

6.0

The aim of CAMS is a shared strategy for the sustainable management of water resources within a catchment. We are also promoting a more consistent and structured approach to local water resource management. This applies to all CAMS that we are developing across England and Wales.

How this strategy was developed

6.1 Overview of the CAMS process

The same basic process is being used to develop all CAMS. Here, however, we have modified the approach to enable the CAMS to be completed within one year so it can be amalgamated with the Witham CAMS in time for the review. We have not completed a Sustainability Appraisal in full, and will not be publishing a final CAMS document. There are five main stages in the production of this CAMS. These are:

- 1 an assessment of the water resource availability calculated using the Resource Assessment and Management Framework (RAM Framework)
- 2 determining the provisional interim licensing strategy
- 3 consultation
- 4 reviewing consultation responses and publishing the finalised interim licensing strategy in the statement of response
- 5 carrying out the strategy over the following two years

An assessment of water resource availability – RAM Framework

This is a detailed investigation into water resource availability in each CAMS area. An assessment is made for a number of smaller units in each CAMS. The method we use to determine if water is available for abstraction is not open to consultation. Abstraction licence holders and interested parties are invited to provide information about the CAMS area that may inform our decision.

Determination of the Interim Licensing Strategy

We have determined the Interim Licensing Strategy by looking at the current licensing strategy and the RAM results, and considering the risk of environmental impacts if we continue with the current licensing strategy.

Consultation

Consultation is an integral part of the CAMS process. It ensures that all interested parties can see clearly how this strategy is developed and have an opportunity to get involved. There are a number of occasions during the process that the public is invited to comment. Initially an awareness raising leaflet is produced to let people know that the CAMS for their area has been started. In the leaflet there is a general request for information to help us carry out the RAM Framework. A Stakeholder Group is set up with representatives from groups and individuals with an interest in the management of water in the catchment. The role of this group is to advise us during the process. This document offers you the chance to comment on our proposed strategy.

Publication and implementation of the CAMS

Following consultation the licensing strategy will be finalised and published within the statement of response to the consultation. The statement of response will be sent to all consultation respondents and parties who have requested a copy, and will be published on the Environment Agency's website. The

strategy is valid for two years and during this time changes to existing licences and new licences will be determined using the licensing policies set out in the CAMS strategy, subject to the normal licensing considerations. After two years the strategy will be reviewed and updated. It will then be re-published and will be valid for six years.

During the two-year period of the CAMS, we will review progress against the strategy. This will include a review of the process so those lessons that we learn can be incorporated into the production of new CAMS.

More detail on the resource assessment and determining the interim licensing strategy for the Steeping, Great Eau and Long Eau CAMS is provided in Section 6.2 and Section 6.3. The next chapter provides details about the Steeping, Great Eau and Long Eau CAMS area.

6.2 Resource assessment and resource availability status

To manage water resources effectively, we need to understand how much water is available and where it is located. We do this by assessing resources, including surface water and groundwater.

We use water in many different ways. The most significant uses are general agriculture, spray irrigation, industrial use, power generation and water supply. For each different use, there may be great variation in the amount of water returned to the area from which the water was abstracted. Where water loss is high, we describe the abstraction as consumptive. This may restrict the availability of water for these purposes, unless a significant proportion of the abstracted water is returned to the water source close to the point of abstraction.

If you want to abstract water you need to know what water resources are available within a catchment and where abstraction for consumptive purposes is allowed.

To provide this information we have developed a classification system. This gives a “resource availability status” and indicates:

- the relative balance between committed and available resources
- whether licences are likely to be available
- areas where abstraction needs to be reduced

Licence applications still have to go through the normal licensing process. More information on this process is in *Annexe 2 of Managing Water Abstraction* on the attached CD.

There are four categories of resource availability status, as shown in Table 16.

We must ensure that we assess and manage water resources consistently. To do this we have adopted a standard approach for use in all CAMS areas.

To make the process as effective as possible we start by breaking down the CAMS catchment into smaller areas with similar characteristics – known as units. We then develop an understanding of the water resources in the area and assess the surface water and groundwater resources. We use all these results to determine the final status of each unit in terms of resource availability.

Depending on the nature of the CAMS, we give these units different names. Where groundwater resources are significant, they are called GWMU. For surface water, they are known as Water Resource Management Units (WRMU). These units are the focus of our assessments and our licensing of abstractions.

Resource assessment

Surface water assessment

Before we can assess the surface water resource, we have to decide how much of the river flow we want to protect – our ecological river flow objectives. These objectives are based on the sensitivity of the local ecology to variations in river flow. Or, to put it another way, how vulnerable the river is to the effects of removing water. We also take account of other flow

Table 16 Resource availability status categories at low flows

Indicative resource availability status	Licence Availability
Water available	Water is likely to be available at all flows including low flows. Restrictions may apply.
No water available	No water is available for further licensing at low flows. Water may be available at higher flows with appropriate restrictions.
Over-licensed	Current actual abstraction is such that no water is available at low flows. If existing licences were used to their full allocation they could cause unacceptable environmental damage at low flows. Water may be available at high flows, with appropriate restrictions.
Over-abstracted	Existing abstraction is causing unacceptable damage to the environment at low flows. Water may still be available at high flows, with appropriate restrictions.

needs. Once we know the minimum flow that we should aim to protect, we can calculate the amount of water that is available for abstraction. These calculations are undertaken at assessment points on the main rivers.

The first step is to give the reaches scores that represent their sensitivity to abstraction. The bands are Very High (VH), High (H), Moderate (M), Low (L) and Very Low (VL).

Table 17 shows the environmental weighting for each assessment point in the Steeping, Great Eau and Long Eau CAMS area.

Table 17 Environmental weighting scores for each assessment point

Assessment point	Assessment point name	Environment weighting score	WRMU
1	Little Carlton	M	1
2	Claythorpe	H	1
3	Cloves Bridge	L	1
4	Bilsby	L	2
5	Willoughby	M	2
6	Chapel St Leonards	L	2
7	Stockwith Mill Bridge	H	1
8	Partney Bridge	H	1
9	Lower Steeping	L	3



River Lymn at Partney Bridge

Next we look at what would happen to river flows if all licences were fully utilised (i.e. the full licensed quantity was being abstracted). We compare the results with our river flow objectives. There will be either a surplus, a balance or a deficit.

This availability of water gives some indication as to whether new licences will be granted for the WRMU or whether we need to reduce water abstraction. However, there are significant variations in flow throughout the year. If we classify an area as over-licensed or over-abstracted, this generally indicates that no new licences will be granted. However, this applies only at times of low flow. When flows are higher, there may be some water available for abstraction. Our classification really relates to resource availability at low flow.

Variability of flow is necessary for many aquatic species. In order to maintain this flow variability, we sometimes include HOF conditions in our abstraction licences. These conditions require you to stop or reduce abstraction when the flow in the river falls below a specified quantity. When river flows are above this quantity, abstraction can take place. Low flows will occur more frequently during the summer months.

In order to maximise abstraction while maintaining the variability of flow, we stagger the quantities at which HOF conditions come into force. Licences are issued on a first-come, first-served basis. The first licences granted have the least restrictive HOF condition. As more licences are granted, more restrictive HOF conditions are used. This maintains variable flows in the river.

If you are thinking of applying for a new abstraction licence, you will want to know how likely the licence is to be granted, and to what extent any HOF condition would affect your right to abstract water. We show the likely impact of a HOF condition as a percentage. This indicates how much of the time you may be able to abstract water. It is based on the minimum amount of time over the long term that the scenario flow (the flow if all licences were fully utilised) exceeds our river flow objective (the level of river flow we wish to protect).

Our assessments assume that all licences are fully used. However, many licences are not used fully, so the real resource availability can be different. If we decide that an area is over-licensed, we use data from actual abstraction to establish whether the status should be over-abstracted – where actual flows are lower than our river flow objectives. In over-abstracted areas abstraction is already unsustainable. In over-licensed ones the classification represents the potential for damage should the full licensed amount be abstracted.

This CAMS area contains two level dependent environments. These are made up of a network of raised river channels flowing (although often ponded) above the level of surrounding land. The surrounding land has a network of drainage ditches, which remove water from the low lying land into the main river during the winter and provide an irrigation resource during the summer.

Our assessment determines the balance of water within these channels by taking account of the needs of local ecology and the requirements of the drain management regime. The impact of the level dependent environment is expressed as a demand on or supply to the main river, depending on whether the management levels within the channels need to gain or lose water. The impact of the level dependent environment is included in the resource assessment to define the resource availability status at the downstream assessment point on the main river.

Some river reaches in the CAMS lie beyond the furthest downstream assessment point and have not been assessed for surface water availability. The Greyfleet Drain and South Dyke that lie in the north of the CAMS area are too small to be considered under the scope of CAMS.

Groundwater assessment

To assess groundwater five tests are proposed to determine groundwater resource availability. These are:

- Test 1:** Comparison of inputs (recharge by rain and lateral groundwater flow) to outputs (abstraction and baseflow)
- Test 2:** Comparison of environmentally acceptable summer baseflow to actual summer baseflow
- Test 3:** Observed trends in groundwater levels or quality
- Test 4:** Research, using historical maps or other evidence
- Test 5:** Optional local tests (in addition to the other tests) as a further check on the groundwater resource availability

Integrating our assessments of surface water and groundwater

We integrate our resource availability results for both the river reaches and the GWMUs. This classification uses both the groundwater and surface water assessment results as well as subsequent checks. The results of the separate surface water and groundwater assessments are available in Chapter 2 of the Steeping, Great Eau and Long Eau CAMS technical document. Both the confined and unconfined chalk units were initially assessed to be no water available, but due to the resource availability status of the overlying rivers were over-ridden to over-licensed.

Detail of each WRMU

WRMU 1 – Great Eau and River Lymn

This unit has an area of 214 km² and includes the whole of the Great Eau and Long Eau system upstream of Cloves Bridge, and the River Lymn and tributaries upstream of Partney Bridge. The Great Eau receives a substantial base flow from chalk springs while the Long Eau receives a much smaller base flow. The River Lymn receives moderate baseflow derived from sandstone springs in its upper reaches. Both river systems flow from the Lincolnshire Wolds across the coastal plain to the sea. The Southern Chalk and Spilsby Sandstone aquifers underlie the WRMU, and most of the water abstracted for consumptive purposes is from groundwater. The Theddlethorpe Level Dependent Management Unit lies within the WRMU and has been considered as part of the assessment. The WRMU is predominantly rural, but also includes part of Spilsby.

There are 34 surface water abstractions within this WRMU. 60.6% of the groundwater abstraction impacts have been assigned to this unit. The total volume of water licensed for abstraction in this unit is 49,034,744 m³/year. There are six significant discharges in this WRMU, discharging a total of 1,707.44 m³/d.

The WRMU has been assessed as over-licensed.

WRMU 2 – Woldgrift Drain and Willoughby High Drain

This unit has an area of 82 km² and includes the Woldgrift drain upstream of Bilsby and the Willoughby High Drain. Both river systems receive minor chalk spring flows in the upper catchments, and flow from the

Lincolnshire Wolds across the coastal plain to the sea. The Southern Chalk and Spilsby Sandstone aquifers underlie the WRMU, and most of the water abstracted is from groundwater. The unit is predominantly rural, but also includes Alford and Chapel St Leonards.

There are three surface water abstractions within this WRMU. 27.7% of the groundwater abstraction impacts have been assigned to this unit. The total volume of water licensed for abstraction in this unit is 2,660,174 m³/year. There are two significant discharges in this WRMU, discharging a total of 901 m³/d.

The WRMU has been assessed as no water available.

WRMU 3 – Lower Steeping

This unit has an area of 90 km² and includes the River Steeping upstream of Haven Sluice up to Partney Bridge. The River Steeping is the lower part of the River Lymn, and becomes the River Steeping once it is a flat highland carrier. The Southern Chalk and Spilsby Sandstone aquifers underlie the WRMU. The River Steeping Level Dependent Management Unit lies within the WRMU and has been considered as part of the assessment. The unit is predominantly rural, but also includes Wainfleet All Saints and part of Spilsby.

There are 17 surface water abstractions within this WRMU. 11.8% of the groundwater abstraction impacts have been assigned to this unit. The total volume of water licensed for abstraction in this unit is 1,544,053 m³/year. There are three significant discharges in this WRMU, discharging a total of 3,532.7 m³/d.

The WRMU has been assessed as water available.



Great Eau at Bellau Bridge



River Steeping at Thorpe Culvert, within the LDMU



Willoughby High Drain at AP5



Willoughby High Drain upper catchment at Claxby

Groundwater Management Unit

This unit has an area of 631 km² and includes all three groundwater units in the CAMS area, the unconfined chalk, the confined chalk and the Spilsby Sandstone. The unit encompasses most of the CAMS area and is predominantly rural, but also includes Skegness, Mablethorpe, Spilsby, Alford, Chapel St Leonards and a small part of Louth.

There are 27 groundwater abstractions within the unit. The total volume of water licensed for abstraction in this unit is 9,710,220 m³/yr.

The unit has been assessed as over-licensed.

6.3 The interim licensing strategy

For this CAMS we have not undertaken the usual Sustainability Appraisal to determine the licensing strategy. Instead we will continue with the current licensing strategy, dependent on a check against the resource assessment results. The resource assessment results help us to check that under this strategy we will not cause any harm to the environment, and also allow us to check that the understanding behind this strategy is sound.

More information on the usual sustainability appraisal process is provided in *Managing Water Abstraction*, which is on the attached CD.

7.0

To help you understand some of the issues that we are asking you to comment upon, you may wish to know more about the character of the Steeping, Great Eau and Long Eau catchment. This section contains background information on the Steeping, Great Eau and Long Eau CAMS area. More detail can be found in the Steeping, Great Eau and Long Eau CAMS technical document.

The Steeping, Great Eau and Long Eau CAMS area

7.1 Introduction to the CAMS area

The Steeping, Great Eau and Long Eau CAMS area encompasses approximately 670 km and includes the towns of Alford, Chapel St Leonards, Mablethorpe, Skegness, Wainfleet All Saints and parts of Spilsby and Louth. The catchment is predominantly rural with much of the land used for agriculture.

The western boundary of the catchment is marked by a chalk escarpment, which gives rise to the rivers in the CAMS area. From the escarpment the land surface falls east to the North Sea coast. Adjacent to the coast is an extensive low-lying plain that is protected by flood defences.

Water is abstracted from groundwater and surface water sources mainly for agriculture and public water supply; the remainder is for private use and industry.

7.2 Hydrology and hydrogeology

7.2.1 Hydrology

Rivers

The CAMS area consists of a series of rivers and drains flowing to the North Sea between Saltfleet Haven to the north and Gibraltar Point to the south. These rivers flow in a generally eastward direction from the dip slope of the Lincolnshire Wolds across a low lying coastal plain where the chalk and sandstone dips beneath boulder clay, gravel and alluvium. From north to south the main

rivers are the Great Eau/Long Eau, Woldgrift Drain, Willoughby High Drain and Lymn/Steeping. The rivers draining from the Wolds become embanked highland carriers where they cross the low lying coastal plain before discharging to the North Sea at the tidal outfalls. Drainage of the low-lying areas between the highland carriers is operated by the Lindsey Marsh Internal Drainage Board. Parts of the Internal Drainage Board area are drained to the highland carriers by land drainage pumps. The remaining areas drain direct to the North Sea by land drainage pump or gravity. All pumping stations are operated by Lindsey Marsh Internal Drainage Board except for Chapel St Leonards and Croft Lane which are operated by the Environment Agency.

The Great Eau receives a substantial base flow from chalk springs while the Long Eau receives a much smaller base flow. Further downstream the Great Eau and the Long Eau become embanked highland carriers surrounded by pumped catchments. The Theddlethorpe pumping station discharges direct to the Great Eau while the Fulbeck pumping station discharges direct to tide to the north of Mablethorpe. Downstream of the Great Eau and Long Eau confluence the river flows northward to Saltfleet Haven where there are three tidal outfalls: Greyfleet Drain and South Dyke share an outfall, Saltfleet pumping station and Great Eau. During periods of dry weather water is transferred from the Great Eau at Cloves Bridge to support abstractions from

the Louth Canal to the public water supply reservoir at Covenham. This transfer is operated by Anglian Water Services Ltd.

The Woldgrift Drain and Willoughby High Drain each receive relatively minor chalk spring flows in the upstream catchments. The Woldgrift Drain shares an outfall with Trusthorpe pumping station. The Willoughby High Drain has the ability to pass normal flows by gravity but higher flows are pumped.

The River Lymn receives moderate baseflow derived from sandstone springs in its upper reaches. Where the river becomes a flat highland carrier it is called the River Steeping. Floodwater is diverted away from Wainfleet by the Wainfleet Relief Channel. Thorpe Culvert, Crown and Croft Lane pumping stations discharge to the Lower Steeping. Further downstream the Burgh Sluice Relief Channel carries high flows to the tidal outfall at Burgh Sluice while summer low flows discharge direct to the Steeping Haven via Wainfleet Clough. Burgh Sluice, Gibraltar Point and Wainfleet pumping stations discharge direct to tide.

Measurement network

The Environment Agency operates an extensive hydrometric network within the catchment, which includes measurement of rainfall, river flows, river levels and level sites. Some sites are linked to the Anglian Region's telemetry system, which enables up to date measurements to be accessed from a central computer.

Rainfall

Rainfall is measured at daily rain gauge sites as well as recording rain gauges. Daily rain gauge sites are read by private individuals who supply the Environment Agency and the Meteorological Office with data on a regular basis. Recording rain gauges log rainfall totals at 15 minute intervals. These sites are linked to the Regional telemetry system. Records for most of these sites begin in the 1980s.

Riverflow

Riverflow is measured at river gauging stations and spring flow sites. River gauging stations measure flow continuously and are linked to the Regional telemetry system. A number of sites only measure low range



River Lymn near Sausthorpe



Long Eau at Little Cawthorpe

flows. Also flow measurement using new ultrasonic technology has recently been installed at some sites in order to measure the high flow range.

There are numerous spring flow sites where flows are measured manually by current meters on a regular basis. At some sites flows are only measured in very low flow conditions.

7.2.2 Hydrogeology

Aquifers are rocks that store and transmit groundwater in economically usable quantities. The study of hydrogeology is concerned with the way in which groundwater flows through, or is stored in aquifers, and the physical and chemical changes resulting from interaction with the parent rock.

The Chalk and Spilsby Sandstone are the main public water supply aquifers in the Steeping CAMS area.

The Lincolnshire Chalk

The Chalk outcrops over much of the western part of the CAM area. From the outcrop the Chalk dips gently eastwards. In the central and eastern part of the catchment it is confined/covered by glacial deposits (principally boulder clay) and alluvium. To the south of Louth, the outcrop Chalk is dislocated from the

confined Chalk area to the east by the buried cliff line which once marked the historical coast line. Groundwater flow in the Chalk generally occurs in a north-easterly direction. Recharge to the confined Chalk is thought to occur primarily through movement of groundwater from the northern confined unit and a small proportion from the unconfined Chalk from leakage through the Chalk bearings.

Spilsby Sandstone

The Sandstone is present beneath the whole of the CAMS area but outcrops only on the valley side of the Lymn catchment. The hydraulic gradient in the Sandstone is principally west to east (except in the Lymn Catchment) and it is recharged mainly by vertical leakage from the overlying chalk. All the water directly recharging the Sandstone is discharged via springs to the surface water system. In the central and eastern parts of the catchment groundwater levels are artesian.

The Spilsby Sandstone has a history of high public water supply abstraction with depressed groundwater levels. There is also uncertainty over the hydrological relationship between the Spilsby Sandstone and the overlying chalk aquifer. Initial models of the system were developed during the 1980s. As part of the

Anglian Groundwater Investigation Modelling Strategy (1998) the Environment Agency are in the process of developing a more comprehensive groundwater model for the chalk and Spilsby Sandstone to improve the resource assessment of the two aquifers. Some of the output from this modelling work will be available during the review of the Witham CAMS.

7.3 Conservation sites

7.3.1 Sites of international importance

These include sites that are designated as Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) under the European Union Habitats Directive (EC Council Directive 92/43/EEC). The purpose of the Directive is to protect important nature conservation sites and species that are at risk within the European Union. These sites form a network called 'Natura 2000'. Also included under this heading are Ramsar sites. These are wetlands of international importance that have been designated under the Ramsar Convention (1971), which requires member states to protect and maintain their ecological character.

Gibraltar Point and Saltfleetby-Theddlethorpe Dunes

At the boundary of the CAMS area are Gibraltar Point and Saltfleetby-Theddlethorpe Dunes, which lie to the



River Steeping at Gibraltar Point

south-east and north-east of the area respectively. Gibraltar Point has a number of designations, which includes SPA, SAC, Ramsar, National Nature Reserve (NNR) and a Site of Special Scientific Interest (SSSI). This is reflected by its mosaic of habitats that includes salt marshes, sand dunes, mud flats, sand flats, freshwater marsh and open water. These habitats are host to a number of important birds, plants and invertebrates such as grey plover (*Pluvialis squatarola*), Knot (*Calidris quanta*), brackish water crowfoot (*Ranunculus baudotii*) and the red-banded sand-wasp (*Ammophila sabulosa*).

Similarly, Saltfleetby-Theddlethorpe Dunes is another very important conservation site. It is currently designated as a SAC, NNR and a SSSI, but may become part of the Humber Flats, Marshes and Coast pSPA and pRamsar site. The dunes support important fauna and flora, which includes natterjack toads (*Bufo calamita*), marsh pea (*Lathyrus palustris*) and sea-buckthorn (*Hippophae rhamnoides*).

7.3.2 Sites of national importance

These sites include SSSIs and NNRs. The only two NNRs within the CAMS area have already been discussed above, under sites of international importance and therefore will not be mentioned further. There are around 20 SSSIs within the Steeping, Great Eau and Long Eau CAMS area (including Gibraltar Point and Saltfleetby-Theddlethorpe Dunes). However, only those that are water dependent will be included in this section. These are described below:

Calceby Marsh SSSI

This site is an important base-rich marsh, which lies adjacent to Calceby Beck, located near South Thoresby.

Mavis Enderby Valley SSSI

Mavis Enderby Valley is located east of Spilsby and lies within the catchment area of the River Lymn. A headwater stream has formed the valley by eroding the overlying Spilsby Sandstone down to the Kimmeridge Clay layers. It is the poor drainage of the underlying clay that has allowed marsh areas to develop beside the watercourse towards the valley floor.

New England Valley SSSI

Located between Somersby and Salmonby, New England Valley is host to an extensive stand of wet valley alderwood, which runs alongside the headwaters of the River Lymn. On a national scale, large areas of woodland dominated by alder are scarce, which gives reason to the sites importance.

Swaby Valley SSSI

Swaby Valley was formed through glacial processes and now supports two rare habitat types in Lincolnshire: lime-rich marsh and unimproved chalk turf.

7.3.3 Sites of local importance

This section includes County Wildlife Sites (CWS), known as Local Wildlife Sites (LWS) in Lincolnshire, which are designated on the basis of their ecological and conservation interest. Many sites will contain species and habitats that are found within national and local Biodiversity Action Plans (BAPs). The Steeping, Great Eau and Long Eau CAMS area will contain a number of these sites which will be water dependent. However, these sites are currently being reviewed and assessed as the guidelines for identifying and selecting Lincolnshire Local Wildlife Sites have only recently been published (July 2006).

7.3.4 National BAP species and habitats

Both water voles (*Arvicola terrestris*) and otters (*Lutra lutra*) are found within the CAMS area. They are both protected under Schedule 5 of the Wildlife and Countryside Act 1981 and otters are further protected under Appendix 1 of the Convention on International Trade in Endangered Species (CITES), Appendix II of the Bern Convention and Annexes II and IV of the Habitats Directive. Both species are Priority Species in the National BAP.

Chalk streams are listed as a Habitat Action Plan within the Lincolnshire BAP and are a priority for conservation in the UK. The main chalk rivers in the CAMS area are parts of the Great Eau and Long Eau and the upper sections of smaller tributaries such as Burlands Beck, which originate from the chalk aquifer situated in the Lincolnshire Wolds.

7.3.5 Other conservation features

The Lincolnshire Wolds were designated as an Area of Outstanding Natural Beauty (AONB) in 1973. Managed by the Lincolnshire Wolds Countryside Service, the site runs from the Humber in the northwest down to Spilsby in the south-east.

7.4 Ecology and fisheries

7.4.1 Ecological quality of rivers in the catchment

The biological assessment of rivers is used to identify and measure the impacts of activities on the water environment, which can cause biological impairment, such as changes to water quality and/or flow. A component of biological assessment is carried out using macroinvertebrates (animals without a backbone large enough to see without magnification, such as snails, mayfly larvae and leeches). It is the presence or absence, or change in the abundance of certain species that can indicate a water quality problem or whether a river has been suffering from low flows. Information collected from macroinvertebrate surveys is used for the biological aspect of the Environment Agency's General Quality Assessment (GQA), which is a classification method of river water quality status.

The last biological GQA for the Steeping, Great Eau and Long Eau CAMS area was carried out in 2005. Biological water quality grades were calculated for 99km of river. The assessment showed that over 78% of the CAMS area has 'very good' to 'good' biological water quality, with the remaining stretches of river assigned to 'fairly good' water quality status. However, there are significant pressures within the CAMS area that are known to detrimentally affect water quality status. For example, the Long Eau at Little Carlton occasionally suffers from shortfalls in water quality, being subject to pressures from local septic tank outfalls and discharges from Legbourne STW.

Other routine biological monitoring has shown that the water quality in the Woldgrift Drain is regularly 'fairly good', but organic discharges from Alford STW and surface runoff from the same town are thought to be responsible for irregular falls in water quality at Washdyke Bridge. This is further augmented by intensive agriculture of the surrounding land.

The River Lymn and the Steeping River is predominately of high ecological quality throughout its length, supporting diverse macroinvertebrate communities in stretches that are unaffected by significant impoundments. A particular concern, although not strictly a water quality issue, is the presence of signal crayfish (*Pacifastacus leniusculus*) in the upper Lymn. This non-native species has the potential to modify ecological communities and consequently distort and misrepresent biological water quality information.

7.4.2 Description of fisheries status

Fishery surveys have shown that eels (*Anguilla anguilla*) and coarse species dominate the Great Eau and Long Eau systems. Despite the Great Eau, upstream and downstream of Claythorpe, still supporting small populations of brown trout (*Salmo trutta*), Salmonids in the Long Eau have gradually declined over the last 20 years (last recorded in 1989) due to lack and/or degradation of spawning habitats. No major barriers exist to migration within either catchment.

Within the River Steeping catchment, neither Gibraltar Sluice (TF553586) nor the Rolling Doors (TF527598) are migration barriers to fish. Fish surveys have shown that there is a naturally sustaining population of brown trout (*Salmo trutta*), which extends up to the catchment's headwaters. Both river lamprey (*Lampetra fluviatilis*) and brook lamprey (*Lampetra planeri*) are present in healthy numbers above Mill Bridge (TF 430641) and spined loach (*Cobitis taenia*) is present throughout the Steeping catchment.

Spined loach (*Cobitis taenia*) is a Lincolnshire BAP species found throughout the CAMS area. Its threatened status in Europe has led to it appearing on Appendix 3 of the Bern Convention and Annex II of the EC Directive on the 'Conservation of Natural Habitats and Flora and Fauna'. Although very local in its distribution, it is relatively common where it occurs (e.g. Lincolnshire and East Anglia) and there are no national conservation measures at present*.

Due to their decline in parts of Europe both the river lamprey (*Lampetra fluviatilis*) and the brook lamprey (*Lampetra planeri*) are listed in Annexes IIa and Va of the EU Habitats Directive and Appendix 3 of the Bern Convention. They also both appear as Long List Species in the UK BAP, which is also known as 'Species of Conservation Concern'.

*Source: Maitland, P. S. (2004). *Keys to the Freshwater Fish of Britain and Ireland, with Notes on their Distribution and Ecology*, FBA, Cumbria, pp. 248.

7.5 Industry and agriculture

Agriculture is the main economic activity within the CAMS area, with arable and fallow accounting for the largest percentage of agricultural land use. Predominant crops are cereals such as wheat and barley.

Large-scale industry is limited within the CAMS area; however, the presence of Conoco (UK) Ltd at Theddlethorpe is an example of development of this nature.

7.6 Water quality

7.6.1 Water quality in the catchment

Within the Steeping, Great Eau and Long Eau catchment there is 99.9 km of watercourse assessed for compliance with River Quality Objectives (RQO) based upon water chemistry. RQO compliance is assessed using a three-year data set. There were six river reaches in the CAMS area that failed their RQO targets by the end of 2005. It is not thought that these failures can be attributed to over abstraction, but instead are likely to be due to runoff from agricultural land and drought.

7.6.2 Consented discharges

There are 14 discharges greater than 20 m³/d in the catchment, 11 of which are discharges from Anglian Water Services Ltd sewage treatment works, and the rest of which are private sewage and trade discharges. The largest sewage works is at Mablethorpe with a dry weather flow of 34,560 m³/day. Other significant discharges include Skendleby STW (1,474 m³/d), Wainfleet STW (1,200 m³/d) and Spilsby STW (858 m³/d).

Figure 1 Distribution of abstraction licences by use category

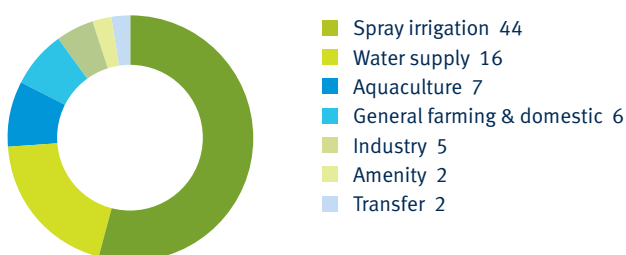
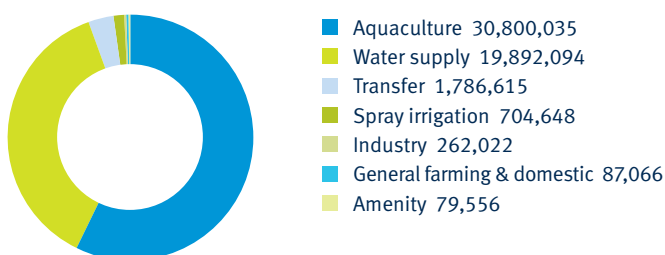


Figure 2 Licensed abstraction volume (m³/yr) by use category



7.7 Water abstraction

There are a total of 81 surface and groundwater abstraction licences within the Steeping, Great Eau and Long Eau catchment that are greater than 20 m³/day. The distribution of licensed abstractions is shown on Map 9 (page 40).

Licensed water is abstracted for a number of uses within the Steeping, Great Eau and Long Eau catchment: public water supply, industry, aquaculture, general agriculture (vegetable washing), spray irrigation, amenity purposes (such as top up water) and to a limited extent domestic use. Figure 1 illustrates the division of licences between the major uses within the CAMS area. Numerically there are more licences for spray irrigation than any other use.

Figure 2 illustrates that when licences are divided by volume between the major uses, aquaculture businesses are the largest abstractors. The aquaculture businesses abstract under seven licences, the combined authorised abstraction under these licences representing 57% of the total amount of water licensed to be abstracted in the entire catchment area. The largest aquaculture abstraction is from the Great Eau at Claythorpe. Under this licence the trout farm can abstract up to 12 million m³/yr. It is important to note however, that aquaculture is a non-consumptive purpose (all of the abstracted water is returned to the source).

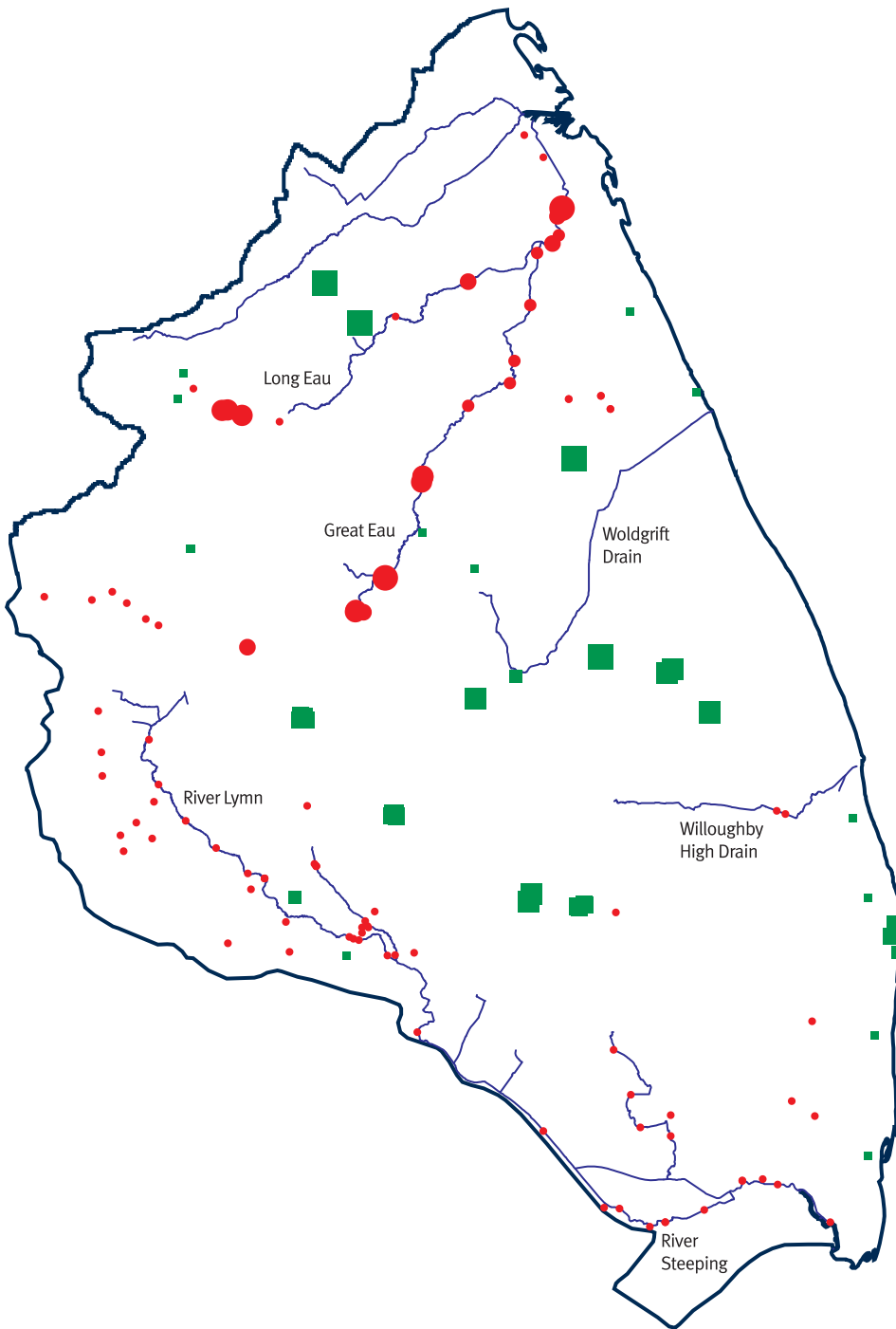
Public Water Supply is the second largest abstraction sector accounting for 37% of the total licensed volume. The largest public water supply abstraction is from the Great Eau at Cloves Bridge. Under this licence Anglian Water Services Ltd can currently abstract up to 9 million m³/yr.

The remaining 6% of the licensed volume is shared largely between uses for spray irrigation, transfers, amenity, industry, and general agriculture and domestic uses. Of these smaller uses, spray irrigation has the potential to cause the greatest impact on the environment as this type of abstraction is fully consumptive (no water is returned to source) and generally takes place during the summer months when flows are low and evapotranspiration rates are high.

7.8 Recreation and tourism

The coastal fringe and Lincolnshire Wolds AONB are popular recreational areas containing a wide variety of walks, cycle routes and bridleways. Recreational walkway sites are located at Burgh Le Marsh, Alford and Tetford at the source of the River Lymn. The cycle routes and bridle ways are situated towards the edge of the Wolds escarpment, and are mostly used during peak

Map 9 Licensed abstractions in the Steeping, Great Eau and Long Eau CAMS area



Legend

Surface water abstractions (Ml/d):	Groundwater abstractions (Ml/d):
● 0.0016–0.2241	■ 0.00093–0.068
● 0.2242–0.6405	■ 0.069–0.1660
● 0.6406–2.495	■ 0.1661–0.49820
● 4.498–7.571	■ 0.49821–1.09589
● 7.572–33.02	■ 1.0959–2.534

Steeping, Great Eau and Long Eau CAMS area
 River network

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Tourist attractions in Ingoldmells near Skegness

holiday periods by tourists visiting the East Coast. The coastal area itself attracts a large number of visitors, with a number of popular amusement parks and beaches.

Recreational fishing is popular in this part of Lincolnshire. Some trout fishing is practised on the River Lymn with the bulk of recreational angling taking place further downstream on the River Steeping and the Wainfleet relief channel. The main species sought on the River Steeping are roach, bream, tench and pike. In other parts of the catchment (e.g. lower reaches of the Great Eau) Mablethorpe and Sutton and District Angling Association operate a mixed coarse fishery, consisting of predominantly roach.

Other water-based recreational use within this CAMS area is confined largely to light boats and canoes where access to the waterway is possible. Some recreational sailing also takes place along the East Coast, for example in the popular holiday destinations of Skegness and Mablethorpe.

Steeping, Great Eau and Long Eau CAMS area has a number of important conservation sites such as Gibraltar Point and Saltfleetby and Theddlethorpe Dunes. These sites are popular destinations for bird watching.

7.9 Historic environment

The rivers, floodplains and estuarine zone within the Steeping, Great Eau and Long Eau CAMS are rich in archaeological remains, especially where remains survive within waterlogged conditions, conducive to the preservation of organic materials. These waterlogged deposits may also contain palaeoenvironmental remains. The study of these remains can lead to a better understanding of the development of the river systems and their changing environments in response to fluctuating sea levels and climatic variations since the end of the last Ice Age. The deposits therefore have

potential to contribute to current research into climate change. Many of the archaeological sites are nationally important and are designated as Scheduled Ancient Monuments. However, consideration must also be given to the many sites which are not designated but are still of national, regional and local importance; these are recorded at the relevant Historic Environment Record centres maintained by Local Authorities.

Activities such as water abstraction may result in the lowering of the water table or a reduction in flow of surface water that may have a detrimental impact upon the preservation of vulnerable organic remains. When deposits are de-watered, they are exposed to oxygen and microbial degradation can occur resulting in the destruction of the organic remains. Therefore it is important to consider the possible impacts on archaeological remains as part of the abstraction licensing process. This will be a feature of our abstraction licensing strategy.

7.10 Future developments in the CAMS area

Lincolnshire's coastal grazing marsh project

The Lincolnshire Coast and Marshes Character Area encompasses the flat coastal plain between Grimsby in the north and Gibraltar Point in the south. The Marshes are historically important, with a rich cultural and wildlife heritage. The loss of functioning grazing marsh throughout the UK means that the Lincolnshire Marshes are a priority for conservation in National, Regional and Lincolnshire Biodiversity Action Plans. There are plans to restore this landscape, which may lead to further demands on water resources in the CAMS area. For further information please see Chapter 5 of the Technical Document.

7.11 Links with other plans

The development of CAMS has links with a large number of other initiatives and plans relating to the management of water resources, both within the Environment Agency and by other organisations. Developing these links is of vital importance to ensure that other groups consider water resource issues. CAMS will be linked to other Environment Agency plans such as the Habitats Directive Review of Consents, the Restoring Sustainable Abstraction programme, Water Level Management Plans, Water Quality Improvement Plans, Biodiversity Action Plans, Catchment Flood Management Plans and the Anglian Region Water Resource Strategy, and take account of water company Water Resource Plans. For further information on the links between CAMS and some of these initiatives please refer to *Managing Water Abstraction*.



Glossary of terms and abbreviations

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. Most individual abstraction records are reported to the Environment Agency each year.

Abstraction charges

The charges payable on an annual basis to the Environment Agency under the terms of an abstraction licence.

Abstraction licence

The authorisation granted by the Environment Agency to allow the removal of water.

Aquifer

A geological formation that can store and transmit groundwater in significant quantities.

Assessment Point (AP)

Critical point in a catchment at which an assessment of available resources is made. Assessment Points are located at the extremities of identified reaches and Water Resource Management Units.

Augmentation (river)

To increase flow.

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.

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.

Consumptive use/Consumptiveness

Use of water where a significant proportion is not returned, either directly or indirectly, to the source of supply after use, e.g. spray irrigation.

Discharge

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

Downward variation

Reduction in quantity.

Environmental impact

The total effect of any operation on the environment.

Fauna

Animal population of a particular area or period.

Flora

Plant population of a particular area or period.

Gauged flow records

Records of flow in a river as conventionally measured. They reflect natural runoff from the catchment and artificial influences (abstraction, discharge, etc) that occur upstream of the measurement point.

Gauging station

A site where the flow of a river is measured.

Groundwater

Water that is contained in underground rocks.

Groundwater Management Units (GWMU)

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.

Habitats Directive

A European directive on Conservation of Natural Habitats and of Wild Flora and Fauna. The Directive is implemented in the UK by the Conservation (Natural Habitats & c.) Regulations 1994 – commonly known as the ‘Habitats Regulations’. The Directive created a network of protected areas across the European Union known as ‘Natura 2000’ sites.



Hands-Off Flow (HOF)

A condition attached to an abstraction licence which states that if flow (in the river) falls below the level specified on the licence, the abstractor will be required to reduce or stop the abstraction.

Hydrogeology

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

Hydrology

The study of the Earth's water, in particular of water under and on the ground before it reaches the ocean or before it evaporates.

Impoundment

An artificial body of water or wastewater such as a pond or dam for collection or storage of water for future use.

Licence application

Formal request by an 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 Environment Agency on what terms to grant or refuse a licence application, by reference to regulatory powers and duties.

Low flow

It is usually determined at a given value of 'Q95', which means that flow falls below this level 5% of the time.

Main river

The watercourse shown on the statutory "Main River Maps" held by the Agency and Defra. The Agency has permissive powers to carry out works of maintenance and improvements on these rivers.

Natura 2000

The Habitats Directive established and protects a network of designated sites of the most important areas for wildlife across Europe. It consists of SPAs to protect bird species and SACs for the protection of habitats.

Non-consumptive

This is where all abstracted water is returned to the source a relatively short distance downstream of the abstraction point. E.g. hydropower generation, fish farming.

Precipitation

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

Public Water Supply (PWS)

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

Q95

The flow of a river which is exceeded on average for 95% of the time.

Ramsar site

A site of international conservation importance classified at the 'Convention on Wetlands of International Importance' 1971, which was ratified by the UK Government in 1976.

Reach

Unit of a river between two Assessment Points, delineated for the purposes of abstraction licensing and resource management.

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.

Restoring Sustainable Abstraction Programme (RSA)

The programme for resolving environmental problems caused by unsustainable abstraction in certain catchments.

Review of consents

The procedure by which the Environment Agency as a competent authority will apply the Habitats Regulations to review all relevant existing discharge consents, abstraction licences, permissions and activities that are likely to affect a designated European site.

Revocation

The cancellation of a licence and all associated rights and benefits.

River

An open channel of fresh water flowing along a definite course, usually towards the sea, which is fed by tributaries.

Site of Special Scientific Interest (SSSI)

An area given a statutory designation by Natural England or the Countryside Council for Wales because of its nature conservation value.

Special Area of Conservation (SAC)

An area classified under the EC Habitats Directive and agreed with the EU to contribute to biodiversity by maintaining and restoring habitats and species.

Special Protection Area (SPA)

An area classified 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. During the summer period it has a high impact on water resources.

Springs

These occur where the water table intersects the ground's surface.

Surface Water

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

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.

Time Limited Licence

Licence with specified end date.

Uptake

The degree to which a licensed entitlement is actually abstracted over a period of time.

Water Resource Management Unit (WRMU)

An area that has similar groundwater and/or surface water characteristics and is managed in a similar way.

Water Resource(s)

The supply of groundwater and surface water in a given area.

Water Rights Trading

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

Water table

Level below which the ground is saturated with water. May vary with rainfall and pumping of boreholes.

Watercourse

Any channel along which water flows.

List of abbreviations

AP

Assessment Point.

CAMS

Catchment Abstraction Management Strategy.

Defra

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

EU

European Union.

GWMU

Groundwater Management Unit.

HOF

Hands-Off Flow.

Km

Kilometres.

ML, ML/d, ML/day

ML = megalitres = 1,000,000 litres = 1,000 cubic metres = 1,000 m³ = 220,000 gallons

ML/d = ML/day = ML per day, = thousand cubic metres per day (tcmd).

pRamsar

Proposed Ramsar.

pSPA

Proposed SPA.

PWS

Public Water Supply.

Q95

Flow exceeded 95% of the time period considered.

SAC

Special Area of Conservation.

SPA

Special Protection Area.

SSSI

Site of Special Scientific Interest.

STW

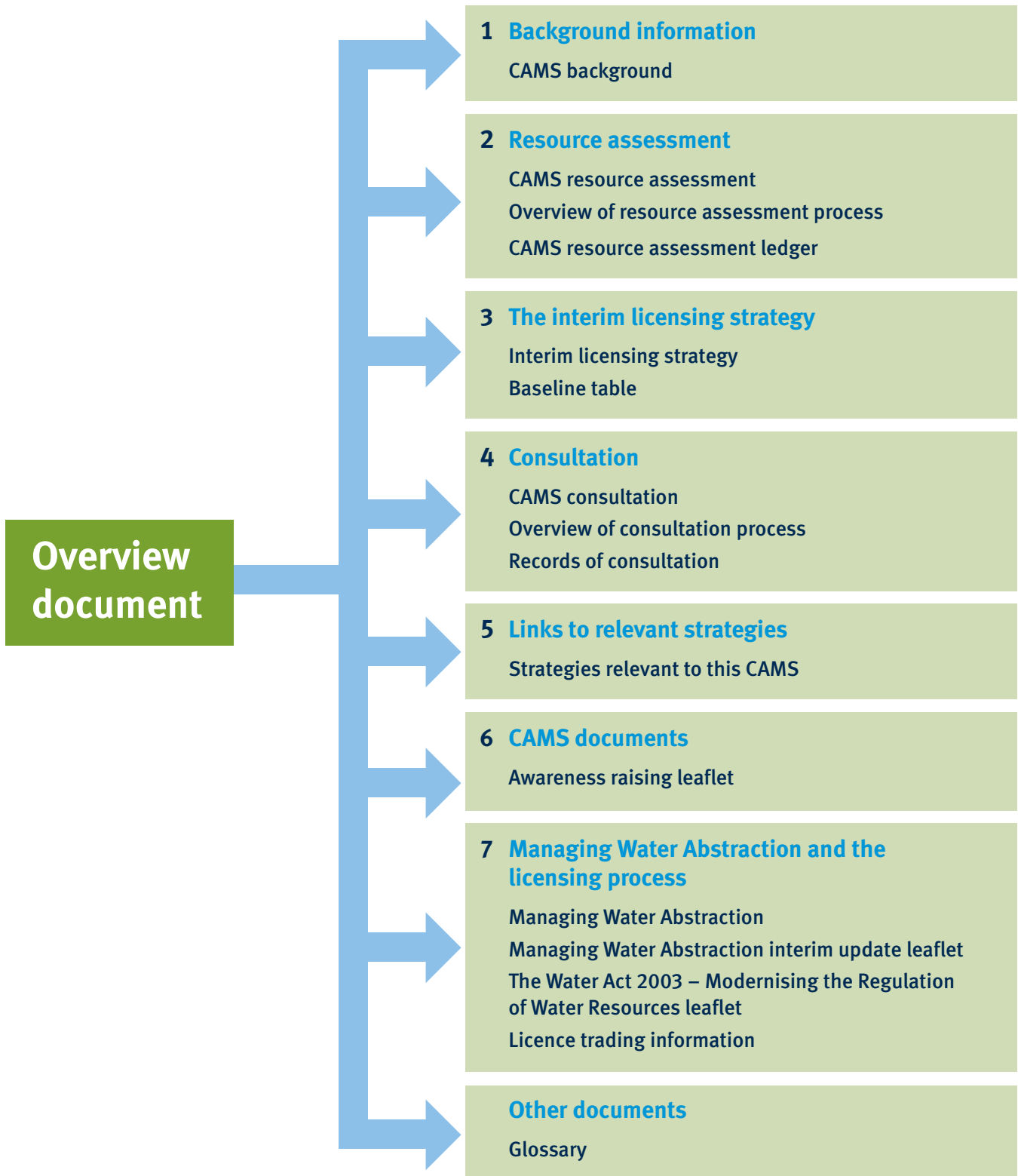
Sewage Treatment Works.

WRMU

Water Resource Management Unit.



Appendix 1: Outline structure and information in technical document





This CD-ROM contains the The Steeping, Great Eau and Long Eau CAMS Technical Document in a printable PDF format and can be viewed in Adobe Acrobat. If you have any problems with the CD, please contact

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