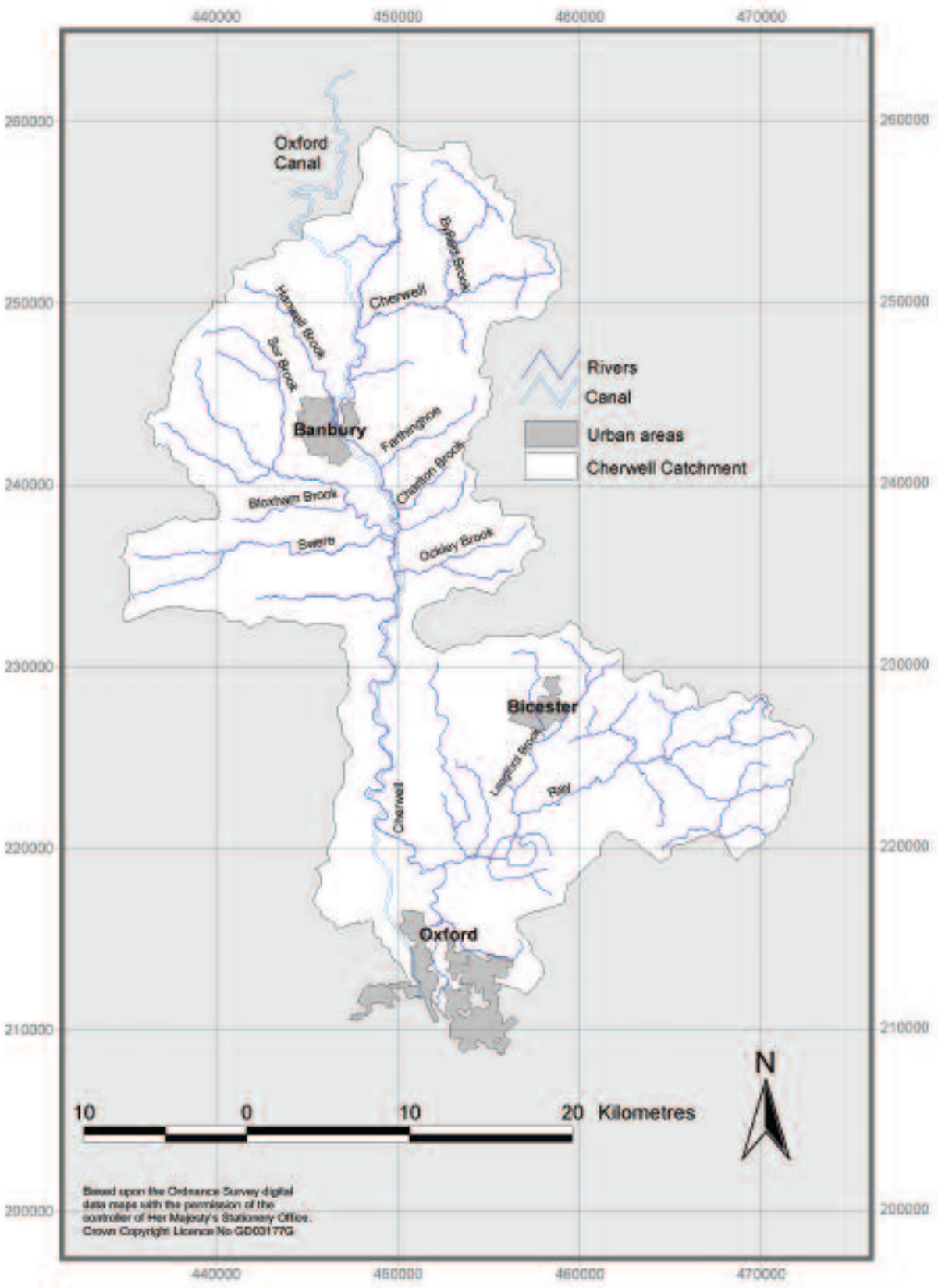


Figure 1 | Cherwell CAMS area

3.4 Abstractions

The total licensed volume of abstraction in the Cherwell CAMS area is 25.95 Ml/d. There is a total of 33 surface water and 226 groundwater abstraction points (see **Figure 2**). However, the volume of water licensed from surface water is significantly greater (23.74 Ml/d) with only 2.21 Ml/d from groundwater.

The impact of abstraction varies significantly across the catchment. In the upper part of the catchment above Banbury, 100 per cent of summer flows can potentially be abstracted, depending on the weather conditions and abstractors' changing needs each year. The River Cherwell above Banbury can, and has in dry years, almost dried up for a couple of days a year. This is primarily a result of a public water supply abstraction granted in the 1960s and other exempt uses of water which are currently not regulated by legislation. Further down the catchment, the impact of abstraction is reduced – the amount of water that can be abstracted is approximately 18 per cent of summer flows as measured at Oxford gauging station, and the river does not dry up.

The majority of licensed abstraction in the Cherwell CAMS area (55 per cent) is for public water supply. **Figure 3** provides a break down of the percentage of licensed abstraction for each purpose. A summary of abstractions by purpose and volume is detailed below (Table 1).

Table 1 Summary of abstractions by purpose and volume

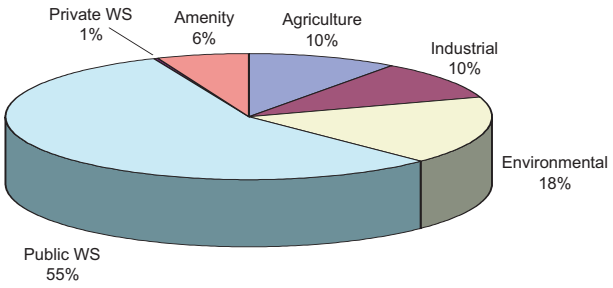
Purpose	Number of abstration points	Total licensed Volume
Agriculture	178	2.59
Industrial	34	2.61
Environmental	1	4.56
Public Water Supply	3	14.50
Private Water Supply	35	0.12
Amenity	8	1.56
Totals	259	25.94

Even though there are many agricultural abstractions in the catchment, these are generally small. Most are for general farming, with some for direct spray irrigation during the summer. Others allow water to be abstracted during the winter and stored in a reservoir, for use during the summer. Other abstractions include those for schools, colleges, hotels, public houses, golf courses, laundry services, breweries and public services. There is also an abstraction from the River Ray, used to maintain water levels in the Otmoor Nature Reserve.

Some abstractions in the Cherwell CAMS area are exempt from licensing, including a significant abstraction from the River Cherwell to the Oxford Canal at Cropredy. Until recently, this abstraction was unmeasured, but a flow meter has now been installed to quantify how much water is abstracted to the canal and this data is provided to us by British Waterways. Other exempt abstractions include those for domestic use of less than 20 cubic metres per day, Crown abstractions, dewatering of quarries, mines and other building/engineering works. We do not regulate these abstractions so there is little information as to the actual volumes of water being abstracted for these exempt purposes.

With the phased implementation of the Water Act 2003, some abstractions will be deregulated and others, such as those for navigation, will come into the regulatory system. However the details of this are still to be confirmed by government. **Table 1** shows a summary of abstractions by purpose and volume.

Figure 3 Pie chart showing the % of licensed abstraction for each purpose



3.5 Discharges

Discharges form an important resource in the Cherwell catchment as they augment flows and support abstractions downstream of the discharge points.

There are nearly 300 consented discharges in the area. There are two major discharges from Banbury and Bicester Sewage Treatment Works (STWs), which account for nearly 70 per cent of the total consented dry weather discharges. There are also many smaller STWs discharging in the area including those from agriculture, fish farms and industrial processes such as cooling water.

There is little information available on the actual quantities of water being discharged. Under the European Urban Waste Water Treatment Directive it is a requirement that STWs with a population equivalent over 2,000 (360m^3) will be monitored by 2005. This, combined with implementation of new procedures for measuring the flow of new discharges, will ensure more data is available in the future.

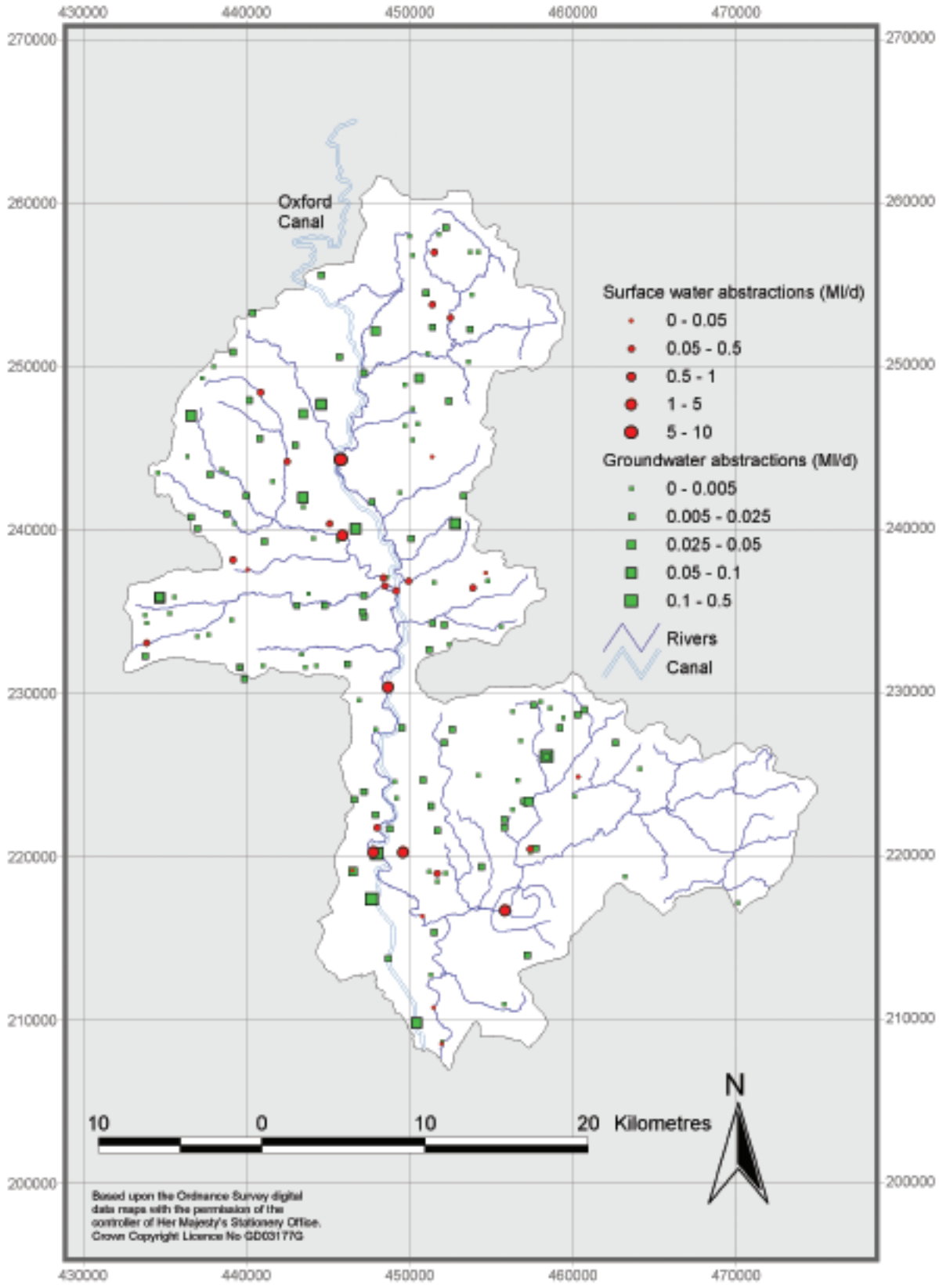


Figure 2 | Licensed abstractions

3.6 Water quality

There are River Quality Objectives (RQOs) for different reaches in a catchment. The RQOs are set using a scheme called River Ecosystem (RE) which is based on the river's ability to support various fish populations. In maintaining rivers within a specified class, the water is suitable for various uses, including water abstraction, recreation and navigation, as well as the ecology.

Most of the reaches in the area have a RE objective of two (good quality). The Gallos Brook, a tributary of the River Ray, has a RE objective of one (very good), but the objective of the Ray from source to Grendon Underwood STW is four (fair quality).

The monitoring in 2002 showed that most river reaches met their RQOs. However Langford Brook between Bicester STW and its confluence with the Ray and the River Cherwell from its source to Banbury failed their RQOs. The failure on Langford Brook was due to dissolved oxygen levels exceeding the standard, due to the quality of effluent being discharged from Bicester STW. The failure on the River Cherwell was thought to be due to low flows affecting dissolved oxygen levels.

Water quality has improved throughout the catchment in the past decade. In 1991, only 17 per cent of rivers were graded good or very good; 55 per cent made these grades in 2003. At the other end of the scale, 23 per cent of rivers were graded poor or bad in 1991; this had been reduced to 12 per cent by 2003.

3.7 Fisheries

The upper reaches of the Cherwell generally have poor coarse fish populations, due to low summer flows, an overwide channel and diffuse pollution. The middle reaches of the Cherwell have some good coarse fish populations including roach, dace, chub and barbel. The lower reaches of the Cherwell between Enslow and Islip have excellent fish populations and conditions support barbel spawning. Downstream of Enslow, poor habitat quality means there are only moderate fish populations.

The River Ray, the largest tributary of the Cherwell has fish populations typical of a fen drain dominated by roach and bream, although chub and dace are present where the habitat is more riverine. The Langford brook, a tributary of the River Ray, has some good coarse fish populations.

Some of the more gravel bedded tributaries of the Cherwell such as the Sor Brook and River Swere support brown trout populations.

Roach

3.8 Conservation

Sites of Special Scientific Interest (SSSIs) are designated by English Nature because of their ecological, physiological or geological characteristics and are protected by the Wildlife and Countryside Act 1981. There are 36 SSSIs within the Cherwell CAMS area, some of which are floodplain neutral and damp grasslands, important fen communities and ancient woodlands.

Those SSSIs which meet the criteria as set out in the EU Habitats Directive, may be designated Special Areas of Conservation (SACs) or Special Protection Areas (SPAs) under the EU Birds Directive. In the Cherwell CAMS area there is one SAC site. This is Oxford Meadows, which consists of Pixey and Yarnton Meads, Port Meadow with Wolvercote and Cassington Meadows SSSIs. Oxford Meadows is predominantly supported by water from the River Thames.

The Environment Agency is a 'competent' body for these Directives and also under the Wildlife and Countryside Act and Countryside and Rights of Way Act with respect to SSSIs. This means that we must contribute to maintaining the favourable conservation status of those habitats that are afforded international and national protection and that maybe affected by Environment Agency authorisations, including abstraction licences. As a regulator, we will screen and appraise all licence applications for their potential impact on SACs and SSSIs and will adhere to the requirements of the Regulations and Acts to maximise environmental protection.

Maintaining water levels is important for conservation, for example at wetland sites. We have produced Water Level Management Plans (WLMPs) for a number of sites, mainly SSSIs, which seek to maintain optimal

water levels to conserve and enhance the biodiversity of a site and to balance this with any flood defence and land drainage requirements. A WLMP has been produced for Otmoor SSSI.

As well as statutory conservation sites, many sites are of local conservation importance in the area, such as County Wildlife Sites, identified as County 'Alert' sites, and are protected through Local Plan policies. There are over 100 such sites in this catchment.

The majority of the River Cherwell and the River Ray floodplain falls within the Upper Thames Tributaries Environmentally Sensitive Area – an agri-environment scheme which aims to enhance habitats and to restore wetlands within the context of agricultural land management.

The Cherwell CAMS area contains some excellent examples of key habitats identified in the UK Biodiversity Action Plan (BAP), in particular neutral grassland and ancient woodland. The neutral grasslands of Otmoor and Long Herdon Meadow are herb-rich which makes them particularly important. Otmoor SSSI and the adjacent RSPB Otmoor Reserve in the River Ray sub-catchment are important sites for breeding waders, including snipe, redshank, curlew and lapwing. The stillwater habitats of Otmoor also contain rare plant communities.

The key habitats contain a number of priority species for conservation as identified under the UK BAP. They include otter, water vole, great crested newt, white-clawed crayfish, fine-lined pea mussel, true fox-sedge and tassel stonewort.

Lapwing on nest

Otmoor SSSI

3.9 Navigation

The Environment Agency acts as navigation authority for several rivers in England and Wales that have a historic public right of navigation – a common law access for boating.

The main navigable route in the CAMS area is the Oxford Canal, which runs the entire length of the catchment and is managed by British Waterways. It was built in the eighteenth century to link Birmingham and Oxford, by linking Coventry Canal and the River Thames. There are a number of interactions between the River Cherwell, its tributaries and the Oxford Canal, such as channel convergence, outfalls and feeder points of varying sizes. For some of its course, the Oxford Canal runs parallel to the River Cherwell, crossing it at Nellbridge and occupying the same channel for 1.5 km between Enslow and Shipton-on-Cherwell. There are limited sites for transient mooring along the canal, particularly in Oxford, however Banbury is a popular mooring location.

The canal utilises the River Cherwell to support levels sufficient for navigation. British Waterways abstract water at various points along the route of the canal to meet requirements throughout the year. At times of low flow this demand on water resources can put a lot of pressure on maintaining flows in the River Cherwell, particularly in the upper part of the catchment. This type of abstraction is currently exempt from the abstraction licensing regulations. Currently there is very little data available about the quantities of water involved in these exempt abstractions.

There is no public right of navigation on the River Cherwell and Ray, however any vessel that enters the River Thames from the Cherwell is required to be registered and conform to our licensing requirements.

Confluence of River Cherwell and Oxford Canal at Enslow

3.10 Restoring Sustainable Abstraction (RSA) programme

The Restoring Sustainable Abstraction (RSA) programme covers sites that are, or are suspected of being, adversely affected by abstraction. In many cases, their identification has come about through better understanding of the hydrological cycle and its relationship with habitats and species.

There are four sites in the Cherwell CAMS area that are on the RSA programme list. One of the sites, the River Cherwell between Grimsbury and Banbury, has been investigated. The improvement scheme to mediate the impact of the public water supply abstraction at Grimsbury has been agreed. The agreed scheme will involve the installation of a new outfall for the sewage treatment works located just downstream of the current abstraction point at Grimsbury so that effluent treated to a high standard can be discharged to the river at this location. This new outfall will be used during periods of low flow in order to maintain a minimum level of flow in the river. The need to review options and to ensure the best solution was adopted has delayed the its implementation. However it is now being progressed and completion is due by the end of 2006.

Resource assessment and resource availability status

4.1 Introduction

To manage water resources effectively, we need to understand how much water is available and where it is located. This is achieved by undertaking a resource assessment, covering both surface water and groundwater.

Water is used for a number of different purposes, the principal categories being general agriculture, spray irrigation, industrial use, power generation and water supply. For each different use, the amount of water that is returned to the water environment close to where the water was abstracted may vary considerably. Where this loss is high, we consider the abstraction to be consumptive. This may restrict the availability of water for these purposes, unless a significant proportion of the water abstracted is returned to the water source close to the point of abstraction.

To easily provide information on the availability of water resources within a catchment that may be used for consumptive purposes, a classification system has been developed. This 'resource availability status' indicates the relative balance between committed and available resources, showing whether licences are likely to be available and highlighting areas where abstraction needs to be reduced. This does not replace the need for the licence determination process, which is applied to licence applications. More information on the determination process is given in Annexe Two of *Managing Water Abstraction*.

There are four categories of resource availability status, as shown in **Table 2**.

So that water resources are assessed consistently in similar situations, a framework for resource assessment and management, to be applied in all CAMS areas, has been developed.

This framework involves the development of an understanding of the water resources of the CAMS area and assessment of the surface water and groundwater resource. These results are integrated to define the final resource availability status of different units within the CAMS area.

Table 2 Resource availability status categories

Indicative resource availability status	Definition	Colour coding for illustration on maps
Water available	Water likely to be available at all flows including low flows. Restrictions may apply.	Blue
No water available	No water available for further licensing at low flows although water may be available at higher flows with appropriate restrictions.	Yellow
Over-licensed	Current actual abstraction is resulting in no water available at low flows. If existing licences were used to their full allocation they would have the potential to cause unacceptable environmental impact at low flows. Water may be available at high flows with appropriate restrictions.	Orange
Over-abstracted	Existing abstraction is causing unacceptable environmental impact at low flows. Water may still be available at high flows with appropriate restrictions.	Red

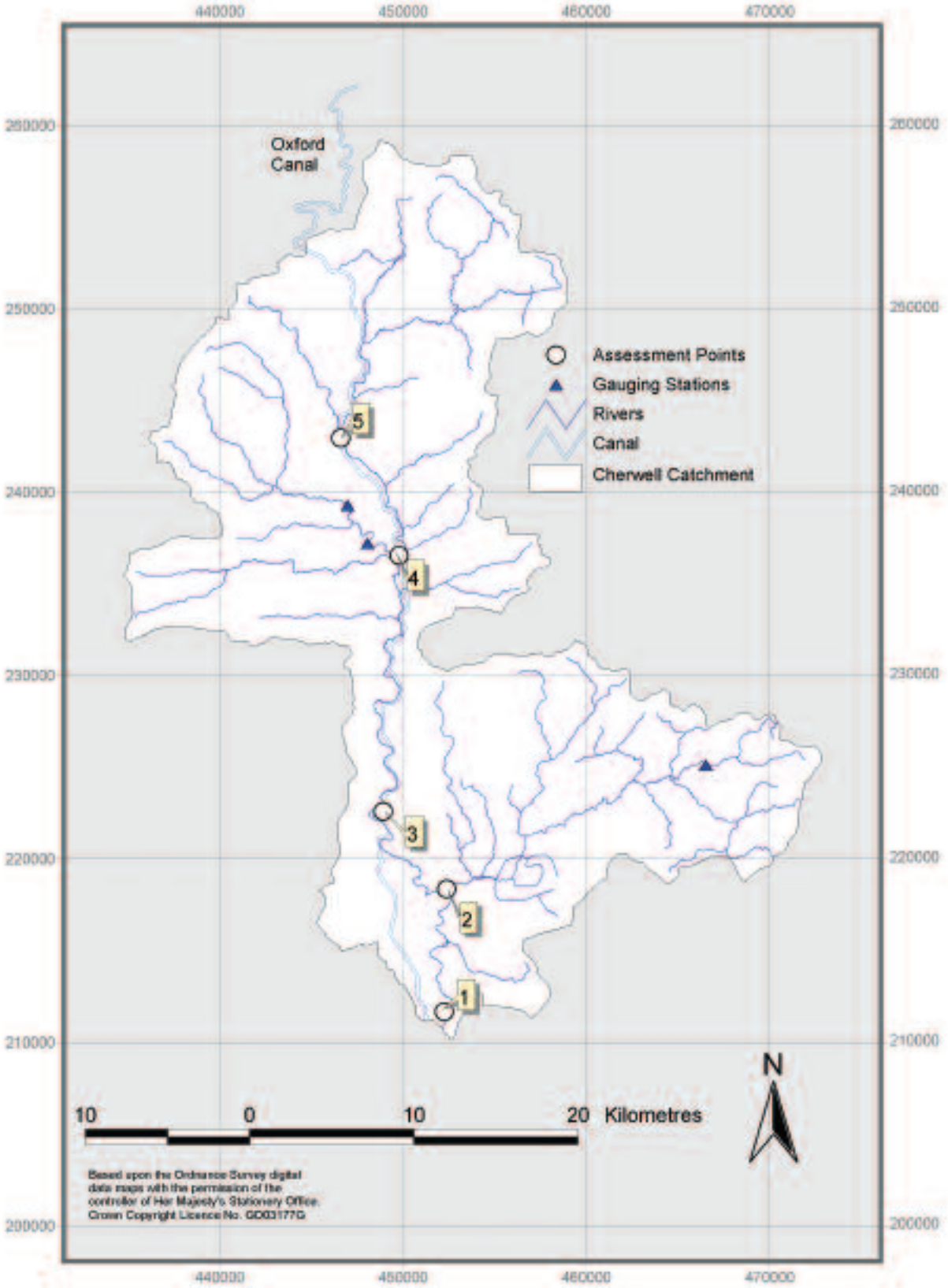


Figure 4 | CAMS rivers and assessment points

Within and between catchments there are variations in characteristics. In order to measure, manage and regulate effectively, we need to break catchments down into smaller areas, recognising similarities in characteristics. In the resource assessment for CAMS, in areas where groundwater resources are significant, groundwater management units (GWMUs) are defined. For surface water, 'assessment points' (APs) are located on the river network. These river APs and GWMUs are the focus of resource assessment and abstraction licensing.

Figure 4 shows the river APs that have been defined for the Cherwell CAMS. Further details on how these were defined are provided in the Technical Document for the Cherwell CAMS.

4.2 Resource assessment of groundwater management units

Although there are a large number of groundwater abstractions within the catchment, none are of significant volume. Due to the lack of large abstractions and the fragmented nature of the permeable layers due to geological faulting, we have not carried out an assessment of groundwater resources for the Cherwell catchment. It was classed as a 'minor' aquifer and not considered significant enough to warrant assessment for this CAMS.

4.3 Resource assessment of river assessment points

The surface water resource assessment requires the definition of 'river flow objectives'. These are based on the sensitivity of the local ecology to flow variations (i.e. their vulnerability to abstraction impacts). It also takes account of other flow needs. These objectives represent the minimum flow that we are aiming to protect. This then affects the amount of water that is available for abstraction.

These river flow objectives are developed by first giving 'environmental weighting' scores to the reaches, which represent the sensitivity of the river reach to abstraction. Reaches are banded according to their sensitivity to abstraction: Very High (VH), High (H), Medium (M), Low (L) or Very Low (VL).

Figure 5 and **Table 3** show the environmental weighting bands for each assessment point in the Cherwell CAMS area.

Table 3 Environmental weighting bands

Assessment point	Assessment point name	Environmental Weighting band
1	Lower Cherwell	M
2	Ray	L
3	Middle Cherwell	M
4	Sor Brook	H
5	Upper Cherwell	L

These river flow objectives are then compared with a scenario flow which assumes that all licences are being fully utilised (i.e. the full licensed quantity is being abstracted). This comparison reveals either a surplus, balance or deficit. The size of the surplus/deficit corresponds to a resource availability status for the unit.

The surface water resource availability classification gives an indication of whether new licences will be available from the river or whether some recovery of resources is required. However, there are significant variations in flow throughout the year. A classification of 'over-licensed' or 'over-abstracted' generally indicates that no new licences will be granted, but this applies only at times of low flow. During periods when flows are high, there may be some water available for abstraction. The classification is therefore about resource availability at low flow.

Abstraction licences are sometimes managed in order to ensure this flow variability is maintained by the use of 'hands-off flow' conditions. These are conditions on licences that require abstraction to cease (or reduce) when the flow in the river falls below a specified level. Therefore, when river flows are above this hands-off flow, abstraction can take place but when flows are below this, no abstraction (or reduced abstraction) can occur.

In order to maximise abstraction while maintaining the variability of flow (required for many aquatic species), a tiered system of hands-off flow is applied. Licences are generally granted with the lowest hands-off flow possible on a first-come-first-served basis. As more licences are granted, the hands-off flow must be increased to maintain sustainable flows in the river.

Potential applicants for new abstraction licences need to know not only the likelihood of obtaining a licence, but also the reliability of a licence if granted with a hands-off flow condition. Within the CAMS resource assessment, reliability is expressed as a percentage. This percentage indicates the minimum amount of time over the long-term that the scenario flow exceeds the river flow objective, therefore allowing abstraction to take place.

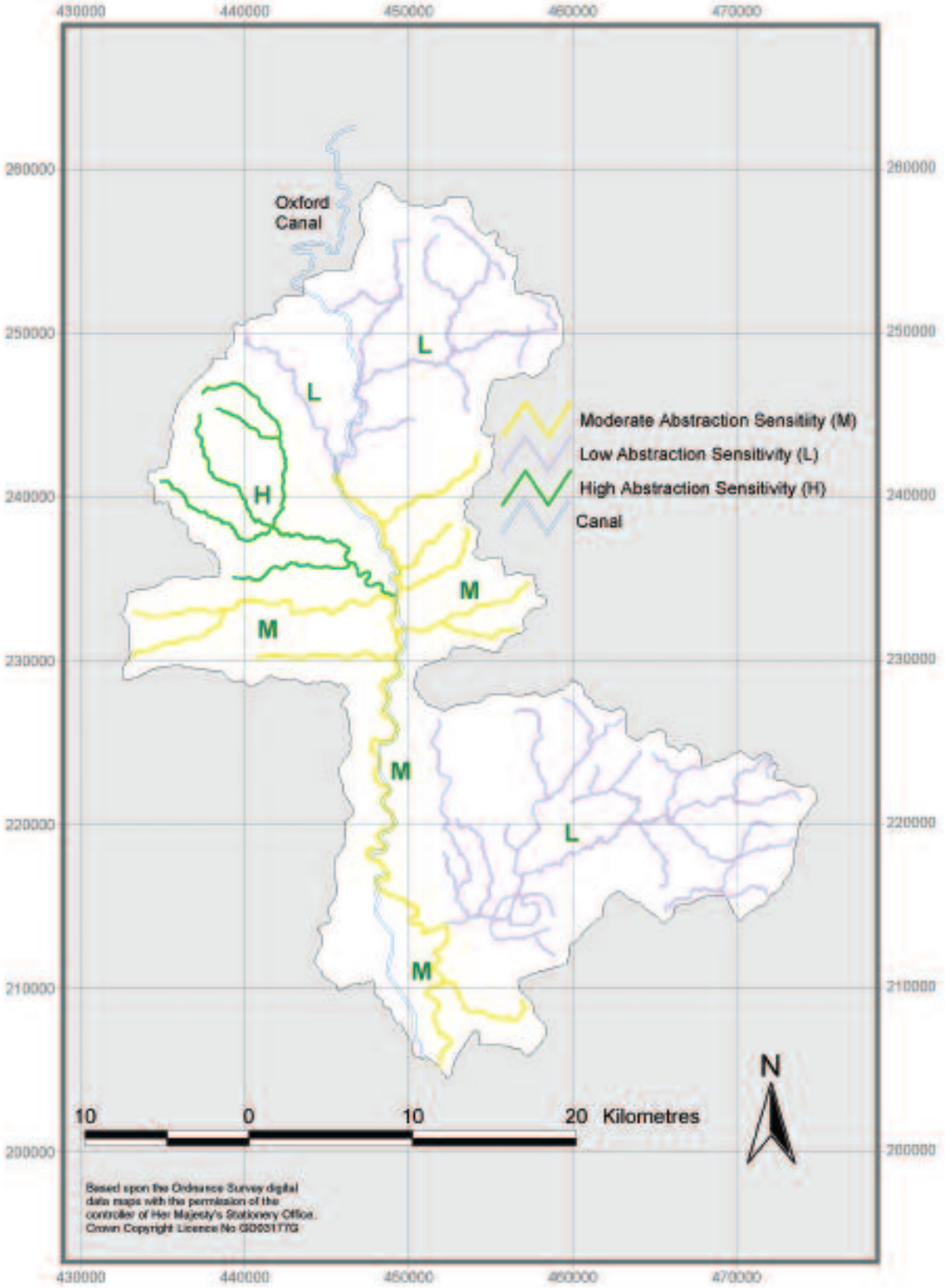


Figure 5 | Environmental Weighting bands

The resource assessments for both surface water and groundwater use a scenario, which assumes that all licences are being fully utilised; that is, the full authorised volume is being abstracted. But many licences are not used fully and so in reality the resource availability can be different. If the result of a resource assessment is 'over-licensed', data of actual abstraction is then used to establish whether the status is 'over-abstracted' (actual flows are lower than river flow objectives). 'Over-abstracted' represents abstraction that is already unsustainable whereas 'over-licensed' represents the potential for damage should the full licensed amount be abstracted.

4.4 Integration of surface water assessments

Figure 6 shows the resource availability status of river reaches in the Cherwell CAMS area. The detail behind the results is available in the Cherwell CAMS Technical Document.

Surface water resource availability status is integrated based on whether the furthest downstream assessment point is critical e.g. 'over-licensed' or 'over-abstracted'. If the furthest downstream assessment point is critical then the upstream assessment points with a resource availability status of 'water available' (less critical) are overridden to 'no water available'. This override recognises that, although the status is 'water available' this low flow surplus is in fact required to meet the needs of the environment and abstraction downstream.

In the case of the Cherwell CAMS there is no downstream critical assessment point within the CAMS area. However, the status of the River Thames where the Thames and the River Cherwell converge is classed as 'over-abstracted' (Eynsham assessment point in the Thames Corridor CAMS), as is the downstream assessment point at Teddington. Teddington is more severely 'over-abstracted' than the upstream assessment point on the Thames at Eynsham and is taken to be the critical assessment point. In accordance with the override rules, the 'water available' status of the upstream assessment points in the Cherwell were overridden to 'no water available' in order to protect the resources in the downstream River Thames from declining further.

4.5 Water Resource Management Units (WRMUs) in the Cherwell CAMS

For the Sustainability Appraisal, some assessment points have been grouped together to form Water Resource Management Units (WRMUs). The Cherwell CAMS area has been split into two WRMUs and these can be seen in **Figure 7**. Assessment points 1, 2, 3 and 4 were combined to form one WRMU. They were combined because they have all been overridden to 'no water available' based on the flow requirements of the Thames and will be managed by the same licensing strategy.

4.5.1 Water Resource Management Unit 1 – Upper Cherwell

River Cherwell at Banbury

The resource availability status of WRMU 1 is 'over-abstracted'. The Upper Cherwell WRMU covers an area of 205 km^2 and encompasses the upper Cherwell and its tributaries, including Hanwell Brook, Highfurlong Brook, Ashby Brook, Byfield Brook and Chacombe Brook.

The majority of the rivers in this WRMU are clay based making the River Cherwell and its tributaries liable to flooding in the winter with sluggish low flows in the summer. The headwaters of the River Cherwell rise from the Lower Lias clay to the north of Banbury, and flows in the River Cherwell, in this upper reach, are derived mainly from drainage of the clays and from springs.

There are 51 licensed abstractions from this WRMU. Most of these are for general farming and spray irrigation, but the largest abstractions are from the River Cherwell for public water supply and to support flows in the Canal. This latter abstraction is currently exempt from licensing. Due to these abstractions, flows in the upper reaches of the Cherwell are lower than they would naturally be during the summer.

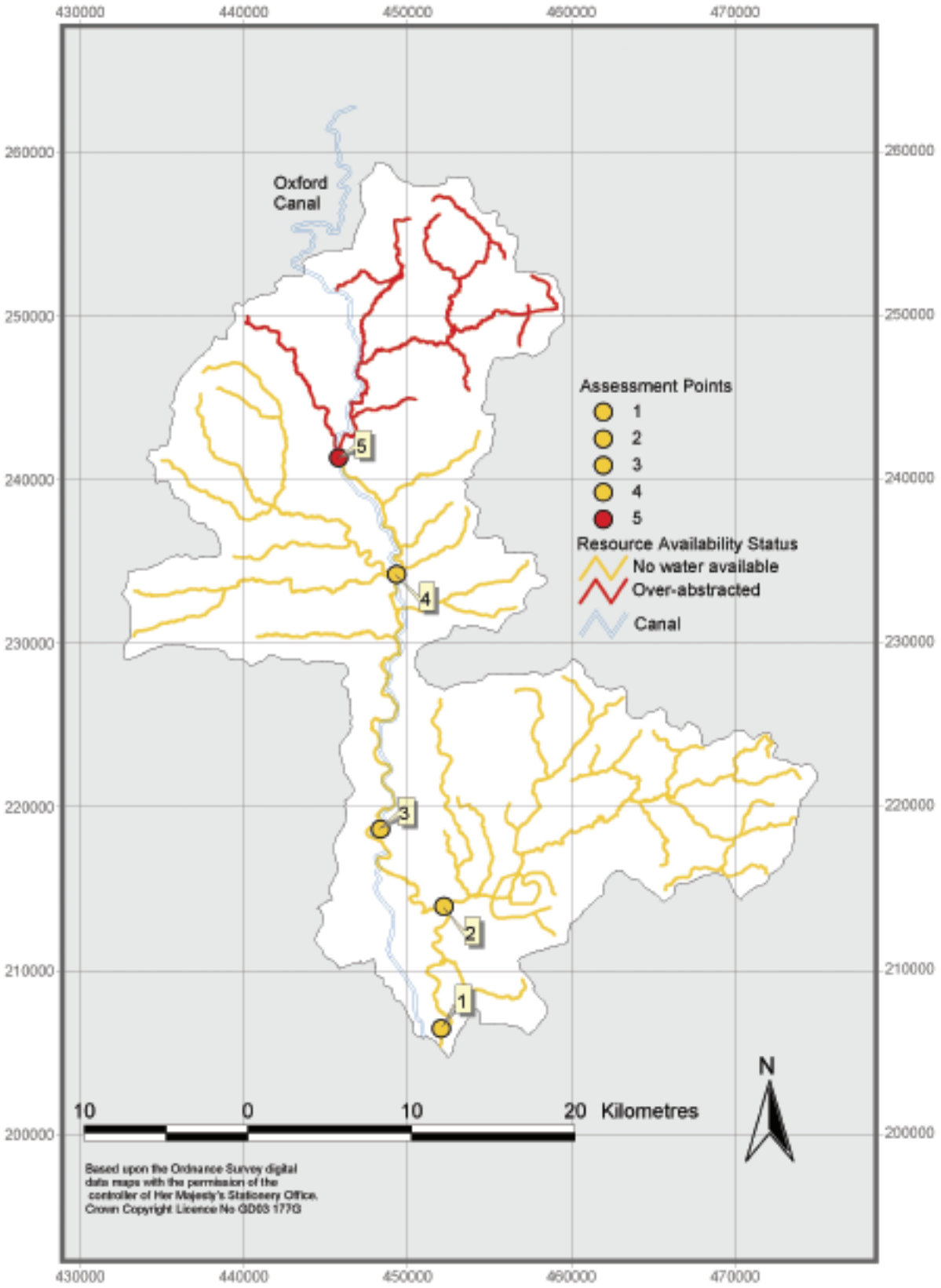


Figure 6 | Resource availability status

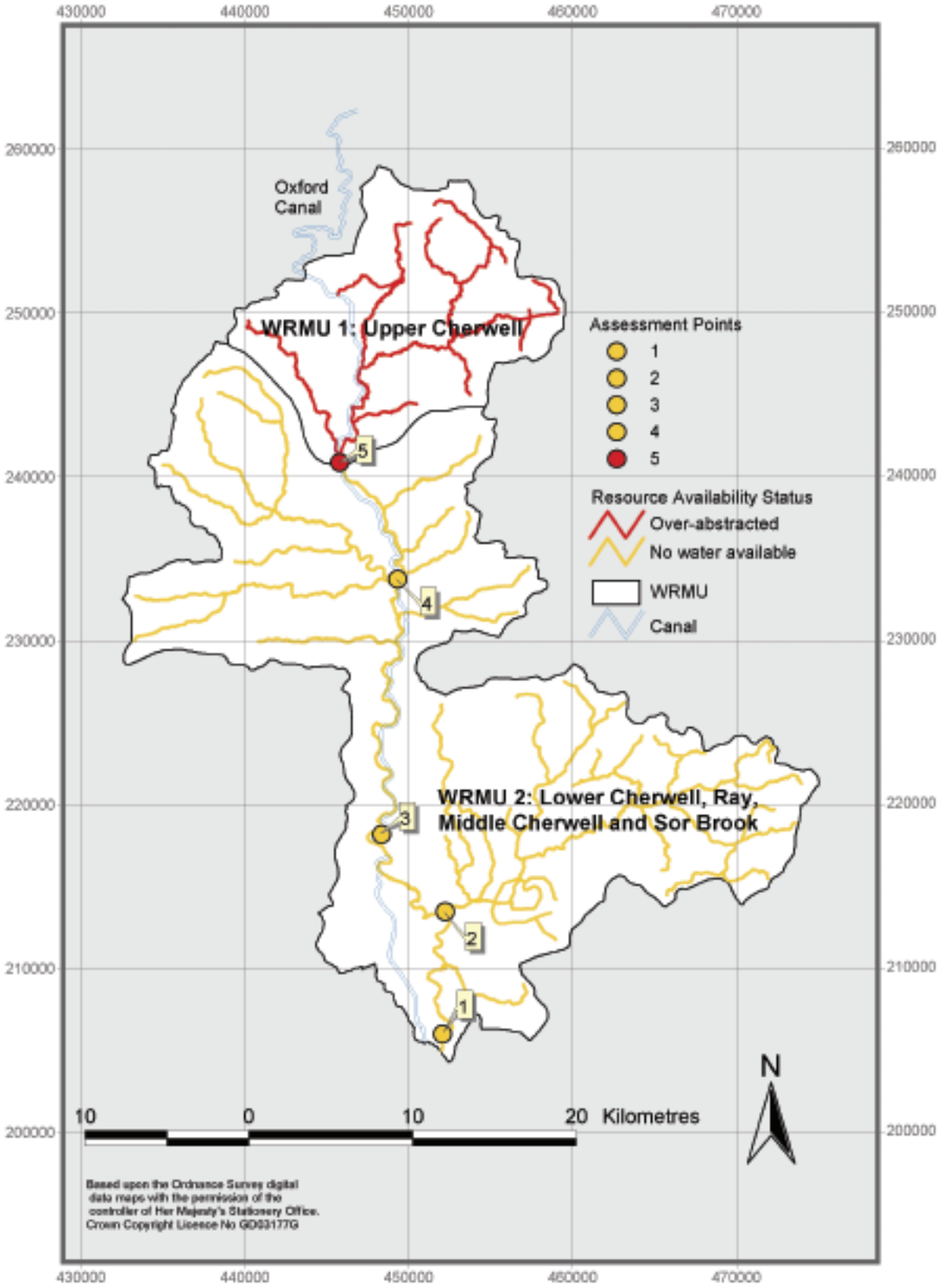


Figure 7 | Water Resource Management Units

4.5.2 Water Resource Management Unit 2 – The River Cherwell from Banbury to Oxford, the River Ray and Sor Brook

River Cherwell at Oxford

The resource availability status of WRMU 2 is 'no water available'. The WRMU covers 738 km^2 and encompasses the majority of the River Cherwell from Banbury to Oxford and its tributaries, including the River Ray, Sor Brook, Bloxham Brook, River Swere, Deddington Brook and Farthinghoe stream.
The majority of the rivers in this WRMU are clay based making the River Cherwell and its tributaries liable to flooding in the winter and having sluggish low flows in the summer.

Flows in the River Cherwell are supported by groundwater-fed springs issuing from the Inferior Oolite exposed on the valley sides; as the river flows over the Inferior Oolite and Great Oolite Limestones the groundwater from these aquifers contribute to the baseflow.

There are 208 licensed abstractions from this WRMU, most are for general farming, although there is one abstraction for public water supply from the Sor Brook which is constrained by a hands-off flow (HOF) of 16 Ml/d. Banbury and Bicester STWs are the major discharges in the WRMU. The discharges result in a net import of water to the WRMU because some of the potable supply comes from Farmoor reservoir. This means that river flows are higher than they would naturally be.

Proposed licensing strategy

5.1 Sustainability appraisal

5.1.1 Introduction

A sustainability appraisal process has been developed to enable us to take account of costs and benefits in the production of CAMS. The process considers the government's four objectives of sustainable development, relating to environment, economics, society and resource use. It uses a largely qualitative, proforma-based approach to consider what the resource availability status for each water resource management unit should or could be after each six-year cycle (Tier 1). This is undertaken for all units in all CAMS areas. It also allows the appraisal of options for recovering water resources, by taking into account the implications of different options on all aspects of sustainability (Tier 2). This is undertaken to determine the most sustainable options for the future management of the catchment including, where necessary options for recovery of resources.
More information on the sustainability appraisal process is provided in *Managing Water Abstraction: The Catchment Abstraction Management Strategy Process.*

5.2 Catchment overview of licensing strategy

This section outlines the licensing strategy for the Cherwell CAMS following a consultation period January – March 2005. Abstraction licensing in the Cherwell catchment will be based on the output from the resource assessment, which has provided us with an improved understanding of water resources in the catchment. This strategy provides an indication of whether licences are likely to be available and the conditions that would be expected on new or varied licences. Please refer to *Managing Water Abstraction Annexe 2* for more information about the licence determination process.

The results of the resource assessment and the licensing strategy are intended to give an indication at a catchment scale of the availability of water for abstraction during low flow periods. This is often a period when demand can be greater than the amount of natural resources available and when the most detrimental impact to the environment can occur.

5.2.1 Licence determination

It is important to note that the strategy relates primarily to licences that have a consumptive use of the abstracted water. We will generally consider non-consumptive licences where the water is discharged back to the river near to the source of supply in all Water Resource Management Units at all times of the year. Non-consumptive abstraction will be determined on a case-by-case basis.
The information contained in this licensing strategy does not negate the need for a local impact assessment with each new application as it is required as part of the determination process, nor does it preclude anyone from applying for a licence. The granting of any licence will always be dependent on a thorough determination by the Environment Agency.

5.2.2 Resource recovery

Resource recovery requires existing licences to be revoked or varied. Without investigations to prove the need to do this, such actions will currently incur excessive compensation costs. The only means of resource recovery that will be undertaken in this CAMS will be to explore possibilities of voluntary revocations or reductions in licences that are unused or only partially used.

5.2.3 Definition of consumptive and non-consumptive abstractions

Consumptive abstractions are those which result in a net impact to the environment. Medium to high loss uses would generally fall within this category. Examples of high loss abstractions include spray irrigation and evaporative cooling. Consumptive abstractions from surface water and unconfined sources have a direct impact on river flows.

Non-consumptive abstractions are those where there is no net impact on the environment. Low and very low loss uses, such as fish farming and mineral washing, would generally fall within this category provided the water is returned locally.

5.2.4 Significant local issues for licensing – Thames Q50 constraint

Due to the low flow resource availability of the Lower Thames being 'over-abstracted' any consumptive abstraction from the tributaries will reduce flows in the Thames, causing the Lower Thames to become further 'over-abstracted'. Flows in the Lower Thames need to be maintained for the environment, navigation, recreation and existing licences, including abstractions for public water supply. The River Cherwell is a tributary of the River Thames and as such, any licensing strategy for the Cherwell CAMS needs to take into consideration the flow requirements of the River Thames.

All new consumptive surface water and groundwater abstractions in direct hydraulic continuity with a nearby river, upstream of Teddington will be constrained by a hands-off flow (HOF) of Q50 as gauged at Kingston on the River Thames. Q50 is the flow that would be present in the River Thames 50 per cent of the time in an average year. This HOF will be enforced when observed flows at Kingston gauging station reach Q50, which is likely to be during the summer (April-October) or in dry winters.

Abstractions that are considered to be non-consumptive or consumptive licences that result in an overall benefit to the environment will be considered, irrespective of the resource availability, subject to the normal local impact assessment.

5.2.5 Abstractions from non CAMS rivers

Some rivers have not had their low flow resource availability assessed. These rivers are known as non CAMS rivers. Applications for licences from such rivers will be dealt with individually through the normal licence determination process and will be subject to the general principles of the CAMS strategy for the catchment.

We will usually grant consumptive groundwater licences which are not in direct hydraulic continuity with a nearby river, subject to the normal licence determination process. They may be restricted by a prescribed groundwater level; restrictions will be determined on a case-by-case basis.

5.2.6 Habitat Directive sites

Applications for abstraction licences in the Cherwell CAMS area close to Oxford Meadows SAC will be screened and appraised for their potential impact on the site and will adhere to the regulations to maximise environmental protection.

5.2.7 Exempt purposes

There are instances, relating to purpose and quantity, in which a water abstraction licence is not required. The types of exemptions are detailed in *Managing Water Abstraction: The CAMS Process July 2002* as amended by the Water Act 2003.

5.2.8 Approach to time limiting

Applications for new and varied licences received after October 2001 have been issued with a time limit. The normal renewal period for all CAMS is 12 years. The common end date for all licences in the Cherwell CAMS area is 2018. There may be exceptional circumstances where a licence may be issued with a longer time limit. These circumstances are outlined in *Managing Water Abstraction – The CAMS Process July 2002* in section 5.4 *Special circumstances for longer-duration licences*.

Similarly there are circumstances where a licence may be issued with a shorter time limit, for example where further investigation is required into the impact of an abstraction on a designated site. These are also outlined in *Managing Water Abstraction – The CAMS Process July 2002* in section 5.3 *Special circumstances for shorter-duration licences*.

There is a presumption of renewal of time limited licences subject to evidence that the application meets the requirements of the following three tests:

- Continued justification of the reasonable need for the water
- Efficient use of water
- Environmental sustainability

Licence holders will be notified that their licences will expire and will be invited to re-apply for them. If a licence is considered to be damaging to the environment, it may not be renewed with the existing rights and conditions. We will endeavour to give six years notice if a licence is not to be renewed, or renewed on more restrictive terms that impact significantly on the use of that licence.

Further information on time limits is available in *Managing Water Abstraction – The CAMS Process July 2002*.

5.2.9 Water efficiency

We will continue to encourage all present and future abstractors to employ water efficiency measures to reduce the demand for water. The importance of water efficiency in reducing demand is summarised in the Regional Water Resources Strategy – *Water resources for the future – A strategy for Thames Region* and on our demand management website: www.environment-agency.gov.uk/savewater

Proof of efficient use of water is one of the three tests that have to be met for renewal of a time limited licence.

5.2.10 Management of licences

- Hands-Off Flows (HOFs)
  Flow constraints, such as HOFs require abstractors to cease or reduce abstraction when river flows drop below a prescribed flow. Where possible, this will be measured at an Environment Agency gauging station or monitoring point. Where this is not possible, an applicant may be required to install a measuring device. Where we monitor flows, abstractors will be notified when they are required to cease or reduce abstraction. Flow constraints attached to an abstraction licence may be reviewed on renewal.

  Licence holders with the dual flow constraint will be required to cease abstraction when flows drop below either of the constraint values. For example, if flows in the Thames fall below the Thames HOF, but local flows are not below the local HOF, abstractors will be required to cease abstraction to protect flow in the Thames. In this example abstractors will only be able to start abstracting again once levels in the Thames have recovered to above the Thames HOF constraint value.
- Spray irrigation bans
  Licences for spray irrigation can be restricted during droughts using existing powers under section 57 of the Water Resources Act 1991. Abstractions for consumptive uses for non-agricultural purposes for direct spray irrigation will include a further restriction on use when restrictions on public water supply are in force.
- Enforcement
  We will continue a rigorous enforcement policy, and will carry out inspections to ensure abstractors are complying with the conditions of their licence.

5.2.11 Impoundments

Applications for impoundment licences will be dealt with through the normal licensing determination process on a case-by-case basis.

5.2.12 Winter storage reservoirs

Winter storage licences have been granted for direct surface water abstraction between 1 November and 31 March inclusive with appropriate flow constraints. The use of reservoirs is and will continue to be encouraged, although the filling of reservoirs will be controlled by flow instead of being operated by seasonal restrictions. As long as river flow is at or above the prescribed level, abstraction for filling the reservoir will be permitted.

Abstracting water at high flows and storing it for use at low flows may overcome the restrictions on consumptive abstraction during low flow periods. An applicant will need to explore any planning requirements for such a storage facility before submitting an application.

There are many options for off-stream reservoirs, so no explicit rules for construction can be given. Development of winter storage in the CAMS area is supported by the Thames Regional Water Resources Strategy.

5.2.13 Proposed strategies for individual water resource management units

The following sections set out the proposed licensing strategy for individual water resource management units. It is important to note that this strategy may not apply to non-consumptive licences, or licences that are consumptive but which we consider to result in an overall benefit to the environment.

5.3 Water resource management unit 1 – Upper Cherwell

5.3.1 Resource availability status and results of the sustainability appraisal

The low flow resource availability status of this WRMU is 'over-abstracted'. Through the sustainability appraisal process, a target of moving towards 'no water available' within the next 12 years (two CAMS cycles) was set.

5.3.2 Guidance on the assessment of new applications

The status 'over-abstracted' means that existing abstraction is causing unacceptable environmental impact at low flows. No new consumptive surface water or groundwater (from unconfined aquifers in direct hydraulic continuity with a river) licences will be allowed except at very high flows.

All new consumptive surface water and groundwater licences (only those that are in direct hydraulic continuity with a nearby river) will be subject to a Q50 HOF set at Kingston-upon-Thames gauging station to protect flows in the Lower Thames. This constraint will impact the availability of abstraction within the catchment, but additionally, a further local control is likely to be deemed necessary during any licence determination process. This would take a number of factors into consideration such as the period of abstraction, other protected rights in the area and the sensitivity of the local environment to abstraction. A flow constraint will affect the reliability of any new licences granted and should be discussed with the local licensing team.

We will usually grant consumptive groundwater licences which are not in direct hydraulic continuity with a nearby river, subject to the normal licence determination process.

Abstractions that are considered to be non-consumptive or consumptive licences that result in an overall benefit to the environment will be considered, irrespective of the resource availability, subject to the normal local impact assessment.

When flows in the Thames or a local river fall below the prescribed HOF, we will notify licence holders with a HOF condition to stop abstracting and when they can restart.

All new licences will normally be time limited to expire with a common end date of 2018 with a normal renewal period of 12 years.

5.3.3 Renewals and management of existing licences

There will be a presumption of renewal, subject to the other renewal criteria, local considerations and the criteria set out in Section 5.2.8. However, licence conditions may be subject to minor changes and water efficiency conditions may be added to the licence.

We will endeavour to give six years notice if a licence is not to be renewed, or renewed but on more restrictive terms that impact significantly on the use of that licence.

Any licences or variations that are renewed will have the common end date of 2018 unless circumstances justify a shorter or longer time limit being applied as outlined in Section 5.2.8. Any existing time limited licences will have the Thames Q50 HOF constraint applied when they come up for renewal.

5.3.4 Resource recovery strategy and other changes to existing licences

The 'over-abstracted' nature of the Upper Cherwell WRMU is due to the combined effects of the public water supply abstraction and the currently exempt abstraction from the River Cherwell at Cropredy to support flows in the Oxford Canal. The public water supply abstraction intake is at Grimsbury, but the associated discharge at Banbury STW is 2 km downstream of Banbury gauging station. This, combined with the abstraction for the canal, has led to depleted flows between Cropredy and Banbury STWs during the summer.

The first step towards improving the Resource Availability Status in the Upper Cherwell is to implement a scheme to improve flows through Banbury as agreed under Thames Water Utilities Ltd Asset Management Programme (refer to Section 3.10). This scheme will improve flows through Banbury and will bring about environmental improvement by addressing part of the cause of the low flows over the next couple of years.

The currently exempt abstraction at Cropredy to support the Oxford Canal has contributed to the 'over-abstracted' situation. While the details for regulating currently exempt abstractions under the Water Act 2003 are being finalised, we will seek to work with British Waterways to gain a better understanding of the abstraction requirements for the Canal, and improve data availability in preparation for any future abstraction licence application.

No resource recovery options, such as revoking licences or reducing licensed quantities of existing licences, will be undertaken as part of this CAMS. We will continue to encourage abstractors to implement water efficiency measures and voluntarily reduce their abstracted volumes, or revoke unused licences, where opportunities arise.

This strategy will aim to maintain the existing resource status without allowing it to get worse until the AMP solution is implemented at Banbury, and the British Waterways abstraction is brought into the licensing system. The ultimate target is to move towards a 'no water available' status, to ensure a sustainable status in the Upper Cherwell for the future.

5.4 Water resource management unit 2 – Lower Cherwell

5.4.1 Resource availability status and results of the sustainability appraisal

The low flow resource availability status of this WRMU is 'no water available'. Through the sustainability appraisal process, we decided that the most sustainable option would be to remain at 'no water available'.

5.4.2 Guidance on the assessment of new applications

The status 'no water available' means that there is no water available for consumptive uses at low flows, but water may be available at higher flows. All new consumptive surface water and groundwater licences (only those that are in direct hydraulic continuity with a nearby river) will be subject to a dual HOF system, with a local HOF to protect flows within the unit and a Q50 HOF to protect flows in the Lower Thames.

Consumptive groundwater licences which are not in direct hydraulic continuity with a nearby river will generally be granted, subject to the normal licensing determination process.

Abstractions that are considered to be non-consumptive or consumptive licences that result in an overall benefit to the environment will be considered, irrespective of the resource availability, subject to the normal local impact assessment.

When flows in the Thames or a local river fall below the prescribed HOF, we will notify affected licence holders to stop abstracting and when they can restart.

All new licences will normally be time limited to expire with a common end date of 2018 with a normal renewal period of 12 years.

No consumptive surface water or groundwater abstractions (from unconfined aquifers in direct hydraulic continuity with a river) will be allowed at low flows from any water resource management unit. Consumptive abstractions from surface water and groundwater will be allowed only at times of high flow. They will be subject to a local HOF to protect flows within the unit and a Q50 HOF to protect flows in the Lower Thames. This will therefore affect the reliability of any new licences granted and should be discussed with the local licensing team.

5.4.3 Renewals and management of existing licences

There will be a presumption of renewal, subject to the other renewal criteria, local considerations and the criteria set out in Section 5.2.5. However, licence conditions may be subject to minor changes and water efficiency conditions may be added to the licence.

We will endeavour to give six years notice if a licence is not to be renewed, or renewed but on more restrictive terms that impact significantly on the use of that licence.

Any licences or variations that are renewed will have the common end date of 2018. Any existing time limited licences when they come up for renewal will have the Thames Q50 HOF applied.

5.5 Opportunities for licence trading in the Cherwell CAMS area

One of the objectives of the CAMS process is to facilitate water rights trading. The term water rights trading refers to the transferring of licensable water rights from one party to another, for benefit. It involves a voluntarily movement of a right to abstract water between abstractors, using the abstraction licensing process. More detailed information is available in *Managing Water Abstraction*.

A guidance leaflet (Water Rights Trading) was published and sent to Licence Holders towards the end of 2002 explaining the scope for water rights trading within current legislation. Consultation on more detailed proposals followed in 2003. After considering the responses to this consultation exercise, further information will be made available to update Licence Holders on our conclusions for a detailed framework within which water rights trading will take place. This information and guidance will be timed to coincide with the expected implementation of the sections of the Water Act 2003 that are most relevant to trading. Further information on Water Rights Trading is available on the Environment Agency website: (www.environment-agency.gov.uk/subjects/waterres).

5.6 The Water Act 2003

Following the first major review of the abstraction licensing system since its inception in 1963, the government set out, in 1999, a new framework for managing water resources. The CAMS process and the move to time limited licences are key elements of the new framework, which is completed by revisions to the statutory framework introduced by the Water Act 2003. The Act updates the Water Resources Act 1991 in several key areas:

- Deregulation of small abstractions
- New controls on previously exempt abstractions for mine and quarry dewatering, trickle and other forms of irrigation, transfers into canals and internal drainage districts
- Stronger powers for water resources planning and management
- Changes to the legal status of abstraction licences
- More flexibility to the licensing regulations to improve its efficiency and to encourage trading
- Stronger powers on water conservation

The deregulation of abstraction licences of less than 20 cubic metres a day came into effect on 1 April 2005. However, as the resource assessment for this CAMS was carried out in 2003/4, these smaller licences are still included but are not thought to have a significant impact on the final results. This will be revisited during the formal review planned for 2008.

For more details on the Act and its implementation, see the Environment Agency's website: www.environment-agency.gov.uk.

Our website will be updated to provide information as the Water Act is implemented.

Future developments in the CAMS area

6.1 Development pressure in the Cherwell CAMS

Demand for water resources is on the increase. In the Cherwell catchment, there are a number of new housing developments planned over the next six years which will significantly add to this demand. A proportion of the 3,900 new homes for Banbury and 4,200 new homes for Bicester agreed under the Oxfordshire Structure Plan have been constructed and development continues. A new Oxfordshire Stucture Plan detailing unchanged demand is due for completion by the end of this year. This amount of development will place increasing pressure on the existing public water supply abstractions. These are likely to be met from outside the catchment.

There is a significant amount of work and consultation going on at the moment for the South East Plan by the South East England Regional Assembly (SEERA). This plan will set out the vision for the Region through to 2026. The first draft and consultation is complete, and it is expected to be submitted for government approval early next year. Once adopted, the South East Plan will supersede the Oxfordshire Structure Plan.

6.2 Climate change

In *Water Resources for the Future: A Strategy for Thames Region*, the possible effects of climate change on water resources are examined and set out in context with the predicted impact on the demand for water, the availability of water and the impact on the natural environment. There is evidence that climate change may increase the variability of rainfall, making the climate less predictable, with both more dry years (with hot and dry summers) and more wet years (with warmer and wetter winters), and it is likely that the occurrence of low flows will increase. This could potentially lead to an increase in demand for water, coupled with a reduction in resources, or a changed pattern of resource availability. As our understanding of climate change improves, we will be able to refine existing scenario predictions and reduce uncertainty for the future. This will help to produce a measured response that allows society to adapt and accommodate the new climate as it evolves. The planned review of the Cherwell CAMS in 2008 will provide an opportunity to reassess the resources in the catchment so will encompass any changes in the available resources in the catchment.

6.3 Cherwell Fisheries Action Plan

A Fisheries Action Plan (FAP) is currently being developed for the Cherwell catchment. FAPs are developed by local angling and fisheries groups, with input from conservation and other interest groups. The plans are based on river catchments but also cover canal and stillwater fisheries as well as rivers. They may cover a wide range of issues from fish habitat, through to angling promotion and land management. FAPs provide a mechanism for managing local fisheries in a holistic way, integrating our fisheries work with that of angling groups, fishery owners, conservation bodies, local authorities etc.

The Cherwell FAP Group has compiled a list of key issues that reflect the concerns of local stakeholders and actions to resolve these issues. These actions will be spread over a number of years and the group will review progress at least annually. Responsibility for delivering each of the actions is ascribed to the Environment Agency or other stakeholders as appropriate. Some of the issues identified have also been raised during the development of the CAMS, for example low flows, particularly through Banbury and poor water quality (suspended solids and colouration). Some of the actions from the FAP and the CAMS will be mutually beneficial, and included in the next review of the CAMS in 2008.

The Cherwell FAP is due to be published in Summer 2005.

7

Post-CAMS appraisal

We will review the Cherwell CAMS starting in 2008 and publish an updated version of the CAMS in 2010. The progress and implementation of the CAMS will be assessed using the measures outlined in **Table 5**.

Table 5 Cherwell CAMS success indicators

No	Indicator	Measure
1	The resource availability of the Upper Cherwell will improve during the second and third CAMS cycles.	By 2010 and 2016 the resource availability status of the Upper Cherwell will show improvement from being over-abstracted 61 per cent of the time. The target resource status is 'no water available'.
2	The resource availability appraisal status of the Lower Cherwell will not deteriorate beyond the 'no water available' status.	Annual updates and the review of this CAMS, along with integration with the downstream Thames Corridor CAMS, will illustrate that the resource availability status will remain at the 'no water available' resource status for the Lower Cherwell.
3	The Environment Agency will continue to work with British Waterways to improve our understanding and quality of data available for the water movements between the River Cherwell and the Oxford Canal.	The subsequent CAMS reviews will be able to incorporate better data to account for the interactions between the River Cherwell and the Oxford Canal. This will increase the certainty of the resource assessment, and support any future licence determinations for new regulations (e.g. previously exempt abstractions for navigation) required under the Water Act 2003.
4	Routine monitoring programmes for fisheries, macrophytes and macroinvertebrates will continue to monitor any changes to the river environment against the baseline identified in this CAMS.	A review of the resource assessment in 2008 will highlight any changes from the current situation, and identify reasons for any change.
5	The Environment Agency will continue to visit licence holders to ensure that licence conditions are met and complied with.	
6	Rights to abstract are protected.	Existing abstractions and lawful uses are not adversely affected or derogated.
7	Any new licence applications in the catchment will be considered with regard to the Cherwell CAMS licensing policy.	

Glossary

Abstraction Removal of water from a source of supply (surface or groundwater).

Abstraction - Actual The volume of water actually abstracted as opposed to the volume of water that may be abstracted under the terms of an abstraction licence. Individual abstraction records are reported to the Environment Agency each year.

Abstraction impact River Abstractions directly from the river. For surface water abstractions behind impoundments, need to take storage into account. Similarly for groundwater abstractions, need to translate abstraction into stream flow depletion both spatially (identifying the river reaches impacted) and temporally (indicating the monthly profile of stream flow depletion).

Abstraction licence The authorisation granted by the Environment Agency to allow the removal of water from a source.

Aquifer A geological formation, group of formations or part of a formation that can store and transmit water in significant quantities.

Artificial impacts Combined impacts of abstraction and discharge on flows at the assessment point.

Artificial influences Catchment activities such as surface water abstractions, effluent returns and groundwater abstractions which individually and collectively have an influence on natural flows or levels.

Assessment Point Critical point in catchment at which an assessment of available resources should be made. Assessment Points are located at the extremities of identified reaches and water resource management units.

Asset Management Plans A scheme where the potential impacts of abstractions for public water supply which are on the RSA programme list are investigated, and improvement schemes for water quantity and quality are implemented. These are funded through water company charges.

Augmentation (river) To increase flow.

Baseflow That part of the river flow that is derived from groundwater sources rather than surface run-off.

Biodiversity The living component of the natural world. It embraces all plant and animal species and communities associated with terrestrial, aquatic and marine habitats. It also includes genetic variation within species.

Borehole Well sunk into a water bearing rock from which water will be pumped.

Canal An artificial watercourse used for navigation.

Catchment The area from which precipitation and groundwater will collect and contribute to the flow of a specific river.

Cessation condition A condition on a licence that requires the licence-holder to immediately cease abstracting when a pre-determined flow or water level is reached, to prevent environmental damage.

Confluence The point where two or more streams or rivers meet.

Consent conditions Terms under which a discharge consent is issued, typically covering limits on flow rate and quality of water discharged, in order to protect the needs of the receiving water and of key end users.

Conservation Regulations 1994 Regulations that implement the Habitats Directive in UK law (also known as the Habitats Regulations).

Constrained abstraction impact The influence of an abstraction source which operates within pre defined flow/level or water quality constraints.

Consumptive use Consumptive abstractions are those which result in a net impact to the environment. Medium to high loss uses would generally fall within this category. Examples of high loss abstractions include spray irrigation and evaporative cooling. Consumptive abstractions from surface water and unconfined sources have a direct impact on river flows.

Consumptiveness Proportion of the water not returned either directly or indirectly to the source of supply after use e.g. water evaporated, transpired or transferred elsewhere.

Demand The requirements for water for human use.

Demand management The implementation of policies or measures which serve to control or influence the consumption or waste of water.

De-naturalisation Process of converting a natural flow to an estimated existing or scenario flow by adding consumptive abstraction and discharge impacts.

Derogate To depreciate or diminish – used in abstraction licensing where a proposed new licence would reduce resources to an existing authorised abstraction.

Derogation In legal terms, the taking away of protected rights under the Water Resources Act due to the granting of a new licence.

Designated water dependent sites Legally defined nationally and internationally important sites potentially affected by water management or water quality issues.

Discharge The release of substances (i.e. water, sewage etc.) into surface waters.

Discharge Consent A statutory document issued by the Environment Agency, which defines the legal limits and conditions on the discharge of an effluent into controlled waters.

Drift A loose, deposit of sand, gravel, clay etc.

Drought A general term covering prolonged periods of below average rainfall resulting in low river flows and/or low recharge to groundwater, imposing significant strain on water resources and potentially the environment.

Drought Order A means whereby water companies and/or the Environment Agency can apply to the Secretary (ies) of State for the imposition of restrictions in the uses of water and/or which restricts or stops abstraction where environmental damage is being caused.

Drought Permit The mechanism by which the Environment Agency (with the consent of the local Navigation Authority, if applicable) permits a Water Company to abstract water outside of the normal terms of an Abstraction Licence.

Dry weather flow (DWF) The average of the annual series of the minimum weekly (seven consecutive days) flows, which can be thought of as the driest week in the average summer. It equates to between Q90 and Q95 in most natural rivers.

E.U. European Union.

EU Wild Birds Directive (1979) Implemented through the Conservation Regulations 1994 along with the Habitats Directive 1992 – collectively known as the Habitats Directive. A network of sites has been established to protect important and threatened species.

EC Directive Issued by the European Commission to member states with the objective of producing common standards in the European Community – member states are then obliged to introduce appropriate legislation to comply with the Directive.

EU Water Framework Directive 2000 First major review of European water policy. Seeks to improve water quality in rivers and groundwater in an integrated way (see Integrated River Basin Management).
This will be transposed into UK law in 2003.

Ecosystem or Ecological River Flow Objectives/level requirements The minimum river flows (or water levels) required to protect ecological objectives.

Effluent Liquid waste from industrial, agricultural or sewage plants.

Environmental flow/level requirements River flow or water level needs within a catchment to prevent ecological damage.

Environmental impact The total effect of any operation on the environment.

Environmental River Flow Objectives The minimum river flows from the area required to protect ecological and other environmental objectives.

Environmental Weighting An assessment of a river's sensitivity to abstraction based on physical characteristics, fisheries, macrophyte and macro-invertebrates for a catchment/sub-catchment.

Environmentally Sensitive Area (ESA) An area where the landscape, wildlife and historic interest are of national importance. Payments are made by MAFF/Welsh Office to ensure appropriate sensitive land use.

Established right (also [pre-] existing right, [pre-] existing users' rights Right to carry out an activity whose effectiveness is dependent on river flow, and may thus be derogated by an activity upstream, which reduces the dependability of such flows in terms of quantity and/or timeliness. The right may be conferred by virtue of an abstraction licence, discharge consent, or the established practice of an activity explicitly exempted from such controls in the relevant legislation. It may, or may not, be a protected right.

Existing abstraction and discharge impacts The amount by which all abstractions reduced natural flows in the scenario year, taking into account the consumptiveness of the use, the location of any effluent return and any lags or smoothing effects between abstraction and outflow impact. Based on estimated abstraction returns from the scenario year.

Fauna Animal population of a particular area or epoch.

Flood plain Land adjacent to a watercourse that is subject to flooding.

Flora Plant population of a particular area or epoch.

Flow duration curve Plot of flow vs. percentage of time a flow is exceeded. Thus QN95 (the natural flow that is exceeded 95 per cent of the time) will be a low rate of flow, and QN5 (natural flow exceeded 5 per cent of the time) will be a high rate of flow.

Flow regime The statistical pattern of a river's constantly varying (mean daily) flow rates.

Fluvial Associated with river processes such as flow and erosion.

Fracture Flow The flows of water through cracks in the rock.

Gauged flow records Records of flow in river as conventionally measured. They reflect not only natural runoff from the catchment, but also artificial influences (abstraction, discharge etc) that occur upstream of the measurement point.

Gauging station A site where the flow of a river is measured.

GQA biology The health of a river is reflected in the variety and abundance of animals and plants it supports. The biological GQA score is determined through analysis of macro-invertebrates (includes insect larvae, snails, worms etc) samples. There are six classes for the biological GQA component, 'a' to 'f', with a being Very Good and f being Bad.

GQA chemistry The chemical GQA score is determined through analysis of three chemical measurements, ammonia, dissolved oxygen and biochemical oxygen demand, which detect the most common types of pollution.

Groundwater Water occurring below ground in natural formations (typically rocks, gravels and sands).

Groundwater baseflow That part of the river flow that is derived from groundwater sources rather than surface run-off e.g. soil water, reservoir releases, effluents etc.

Groundwater Management Units Administrative sub-divisions of aquifers, defined on geological and hydrogeological criteria, which form the basis for groundwater resource management and licensing policy decisions.

Habitat Place in which a species or community of species live, with characteristic plants and animals.

Hands-Off Flow A condition attached to the abstraction licence so that if the flow in the river falls below the flow specified on the licence then the abstractor may be required to stop or reduce the abstraction.

Hands-Off Level Level below which an abstractor may be required to stop or reduce abstraction (i.e. groundwater level or river stage, to be specified on a licence, as a condition of that licence).

Hydrogeology Branch of geology concerned with water within the Earth's crust.

Hydrograph Plot of flow versus time.

Hydrology The study of water on and below the earth's surface.

Hydrometric network Networks of sites monitoring rainfall; river flow; river, lake, tidal and groundwater levels and some climate parameters. The data is used extensively for water resources management and planning, water quality and ecological protection and improvement, flood defence design, flood forecasting and flood warning.

Hydrometry The measurement of water on or below the earth's surface.

Impoundment A dam, weir or other work constructed in an inland water, whereby water may be impounded and any works for diverting flows in an inland water associated with the construction of a dam, weir or other work.

Integrated River Basin Management The method by which the EU Water Framework Directive will be implemented to ensure that all requirements of and pressures on the Environment Agency are taken into account. CAMS is a component of this.

Irrigation Supply (land) with water by means of artificial canals, ditches etc, especially to promote the growth of food crops.

Land drainage Actions taken to reduce waterlogging of agricultural land and to minimise flood risk.

Leakage Water lost from a supply network between the point of supply and point of demand.

Local Environmental Action Plan Local Environment Agency Plan (previously Catchment Management Plan). The process by which the Environment Agency plans to respond to the environmental issues in a catchment. A consultation plan is published followed by an action plan, which is reviewed every five years.

Licence Formal permit allowing the holder to engage in an activity (in the context of this report, usually abstraction), subject to conditions specified in the licence itself and the legislation under which it was issued.

Licence application Formal request by individual or organisation to the competent authority for a licence. For abstraction licences, the competent authority is the Environment Agency.

Licence determination A decision by the competent authority on whether and on what terms to grant or refuse a licence application, by reference to the authority's regulatory powers and duties.

Licence of Right Licence granted under section 23 of the Water Resources Act 1963 in respect of an abstraction that was already in operation when that Act was implemented in 1965.

Licensed abstraction and discharge Impacts The impacts of abstractions and discharges calculated for current abstraction licences and discharges based on full uptake of licensed abstraction rates and consumptiveness assumptions.

Licensed entitlement Amount of water that may be abstracted within the terms of a licence. Generally specified in terms of maximum per day, month and year (or season), with the monthly/annual amounts being typically less than the factored daily equivalent.

Licensing methodology Procedure to aid licence determination.

Low flow The flow that is exceeded for a given percentage of the time. For example Q95 is the flow that is exceeded 95 per cent of the time, this means that flow will only fall this low 5 per cent of the time.

Minimum acceptable flow The minimum acceptable flow of an inland watercourse as defined in Section 21 of the Water Resources Act 1991.

Mitigation Refers to the environmental impact of scheme development or operation, and the actions, which may be taken to reduce or ameliorate such impacts.

Natural flow regime The river flow pattern experienced prior to the influence of man, with no abstraction from or discharge to the catchment.

Natural flows The flows, which would naturally leave an Assessment Area or assessment point in the absence of any artificial impacts.

Non-consumptive Non consumptive abstractions are those where there is no net impact on the environment. Low and very low loss uses would generally fall within this category provided the water is returned locally.

NRA National Rivers Authority (now incorporated within the UK Environment Agency).

OFWAT Office of Water Services.

Permeability The characteristic of a rock or soil that determines the rate at which fluids pass through the rock or soil under the influence of differential pressure.

Potable water Water of a suitable quality for drinking.

Potential yield The volume of water which can be withdrawn from a reservoir or aquifer in specified conditions, without depleting the storage so that withdrawal is no longer possible.

Precautionary principle Where significant environmental damage may occur, but knowledge on the matter is incomplete, decisions made should err on the side of caution.

Precipitation Deposition of moisture including dew, hail, rain sleet and snow.

Pre-existing (Users' Rights) See 'established right'.

Prescribed flow A generic term for any flow 'prescribed' under statute or regulation.

Primary gauging station A permanent river flow gauging installation included in the National Surface Water Archive.

Protected right Protected rights include all existing licensed abstractions, and certain exempt abstractions for domestic and agricultural purposes (excluding spray irrigation) not exceeding 20 m3/d.

Public water supply Term used to describe the supply of water provided by a water undertaker.

Q50 The flow of a river which is exceeded on average for 50 per cent of the time.

Q95 The flow of a river which is exceeded on average for 95 per cent of the time.

RAM framework Resource Assessment and Management Framework – a technical framework for resource assessment (for the definition and reporting of CAMS) and subsequent resource management (including abstraction licensing).

Reach A length of river.

Recent actual abstraction and discharge impacts The impacts of abstractions and discharges calculated for current abstraction licences and discharges based on recent abstraction returns or estimated from uptake and consumptiveness assumptions.

Recharge Water which percolates downward from the surface into groundwater.

Regime (Flow) The statistical pattern of a river's constantly varying (daily) flow rates.

Regulated river A river where the flow is augmented through the addition of water from another source.

Restoring Sustainable Abstraction Programme (RSAP) The programme for resolving environmental problems caused by over abstraction in certain catchments.

Revocation Cancellation of licence and associated rights and benefits.

Rio Earth Summit, 1992 This was the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro. It was the largest ever gathering of world leaders (over 150 Heads of Government). At this conference 153 countries signed the Convention on Biological Diversity.

River An open channel in which inland, surface water can flow.

River corridor The continuous area of river, riverbanks and immediately adjacent land alongside a river and its tributaries.

River flow objectives (RFOs) The minimum river outflows from the area required to protect ecological objectives, effluent dilution requirements, navigation and amenity in-river needs.

Riverine Relating to, or resembling a river.

River quality objective (RQOs) A River Quality Objective is an agreed strategic target, expressed in terms of River Ecosystem standards, which is used as the planning base for all activities affecting the water quality of a stretch of watercourse.

River reach Unit of a river between two assessment points, delineated for the purposes of abstraction licensing and resource management.

Scenario abstraction and discharge impacts The amount by which all the abstractions in the area reduce natural outflows from it, taking into account the consumptiveness of the use, the location of any effluent return and any lags or smoothing between abstraction and outflow impact. Based on an assumed abstraction and discharge scenario (e.g. full Licensed rate, 'Existing', 'Recent Actual' etc).

Scenario flows The flows, which would leave the assessment point in the specified year, based on the assumed scenario abstractions and discharges.

Source of supply Either an inland water (river, stream, canal, lake, etc.) or underground strata. See Section 221 WRA91.

Special area of conservation (SAC) A Special Area of Conservation is one classified under the EC Habitats Directive and agreed with the EC to contribute to

biodiversity by maintaining and restoring habitats and species.

Special Protection Area (SPA) A Special Protection Area is one classified as such under the EC Birds Directive to provide protection to birds, their nests, eggs and habitats.

Spray irrigation Abstracted water sprayed onto grassland, fruit, vegetables etc. Can have a high impact on water resources.

Springs These occur where the water table intersects the ground surface.

Site of Special Scientific Interest A Site of Special Scientific Interest is an area given a statutory designation by English Nature or the Countryside Council for Wales because of its nature conservation value.

Strata Layers of rock, including unconsolidated materials such as sands and gravels.

Surface water This is a general term used to describe all the water features such as rivers, streams, springs, ponds and lakes.

Surface water catchment The area from which runoff would naturally discharge to a defined point of a river, or over a defined boundary.

Surplus or deficit How much more or how much less abstraction impact is acceptable:
= Scenario flows – RFOs.

Sustainable development Development that meets the needs of the present without compromising the ability of future generations to meet their own needs. This involves meeting four objectives simultaneously:
- social progress which recognises the needs of everyone;
- effective protection of the environment;
- prudent use of natural resources;
- maintenance of high and stable levels of economic growth and employment.

Sustainable management The interpretation of the principles of sustainable development at a local/regional level within the boundaries of national and international political, economic and environmental decisions.

Telemetry Telemetry is a means of collecting information that has been collected by unmanned monitoring stations (often for river flows or rainfall) using a computer that is connected via the public telephone system.

Threshold A Hands Off Flow (HOF) value within a sequence of HOFs, each INT Ml/d higher than the previous.

Time limited licence Licence with specified end date.

Total licensable resource Is equivalent to the 'acceptable abstraction impacts' i.e. The abstraction impacts which are considered acceptable given target outflows in the specified year.
e.g. = Benchmark (Natural) river flows – RFOs, or
or = (Surplus or Deficit) + Scenario Abstraction Impacts below will vary with reference to assessment point and time frame (e.g. season).

Treatment works (also Waste water treatment works) Sewage treatment Works or Water Treatment Works.

Trickle irrigation The irrigation of crops by taking water direct to roots of plants, but without spraying or ejecting into the air.

Unconstrained abstraction impact Abstraction impacts not related to hydrological or water quality constraints. Also see abstraction impacts.

Underground strata A term used to signify geology under the surface soil layer. If groundwater exists, or if water is being discharged to the ground, the geology underneath the soil layer is known as underground strata.

Unlicensed abstraction An abstraction that is carried out unlawfully or that is exempt from licensing.

Water Level Management Plans (WLMPs) These provide a framework by which the water level requirements of a particular site can be discussed to incorporate and integrate a range of activities. We have a responsibility to be involved in the production of these plans in consultation with other interested bodies such as English Nature, Internal Drainage Boards, conservation groups and landowner.

Water resource The naturally replenished flow or recharge of water in rivers or aquifers.

Water Resource Management Unit An area that has similar groundwater and or surface water characteristics and is managed in a similar way.

Water resources strategies (The) Strategy for Water Resource planning in England and Wales over the next 25 years to ensure sustainable use and sufficient water for all human uses with an improved water environment. The strategies predict demand using different social and economic scenarios.

Water rights trading The transfer of licensable water rights from one party to another for benefit.

Water table Top surface of the saturated zone within the aquifer.

Watercourse A stream, river canal or channel along which water flows.

Wetland An area of low lying land where the water table is at or near the surface for most of the time, leading to characteristic habitats.

Yield The reliable rate at which water can be drawn from a water resource. (see also Hydrological, Potential and Specific Yield).

List of Abbreviations

AMP The acronym for the Asset Management Plan produced by the Water Companies for OFWAT. It sets out the water industry investment programme. These plans are drawn up through consultation with the Environment Agency and other bodies to cover a five year period. AMP's have to be agreed by the DETR and OFWAT.

AONB Area of Outstanding Natural Beauty.

AP Assessment Point.

BAP Biodiversity Action Plan.

BW British Waterways.

CAMS Catchment Abstraction Management Strategy.

CEH Centre for Ecology and Hydrology, incorporates the former Institute of Hydrology, IoH.

DEFRA Department of the Environment, Food and Rural Affairs (succeeds former DETR).

DETR Department of the Environment, Transport and the Regions.

EIA Environmental impact assessment.

ESA Environmental Sensitive Area.

EU European Union.

EW Environmental Weighting of a river reach based on its physical, macrophyte, fisheries and macroinvertebrate scores.

FDC Flow Duration Curve.

GIS Geographical Information System.

GQA General Quality Assessment.

GWRU Ground Water Management Units.

HOF Hands off flow.

km Kilometres.

km² Square kilometres.

LEAP Local Environment Agency Plan (previously Catchment Management Plan). The process by which the Environment Agency plans to respond to the environmental issues in a catchment. A consultation plan is published followed by an action plan, which is reviewed every five years.

m³/s Cubic metres per second.

Ml, Ml/d, Ml/day Ml = megalitres = 1,000,000 litres = 1,000 cubic metres = 1,000 m^3 = 220,000 gallons.

Ml/d = Ml/day = Ml per day, = tcmd, thousand cubic metres per day.

Ml/a Ml/a = Ml per year = Megalitres per year.

mm Millimetres.

NRA National Rivers Authority (now incorporated within the UK Environment Agency).

OFWAT Office of Water Services.

PF Prescribed Flow.

PWS Public Water Supply.

Q50 Flow exceeded during 50% of period over which flow data are being considered.

Q95 Flow exceeded during 95% of period over which flow data are being considered.

RE River Ecosystem.

RFO River Flow Objectives.

RQO River Quality Objective.

RSA Restoring Sustainable Abstraction.

RSPB Royal Society for the Protection of Birds.

SAC Special Area of Conservation.

SPA Special Protection Area.

SSSI A Site of Special Scientific Interest i.e. an area given a UK statutory designation because of its conservation value.

SW Surface water.

TCAMS Thames Corridor CAMS.

WRMU Water Resource Management Unit.

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