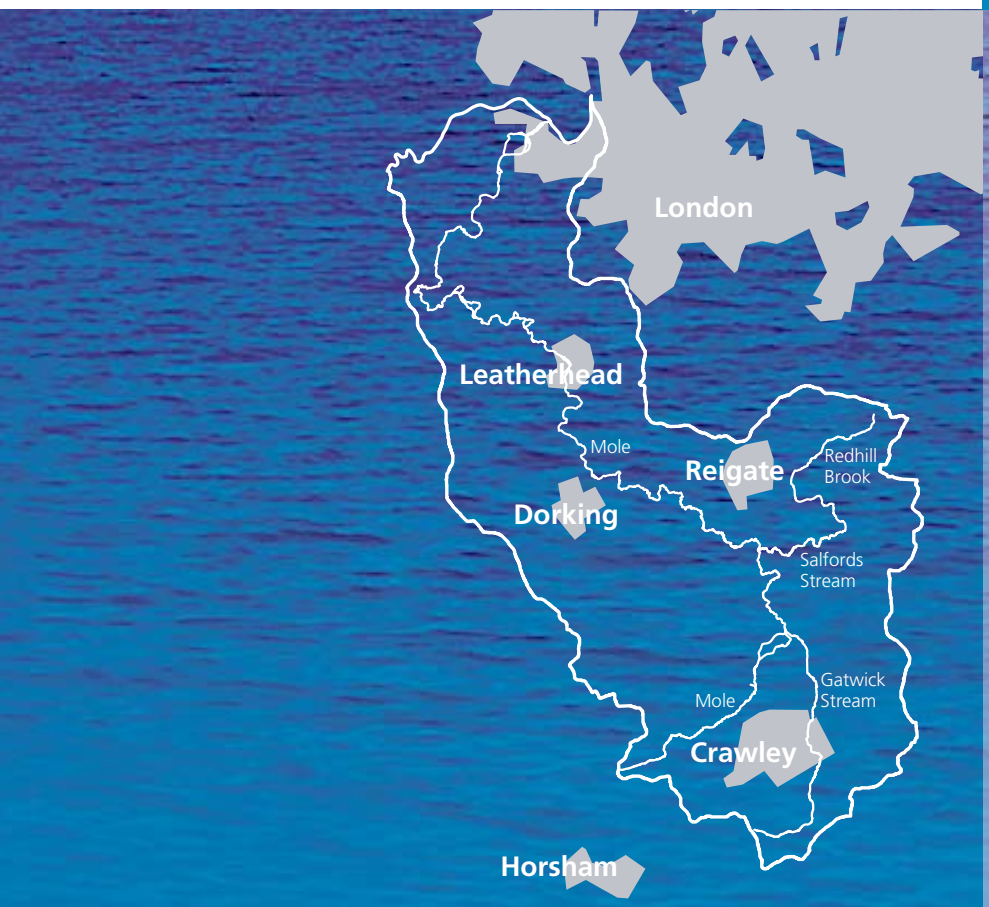

www.environment-agency.gov.uk/cams

The Mole Catchment Abstraction Management Strategy

Consultation Document
January 2006

Environment Agency

www.environment-agency.gov.uk/cams

The Environment Agency is the leading public body protecting and improving the environment in England and Wales.

It's our job to make sure that air, land and water are looked after by everyone in today's society, so that tomorrow's generations inherit a cleaner, healthier world.

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.

Published by:

Environment Agency
Rio House
Waterside Drive, Aztec West
Almondsbury, Bristol BS32 4UD
Tel: 01454 624400 Fax: 01454 624409

This report is printed using water based inks on Cyclus Offset, a recycled paper using 100% post consumer waste.

Front cover photograph by David Dennis, Environmental Images.

Contents

1

Introduction

VISION FOR THE CAMS AREA

The vision for the River Mole Catchment Abstraction Management Strategy (CAMS) is to ensure a fair share of water for abstractors, river users and the environment. We will achieve this by:

- ensuring that abstraction licences allow realistic volumes of water to be abstracted;
- investigating the water requirements of the River Mole, Gatwick Stream, Redhill Brook and Salfords Stream;
- having regard for water resources in the groundwater supplies of the Chalk and Lower Greensand aquifers;
- considering the needs of the River Thames when licensing in the Mole catchment.

Catchment Abstraction Management Strategies (CAMS) are strategies for the 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. It also describes the process of developing CAMS and provides information on the structure and content of CAMS documents. This consultation document should be read in conjunction with *Managing Water Abstraction*.

The Mole CAMS consultation document sets out how much water is available in the catchment and the options we are proposing for managing water resources, now and in the future. It also provides an opportunity for members of the public to comment on our proposals and input into the process.

The Mole catchment is part of the larger River Thames catchment. Because of this all water licensed within the Thames tributaries will have an impact on river flows in the River Thames. Any management policy in the tributary CAMS must therefore have regard to the licensing polices within the River Thames.

If you would like more information on water resources and licensing policy for the River Thames refer to the Thames Corridor CAMS.

CAMS is a cyclical review process, with all catchments entering the cycle over a six year period.

In 2008 the Mole CAMS will start the review process, and will provide us with a better picture of water resource availability for the Mole catchment. Further work, including improved environmental monitoring is proposed, giving us a better understanding of the needs of the water environment in the Mole catchment.

A technical document (consultation version) for the Mole 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 address overleaf. A hard-copy version of the document is also available for viewing at the same office.

The River Mole at Leatherhead

2

Consultation on the Mole 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 allow us to manage water resources in a 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 various pre-consultation activities.

These were:

- an awareness raising leaflet
- a CAMS stakeholder group
- contact with a wider consultation group
- update reports sent to interested parties.

The leaflet was distributed in August 2002. Its aim was to raise awareness of the development of the CAMS in the local area and invite anyone with an interest to send in written comments, provide information, views and suggestions for consideration during the early development of the CAMS.

A stakeholder group has been set up for the Mole CAMS. The role of the group is 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 Mole CAMS stakeholder group and the interests they represent are as follows:

Dr Liz Wolfenden	Chair
Mr Rod Shaw	Local councils
Dr Louise Bardsley	Conservation
Mr Lester Sonden	Public water supply
Dr David Kennedy	Fisheries
Mr Norman Dampney	Betchworth Park Golf Club
Mr E.R. Thompson	Agriculture

In addition, detailed information on the CAMS process was sent to local councils, water companies, conservation groups, angling associations and farmers to reach a wider range of interested parties and encourage their feedback.

This document is the formal part of the Mole CAMS consultation process and provides the opportunity for all interested parties to comment on the proposed strategy.

Responses should be sent, in writing to:

Sarah Rennie – Mole CAMS Officer
The Environment Agency
South East Area, Thames Region
Swift House
Frimley Business Park
Frimley
Camberley
Surrey
GU16 7SQ
Tel: 08708 506 506
Fax: 01276 454301

Or by email to:
cams.thamesse@environment-agency.gov.uk

The closing date for responses is 31 March 2006. Please ensure that you include, where appropriate a reference to the element of the proposed strategy that you are addressing.

Once the responses have been analysed, a statement of response will be produced. This will summarise the responses, highlighting the main issues raised. It will be sent to all respondents and will also be available to others on request. Extracts from responses may be included in this statement. If you would like your response to be treated as confidential, please state this clearly. Key dates for the Mole CAMS are shown in **Table 1**.

Table 1 Key dates for the Mole CAMS

Date	Description
Summer 2002	Publication of Mole CAMS Raising Awareness Leaflet.
Winter 2005	Publication of the Mole CAMS Consultation Document, followed by a two month consultation period.
Spring 2006	Publication of the Statement of Response.
Summer 2006	Publication of the Mole CAMS.
Spring 2008	Start date for the review of the Mole CAMS.
31 March 2017	Common end date for time-limited licences in the Mole CAMS area.

3

The CAMS area

The River Mole rises in the North Sussex hills near Rusper, and flows northward to join the River Thames at Molesey near Hampton Court. A map of the general Mole catchment is shown in **Figure 1**.

The catchment covers an area of 512km^2 and forms nearly 5 per cent of the River Thames catchment above Teddington. The boundary of the CAMS area is the topographic boundary.

The major towns in the CAMS area are Crawley, Reigate, Leatherhead and Esher. There are smaller towns in the catchment including Horley, Dorking and Cobham, and a large number of rural villages – mainly in the south of the catchment.

The River Thames in Walton-on-Thames is the northern boundary of the CAMS area, and the area around Crawley the southern boundary. There is a distinct divide between the north of the CAMS area, which has seen significant growth in housing and retail development, and the south of the area, which is more rural – although Gatwick Airport is present.

The main rivers in the area (identified as the CAMS rivers) are the River Mole and its tributaries: the Gatwick Stream, Redhill Brook and Salfords Stream. These are considered CAMS rivers because they are, or have the potential to be, used for abstraction.

View from Box Hill

3.1 Hydrogeology and Hydrology

Annually the Mole catchment receives an average of 761mm of rainfall.

This level of rainfall is greater in the higher parts of the Mole catchment around Crawley, where an average of 800mm is received per year. This amount is also received on the high ridges of the Chalk and Greensand outcrops around Dorking. Around Dorking the annual average rainfall is typically 770mm per year.

The River Mole rises on the Weald Clay and from small springs on the north facing slopes of the Hastings Beds around Rusper. The river flows 80km in a general northerly direction from Rusper, to its confluence with the River Thames at Molesey. As the Mole flows over the Weald Clay, it is fed by a network of tributaries, rising on the Tunbridge Wells Sands/Weald Clay to the south. The Ifield Brook is the most notable of these. The geology of the Mole CAMS is shown in **Figure 2**.

To the south east, the Tilgate Brook rises near Pease Pottage, joining the Gatwick Stream at Crawley. The Gatwick Stream skirts the major conurbation of Crawley, and flows northwards from its source on the Tunbridge Wells Sands, meeting the River Mole south of Horley. The Burstow Stream has its source near Crawley Down, flowing north and joining the Mole at Meathgreen in the north-west of Horley.

Runoff from the large urban area around Crawley and Horley, including Gatwick Airport accentuates the already 'flashy' nature of the top part of the catchment. It is referred to as 'flashy' because the river responds to rainfall in the catchment very quickly.

In the middle part of the catchment the Mole is joined from the east and west by a number of other tributaries. To the north of Horley, flowing from its source south of Bletchingley, the Salfords Stream joins the River Mole above Sidlow Bridge from the east. The Redhill Brook flows north from Bletchingley, through Redhill and joins the Salfords Stream below Redhill Airport. A number of tributaries flow into the Mole from the west including, the Leigh Brook, Tanners Brook, Pipp Brook and the Deanoak Brook.

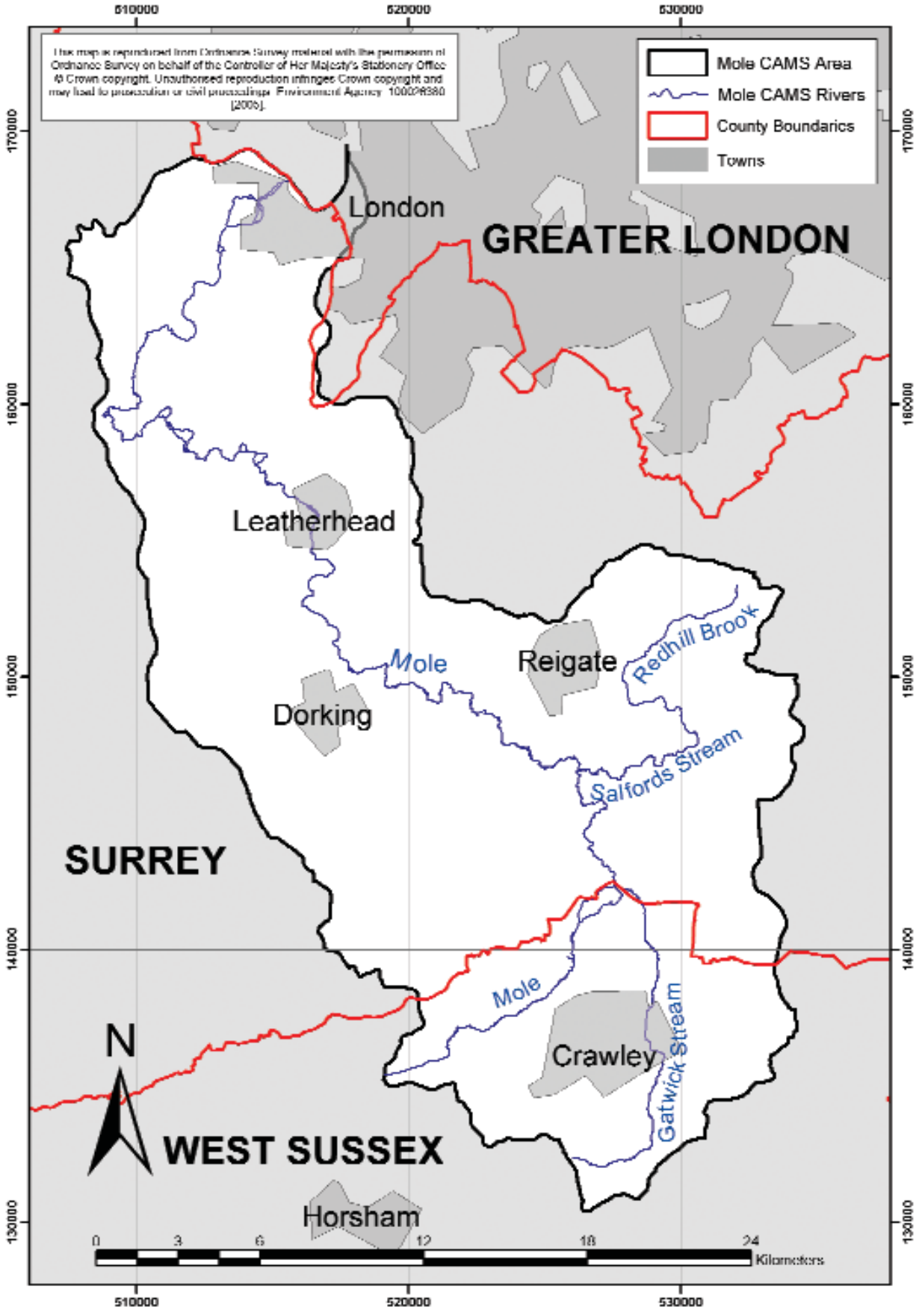

Figure 1 | General Mole Catchment

Many of the tributaries in the middle of the catchment take runoff from the Weald Clay, but in the east there is some groundwater contribution to flow in tributaries that rise or pass across Chalk and Greensand outcrops. This is also the case for some tributaries to the west of the Mole, although to a lesser extent.

The Mole catchment straddles part of the two main geological units present in South East England – the Wealden Anticline in the south and the London Basin to the north.

The upper catchment is formed of highly faulted sandstone, silts and clays. The lower catchment includes younger deposits of chalk, sands, silts, gravels and clays. In the upper catchment, the majority of effective rainfall runs off the impermeable clays and into the river system.

The river flows gently northwards over the northern limb of the Wealden anticline, over Weald Clay to just south east of Dorking. Here it crosses the hills formed by the east west outcrop of the Lower Greensand. It then flows over narrow bands of Gault Clay and Upper Greensand, and onto the Chalk at the southern end of the Mole Gap in the North Downs.

Between Dorking and Leatherhead the Mole flows northward across the Chalk. In this area the river is connected to the underlying aquifer by swallow holes. These extend northwards as far as Mickleham. In times of dry weather this can lead to water loss from the river to the groundwater, occasionally causing the river to dry up completely.

The water flows underground within the Chalk to emerge as powerful springs in the riverbed just south of Leatherhead. This input and another Chalk spring input at Fetcham form the only major aquifer inputs of groundwater into the River Mole. These aquifer inputs help maintain the flow north of Leatherhead during dry weather.

As the river flows north from Leatherhead it passes over areas of tertiary strata – the London Clay and Bagshot Beds – before reaching the River Thames at Molesey.

3.2 Hydrometry

We monitor water resources using an extensive network of hydrometric stations. This data is used on a routine basis for drought and flood monitoring, for water resource investigations and to assess the resource availability in the catchment. We have a well established hydrometric monitoring network in the Mole catchment (illustrated in **Figure 3**).

The hydrometric network in the Mole catchment consists of seven gauging stations (listed in **Table 2**), and 12 raingauges.

Table 2 Gauging stations in the Mole CAMS area

Gauging Station	River
Gatwick Airport	River Mole
Gatwick (M23 Link Road)	Gatwick Stream
Horley	River Mole
Kinnersley Manor	River Mole
Dorking (Castle Mill)	River Mole
Leatherhead	River Mole
Esher	River Mole

We have 17 active groundwater level monitoring boreholes in the Mole catchment, most of which are monitored on a monthly basis. All these sites monitor water levels within the Chalk, with the exception of one borehole, which records water levels for the Lower Greensand Aquifer.

Weir on the River Mole at Horley

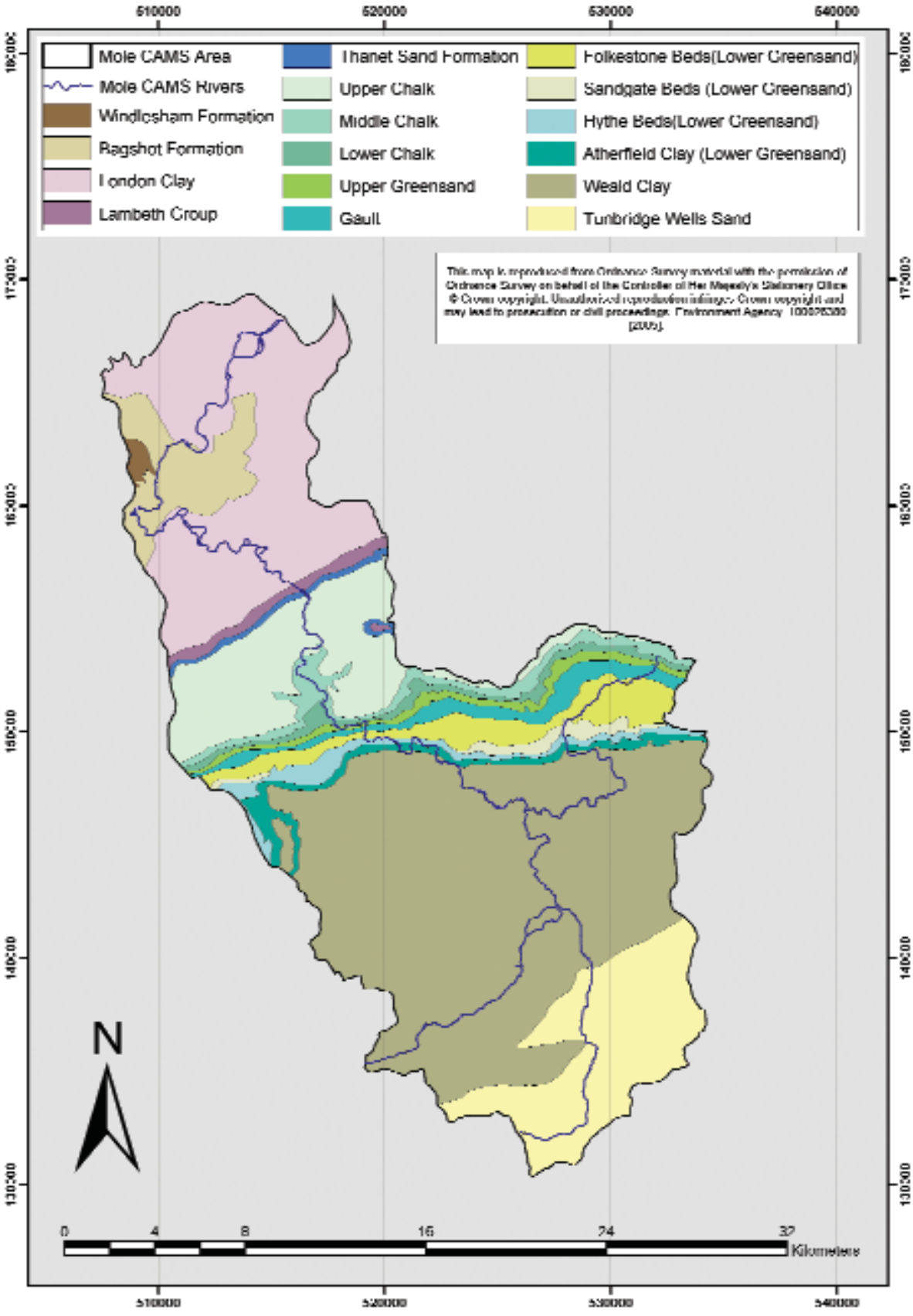

Figure 2 | Solid geology of the Mole catchment

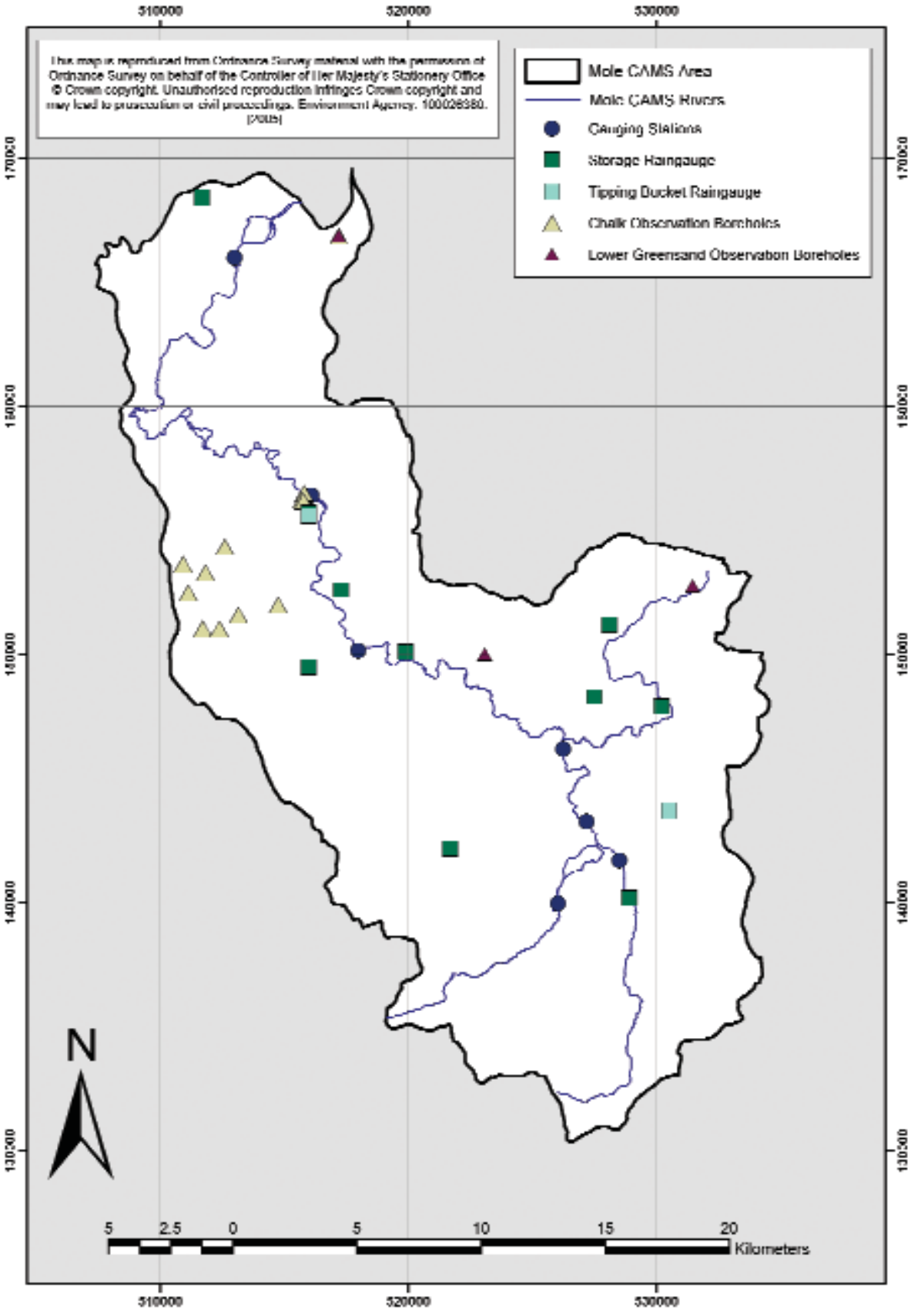

Figure 3 | Hydrometric monitoring network in the Mole catchment

3.3 Abstractions and discharges

3.3.1 Abstractions

There are currently 44 abstraction licences in the Mole catchment, licensed to abstract over 96Ml/d (**Figure 4**).

Groundwater abstraction accounts for 68 per cent of all licensed abstractions. The majority of groundwater abstraction is from the Chalk aquifer. The needs of public water supply accounts for 82 per cent of licensed water abstracted in the Mole catchment. All abstraction for public water supply is from groundwater sources in the Chalk.

The rural nature of the catchment has led to the development of many abstractions for agricultural purposes. Many of these abstractions are for crop irrigation, and in some cases abstraction is limited to the summer growing season. In areas where summer resources are fully committed, some farmers and other water users have developed storage facilities, such as reservoirs, to enable water to be abstracted in the winter period and stored for subsequent summer use.

Golf course irrigation also accounts for a significant volume of the water licensed for abstraction in the catchment.

Abstractions are also licensed for a variety of industrial uses, mainly located in the urban areas of Leatherhead, Dorking, Molesey and Horley. Most of these are from surface water sources. Industrial uses include manufacturing processes and mineral extraction. Most large abstractions at quarries are for washing the extracted minerals, with the majority of the water being returned to wet pits or watercourses via settlement lagoons.

There are several abstractions in the catchment that are exempt from licensing. Exempt abstractions include domestic abstractions of less than 20m^3/d, Crown abstractions and abstractions for dewatering mineral workings. In the latter case, the water is almost always returned close to the point of abstraction with little or no loss of water.

There are also several licensed abstractions that include a provision for emergency purposes, such as providing an alternative water supply in periods of mains supply failure, or augmentation of river flows. We have removed these types of abstractions from the resource assessment because they do not reflect the usual consumption of water in the catchment.

3.3.2 Discharges

There are over 750 consented discharges in the Mole CAMS area, the majority of which (over 400) are for small volumes of treated sewage from domestic properties.

Thames Water Utilities Limited have 29 consents for their 15 Sewage Treatment Works (STWs) in the catchment. The six largest STW discharges make up approximately 90 per cent of the consented effluent volume in the catchment. Four of these six have maximum permitted flows in excess of 10,000m^3/d, the largest of which is Reigate STW, with a maximum flow of 118,500m^3/d. The other three are Crawley, Leatherhead and Dorking.

At present there is very little information available on the quantity of effluent actually discharged by these STWs, or in fact any other consented discharges in the catchment. Under the Water Resources Act 1991 (as amended by the Environment Act 1995), flow returns are required for the larger discharges, but at present, they tend to be sporadic and there remain concerns over the accuracy and reliability of some of this data. By 2005 all large STWs will have to monitor discharges as a requirement of the Urban Waste Water Treatment Directive (UWWTD).

There are eight consented discharges from Water Treatment Works (WTWs) in the Mole CAMS area, but most discharge into the River Thames or reservoir channels. The largest is to the intake channel from the River Thames from Walton WTW (maximum volume of 7,250m^3/d), and therefore does not impact on the River Mole. The largest WTW discharge to the Mole is from Elmer WTW near Leatherhead, which is allowed to release up to 1,000m^3/d to the Mole.

There are seven consented discharges from Gatwick Airport. These are all related to runoff from the site, and some discharge to the Mole or its tributaries via a series of pollution control ponds. One of these consents allows increased discharge from one of the control ponds when flow in the Mole increases above an agreed rate.

The River Mole upstream of Dorking Sewage Treatment Works

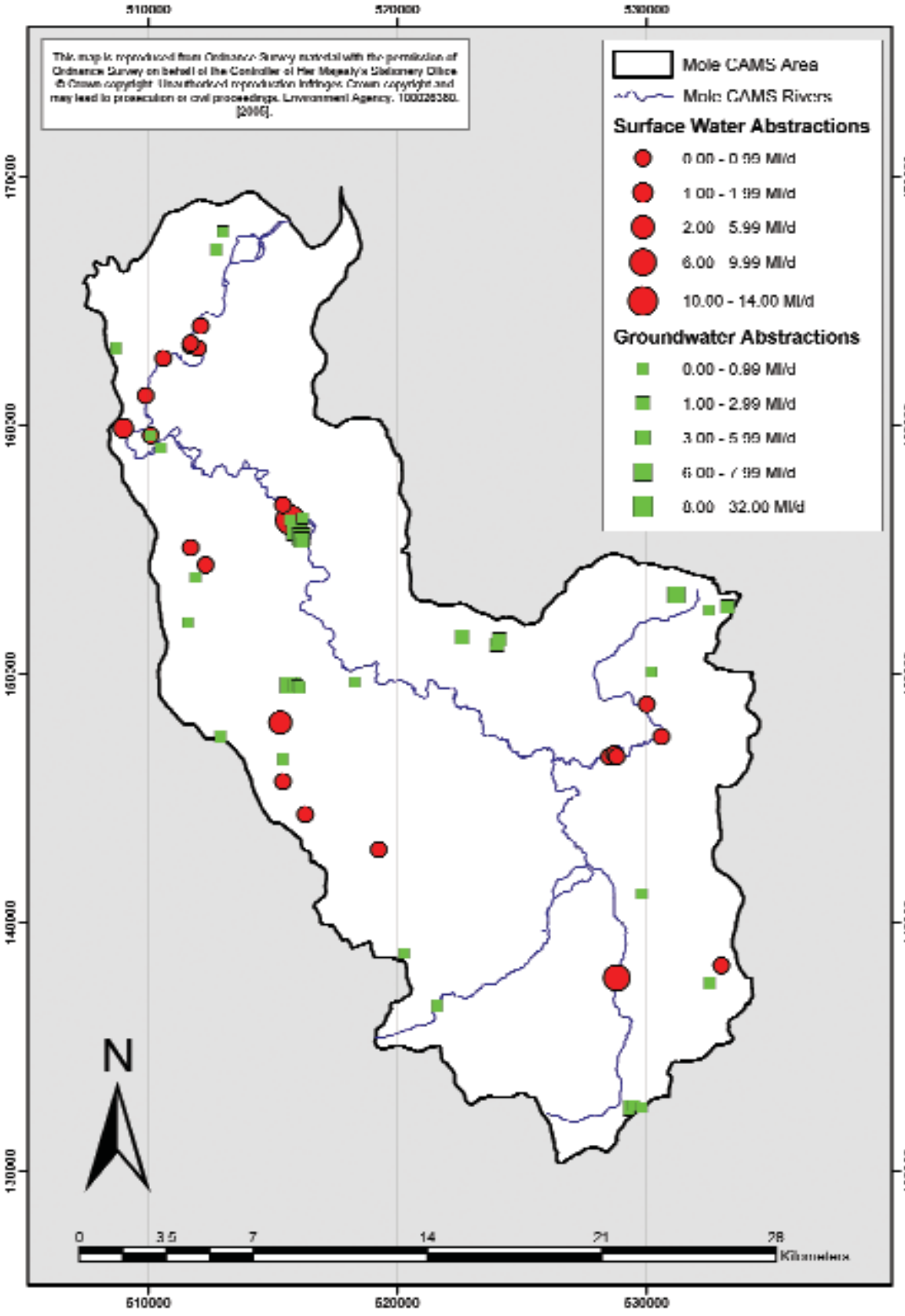

Figure 4 | Licensed surface water and groundwater abstractions

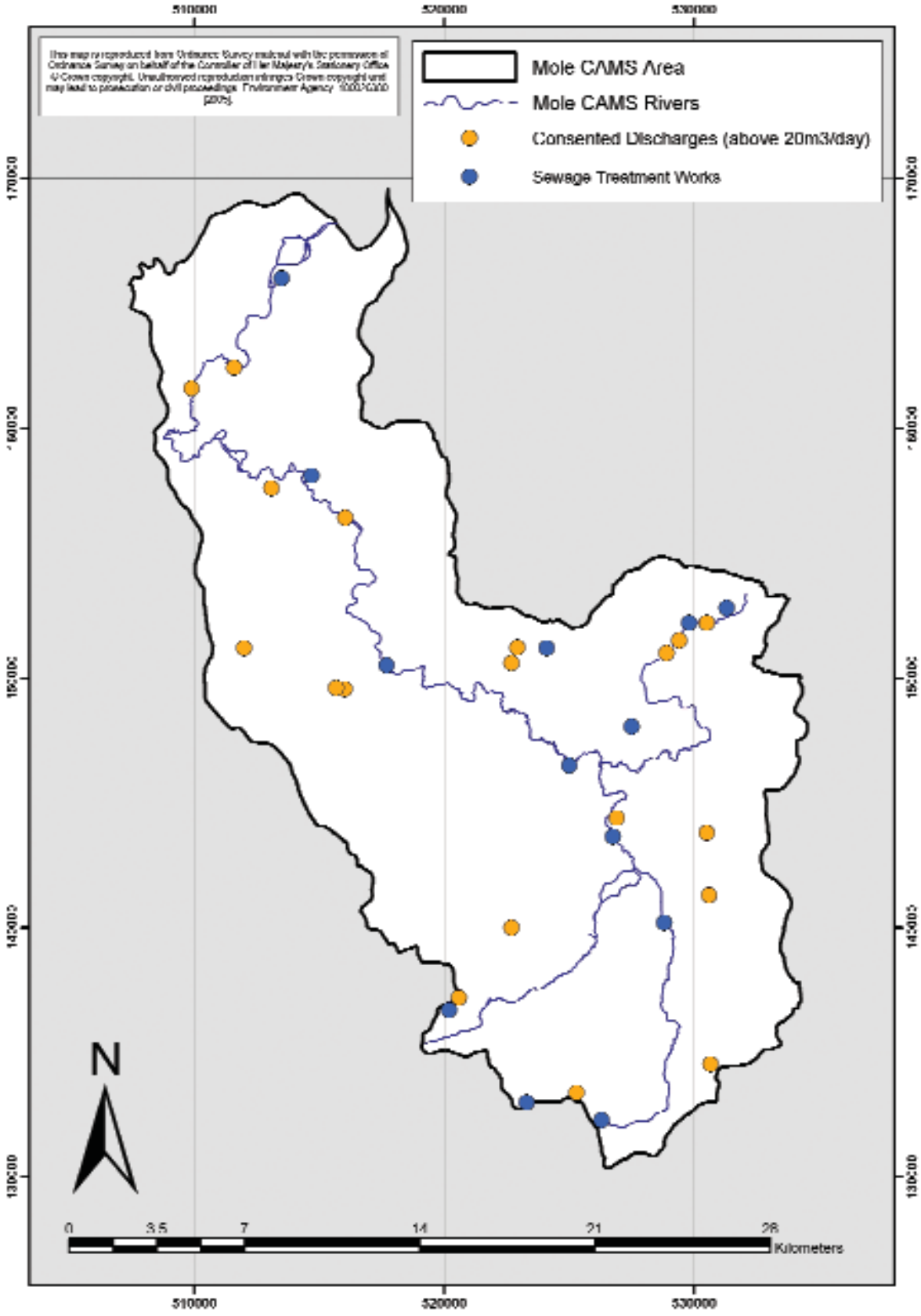

Figure 5 | Consented discharges above 20 m^3 per day

3.4 Conservation designations

The Mole catchment is home to a diverse range of habitats and species, a number of which are water-dependent. Ponds are particularly important in the catchment, while other habitats reliant on water include streams, wet woodland, fens, mires, wet heath and marshy grassland. These habitats and the species they are home to can be found on the full range of statutory and non-statutory sites, as well as non-designated areas that form important links.

Conservation sites can broadly be split into three categories, those of international, national and local importance.

International sites include Special Protection Areas (SPAs) and Special Areas of Conservation (SACs) designated under European Directives, as well as the internationally important wetlands known as Ramsar sites. All international sites are composed of one or more Sites of Special Scientific Interest (SSSIs). SSSIs are the statutory nature conservation sites for England, Wales and Scotland. Local Nature Reserves (LNRs) are statutory sites of local importance which encourage access for educational purposes. Non-statutory sites are designated on a county basis and are given a variety of titles. In Surrey and West Sussex they are known as Sites of Nature Conservation Interest (SNCIs).

The Mole catchment contains small composite parts of two SPAs. Knight and Bessborough Reservoirs SSSI is a component SSSI of the South West London Waterbodies SPA which is also a Ramsar Site. This particular SSSI consists of two connected, artificially embanked water storage reservoirs which support a variety of waterfowl, including nationally important numbers of wintering shoveler. This species is one of the designated features of interest for both the SPA and the Ramsar site. Wintering gadwall, cormorant and goldeneye also occur in notable numbers.

The Mole catchment also contains a very small part of Ockham and Wisley Commons SSSI which is a component SSSI of Thames Basin Heaths SPA. The designated features of the SPA are not water-dependent.

The Mole catchment supports one SAC known as the Mole Gap to Reigate Escarpment SAC, which consists of the majority of the Mole Gap to Reigate Escarpment SSSI. There are seven designated features of European interest in this SSSI, most of which are not water-dependent. However, one of the features of interest is the occurrence of great crested newts, for which this area is considered to support a significant presence. This species needs ponds and pools for breeding but also suitable adjacent terrestrial habitats to hibernate and feed for most of the year. This site fulfils these habitat requirements and is therefore one of the best sites in Europe for this species. As well as being listed in Annexes II and IV of the Habitats Directive, great crested newts are listed in Appendix II of the Bern Convention, is fully protected under The Wildlife and Countryside Act 1981 and is a priority UK Biodiversity Action Plan (BAP) species.

Great crested newt

SSSIs, which are sites of national importance, are designated under the Wildlife and Countryside Act 1981 (as amended). The Mole catchment contains all or part of 15 SSSIs, 12 of which support wetland features. These include ponds, streams, wet woodland, fens, mires, wet heath and some marshy grassland. English Nature, the government's statutory nature conservation body, carry out condition assessments of all SSSIs as part of the DEFRA Public Service Agreement (PSA) Target to bring 95 per cent of all SSSIs (by area) in England into favourable condition by 2010.

Ponds are important wetland habitats in this catchment and are relatively common, particularly on the clay. Those on clay are primarily dependent on surface water rather than groundwater sources. A number of the SSSIs contain ponds, some of which support rare and declining species, often in association with other surrounding wetland habitats. The following gives some examples of SSSIs with ponds and other wetland habitats.

Bookham Commons SSSI, situated on the London Clay, has several woodland ponds that support thread-leaved water-crowfoot, which is rare in Surrey and fat duckweed, which is uncommon in the county. Tall fen vegetation occurs in the chain of ponds and support orange foxtail and eared willow, which are both scarce in Surrey. The ponds and fen (a priority habitat in the UK BAP) also support a range of breeding birds including reed bunting, a priority species in the UK BAP. The Bookham Brook, a tributary of the Mole, also flows through the woodland.

Buchan Hill Ponds SSSI includes three ponds that are the best example in West Sussex of Wealden hammer ponds on acid Tunbridge Wells sands and these, together with the marginal fen communities, support a range of wetland plants. The ponds and surrounding vegetation support 17 species of dragonfly which represents a nationally significant population and includes the hairy dragonfly and brilliant emerald which are both nationally uncommon. The ponds are surrounded by wet woodland, which is a priority habitat in the UK BAP and supports a rich ground flora. The condition of this SSSI is 'unfavourable, recovering' (Oct. 2003) but this is mainly due to site management issues rather than reduced water availability.

Epsom and Ashtead Commons SSSI, situated on the London Clay, contains a number of ponds, including two dating from medieval times as well as smaller woodland ponds and The Rye Stream. The medieval ponds support the richest flora of all the ponds and include white water lily, which is rare in Surrey, and narrow-leaved water-plantain, which is scarce and declining in the county. There are a number of breeding birds associated with the open water, including kingfisher and little grebe. The two medieval ponds are considered to be in 'unfavourable, no change' condition (Nov. 1999), for a number of reasons including overstocking of fish, lack of aquatic flora and scrub encroachment. Water resources are not considered a problem here due to the ponds being on clay and therefore not dependent on groundwater.

Kingfisher with bullhead

Reigate Heath SSSI supports a range of habitats including wet alder carr woodland and marshy meadows. When notified the woodland had a rich ground flora including the Surrey rarity white sedge, while the marshy meadows had a large colony of southern marsh-orchid which is uncommon in the county but which has since greatly declined. The Wallace Brook runs along the eastern edge of the meadows and provides a feeding area for birds such as kingfisher.

Since at least the 1970s, this site has suffered from severe adverse hydrological impacts which is possibly due to drainage issues outside of the SSSI boundary causing lowering of the water table. Long-term depression of the underlying aquifer has occurred to the west. Dredging of the Wallace Brook and lack of management of the site are also likely to have contributed to its poor condition. The peat soil is drying out and shrinking, resulting in soil erosion and the invasion of terrestrial species. The alder woodland has been assessed as 'unfavourable, declining' (June 2002) while the marshy meadows have been assessed as 'unfavourable, no change' (February 2001).

Water resources are therefore a major issue with this site and any increase in consumptive abstractions that could potentially affect the hydrology of the site must be carefully considered. Therefore any new consumptive abstraction near to the site is unlikely to be granted, and would only be permitted with suitable constraints to protect the environment.

All new licences will follow licence determination procedure to ensure need, efficiency and sustainability. Ways to restore the historic water table are urgently required if the site is to return to its original favourable condition. However, in the short term no improvement to the hydrological management can be made as the groundwater level is low. We are currently carrying out detailed hydrological monitoring. Botanical studies are also required to identify the behaviour of the groundwater, sources of water and current interest of the site. There is a Water Level Management Plan for Reigate Heath and investigations are currently underway to ascertain the reasons for the site drying out and to propose potential remedies.

Surrey has a number of LNRs, one of the most recent to be designated being the River Mole LNR. This includes stretches of the river corridor through Leatherhead and is one of very few riverine LNRs in the country.

The Mole catchment contains over 130 SNCIs, which are designated by Local Authorities and the County Conservation Forums. Although these are non-statutory they are important as a biodiversity resource and to local communities and the local planning authorities take them into account in the planning process. Together with statutory sites and countryside features such as rivers forming wildlife corridors, these SNCIs help form a network of habitats maintaining the diversity of the flora and fauna in the catchment.

Approximately half of the SNCIs have wetland features that include ponds and lakes, streams, wet

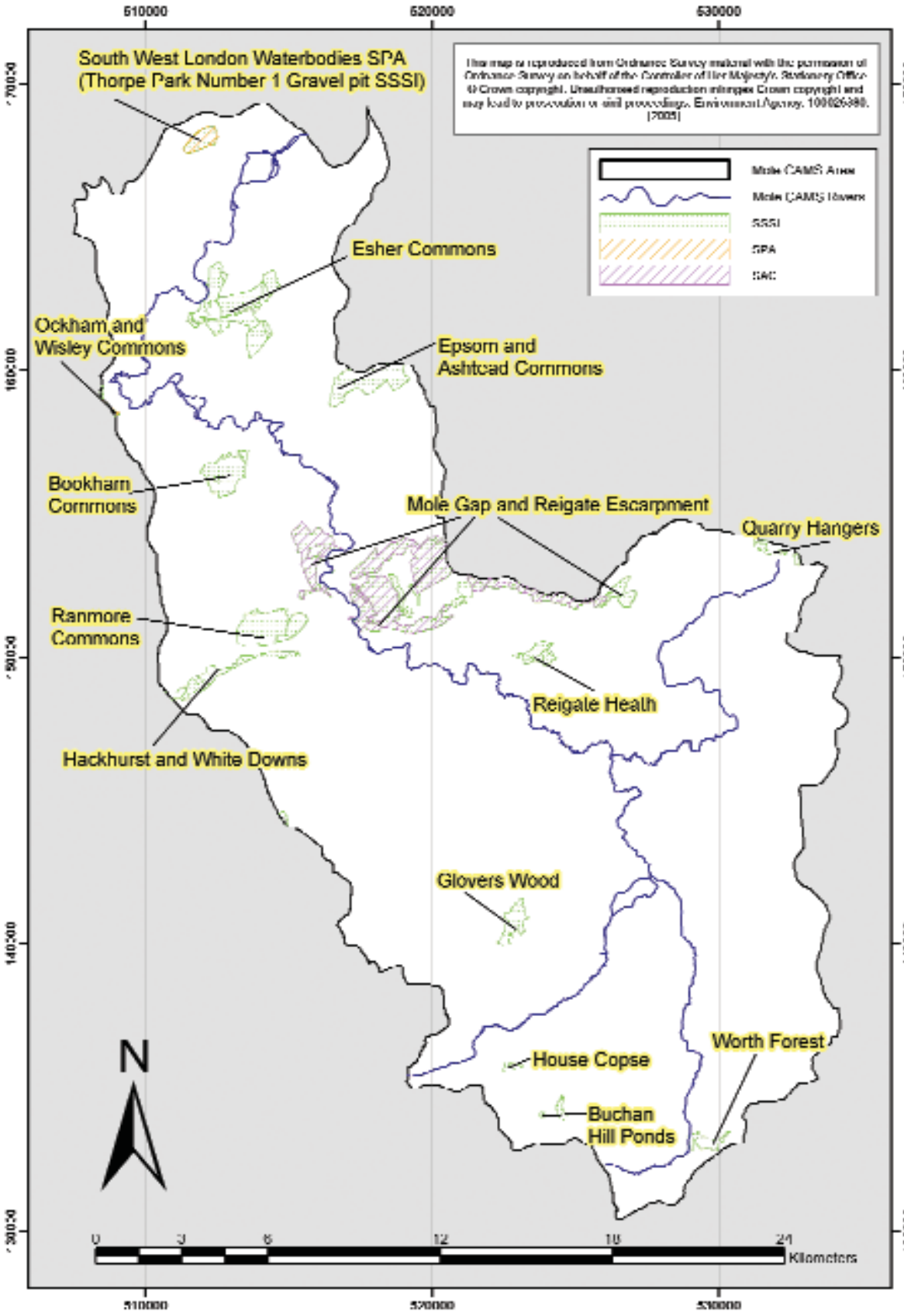

Figure 6 | Sites of conservation interest in the Mole catchment

woodland and marshy grassland. A high proportion of the ponds support populations of great crested newt, which are an important resource in addition to those found on the designated sites. Some of the ponds support fringed water-lily which is rare in Surrey and one has white water-lily which is rare in Surrey and only occasional in West Sussex. Marshy grassland is rare in the catchment but one SNCI in West Sussex has an area of this habitat supporting orange foxtail which is a very rare species in the county. Another species of interest in the county is greater dodder, a nationally scarce plant that is parasitic on stinging nettles. It is locally common along the banks of the River Mole.

Greater dodder (courtesy of Peter Wakeley / English Nature)

The UK BAP was published by the government as a result of the Earth Summit and in particular the Convention on Biological Diversity in Rio, in 1992. It lists priority habitats and species that are rare or declining in the UK. Each habitat or species has an individual Action Plan or Species Statement. The action plans set out objectives, targets and specific actions to be carried out by particular organisations, within a particular timeframe. Local BAPs, often written on a county basis, aim to meet the targets of the UK BAP by the means of more specific, local actions. Two local BAPs affect the Mole catchment, namely the Surrey BAP and the Sussex BAP.

3.5 Status of ecology and fisheries in the CAMS area

We collect and analyse a large amount of ecological information. The data we collect can give an indication of the status of a river in relation to abstraction and water quality. This data has helped us understand the water needs of the in-channel ecology of rivers within the Mole CAMS.

3.5.1 Fisheries

The River Mole and the tributaries covered in this strategy support coarse fish populations of varied, but improving quality. There used to be a distinct difference in the species and year classes present in the upper and lower reaches of the Mole. This distinction between the upper and lower reaches now seems to be blurring.

The Gatwick Stream around Horley is dominated by coarse fish, with high biomass and density. Brown trout, brook lamprey and eel can be found in the stream around Horley. Brown trout dominate through Crawley, despite the threats of diffuse pollution.

In May 2003, an unknown substance entered the stream at Pease Pottage and killed nearly everything down to Maidenbower village (approximately 600 to 1000 brown trout and 1500 minor species).

Everything possible was done to stop the pollutant, and 250 to 300 brown trout were electrofished out from the polluted water and transferred to a side stream. Brown trout are now re-colonising the stream (November 2005 survey).

The Middle Mole supports many species of fish, usually in large numbers and of small to medium size.

The Mole at Horley swimming baths consists of an impounded section, originally dominated by still water species such as bream, tench and carp. Notching the weir in 2003 dropped the water level and encouraged a more riverine fish population, with reduced biomass and good species diversity.

The Mole at Meath Green underwent some enhancement work to create a gravel spawning area for fish. Roach had previously dominated this reach, but improvements in discharges form the Horley and Crawley Sewage Treatment Works have resulted in chub and dace numbers increasing.

The Mole at Boxhill cuts through the chalk of the North Downs, and supports excellent populations of chub, roach, dace and even barbel and brown trout. Barbel and brown trout are sensitive to poor water quality, but are breeding in these favourable water quality conditions.

The Lower Mole has, historically supported larger predatory fish such as chub, perch, pike and eels, together with some very large barbel, carp and bream. However, things are beginning to change, eels are declining as are the numbers of large, old chub. The water quality of this part of the Mole is good, and the large size of the fish indicates that there have been no major recent pollution incidences.

The Old Mole channel downstream of Esher is dominated by floating pennywort, a highly invasive weed. One hundred per cent shading of the riverbed provides a poor habitat for fish. Where the channel is not dominated by this weed, good populations of chub, eel, roach and dace can be found.

The parallel Ember Flood Relief Channel has an even more diverse fish population, with lots of chub, dace, roach and bleak, together with large pike and barbel. Large carp and bream are also known to exist in this section.

3.5.2 Ecology

The health of rivers is reflected in the variety and abundance of the animal and plant life they support. We routinely monitor the macroinvertebrate life in rivers, streams and canals using nationally recognised procedures.

Biological monitoring provides a useful measurement of water quality because macroinvertebrates are continuously exposed to changes in water quality and communities respond to both intermittent and low level pollutants, which can often remain undetected by standard chemical methods. The Biological GQA (General Quality Assessment) scheme is made up of six grades ranging from 'a' to 'f', with grade 'a' reflecting the highest quality.

The Biological GQA grades for 2000 were used in this CAMS. The Biological GQA of the Mole catchment demonstrates that in general the River Mole has a good biological quality with a biological GQA grade 'b' along much of its length. The main tributaries – the Gatwick Stream and the Salfords Stream show lower biological quality, grade 'd' (fair) and grade 'c' (fairly good) respectively. This may be explained by the restrictions put on the invertebrate populations by urban pollution and mans' activities of dewatering.

Shell Bridge, Leatherhead

3.6 Water Quality

The Chemical GQA (General Quality Assessment) scheme is used to assess and report water quality using the sample results and is made up of six grades ranging from 'A' to 'F', with grade 'A' indicating the highest quality.

The chemical quality of watercourses in the Mole CAMS area has improved substantially since 1990. In 2002, 60 per cent of the 173 kilometres of classified watercourse were graded as B (good), with a further 29 per cent classified as C (fair) and no stretches classified as F (bad). This compares very favourably to 1990 when only 23 per cent of the river lengths achieved 'good' quality status, 47 per cent attained C (fair) quality and 8 per cent were graded as F (bad) quality.

There are several Sewage Treatment Works in the Mole CAMS that release treated sewage effluent into rivers. These have the potential to have an important influence on water quality. Because of this we set standards for these discharges and carry out monitoring to check that river quality is protected. Over the past five years water industry investment has improved these discharges, which has contributed to the change in river quality we have seen since 1995.

Recently, water companies have also started to remove nutrients from some of the discharges. This will help prevent the growth of algae, which can sometimes cause low oxygen levels in the Mole CAMS area, this should also mean that water quality continues to improve.

3.7 Stakeholder concerns

The Mole Stakeholder Group has provided us with valuable advice and guidance during the development of this CAMS. Each stakeholder represented a specific activity or industry, intended to reflect a general opinion. All members were asked to consult with people in their field of interest, to inform them about CAMS, and bring issues back to the group. The group has so far met three times. The group was briefed on resource availability calculations and status, after which they then helped identify and evaluate options for future water resource management.

One of the key activities the group was involved in was to define issues of importance to their particular interest. They were able to identify issues that they would like to see addressed by the CAMS. Some of these issues cannot be resolved by CAMS and have been transferred to other Environment Agency departments.

Limitations of CAMS were also raised and discussed, such as;

A. CAMS cannot specifically address resource needs of wetlands due to their small scale and complex interactions. However, how a particular licensing strategy impacts wetlands is considered within the sustainability appraisal phase of CAMS. Needs of wetlands are also addressed specifically in other Environment Agency initiatives, the Habitats Directive, water company plans and the abstraction licensing process itself.

B. CAMS cannot take into account future water demand due to increased development as these are not exact or definite. To include potential demand may therefore lead to an inaccurate and misleading assessment. CAMS does work as an initial baseline from which we can move forward, addressing future data needs and raising issues. We hope that CAMS will be used by decision-makers to make well-informed decisions.

C. CAMS cannot look at water quality specifically, only where water quality has been reduced by abstraction. How a particular licensing strategy impacts on water quality is considered within the sustainability appraisal phase of CAMS.

3.8 Links with other plans

Developing links with other plans will ensure that other groups consider water resources issues. CAMS will be linked to other Environment Agency plans such as Water Level Management Plans, Catchment Flood Management Plans, Fishery Action Plans and Biodiversity Action Plans.

CAMS will complement the existing Environment Agency, Thames Region, Water Resources Strategy and take account of water companies Water Resource Plans. Where possible we should also encourage links with plans produced by external groups such as local development plans and Area of Natural Beauty Management Plans.

4

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 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 3**.

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.

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.

Table 3 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

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 7 shows the GWMUs and river APs that have been defined for the Mole CAMS. Further details on how these were defined are provided in the technical document for the Mole CAMS.

4.2 Resource assessment of groundwater management units

For the groundwater resource assessment, various tests are applied to each unit to determine the resource availability status. These tests include examining the balance between recharge to the unit and abstraction from it, and the impact of abstraction on summer outflows from the unit.

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 A to E, A being most sensitive to abstraction and E being the least sensitive.

Figure 8 and **Table 4** show the environmental weighting scores for each assessment point in the Mole CAMS area.

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. However, this applies only at times of low flow. During periods when flows are higher, there may be some water available for abstraction. The classification is therefore really a classification of resource availability at low flow.

Table 4 Environmental weighting scores for the Mole CAMS rivers

Assessment point	Assessment point name	Environmental Weighting band
1	Lower Mole	D
2	Mole Gap	C
3	Middle Mole	C
4	Salfords Stream	D
5	Gatwick Stream	C
6	Upper Mole	C

Abstraction licences are sometimes managed in order to ensure this flow variability is maintained by the use of 'hands-off flow' (HOF) 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. Low flows will occur more frequently during the summer months.

In order to maximise abstraction, while maintaining the variability of flow (required for many aquatic species), a tiered system of hands-off flows 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.

For potential applicants for new abstraction licences, it is therefore important 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.

The resource assessments for both surface water and groundwater use a scenario that assumes that all licences are being fully utilised; that is, the full authorised volume is being abstracted.

However, many licences are not used fully and therefore 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.

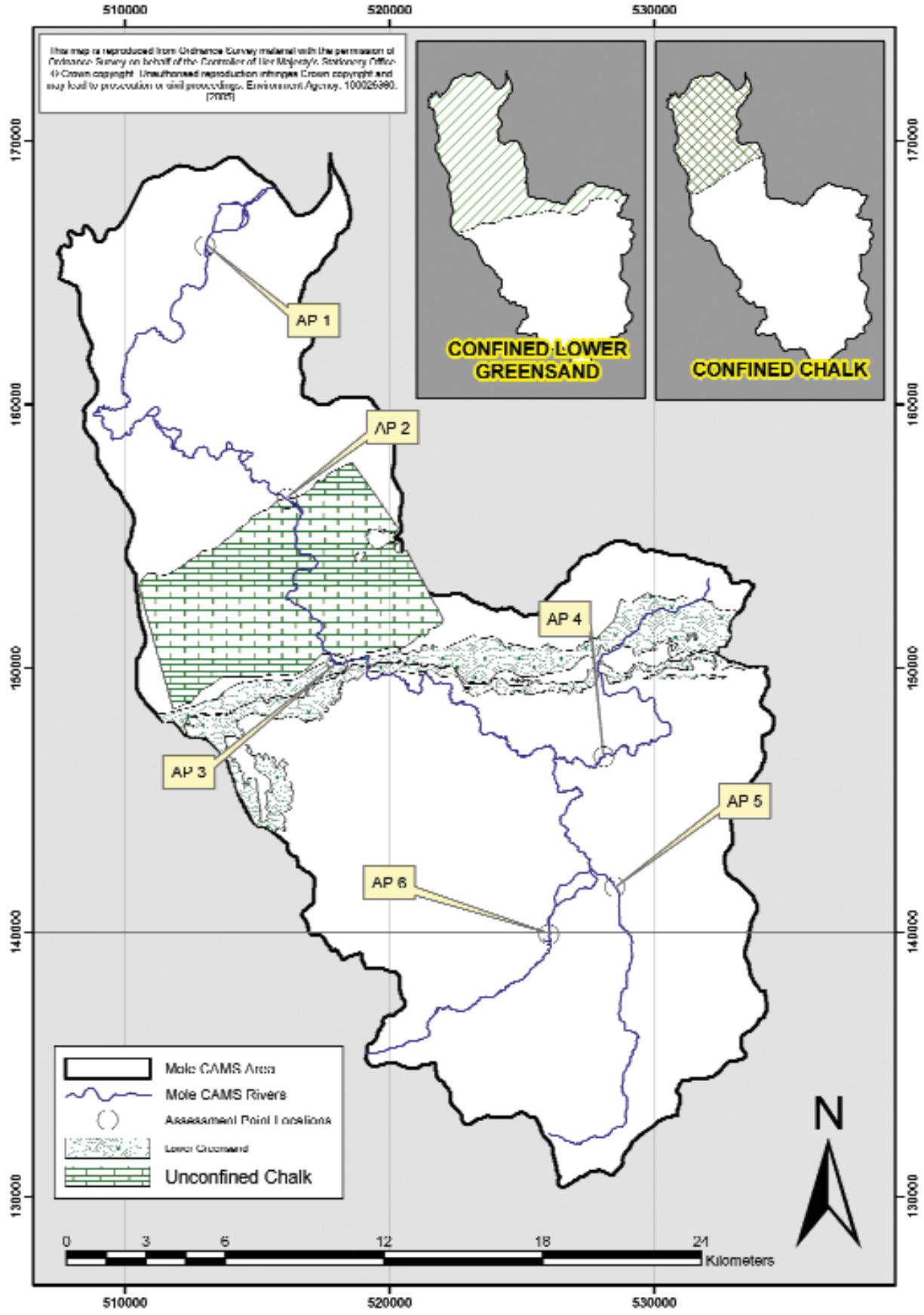

Figure 7 | GWMUs and river APs of the Mole CAMS

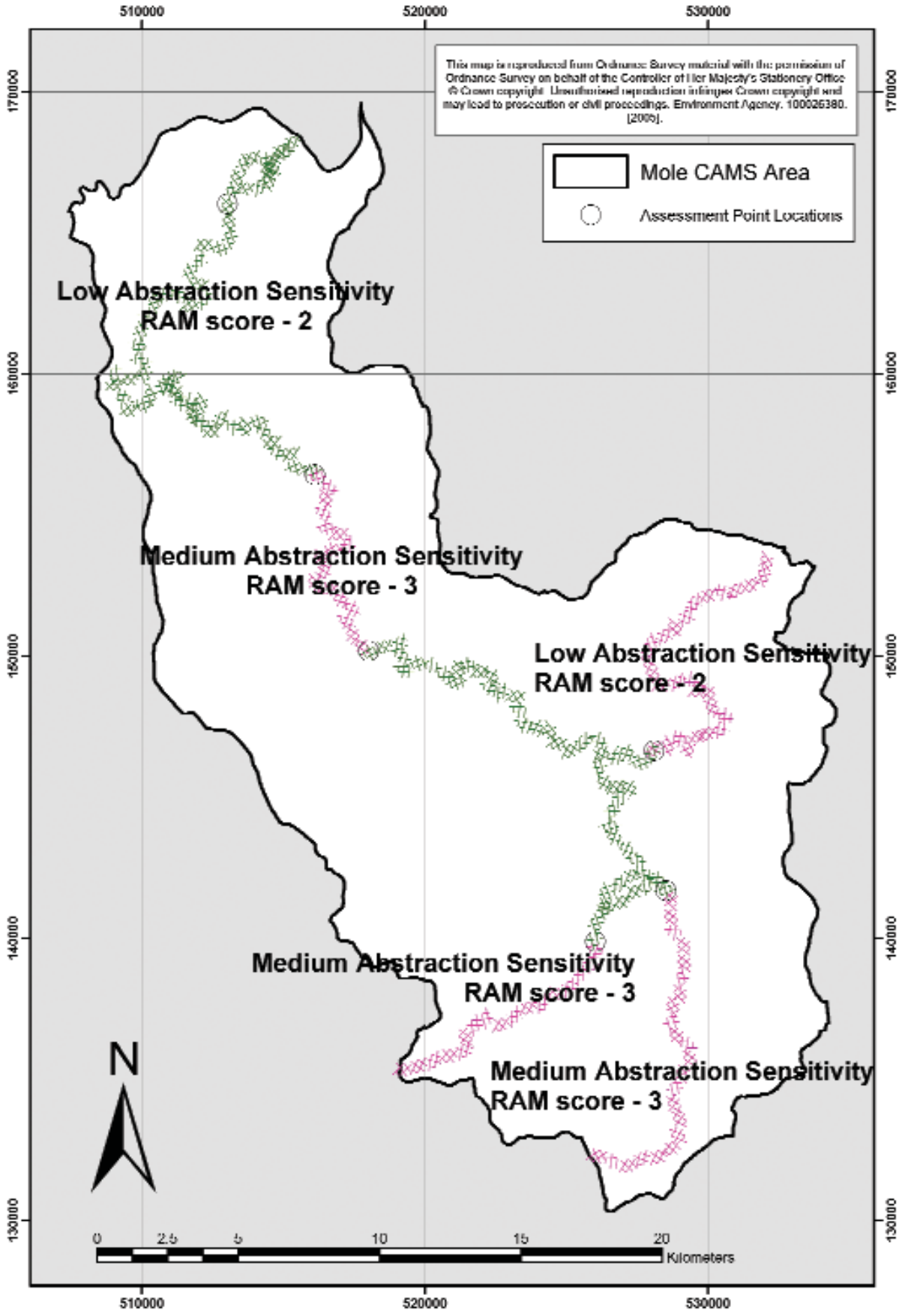

Figure 8 | Environmental Weighting Scores

4.4 Integration of the surface water and groundwater resource assessments

The resource availability results for river reach and groundwater management unit assessments are integrated and iterations made.

Figure 9 shows the resource availability status of groundwater management units and river reaches in the Mole CAMS area.

This is the classification following integration of the groundwater and surface water assessment results and subsequent iterations. The results of the separate surface water and groundwater assessments are available in the Mole CAMS Technical Document.

All of the surface waters in the catchment were initially assessed to be 'water available'. These statuses were overridden to 'no water available' following the integration with the Thames Corridor CAMS. **(This is discussed in section 4.5.6 Integration with the Thames Corridor CAMS)**.

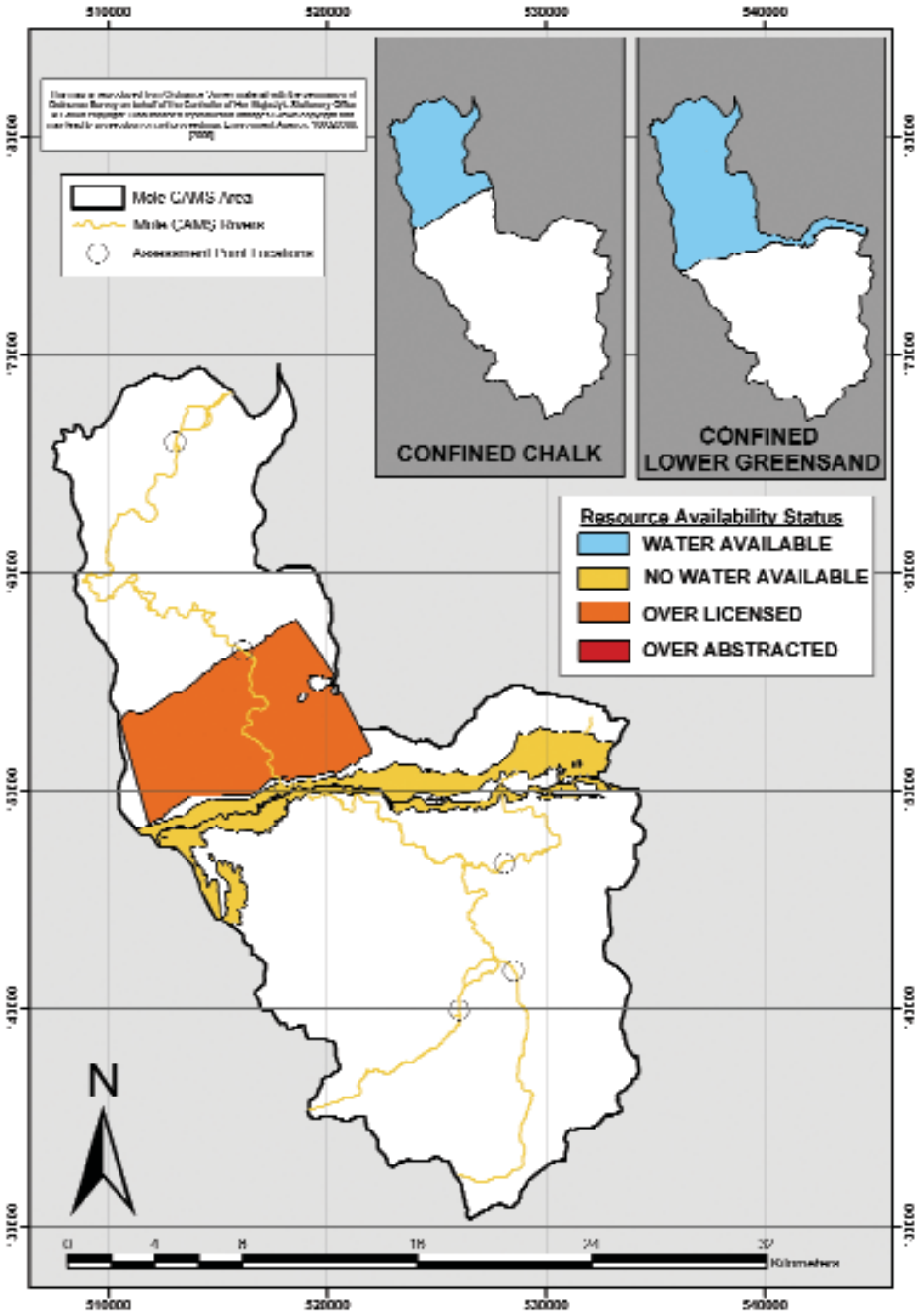

Figure 9 | Integrated surface water and groundwater resource availability

4.5 Water Resource Management Units (WRMUs) for the Mole CAMS

The assessment points and Groundwater Management Units have been grouped into water resource management units (WRMUs) shown in **Figure 10**. They have been grouped according to their resource availability status (RAS).

These units can then undergo a separate sustainability appraisal to determine the best abstraction licensing strategy for that unit.

The Mole CAMS has five WRMUs. These units include all of the major abstractions in the area.

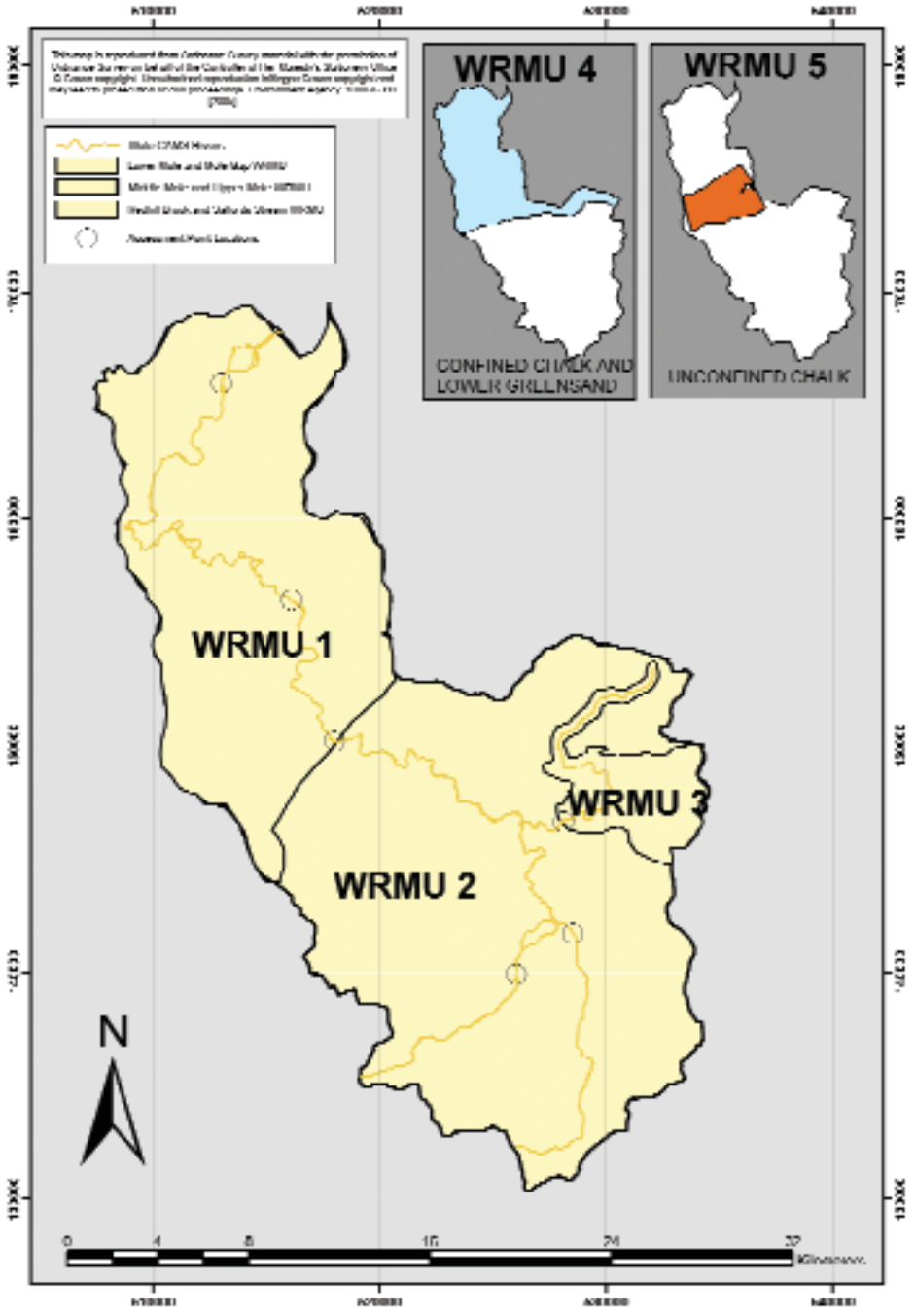

Figure 10 | Water Resource Management Units for sustainability appraisal

4.5.1 Water Resource Management Unit 1 – Lower Mole and Mole Gap

This WRMU consists of the Lower Mole and Mole Gap, which includes surface waters assessed with AP1 and AP2 (up to the boundary of AP3). The unit covers the area of the Mole between Castle Mill gauging station at Dorking AP3 down to AP1, located at the confluence of the Mole and the River Thames. **This WRMU is a surface water only unit**.

This unit includes 25 licensed abstractions. There are also some significant discharges to the rivers within this WRMU from the large STWs at Leatherhead and Esher.

All rivers within the catchment flow through this unit. This unit includes part of the South London Waterbodies SPA. There are also SSSIs with water-related features, which include the Epsom and Ashtead Commons, Esher Commons and Bookham Commons. The Lower Mole and Mole Gap WRMU has a diverse range of BAP species. The WRMU supports larger, mainly predatory fish such as chub, perch, eels and pike.

The local resource availability status of the surface water in the Lower Mole and Middle Mole was 'water available'. This status has been overridden to 'no water available' following the integration with the Thames Corridor CAMS. **(This is discussed in section 4.5.6 Integration with the Thames Corridor CAMS).**

This unit was assessed as 'No water available'.

View of River Mole from Town Bridge, Leatherhead

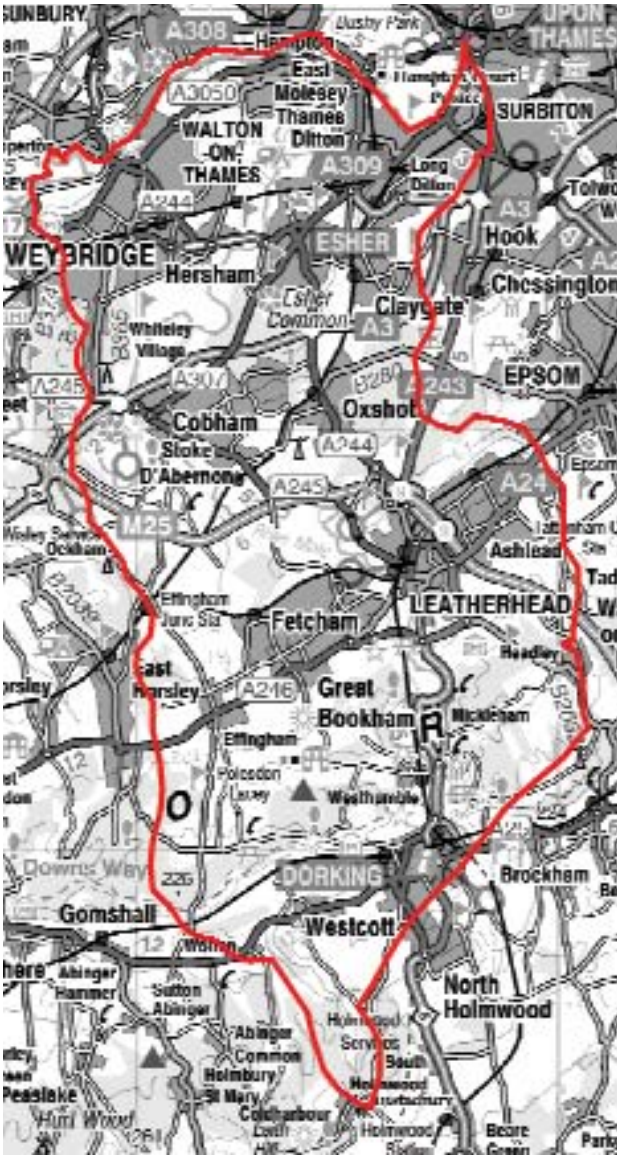

Figure 11 Water Resource Management Unit 1 - Lower Mole and Mole Gap