CAMBRIDGE WATER COMPANY

Cambridge Water

Final Drought Plan

making water count

October 2018

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Executive Summary

This plan has been prepared by South Staffs Water, for the Cambridge Water region in compliance with its statutory duty, as a water undertaker, to prepare and maintain a drought plan.

A drought plan is defined as;

'a plan for how the water undertaker will continue, during a period of drought, to discharge its duties to supply adequate quantities of wholesome water, with as little recourse as reasonably possible to drought orders or drought permits'.

Drought plans compliment water undertakers' Water Resources Management Plans (WRMPs). Whilst WRMPs take a long term 25 year view of how water companies plan to meet future demands, drought plans set out the short term operational steps that companies will take before, during and after a drought. They should be flexible enough to deal with a range of possible drought scenarios, and be able to demonstrate, with confidence, to customers and other stakeholders how management decisions and actions will be taken and communicated during a drought. This plan sets out the measures and actions that we will take before, during and after a drought to provide a secure water supply to customers, with minimal impact on the environment.

Cambridge Water published its first statutory drought plan in early 2008 and updated it in 2012. We are now required to update it again, in line with the latest legislation and published guidance. We have based this plan on our previous 2012 drought plan, but have developed it in accordance with the latest Environment Agency guidance, and to incorporate recent events and operational changes since the last plan.

This revised plan includes the 2010-12 drought sequence in our analysis, and we have also reviewed the vulnerability of our sources to more severe and extreme droughts, as well as developing some of our triggers to provide more robust monitoring during drought events.

Our supply side options presented in this plan have been amended to reflect the current operational conditions and status of source works. The section on monitoring and environmental assessment of supply options has been developed to incorporate the latest guidance, and this includes an assessment of impacts from utilising our existing licences above historical use. Demand actions remain unchanged; however, we have revised and expanded the section on Communications to align with Company changes to roles and responsibilities, and to include recommendations arising from the 2010-12 drought review.

The changes to our updated plan do not alter the conclusion in the previous plan, following published guidance, that a Strategic Environmental Assessment is not required.

In the Cambridge Water region we have for many years maintained a healthy supply demand balance with licence capacity at a level to provide security of supply and flexibility of operations. This licence capacity has been utilised during droughts when

demand is raised and supplies from some sources may be affected by low rainfall. Deployment of resources in this way is a vital part of our drought management strategy. There is some uncertainty regarding future licence capacity arising from implementation of the Water Framework Directive. We are currently working closely with the Environment Agency to understand whether this will result in a reduction in licence capacity available for use during drought periods. If this were to be the case, we would need to review drought triggers and actions and provide a further updated drought plan.
In support of this work, we have undertaken an environmental assessment of abstractions that are likely to increase as a result of drought management actions. This has shown that use of existing licenced abstractions during a drought has the least environmental impact of any options to manage supplies during a drought, and requires no recourse to apply for drought permits.

In summary, the Company is confident that it has robust plans in place to deal effectively with a range of droughts, through the implementation of a series of timely and appropriate management actions. This plan is based on the information currently available to us which includes some short term uncertainty. The plan will be reviewed as necessary to address changes arising from clarification of this uncertainty. This plan explains in more detail how our management actions have been derived, and how they will be communicated, in the event that they need to be implemented.

1. Introduction

1.1 Overview of the Process

The drought planning process undertaken by water companies is covered by a number of statutes:

> The Water Act 2003, by amending the Water Industry Act (WIA) 1991 Section 39, introduced a statutory requirement for water companies to prepare and maintain drought plans. In addition the Flood and Water Management Act (FWMA) 2010 introduced miscellaneous provisions relating to particular aspects of drought planning – including temporary bans on water usage – which in turn, modified certain provisions of the WIA relating to hosepipe bans. Further provisions for the publication of drought plans on consultation and responses to representations are within the Drought Plan Regulations 2005.

Water companies are advised to follow the latest Environment Agency (EA) guidelines when preparing their drought plans to ensure that all the provisions of current legislation are met.

A Drought Management Plan sets out how we will respond to periods of extended dry weather and demonstrates how we will monitor and manage these drought events, and the actions we will take before during and after a drought. To manage droughts of varied severity and longevity we plan to use a range of drought management interventions on both the supply and demand side to maintain supplies. A longer planning timeframe and the management of the supply demand balance under normal conditions and climatic fluctuations is considered in our Water Resources Management Plan (WRMP).

Our last Drought Management Plan was published in December 2012, and in accordance with the Drought Direction 2016 this draft plan has been submitted to the Secretary of State for the Department of the Environment, Food and Rural Affairs (DEFRA) within 4 years and 3 months of the anniversary of the previous published plan. This plan has been produced in accordance with the latest published Environment Agency Drought Plan guidance, published in July 2015.

The Drought Direction 2016 requires companies to include the following;

3.—(1) A water undertaker, in its drought plan, must address the following matters—

> *(a) the management structure that the water undertaker will put in place during a drought and an explanation of how the management structure will manage, communicate and make decisions during a drought;*
>
> *(b) the magnitude and duration of droughts for which the drought plan has been tested;*
>
> *(c) the permits and approvals that the water undertaker expects to need in order to implement the drought management measures;*

(d) the discussions that have occurred between the water undertaker and the bodies responsible for granting those permits and approvals and the arrangements for discussions with those bodies during the onset, duration and abatement of all droughts covered by the drought plan;

(e) the measures that may be needed to mitigate any adverse effect on the environment resulting from the implementation of a drought management measure;

(f) the permits and approvals that the water undertaker expects to need in order to implement those mitigation measures; and

(g) the compensation that may need to be made as a result of the implementation of a drought management measure.

1.2 The Cambridge Region Drought Plan

The Company published its first statutory drought plan for the Cambridge Region, formerly Cambridge Water Company, in February 2008, in accordance with the legislation and EA supplementary guidance current at that time. The 2008 plan was revised in 2012 following the introduction of the Flood and Water Management Act on 1 October 2010, which constituted a material change.

In 2012 Cambridge Water merged with South Staffs Water, and Cambridge Water became a trading name of South Staffs Water used within the Cambridge region of the Company. Due to the nature of drought plans and the geographically separate areas of the regions, each region of South Staffs Water publishes its own drought plan.

The Drought Plan Direction 2016 states that companies should produce a draft Drought Plan for submission to the Secretary of State;

(b) for a revised drought plan—

(i) if section 39B(6)(a) of the Act applies, within 6 months after the date on which the material change of circumstances occurs; and

(ii) if section 39B(6)(c) of the Act applies, within 4 years and 3 months after the date on which its drought plan, or its last revised drought plan, is published.

This Plan is divided into sections as below:

- Sections 1 – 3. These sections outline the requirement and process for producing this plan, along with supporting and background information on the context of water supply in the Cambridge region.

- Section 4. Explains the drought scenarios we have considered, historic drought sequences and experiences

- Section 5. Discusses the drought triggers that we use, and how these have been developed

- Section 6. Outlines the management actions that are available to reduce demand or increase supply and the structure of the decision making for implementing various actions

- Section 7. Considers the environmental impacts of our actions, mitigation and monitoring requirements.

- Section 8. Describes the monitoring of drought conditions and the drought indicators used

- Section 9. Outlines our drought management structure

- Section 10. Describes the communications strategy applied before during and after a drought

- Section 11. Provides a summary of actions we would take at the end of a drought.

- Section 12. Discusses the conclusions of this plan, and some of the uncertainty that we have considered in this plan.

We are required when publishing our drought plan to exclude any matters of commercial confidentiality and any material that is contrary to interests of National Security. We confirm that our plan does not contain any commercially confidential information.

1.3 Background to Cambridge Water

The Cambridge University and Town Waterworks Act received the Royal Assent on June 14, 1853. This set up a Company to supply fresh water to the town and university as a commercial enterprise. The Company remained privately owned until 1996, when it became a Public Limited Company. In October 2011, Cambridge Water was acquired by the South Staffordshire Group. The acquisition was referred to the Competition Commission, which determined that the merger of Cambridge Water and South Staffs Water could go ahead without impact to customers. Details of the Commissions conclusions are publicly available online. On 1 April 2013 the Company was merged in to South Staffordshire Water PLC, but continues to trade under the name of Cambridge Water, following the successful application to Ofwat to merge licences. As Cambridge Water operates in a distinctively separate geographical and water resource area, this plan covers the Cambridge region only.

In the Cambridge region, South Staffs supplies wholesome potable water to a population of 315,000 in Cambridgeshire and Huntingdonshire, an area that includes Cambridge city and extends to Ramsey in the north, Gamlingay in the west, Balsham in the east and Melbourn in the south. The area supplied is shown in Figure 1.

The Company's water resources are supplied from groundwater sources, 97% from chalk aquifers and the remaining 3% available from greensand aquifers. The underground chalk strata is generally a robust water storage aquifer, recharged by rainfall mostly during the winter months each year. We abstract water using boreholes sunk into the ground, at 26 sites across the area. There are also a number of small bulk imports and exports with neighbouring water supply companies, which have been in operation for a number of years at the periphery of the Company's supply area.

Figure 1. Cambridge Region Area of Supply

2. Consultation on the Drought Plan

South Staffordshire Water is committed to engaging with all of the stakeholders who have an interest in this plan. The Company has undertaken consultation with these stakeholders and the general public for the Cambridge region Drought Plan.

2.1 Pre consultation

In accordance with the EA drought plan guidance we have consulted with statutory consultees prior to producing our draft plan to identify any issues of importance and for any comments that we should consider in our plan. Our pre-consultation ran from 4 to 26 August 2016, for which we contacted the following stakeholders to invite comments for consideration in the revised plan;

- Affinity Water
- Anglian Water
- Defra
- Environment Agency
- Natural England
- NFU
- Ofwat
- Customer Challenge Group
- Consumer Council for Water (CCW)

Under the EA guidance companies are also required to consult with any licensed water supplier which supplies water to premises in the undertaker's area via the undertaker's supply system. These are 'inset' appointments, and there are currently no such licensed water suppliers operating in the Cambridge Water area of supply in addition to those listed above. (Anglian Water have the only inset to date) The comments received during the pre-consultation are presented in Appendix A, and have been summarised in table 1 below;

Table 1. Summary of Pre Consultation Comments

Consultee	Nature of response received	Relevant section of Plan
Defra	No response	N/A
Environment Agency	The key points to be considered in the revised Drought Plan are:	
	• The sequencing of drought actions - customer restrictions and demand interventions should be implemented prior to any drought permit/order application.	6 & table 4
	• Effective engagement with customers and stakeholders in a drought.	10
	• An appropriate range of drought scenarios to ensure the plan is robust, including more severe drought events than those in the historic record.	4
	• A broad range of potential drought options.	6
	• An assessment of the effect that the plan will have on Water Framework Directive status or potential. Specifically, whether the increased use of any licence would cause deterioration under the Water Framework Directive.	8.3.2
	• The requirements for environmental monitoring and assessment needed to support the draft plan. Details of the environmental monitoring programme should be included in the drought plan	8
	• The prioritisation of the use of supply side sources to minimise the impact of abstraction on environmentally sensitive sites. In particular, the use of Sawston and Hinxton Grange sources should be limited to historical levels to protect Dernford Fen SSSI and Sawston Hall Meadows SSSI, and the use of Duxford should also be limited in order to protect Thriplow Peat Holes SSSI.	8.3.1
	• The impact on Company abstraction licences of the potential non-renewal or renewal with significantly reduced quantities of the Environment Agency's groundwater support scheme abstraction licences, specifically the Rhee and the Lodes Granta licences.	8
	• Natural England (NE) views if any proposed drought actions may affect a designated site.	8
	• Management of small import/export agreements in place with neighbouring companies.	6.3.3

Natural England	Seeking confirmation that our view that the plan is not subject to the Strategic Environmental Assessment (SEA) Directive 20001/42/EC is based on the conclusions made in the current drought plan in section 4.1.2.2. Keen to discuss further 3 sites (Dernford Fen SSSI, Sawston Hall Meadows SSSI and Thriplow Peat Holes SSSI) and the risk of increased abstraction beyond historic abstraction rates during drought periods.	7.5 8.3.2
Anglian Water	No response	N/A
Ofwat	No response	N/A
Customer Challenge Group	Levels of service – If levels of service are to change than consultation with this Group should be undertaken. Presentation of the plan – a glossary would be helpful and the plan needs to be presented more clearly in order to enable proper evaluation. The time taken for a temporary use ban to be implemented is considered to be too long at 9 weeks. Consistency of drought messages across water companies - Customers can be confused as to whether or not there was a temporary use ban if neighbouring water companies have different drought actions in place. Communications in this area should be reviewed to minimise customer confusion. Customer communication should consider a much wider range of channels including social media. Customer communications must be clear regarding what the restriction actually means and whether there are any exemptions. Regular feedback to customers on levels of water use should be considered to encourage customer engagement and participation.	N/A App. L 6.2.2 10 10.5 6 & 10 10
Consumer Council for Water (CCWater)	The revised plan should: • Follow the principles set out in the Water UK/UKWIR Code of Practice on Temporary Use Restrictions, demonstrating an understanding of the impact of any measures on different customer groups. • Reflect customers' priorities and preferences in relation to the actions that a Company plans. • Explain the Company's strategy for engaging with domestic customers, including its strategies for both managing drought and promoting water efficiency in non-drought times • Show evidence of engagement and reflect the views of	6 & 10 10 10.3.4 2

	relevant stakeholders, such as Government departments, other water companies, NGOs, business and the agriculture sector. • Outline what would happen in an emergency drought situation, such as when supplies might be interrupted/subject to rota cuts or standpipes. • Be clearly written and accessible and provide a customer friendly non-technical summary for the Cambridge region.	6.3.6 to follow for public consultation phase
Affinity Water	No response	N/A
NFU	The following should be taken account of in the next drought plan: • The increasing importance of the Anglian aquifer to local food production and national food security • Pressures being placed on all licence holders arising from WFD 'no deterioration' issues • The lack of clarity in how groundwater dependent farmers will be subject to (and respond to) future statutory s57 restrictions and voluntary restrictions • Opportunities arising from initiatives such as WRE to trade/share water, including during times of shortage • Agricultural need is seasonal and highly variable depending on current weather and soil moisture deficits (making access to groundwater during droughts particularly important for crop yield and quality)	N/A 8.3.2 & 12.1 N/A N/A N/A

2.2 Consultation on the Draft Plan

This draft plan was published on 28th February 2017, initially to Defra for approval of security measures. Following Direction from the Secretary of State to publish publically on 3 April 2017, there will follow a period of 8 weeks for representations to be made on this plan, and for us to produce our statement of response.

Our statement of response (SoR) to representations received was published 24 November 2017 detailing any revisions made to the revised draft plan as a result of the representations. A revised final plan will be published once approval to do so is received from the Secretary of State following publication of the SoR.

In July 2018, Defra wrote to give permission to publish the final Cambridge Water drought plan on condition that we commit to make specific changes in relation to:

- Drought scenario testing
- Environmental assessment, monitoring and mitigation

- Compliance with all of the Drought Plan (England) Directions 2016.

The Government guidelines for consultation on the Drought Plan indicate that the following groups must be notified of the consultation;

- The Secretary of State for Environment Food and Rural Affairs
- The Environment Agency
- Ofwat
- Relevant water undertakers –Affinity Water, Anglian Water, Essex and Suffolk Water
- The relevant Local Authorities
- Natural England
- English Heritage
- Canal and Rivers Trust (formerly British Waterways)
- The Consumer Council for Water

In addition to meeting these minimum requirements for consultation the Company will undertake additional consultation with a selection of interest groups or individuals;

- Members of Parliament
- The British Horseracing Authority
- The British Swimming Pool Federation
- The Car Wash Association
- The Horticultural Trades Association
- The National Council for the Conservation of Plants and Gardens
- The Royal Yachting Association
- The Racecourse Association
- The Turfgrass Growers Association
- The National Farmers Union
- The Country Land and Business Association Limited
- The Drinking Water Inspectorate
- The Angling Trust
- The Cambridgeshire Beds and Northants Wildlife Trust

3 Water Resources in the Cambridge Region

3.1 Supply Demand Balance Position

The Company's current Water Resources Management Plan (WRMP14) includes details of our projected resources position and is published on our website www.cambridge-water.co.uk/environment. The WRMP examines the way in which we plan to meet the demand for water over the next 25 years. Cambridge Water is in one of the driest and fastest growing regions in the UK where significant housing growth is planned.

The Company has a single Water Resource Zone (WRZ) which has been defined according to WRMP methodologies and requirements. This boundary matches the regional area of supply. Figure 2 shows the area of supply.

The current plan demonstrates that deployable output exceeds dry year average daily demands and that we are confident we can maintain security of supply for our customers under normal conditions. Projected peak demands for the critical period of a 'peak week' over the planning period can also be met with available peak deployable output.

Since the late 1990s we have seen a significant reduction in the trend for increasing demand. Some of this is due to;

- Leakage reduction – we have invested in reducing leakage below the economic level and in monitoring the network to reduce the number and run time of leaks by installing district metered areas.

- High meter penetration – metering of hosepipe supplies in the 1990s, continued promotion for meter optants, and compulsory metering of all new properties has led to 70% of domestic customers being charged on a measured basis. Metered customers are generally more aware of how much water they use and more likely to use less than unmeasured customers.

- Water efficiency – in the 1990s we targeted our promotion of water efficiency for existing housing stock and encouraged high standards for water efficiency for new dwellings.

There remains significant growth forecast in the region over the next 25 year, and the current plan demonstrates a continued surplus of supply over demand that will meet the expected increased demand, whilst maintaining headroom in supplies.

The available Deployable Output (DO) in the WRMP is subject to the licenced volumes at annual average, and peak day, being available to the Company. These abstraction licences are granted by the Environment Agency, and in some cases these contain conditions under which we must restrict our abstraction to avoid unacceptable environmental impacts.

Figure 2. Parishes in Cambridge Region WRZ

Fig. 2

The WRMP will be revised this year and a draft publication is due to be submitted to the Secretary of State in December 2017. Prior to this the Environment Agency will notify all water companies of the requirements of a new National Environment Programme (NEP) detailing each companies obligations to review and potentially amend abstraction licences to address risks to the environment. This programme may include Sustainability Reductions that may reduce available deployable output. The EA is currently developing its approach to achieving Sustainable Catchments and is expected to publish more detail whilst this draft drought plan is in the consultation period. Until this detail is received the potential impact on the Company's drought plan cannot be determined. If there is a material impact requiring significant change to the drought plan then a revised drought plan may be triggered in accordance with the legislation.

3.2 Levels of Service – Frequency of Restrictions

This drought plan is consistent with the current WRMP, which assumes for planning purposes that a stated level of service as justified by the current supply-demand balance, together with experience gained during recent droughts (see Section 4.1), is as follows:

- the need for a major publicity campaign requesting voluntary savings of water not more than once in 10 years
- a temporary use ban (TUB), previously known as a *hosepipe ban* (which was redefined under the terms of the Flood and Water Management Act 2010) on average not more than once in every 20 years
- a restriction on non-essential usage not more than once in every 50 years
- the risk of rota cuts or use of standpipes on average less than once in 100 years.

This level of service is supported by the experiences of managing previous drought sequences, and by modelling the impact of reduced rainfall on abstraction sources and how this would be expected to affect the yields of available resources.

3.2.1 Compensation

Unless it is judged unreasonable by virtue of exceptional circumstances, in the event that customers' supplies were to be interrupted or cut off under the authority of an ordinary drought order (non-essential use ban) or emergency drought order, the Company may consider that compensation would be payable (or credits made) to those affected. Customers may be able to claim compensation in the event of supplies being interrupted or cut of that are as a result of our mismanagement during a drought.

Any compensation payments would be in accordance with our Code of Practice for domestic and business customers, and the Guaranteed Standards Scheme (GSS), available on the Company website www.cambridge-water.co.uk, and periodically

updated. Total payments will be capped at the average annual bill for the previous year. Our guarantees do not apply if we are prevented from meeting standards in exceptional circumstances or severe weather, including droughts.

The payments will be varied from time to time, in line with our guaranteed standards scheme.

3.3 Deployable Output

The overall amount of water available to meet demand is measured in terms of the Company's 'deployable output', which is the total quantity licensed for abstraction, less allowances for local source works constraints, such as pump or treatment plant inefficiencies.

Cambridge Water's deployable output figure has been derived from a comprehensive Source Reliable Output (SRO) study, first undertaken in 1998, of all the Company's borehole sources. The study comprised a programme of test pumping, hydrogeological studies, and actual borehole data collected during the 1988/93 drought. Supplemental studies have been carried out in 2012, and 2016 in line with works upgrades and other changes, to ensure that the deployable output figure set out in our WRMP reflects the latest position.

Any changes to deployable output are reported on annually in the Water Resources Management Plan Annual Review submitted to the Environment Agency and published on our website.

The 1998 SRO study also assigned a Deepest Advisable Pumping Water Level (DAPWL) to each source, beyond which pumping could not be sustained. At several sources the DAPWL, rather than the abstraction licence, pump, or treatment plant, was identified as the limiting factor governing the amount of water that could be pumped during a drought.

3.4 Leakage Control

Cambridge Water has undertaken leakage control activities since the 1930s. As new approaches were adopted during the 1990s leakage fell by about 25%. The Company has consistently met the annual leakage targets set by the Water Services Regulation Authority (Ofwat) following their introduction in 1998/99. The Company's total leakage target has remained constant, even though the length of mains and service pipes has increased year by year as the housing stock has grown.

Further improvements on leakage management have included substantial investment to increase the level of district meter area (DMA) coverage and a greater emphasis on proactive leakage control. This has meant that despite some periods of rapid increase in leakage due to very cold winter and subsequent thaw events, we have been able to respond promptly and mitigate these impacts on leakage. Further improvements to the existing DMA areas continue to be made allowing improved detection of leakage. Alongside this we are committed to a rolling programme to renew those mains which have the poorest record of bursts and background leakage.

3.5 Water Efficiency

The Company undertakes a range of activities to promote the efficient use of water to our customers The WRMP14 includes a target for effective savings of 1litre/property/per day, which is incorporated into the Company ODI for reduction of per capita consumption. A number of targeted campaigns are undertaken each year, and the Company provides the following services to its customers;

- Free repair of first leak on supply pipe
- Free leak detection service for domestic customers
- Free water saving products, including W.C. cistern devices, and shower and tap inserts
- Promotion of other water saving products such as water butts and shower heads through partnership with Save Water Save Money
- Promotion of grey water use and water recycling technologies for efficient new and refurbished buildings, through local development plans and councils
- Support and advice for registered social landlords on metering strategies for dwellings.
- A minimum of one major public water efficiency event each year
- Regular updates and water efficiency messages on the Company website and on bill inserts for measured customers
- An annual promotion or media campaign with a focus on water efficiency

4 Drought Scenarios

4.1 Historic Droughts

The Company has assessed the impact of droughts by conducting a rigorous analysis of rainfall data collected since 1912, with reference to four particular drought sequences: the early 1920s, 1972-77, 1988-93 and 1995-1998; and also by reviewing the experiences of recent years.

There are no records of the 1920s drought, and there is a paucity of information relating to the management actions taken during the 1972-77 drought sequence. However, there are good records of the two 1990s drought events, and of the 2003-2007 and 2010-2012 drought events, which readily demonstrate the Company's timely and effective response to drought situations and show how the drought triggers developed would have prompted drought management actions.

The drought sequences above include plausible droughts that could impact our groundwater resources, including the worst drought on record. Any drought more severe than these would extend beyond a third dry winter, and this has not been experienced to date. Therefore, this can only be modelling using hind casting methods for determining the impact of reduced rainfall on groundwater levels. This type of drought event would be considered exceptional.

The following graphs illustrate trends during the key historical drought sequences of the 1970s, 1980s, 1990s and 2000s, with reference to the indicators that were current at the time. Figure 3 shows the rest levels observed at the Company's major Fleam Dyke source, and Figure 4 depicts the cumulative shortfall in monthly rainfall, compared with the cumulative long-term average, observed at Fleam Dyke through the drought sequences illustrated in Figure 3. For comparison, the rainfall deficit during the severe drought sequence of 1920/25 has been added to Figure 4, although the records for rest water levels are not available for this period.

Figure 3. Water levels in Historical Droughts

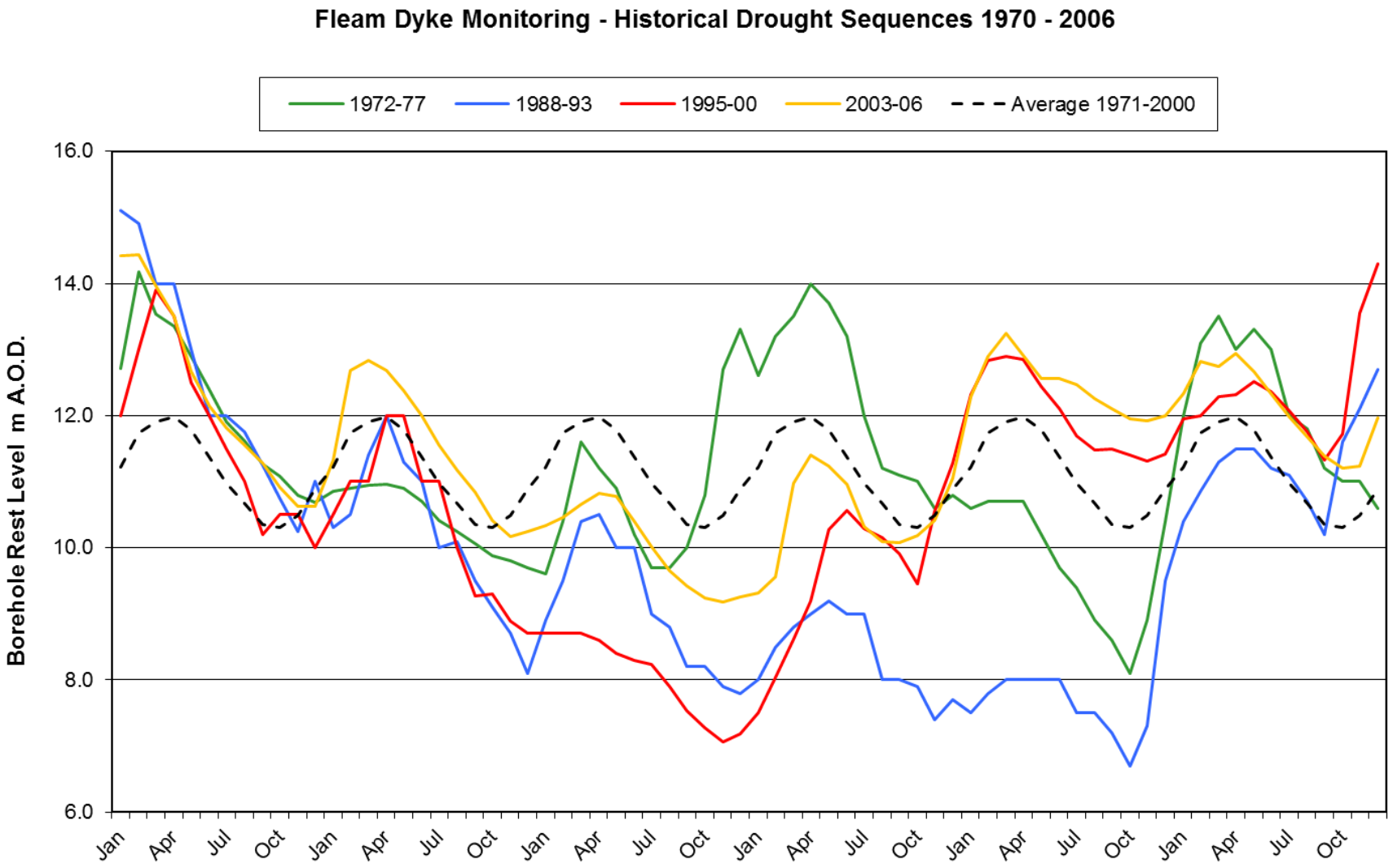
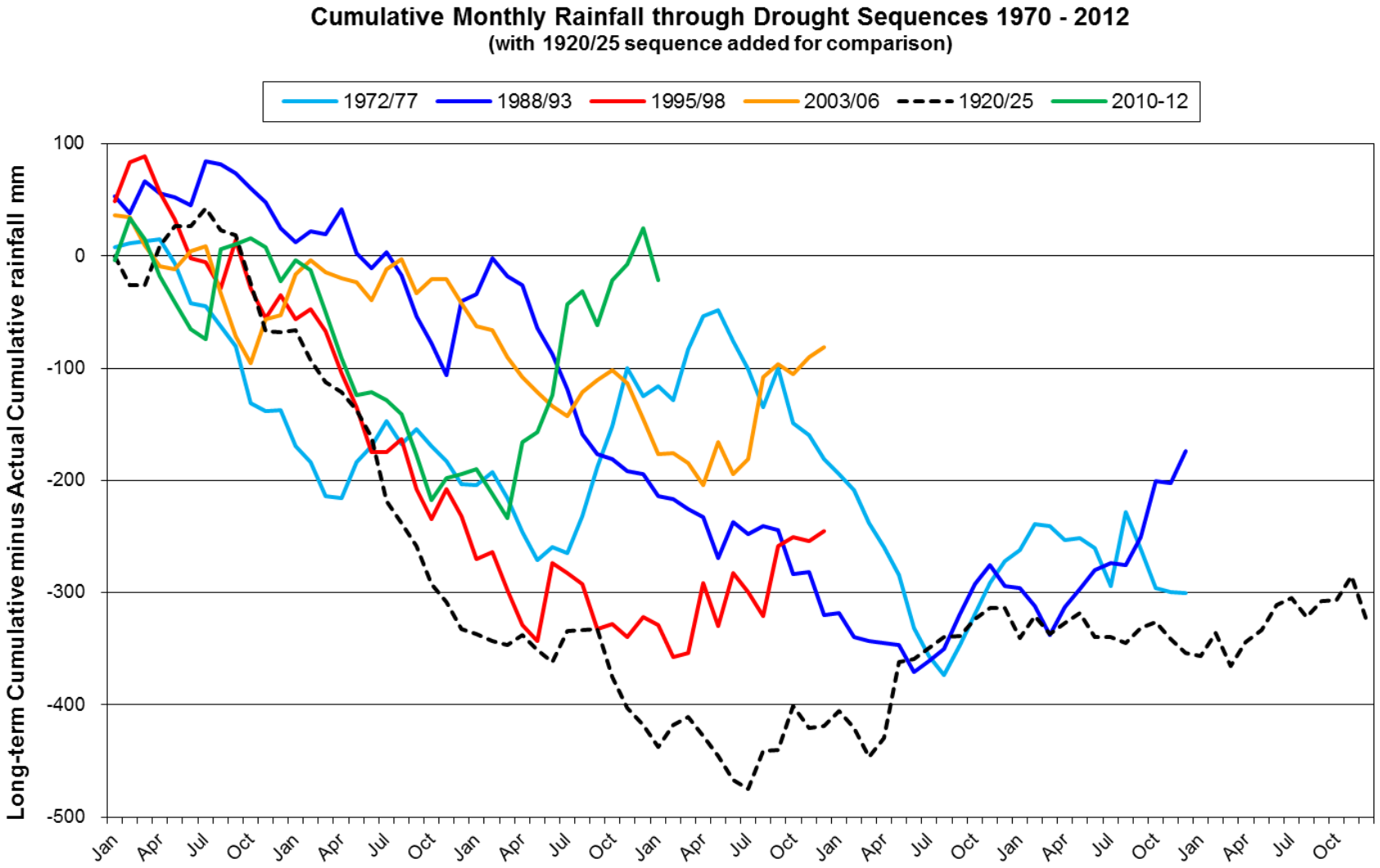


Figure 4. Rainfall Deficit through Historical Droughts



4.1.1 1920s Drought Sequence

Although there are no detailed records of this drought it needs to be considered in scenario planning, as it comprised three successive dry winters, and was therefore the most severe drought since the Company began keeping rainfall records. Many of the current sources of supply had not been developed at this time, and the customer demand profile would have been substantially different.

This drought sequence would be considered a long duration drought of more severe magnitude, and is the worst on historical record.

We have recently reviewed the modelled drought yield curves used to derive deployable outputs under drought conditions to include the effect of historic rainfall data on ground water levels, and hence achievable outputs. The hindcast minimum groundwater levels indicate the robustness of current sources under more severe drought conditions than previously experienced.

4.1.2 1972-77 Drought Sequence

There is little information regarding this drought sequence but it is included as a reference for later droughts. This is in part because of the small sample from which to draw conclusions and partly because a system's response is the result of a complex interplay of many different system-specific characteristics, including climate, catchment, infrastructure, demand and licence constraints. As above, this sequence can be understood by hind casting minimum groundwater levels.

This drought sequence was actually 2 sequences sandwiching a period of recovery. As this recovery period was relatively short, the second part of the sequence from 1975-76 would be considered a short duration, severe magnitude. Taken as an entire sequence, it would be more akin to a long term drought of less sever magnitude.

4.1.3 1988-93 Drought Sequence

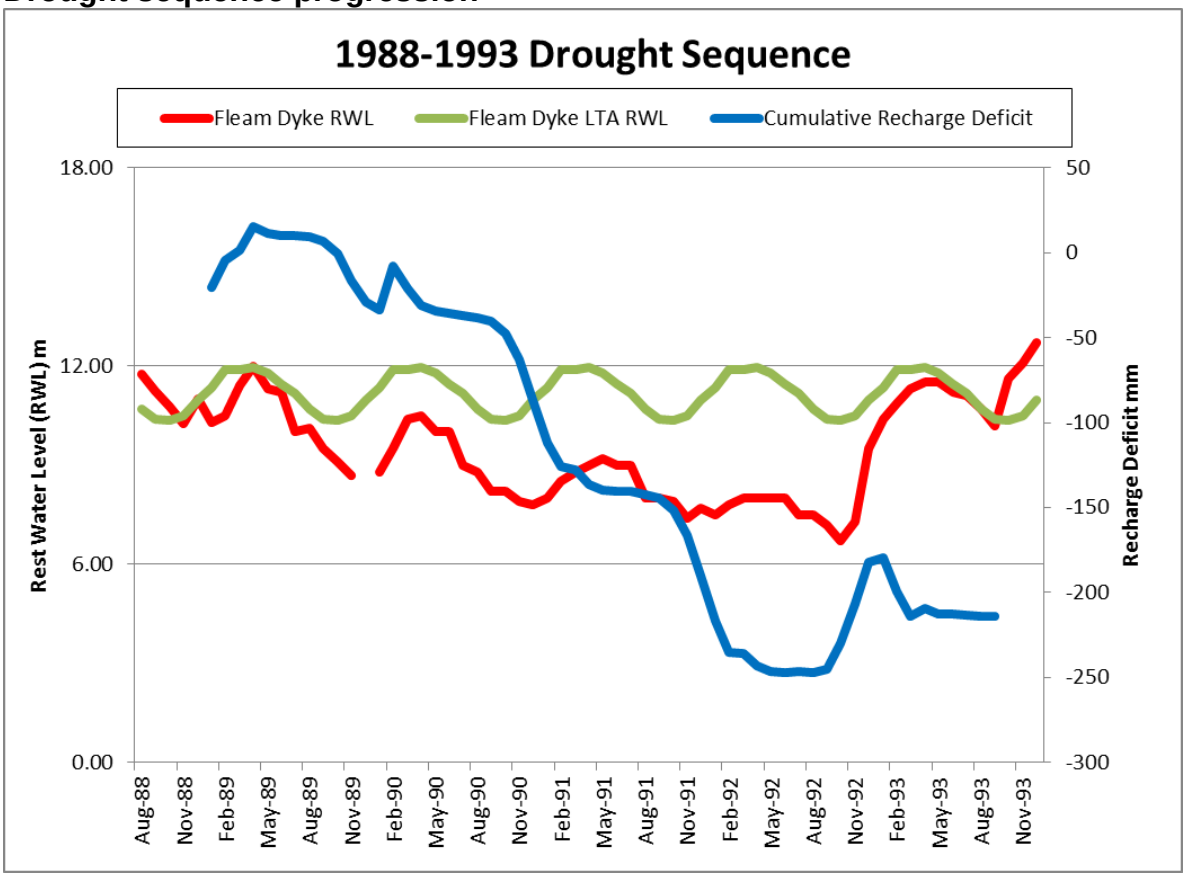
The situation started to deteriorate during the summer of 1989. Higher than average rainfall during the winter period 1989/90 helped borehole levels to recover, but they did not reach their long-term average levels, and fell still further during the summer of 1990. On the supply side, efforts to commission new sources were accelerated. On the demand side, press appeals for restraint during the summer of 1989 had the effect of reducing consumption. Further publicity appeared in the local press around Christmas that year, and continued at fortnightly intervals during early- and mid-1990.

Two new sources, Dullingham and Horseheath, were commissioned in the summer of 1990, which increased deployable output. After the expected winter rainfall had failed to take place, a hosepipe and sprinkler ban was imposed at the start of 1991, and was not lifted until the end of 1992, by which time the new Euston (Thetford) source had been temporarily commissioned.

It was estimated at the time of the hosepipe and sprinkler ban that around 4 Ml/d was being saved on Sundays (the 'peak' day of the week, according to the Company's

recording methodology) through cars not being washed by hosepipe. Finally, during 1992/93, a programme to compulsorily meter all registered sprinkler users was undertaken.

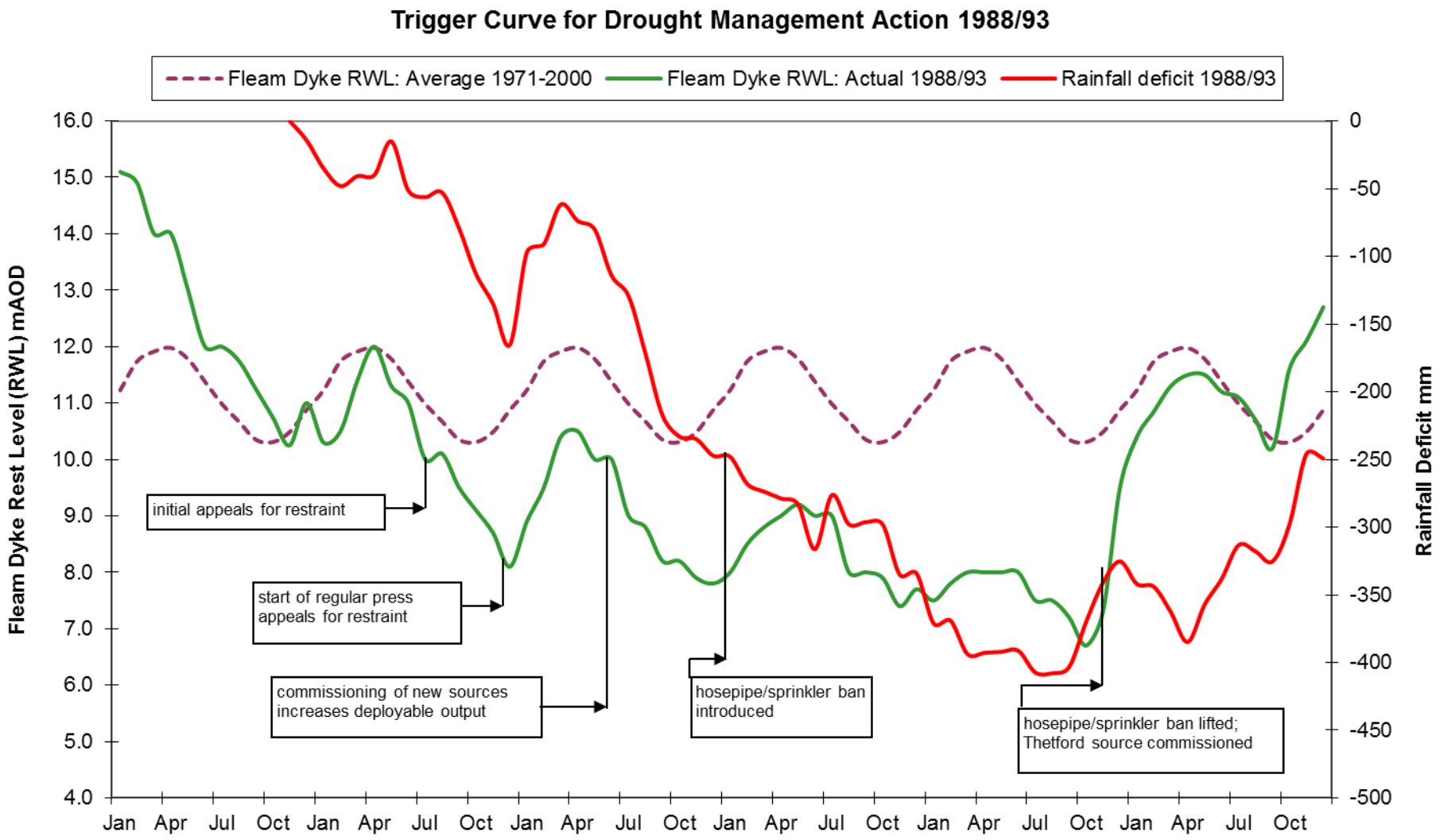
Drought sequence progression



This drought would be considered a medium term drought, of severe magnitude as it consists of 2 dry winters, and conditions declined rapidly enough for a hosepipe ban to be imposed.

The triggers for management actions taken during this sequence are shown in Figure 5.

Figure 5. The 1988-93 Drought Sequence



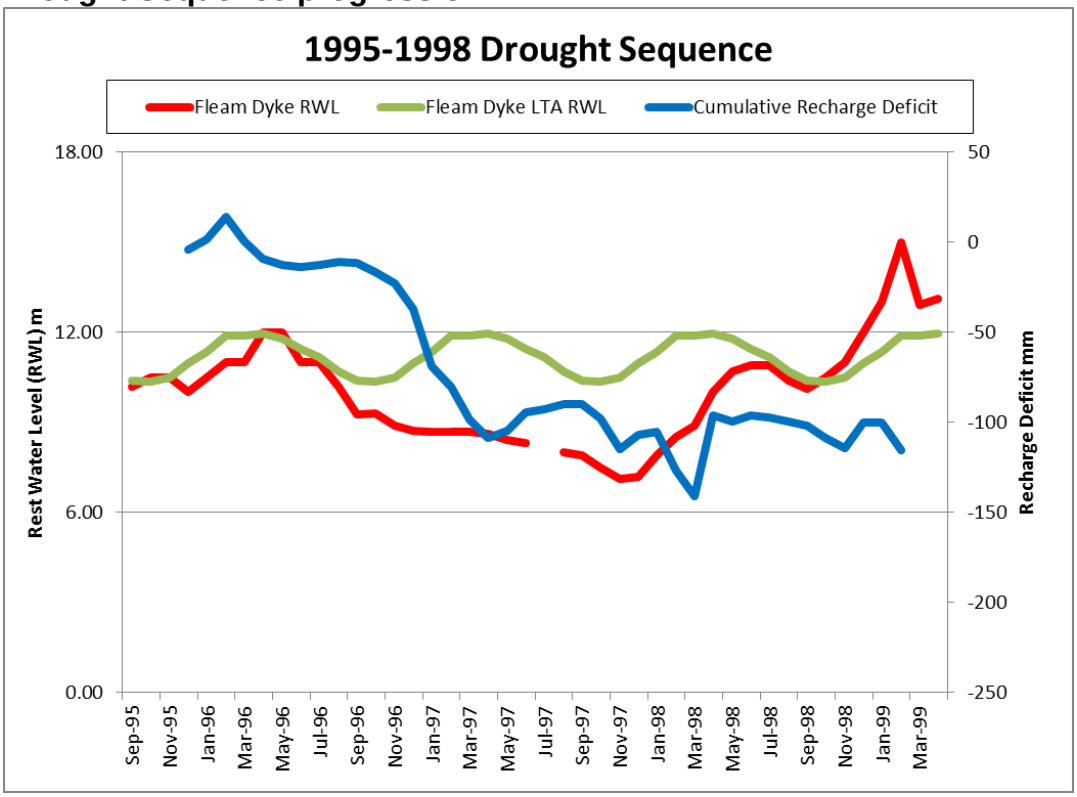
4.1.4 1995-98 Drought Sequence

After a drier than average 1995/96 winter, the message was broadcast to customers to “use water wisely”, although restrictions were not envisaged. Borehole levels fell towards the end of 1996, but stabilised during the winter months. The decision was taken to progress the development of a second source at Thetford, and also to undertake a Source Reliable Output study of existing sources.

Demands during the winter of 1996/97 were markedly less than for the previous winter, thanks to the effects of an extensive metering programme, and these demand reductions continued through the summer of 1997. Significant, and successful, effort was also put into reducing leakage during this period. Borehole levels began to fall more sharply towards the end of 1997, triggering the consideration of a hosepipe and sprinkler ban; however, the effect on peak demands would have been negligible at that time of year. Instead, a major initiative to meter registered hosepipe users was launched, which effectively curbed peak demands during subsequent years. The triggers for management actions taken during this sequence are shown in Figure 6.

This drought would be considered a medium term drought, as it consists of 2 dry winters, although recovery was more rapid than seen for the earlier 1990s drought.

Drought Sequence progression



4.1.5 2003-07 Drought Sequence

Overall, 2003 was drier than average but winter 2003/04 was wetter than average, which aided borehole recovery and ensured that 2004 was overall wetter than

average. December 2004 marked the start of a prolonged dry spell, during which monthly rainfall totals were consistently below average, and borehole levels remained firmly below their long-term average values as a result. After a brief respite during the autumn of 2005, another dry spell was witnessed during the 2005/06 winter period. As a result, only limited borehole recovery took place and drought management actions were initiated, including increased leakage activity and the introduction of an intensive public awareness campaign.

During the summer of 2006 borehole levels declined to depths similar to those seen in 1996; however, despite prolonged periods of very hot weather during the summer, peak demands were lower than expected (partly due to the knock-on effects of demand restrictions imposed in parts of the south-east) and restrictions were not considered necessary by the Company. Nevertheless, the possibility of a third successive dry winter remained, and steps were taken to initiate a supply-side option, to upgrade Brettenham pumping station, enabling full use to be made of that source's licensed capability. An early decision was necessary because of the long lead times for plant and other works.

Heavy rain during the late summer helped to reduce soil moisture deficit at the start of the winter period but, at that time, the prospects for 2007 remained uncertain, and a letter was sent to all customers, thanking them for their efforts during the year, but warning of the possibility of restrictions in 2007. In the event, aquifer recharge continued throughout the winter, and borehole levels had generally reached their long-term average values by the spring of 2007. The triggers for management actions taken during this sequence are shown in Figure 7. This drought would be classified as a short duration, and low magnitude.

Figure 6. The 1995-98 Drought Sequence

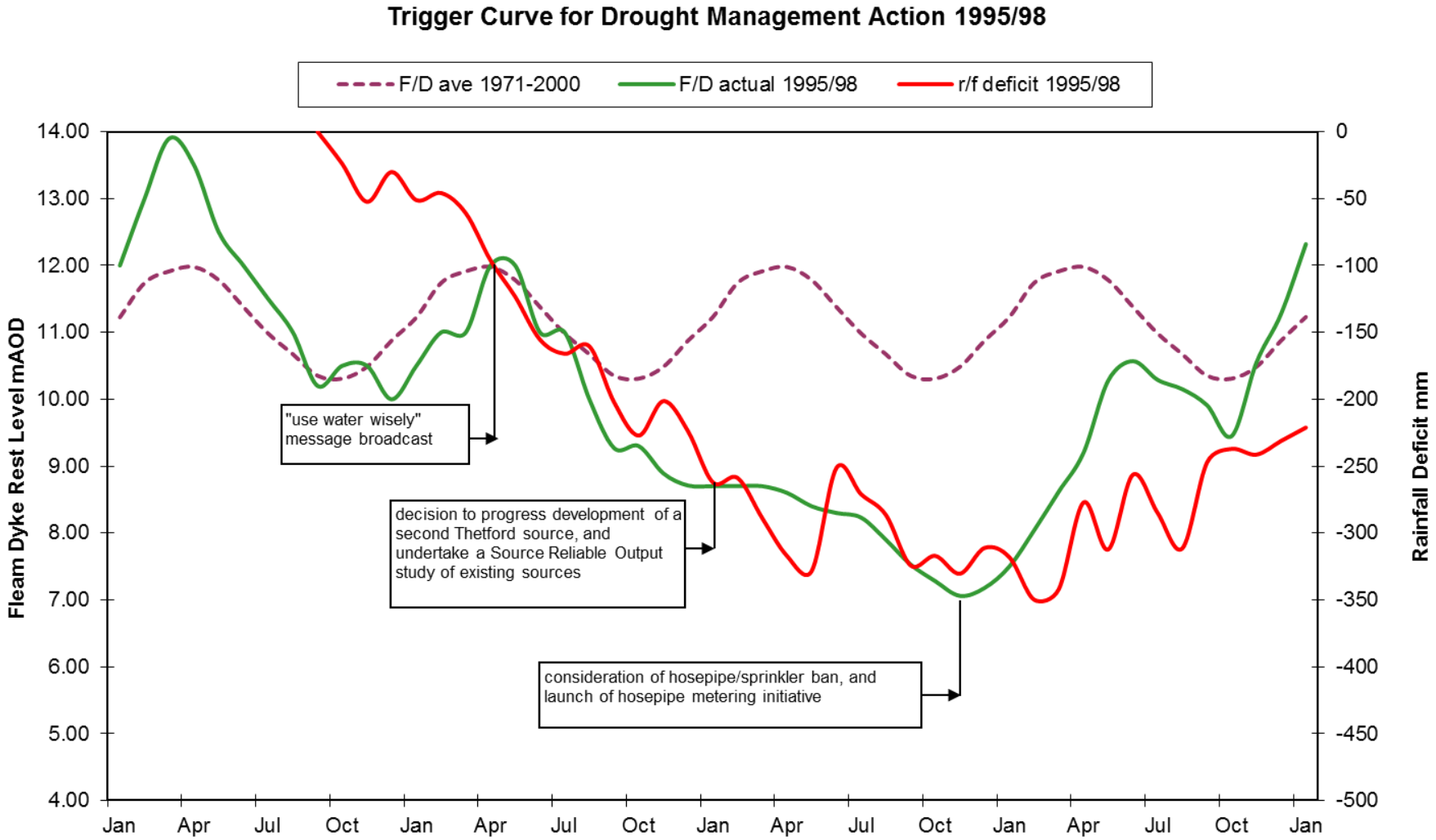
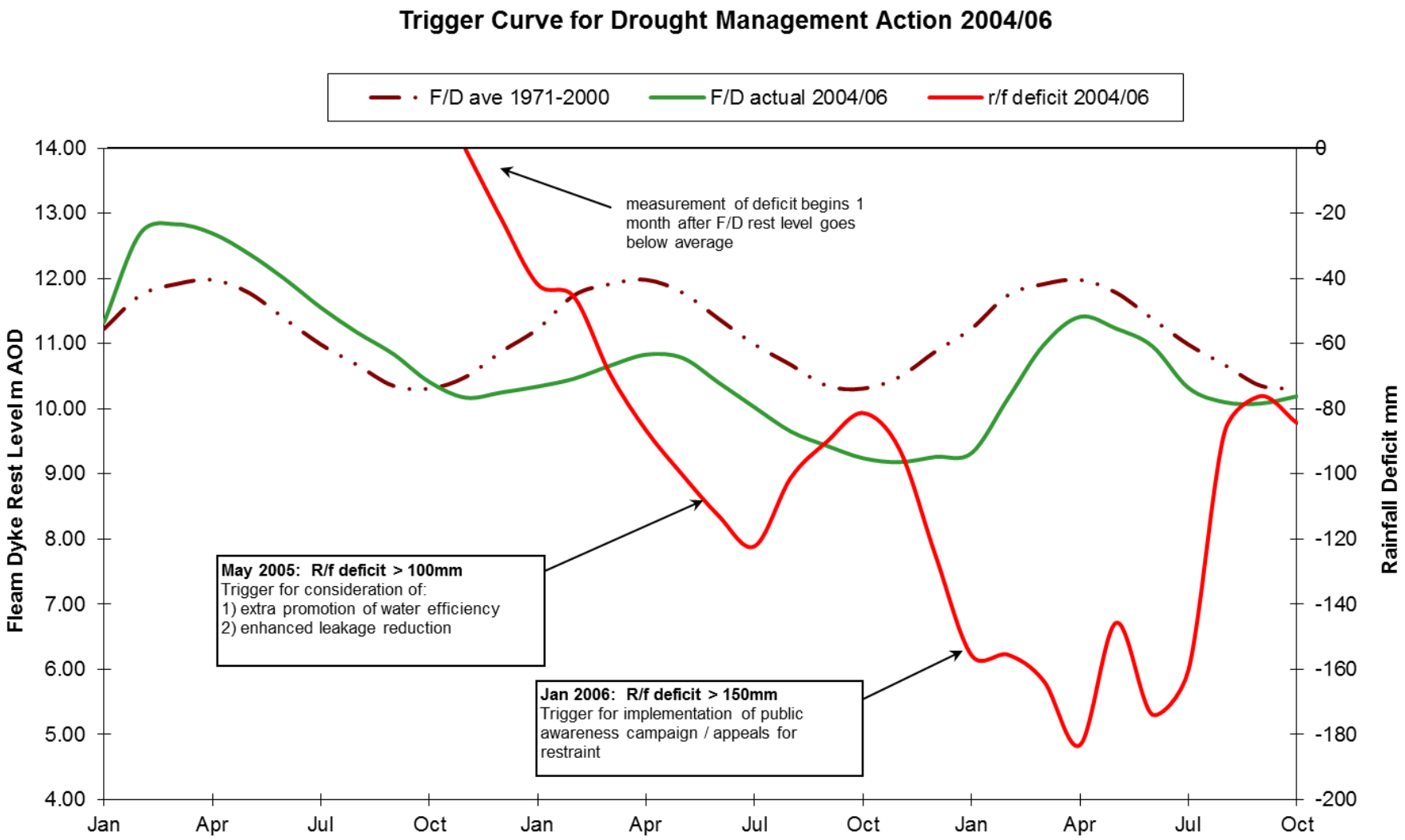


Figure 7. The 2003-07 Drought Sequence.



4.1.6 2011-12 Drought Sequence

Winter rainfall for 2010 was lower than average, with the year overall experiencing below average rainfall. Following this, 2011 was one of the driest years seen in many decades and the latter part of winter of 2011-12 was very dry. As a result of these two successive dry winters, groundwater levels in the Cambridge Water area were depleted to a point where some of our drought triggers had been breached, initiating management actions in line with the drought plan at that time. Early mitigation actions included significant capital investment being made in reducing leakage levels, and appealing to customers to exercise restraint through an enhanced communications programme. Whilst other companies in the south east imposed temporary water use bans, our trigger thresholds for this action were not reached, and we did not do the same. Preparations to implement a supply side option ready for another dry winter were undertaken. The spring of 2012 saw well above average rainfall, and as a result of this, unprecedented late spring/early summer recharge. By the summer most borehole levels had returned to average or above average conditions.

4.2 Drought Scenarios

In order to assess the robustness of our drought management plan for the Cambridge region, we have considered different drought scenarios, of increasing severity, appropriate to the area of supply. All the water supplied in the Cambridge region is from groundwater sources, recharged by winter rainfall, and it is the lack of winter recharge over successive dry winters, which leads to a drought situation impacting on water resources. This is confirmed by the analysis of historic drought sequences described above.

There is no evidence to suggest that other rainfall events – e.g. single season dry summers; single season dry winters; or even two consecutive dry summers with an intervening wet winter – would affect the Company's ability to supply water.

The historic drought sequences, and worked examples in sections 4.2.1 - 4.2.3 for droughts of varying durations, have been used to inform an overall robust approach to drought management, actions and measures. This is shown in the worked example in Figure 10 for a typical drought trigger curve and drought management actions.

4.2.1 A Short Duration Drought

Typically, a short duration drought may last 6 to 12 months, and include a single dry winter. In this scenario it is assumed that aquifer levels will be at their long-term average at the start of the normal winter recharge period (October), but that winter rainfall is seriously curtailed.

A study of the Company's rainfall records since 1912 reveals only rare occurrences where a short duration drought comprising a single 'dry' winter (less than 80% average rainfall) is followed by a dry summer, or where a dry winter is sandwiched between two dry summers. In recent times, this has happened in 1976 and 1996 (although, in the latter case, this was part of a longer drought sequence, and is considered separately).

The recent drought sequence of 2011/12 can be considered a short duration drought starting in March 2011 and ending in April 2012. Although this drought included two dry winters, and the summer between was relatively dry, demands were low due to the generally cool weather, and the spring following the 2nd dry winter was exceptionally wet. Unprecedented rainfall above that historically observed in April and July 2012 led to a rare and rapid late recovery of borehole levels, and recharge was experienced much later in the year than normally expected. It is this unique set of circumstances that define this drought as short duration rather than medium duration, as recharge occurred after the second dry winter when it would not normally be experienced.

During the winter of 2010/11 borehole recovery was as expected, however March – May 2011 saw the lowest cumulative rainfall since our records began over a 99 year period, and this had a severe impact on winter recovery. Summer rainfall was less than 60% of average, however demands were low, as were leakage levels, and impact on resources was neutral. The Environment Agency declared a drought for Cambridgeshire in June 2011, and as a result we increased drought communications with our customers, the Environment Agency and other stakeholders. The drought management team was invoked, and scenario planning was undertaken to determine the likelihood of customer restrictions as per the Company drought triggers, for various rainfall scenarios.

This activity continued through 2011 and into 2012, during which the September and October of 2011 at the start of the normal winter recovery period were exceptionally dry, experiencing less than 30% of average rainfall. Fortunately, as a result of above average rainfall in November – January, the situation improved slightly, with borehole levels showing some signs of recovery. February and March of 2012 again saw below average rainfall, and this was again a cause for concern over falling borehole levels into the summer, and a temporary ban on water use was considered a possibility. It was determined that forecasted borehole levels based on rainfall received would, however, not be approaching critical levels and in turn breach the drought triggers for the introduction of a temporary ban on water use before the autumn of 2012. A number of water companies, including Anglian Water and Veolia central on the Company's boundary, introduced temporary use bans in April 2012 as they breached their own drought triggers. The presence of these restrictions close to our supply area, together with our own continued customer communications campaigns and heightened customer awareness, undoubtedly helped to maintain low levels of demand, and together with low leakage levels ensured that we maintained healthy supplies, in spite of small cutbacks at a number of sources to protect yields due to low groundwater levels.

Following a dry February and March, the spring of 2012 saw exceptional rainfall, above historically observed levels, and this unusually led to an extended recharge period beyond that normally seen for the winter months. Borehole levels saw rapid recovery and by August, levels at drought indicator sites were at or above average for the time of year.

The Company effectively managed this drought with the tools available and is confident it could effectively manage a future drought of similar characteristics.

4.2.2 A Medium Duration Drought

A medium duration drought for Cambridge Water would comprise two successive dry winters, with an intervening dry summer. In recent times this has occurred in 1995-97, and was looking to be the case in 2011-12 before exceptional recharge much later than normally expected – see Section 4.2.1. The sequence of events and actions undertaken at that time is referred to in detail in Section 4.1 above.

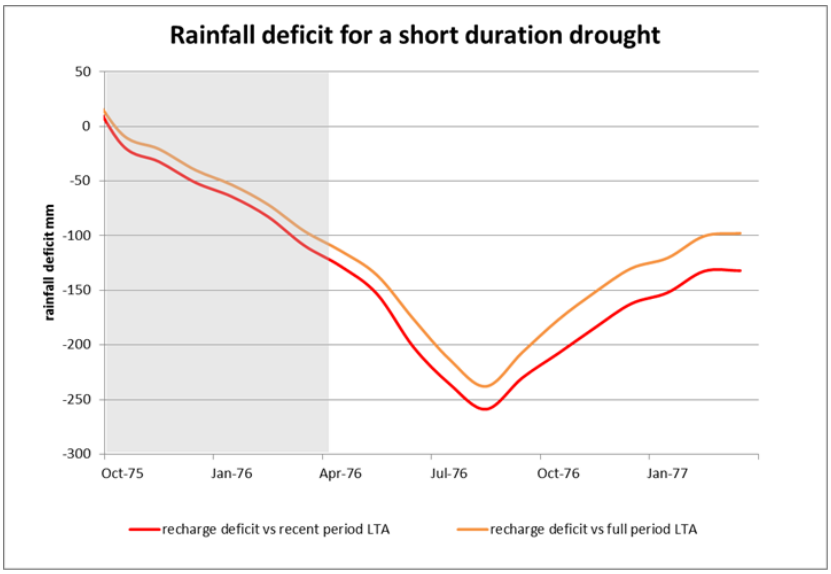
The 1988/93 and 1995/98 drought sequences can both be considered medium duration droughts with only a short recovery time between each sequence.
The 1988/93 drought was a more severe event, in terms of the effect it had on borehole levels. This was a result of a combination of two successive dry summers, two successive years of low total rainfall, and two dry winters. However, a combination of a temporary hosepipe and sprinkler ban, a subsequent campaign to meter sprinkler users, and heightened leakage activity, saw average daily distribution input fall from a high of 78.5 Ml/d in 1990 to 72.3 Ml/d in 1993.

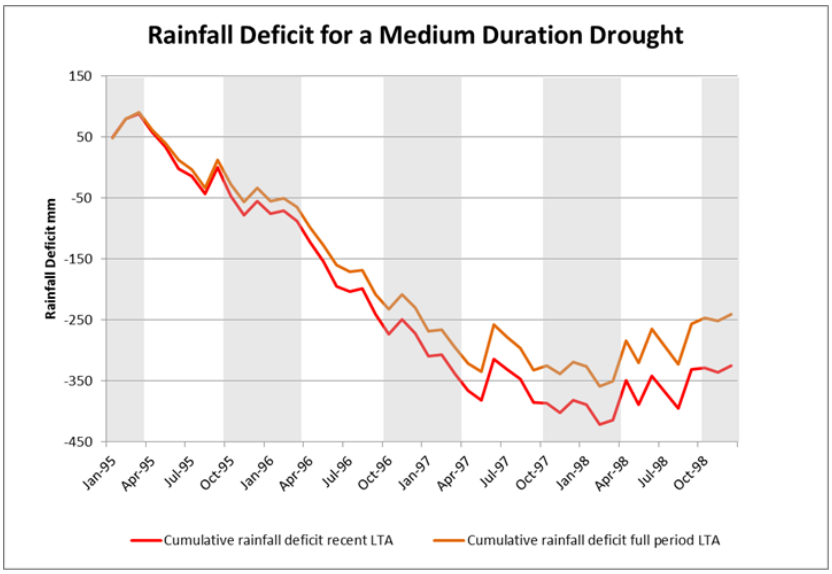
The 1995/98 drought included a dry summer followed by 2 dry winters with a dry summer between. The driest year saw just 65% of average rainfall in total and borehole levels fell quickly during 1996-97. Measures to curb demands and above average rainfall during the latter part of 1998 saw boreholes recover and the following few years experienced above average rainfall, further aiding recovery.

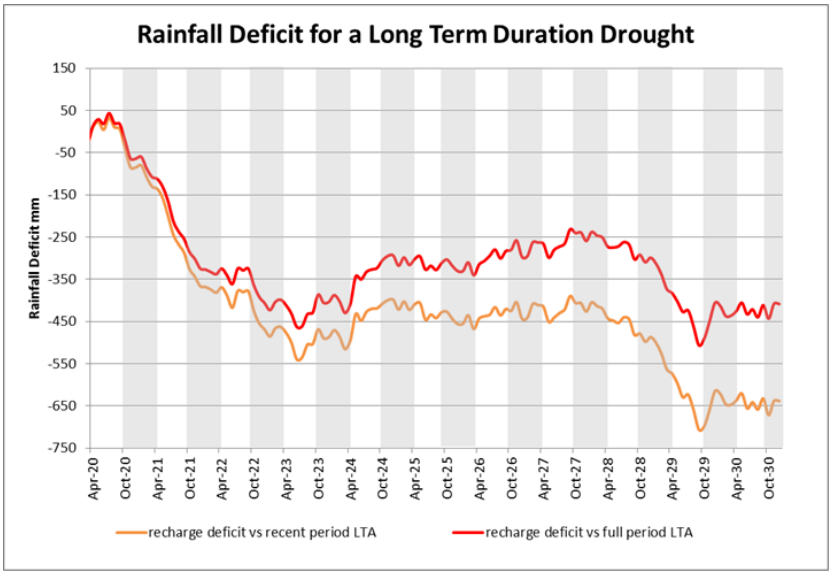
The 2011/12 drought sequence could have been more severe, had it not been for exceptional rainfall in the spring of 2012. However, it was forecast that the trigger for implementing a temporary use ban would not be breached before a third dry winter, even with very low rainfall scenarios. This further warrants the robustness of our resources position to a medium term drought.

The Company effectively managed the 1988/93 and 1995/96 medium duration droughts, through successive demand and supply management options. Had the 2011/12 drought continued it is predicted that there would have been no need for implementation of a temporary use ban in advance of a third dry winter. The Company is therefore confident it could effectively manage a future medium duration drought.

Figure 7a. Example rainfall deficit and duration for drought sequences







4.2.3 A Long-term Drought

This scenario examines the possible effect of a succession of three consecutive dry winters (similar to the sequence witnessed during 1920/25), with a succession of intervening dry summers. This would be the critical drought scenario for Cambridge Water and would inevitably involve the imposition of restrictions, with the Company, its customers and other stakeholders having to work closely together to manage the situation. Our scenario for managing a drought of this magnitude, through the implementation of a succession of supply- and demand-side actions, as defined in this plan, is illustrated in Table 2.

At present, average daily available deployable output exceeds average day demands by around 9Ml/d, and peak deployable output exceeds peak demand by around 27 Ml/d.[1] It is predicted that the prolonged lack of effective rainfall over three successive dry winters would cause groundwater levels at a number of sites to eventually fall to an unsustainable level (i.e. close to their DAPWL – see Section 3.4) if pumping were to be allowed to continue at normal rates. Not all sites would be affected, and not all those affected would see the impacts at the same time. We would therefore plan to reduce production progressively at those sites, in conjunction with other drought actions, to ensure that security of supply was maintained.

These cutbacks would vary on a site by site basis and be determined by localised conditions. Recent drought vulnerability analysis[2] has applied rainfall and the hind casting of groundwater levels, using the UKWIR source reliable output methodology to determine what type of drought sequence would lead to the lowest water levels at each supply source. This not only provides an indication of those sources vulnerable to drought where cutbacks would be required, but also if a one, two or three dry winter sequence would be most critical, as the timing and susceptibility of sources to reduced rainfall has been assessed.

A summary of the relative vulnerability of sources to drought sequences can be found in the Appendices G and H to this plan.

The sources identified are:

- Dullingham
- Duxford
- Duxford Grange
- Fleam Dyke 36"
- Fulbourn
- Great Chishill
- Melbourn
- Mordon Grange
- Westley
- Weston Colville

[1] Based on WRMP Annual Review, South Staffs Water 2016, www.cambridge-water.co.uk/environment/ - Calculations and review of Deployable Output
[2] Climate Change and Source Vulnerability – Drought Support, Mott MacDonald 2016

Table 2. Indicative Drought Actions in a Severe Drought

Trigger(s) and indicative timing in drought sequence	Drought management Action	Average Demand Conditions			Peak demand conditions		
		Deployable Output	Net Surplus	gain/ loss	Deployable Output	Net Surplus	gain/ loss
*Initial surplus; Annual Average deployable output (9Ml/d) and Peak deployable output (27Ml/d) (as revised for WRMP annual Review 2016)**							
Spring following 2nd dry winter; > 120mm recharge deficit	D3 appeals for restraint	108	12	+3 *	131	30	+3
	D2 enhanced leakage efforts	109	13	+1	132	31	+1
October of 3rd dry winter; > 180mm recharge deficit; and RWL1 trigger exceeded	D4 Prepare to implement temporary ban on water use, allowing time for representations						
November of 3rd dry winter; RWL2 trigger exceeded, outlook dry conditions	S1 Initiate Fleam Dyke 12 recommissing (5 months lead time)						
January of 3rd dry winter; RWL3 trigger exceeded	S2 Initiate Croydon recomissioning (10 months lead time)						
April following 3rd dry winter	Introduce temporary ban on water use	114	18	+5 **	137	36	+5
	S3 Initiate Kingston recommissioning (10 months lead time)						
Spring following 3rd dry winter	Recommission FD12	117	21	+3	140	39	+3
Melbourn PS <2m above DAPWL	Reduce Melbourn output by >50%	110	14	-4	136	35	-4
Dullingham PS <2m above DAPWL	Reduce Dullingham output by >50%	109	12	-1.5	134	34	-1.5
Gt Chishill PS <2m above DAPWL	Reduce Gt Chishill output by >50%	108	12	-0.5	134	33	-0.5
Fleam Dyke PS <2m above DAPWL	Reduce Fleam Dyke output by >25%	105	9	-3.1	131	30	-3.1
Fulbourn PS <2m above DAPWL	Reduce Fulbourn output by >25%	104	8	-0.5	130	30	-0.5
Winter (Nov) following 3rd dry	Recommission Croydon	106	10	2.0	133	32	2.5
Westley PS <2m above DAPWL	Reduce Westley output by >25%	104	7	-2.7	130	29	-2.7
February of next year following 3rd dry winter	Recommission Kingston	105	8	+1	131	30	+1

August following 3rd dry winter; RWL5 trigger exceeded	S4 Initiate St Ives PS recommissioning (10 months lead time)						
	D5 initiate non essential use drought order (3 months lead time) ***						
November following 3rd dry winter	Earliest Implementation of non essential use Drought Order	107	10	+2	136	35	+5
Duxford PS <2m above DAPWL	Reduce Duxford output by >50%	104	8	-2.6	134	33	-2.6
Weston Colville PS <2m above DAPWL	Reduce Weston Colville output by >50%	103	6	-1.5	132	31	-1.5
Morden Grange PS <2m above DAPWL	Reduce Morden Grange output by >50%	102	6	-0.5	132	31	-0.5
Duxford Grange PS <2m above DAPWL	Reduce Duxford Grange output by >50%	100	4	-2	130	29	-2
Spring of next year following following 3rd dry winter	Recommission St Ives PS	102	5	+1.6	134	33	+4.5

* Based on actual reductions experienced during previous droughts and customer campaigns

** Based on previous ban, and also in line with the 5-9.5% from the Code of practice and guidance on water use restrictions, UKWIR 11/WR/33/3, and conservative in comparison to the EA estimate of 10% during TUB implementation in Quantifying the Impact of Water Company Drought Demand Measures, The Environment Agency, 2013, and Understanding the Impacts of Drought Restrictions, UKWIR 14/WR/01/13

Summary of Drought Triggers in table 2

Drought Action Initiation Sequence	1st Dry winter	2nd Dry winter	Spring		3rd Dry winter			Spring		Summer	Winter			Spring
			Mar	Apr	Oct	Nov	Jan	Mar	Apr	Aug	Oct	Jan	Feb	May
Trigger Action			D2/D3		D4	S1	S2		S3	S4/D5				
Implementation								S1	D4		S2	D5	S3	S4
Effect Ml/d								3	5		2	2	1	1.6

For a long term drought over 3 consecutive dry winters, a 25-50% cutback at each site has been assumed to indicate a worst case - this figure far outweighs the actual reductions that had to be made as a result of the events of 2003/06, and earlier droughts, and exceeds the predictions of borehole behaviour arising from the Source Reliable Output Studies and Drought Vulnerability analysis. The cutbacks are deliberately over-estimated to illustrate the Company's ability to cope during the worst

possible drought scenario. The progression of these actions and other interventions through a long term drought is shown in table 2 above.

This demonstrates likely actions that would be taken in a severe drought, of similar magnitude to that experienced in the 1920s, which was the worst in almost 100 years. It indicates that we would be able to maintain a surplus supply over demand, and ensure security of supply for customers. The surplus on the Company's peak licences provides assurance that there is sufficient flexibility in supplies without recourse to drought permits in the event of a severe drought.

5 Drought Control Rules - Triggers and Actions

The aim of this plan is to demonstrate how we would manage resources and demands through a number of variable but plausible drought sequences, by implementing a range of available management options. The plan does not set out to be prescriptive, as maintaining flexibility in the face of particular circumstances is a key requirement, but presents a framework and timetable of actions to be considered through the most likely drought sequences we might expect. This allows operational managers to make informed decisions and develop action plans to apply in an effective manner.

5.1 Groundwater and Rainfall Monitoring

Continuous monitoring of key water resources parameters – rainfall, borehole pumping level, and borehole rest level – has been undertaken historically at the Company's key source at Fleam Dyke. Rainfall records for Fleam Dyke exist for the period from 1912 to the present day, providing a reliable indication of normal and abnormal rainfall events. The long-term average rainfall figure obtained from the site accords, to within 2%, with data collected by Cambridge University. Borehole rest level data for Fleam Dyke are also readily available from 1949 to date, enabling reliable values for long-term monthly average rest levels to be determined.

For earlier drought plans Fleam Dyke was used as the sole indicator of aquifer condition; however, in order to improve the flexibility of monitoring across the aquifer, a range of drought indicator sites was developed in 2006[3] by hydrological consultants. Since that time, the drought indicators have been reviewed; in 2012[4] as prompted by certain operational changes that took place, and again in 2016 to provide further resilience and breadth of monitoring the aquifer.

The current primary indicator sites are: Fleam Dyke, Fowlmere, Melbourn, Lowerfield, Babraham and Great Wilbraham - see Figure 8 for approximate locations. The spread of sites gives a good representation of how different parts of the aquifer behave during a drought, and all have long and reliable records of pumping and rest level data. All six sites showed a similarity in their pattern of decline during the 2003-07 drought sequence. Recent work has developed a further 6 indicator locations, correlated to the known historical behaviour of our sources, but at Environment Agency Observation boreholes. This allows us greater flexibility where operational constraints cannot allow boreholes to be rested and additional information on the condition of the aquifer under drought conditions. The exchange of data with the EA during a drought is critical to monitoring this wider network of boreholes.

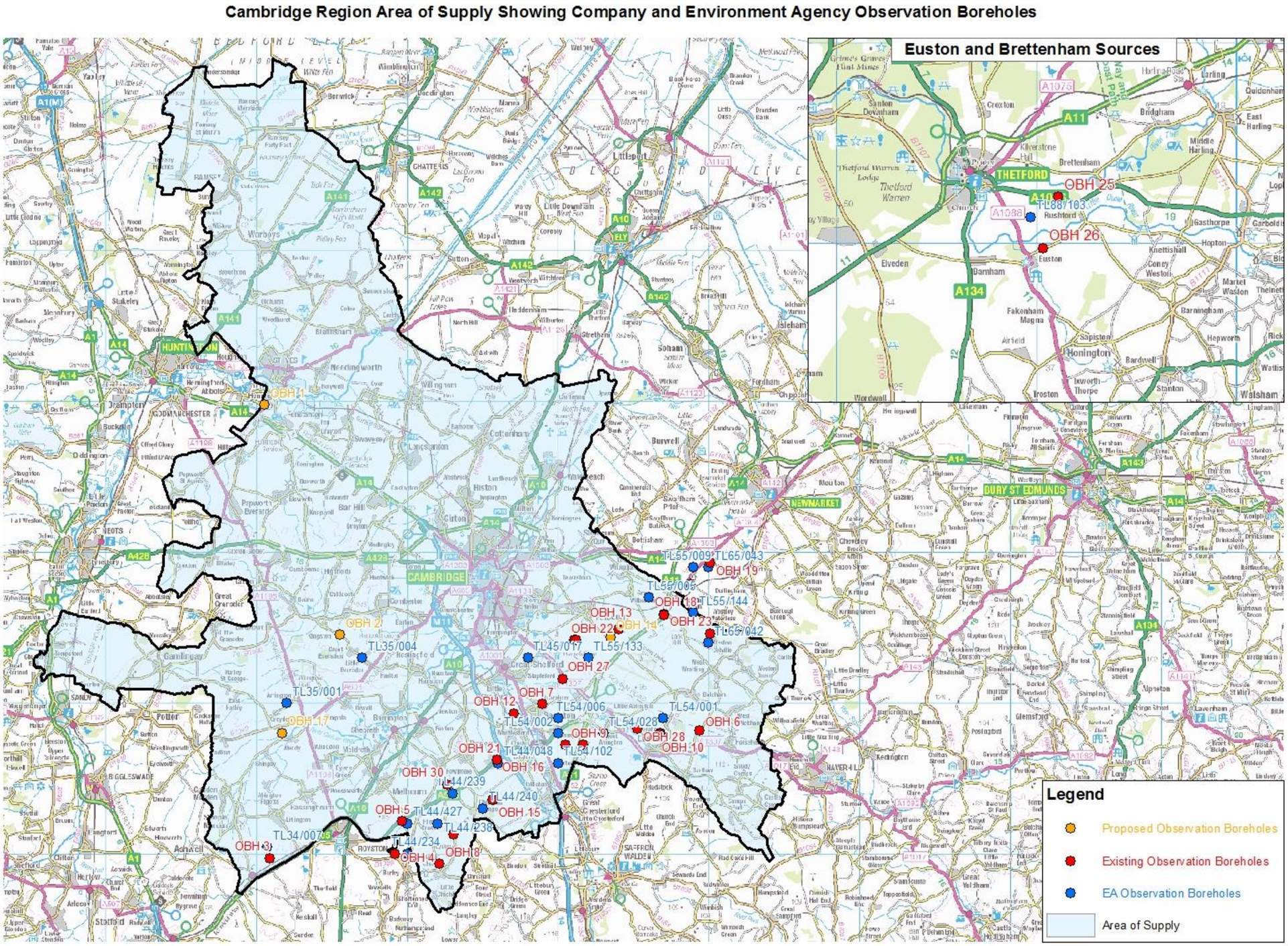
Although total rainfall continues to be monitored at Fleam Dyke on a daily basis to allow assessment of total rainfall against long term averages over the winter and entire year, effective rainfall is now the basis of measurement of aquifer recharge. This data is provided monthly by the Meteorological Office Rainfall and Evaporation Calculation System (MORECS). This data takes account of losses due to evaporation, evapotranspiration and to the soils which reduce infiltration to the

[3] Development of Drought Indicators, Mott MacDonald 2006
[4] Review of Drought Indicators, Mott MacDonald 2011

aquifer, giving a recharge figure based on actual rainfall and antecedent meteorological conditions.

Monitoring through a drought sequence will not be limited to the physical parameters listed above. Pumping programmes will be checked for their effects on vulnerable sources, and adjusted accordingly; the impacts of public messages will be gauged; other data such as soil moisture deficit and rainfall forecasts will be utilised to aid scenario forecasting. In addition, environmental effects will be studied, and monitoring programmes triggered as a drought progresses, this is covered in detail in Section 7.0 of this plan.

Figure 8. Drought Monitoring Locations



5.2 Drought Indicators

In addition to monitoring the rest water levels at the key indicator sites, the Company continues to use cumulative recharge deficit as a drought indicator. The recharge deficit is deduced from monthly data provided by the Meteorological Office Rainfall and Evaporation Calculation System (MORECS). We consider that monthly data is adequate for this purpose, given the slow response times of our groundwater sources. Rest water levels are monitored monthly under normal conditions, and both drought indicators are monitored more regularly once a drought sequence seems likely, and during a drought.

Recharge deficit was adopted by the Company as a drought indicator following detailed studies undertaken by consultants into appropriate indicators, as described in Section 5.1 above. Prior to this, cumulative rainfall deficit had been used as an indicator, but this was shown by the studies to be a less reliable measure. For example, a summer of high rainfall in between two dry winters, whilst suggesting a low rainfall deficit, gave no indication of the effectiveness of the rainfall in aquifer recharge. Cumulative recharge deficit is calculated from the MORECS data on effective precipitation supplied by the Meteorological Office.

Borehole rest water level (RWL) continues to be used as an indicator of the overall condition of the aquifer during a drought, by comparing it with the long term average RWL for each indicator site. During a drought sequence recharge deficit increases over time, and gives an indication of the length and severity of the drought. Measurement of the cumulative recharge deficit begins in the month when the rest levels at three or more of the six indicator sites fall below their long-term average level, and continues until normal conditions have resumed.

A spread sheet tool allows both indicators (borehole rest water level and cumulative recharge deficit) to be monitored continuously, and provides timely warning when trigger levels are exceeded.

5.3 Drought Triggers

The drought indicators are used to trigger demand side and supply side drought management actions. Figures and commentary in Section 4 show how they came into play during previous drought sequences.

The triggers that were adopted as a result of the 2006 review of drought indicators[5] were determined by:

- statistical analysis of MORECS data from previous drought sequences, taking note of the timing of any drought management actions taken
- a statistical analysis of the observed behaviour of the borehole indicator sites during previous drought sequences

The defined trigger levels combine borehole levels and recharge deficit to determine the impact of the drought sequence together with the severity. Typically in a drought

[5] Development of Drought indicators, Mott MacDonald 2006

sequence, borehole levels will decline below the seasonal average, and continue to do so for a period of time, and are therefore the initial trigger(s) in a sequence. Once a number of these are below average, the recharge deficit calculation begins. As borehole levels continue to decline, further triggers are reached indicating the progression of a drought sequence. These rest water level triggers, RWL1-RWL5, together with cumulative recharge deficit are linked to drought actions. The trigger levels for rest water levels are shown in Table 3 below.

Table 3. Rest Water Level (RWL) Triggers

RWL Indicator	Fleam Dyke	Fowlmere	Melbourn	Babraham	Great Wilbraham	Lowerfield
RWL1	8.0	19.5	21.9	13.2	10.0	28.9
RWL2	7.8	19.3	21.5	12.8	9.1	28.2
RWL3	7.5	19.1	21.3	12.5	8.9	28.0
RWL4 *	7.2	19.0	21.0	12.3	8.1	27.9
RWL5 **	4.7	17.3	20.0	7.9	4.8	24.3

*RWL4 is the statistical 99% probability of exceedance in 30years

**RWL5, one of the combined triggers for imposing a restriction on non-essential use, has not been calculated using a statistical approach, as have the other RWL triggers, as there is no historical record of the indicator boreholes having reached those depths. Instead, the RWL5 trigger has been set with respect to the deepest advisable pumping water level (DAPWL). See Section 3.4. This is a physical restriction on borehole output, and therefore recognition of the Company's inability to supply, in what would amount to exceptional circumstances.

Table 4. Combination of Drought Indicators

Drought Option Ref.	Trigger Level or preceding actions		Demand Control	Resulting Action
	Recharge Deficit	Groundwater		
Action Initiation	Initiation – rest level at any 3 of 6 indicator sites falls below average RWL. At this point recharge deficit calculation initiated			
D1	>55mm deficit			Extra promotion of water efficiency
D2	>55mm deficit			Enhanced leakage reduction
D3	>120mm deficit			Appeals for restraint
D4	>180mm deficit	3 or more indicator sites reach RWL1		Prepare to implement temporary ban on water use
S1		3 or more indicator sites reach RWL2	**Hosepipe ban in place**	Initiate Supply side options: recommissioning of Fleam Dyke 12, Croydon, Kingston
S2		3 or more indicator sites reach RWL3		Commission Fleam Dyke 12 PS
S3		3 or more indicator sites reach RWL4		Commission Croydon & Kingston PS
S4		3 or more indicator sites reach RWL5		Initiate St Ives PS recommissioning
D5	>260mm deficit	3 or more indicator sites reach RWL5		Restrictions on non-essential use (Ordinary Drought Order)

Table 4 shows the trigger levels for recharge deficit and groundwater level together with the associated drought management action.

The way in which the defined triggers relate to the drought management actions taken during the historic drought sequences is shown in Figure 9. These sequences are used as the basis for forecasting forward to indicate the subsequent actions that would be taken in the event of a third successive dry winter, as shown in the worked example in Figure 10. The actions listed here are not exhaustive, but are a pictorial representation of the triggers and actions set out in Table 4, indicating the likely timeline of progressive drought management extending beyond a historical drought event.

The sequence and effect of the available actions is also shown indicatively in table 2, in section 4.2, which accounts for the implementation of actions alongside cutbacks to source outputs and how this impacts available supplies. Section 6 and Appendices C and D describe all the available supply side and demand side options, in more detail.

Figure 9. Development of Drought Trigger Curve

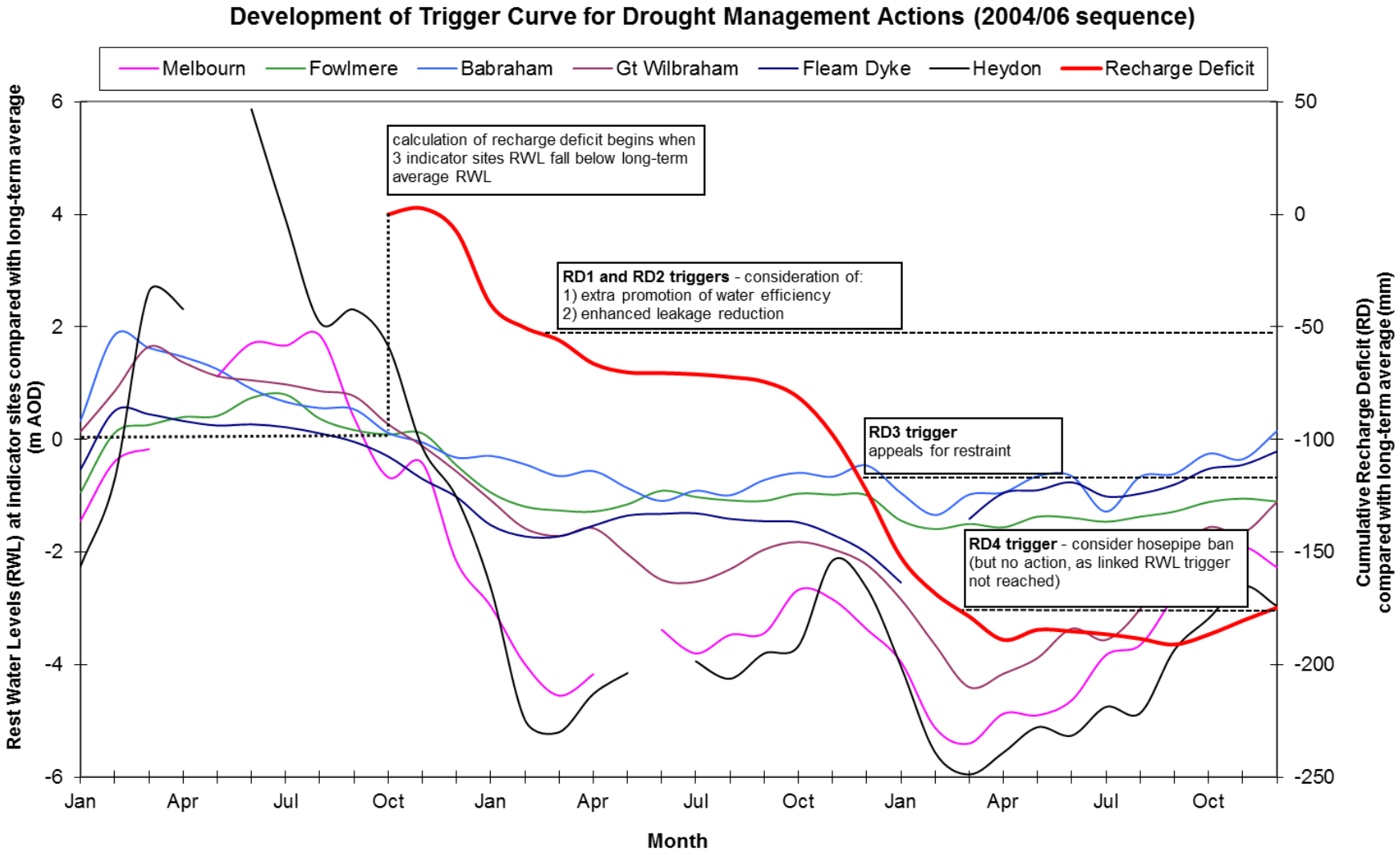
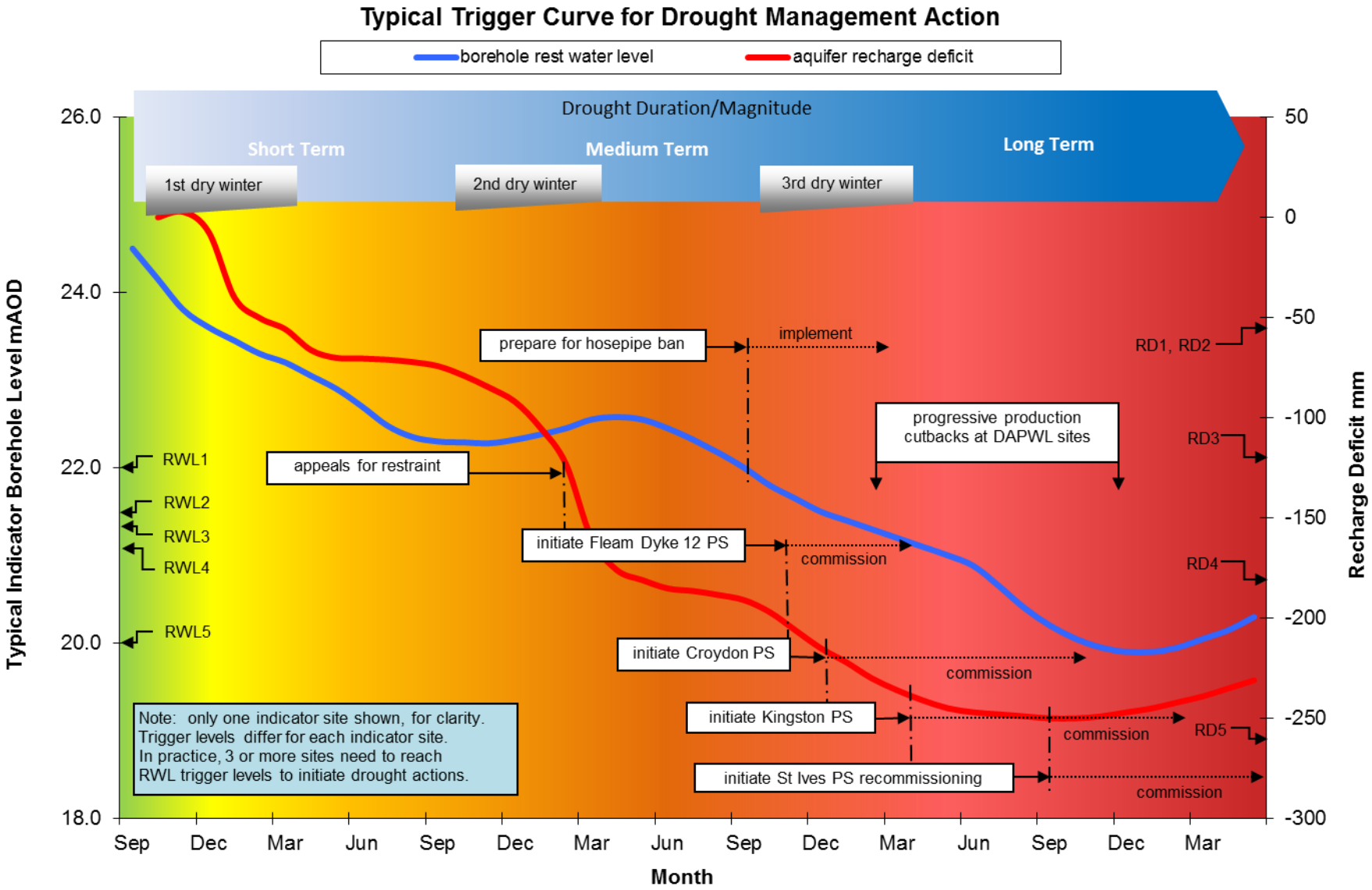


Figure 10. Typical Drought Trigger Curve and Management Actions



6 Drought Management Actions

6.1 Overview

Drought management seeks to balance the needs of customers against the needs of the environment through the consideration and implementation of a range of supply-side and demand-side measures. With the exception of drought orders, any of the measures described in this section may be considered for implementation during the range of droughts for which we have planned, based on our previous experience. We expect that drought orders (see Section 6.3) will only be needed under unprecedented drought conditions.

The management actions taken during a drought will be implemented broadly according to the triggers as described in Section 5. These have been developed using the experiences of historical drought sequences and actions along with the predicted impact of more severe droughts using statistical methodologies. A carefully managed strategy will engage with all stakeholders, such as customers, regulators and businesses, and will reduce the impact of drought conditions. A key element therefore, is the communications strategy, which is covered in Section 10 of this plan.

The management actions identified for this plan would allow the Company to manage a progressive drought sequence similar to those historically experienced, and beyond, to a more severe 3 dry winter drought. The Environment Agency Water Company Drought Plan Guideline states that*; 'drought plans do not have to include details of arrangements for providing water supplies to cope with situations when there is a civil emergency as a result of water shortage*.'

Where a more catastrophic drought could not be dealt with by the actions in this plan, and severe water shortages were experienced, then the Civil Contingencies Act would apply, and the Company's Emergency Plan would be implemented. This would provide additional powers and access to additional resources to ensure water supplies were maintained.

6.2 Demand-Side Actions

Normal demand patterns do not present a problem, since the introduction of various measures during the 1990s to curb rising peak demands (see Section 4.0). Despite significant growth in new dwellings, the highest peak week distribution input seen in recent times remains around 5% below the levels being experienced in the mid-1990s following these efforts to manage peak demands.

The drought options set out in the Appendices include demand side options that will be employed during a drought sequence. The quantities expected to be saved have been derived from experience gained during previous droughts, together with an understanding of demand patterns, notably the causes of fluctuations in demand, and the sensitivity of demand to different types of fluctuation. These have where applicable been cross referenced with the UKWIR Code of Practice[6] expected

[6] Managing through drought: Code of practice and guidance for Water companies on water use Restrictions – UKWIR Report 09/WR/33/2 (2009), amended by UKWIR 11/WR/33/3 (2011)and UKWIR14/WR/33/6 (2013)

savings. The quantities saved do not represent year-round reductions; they are likely to be seasonal reductions only, curbing peak demands and maintaining a closer to average demand throughout the year. The assumed reductions take account of the reduction in peak summer demands witnessed over the last 15 years as a result of high meter penetration among the Company's customers.

6.2.1 Leakage Reduction

One of the demand side options listed is enhanced leakage reduction, which would be effected through the deployment of additional leakage detection resource. A defined benefit from this activity is difficult to precisely quantify as it is in part reliant on the ability to detect more and smaller leaks, as well as the ability to procure the additional skilled personnel. The additional benefit would depend on the preceding level of leakage control already in place, and is estimated at anything between 0.5-2Ml/d. It is the Company's view that there will be little benefit in additional leakage control within the timescales of a single season drought given the Company's resource position. We would however expect to prepare for implementation of this option following a second dry winter so that we are able to implement activities alongside appeals to customers for restraint. In any case the Company would review the current leakage position from the beginning of a drought sequence and fully consider the benefits of implementing additional leakage detection and repair activity at any time.

Some limited pressure management has already been implemented, in the form of pumping programme efficiencies. The scope for introducing further pressure management measures, which is believed to be relatively minor, is being investigated as part of the Company's long-term leakage strategy. We do not believe that the scope for savings is significant. However, this option would be considered alongside other demand management options.

6.2.2 Temporary Water Use Restrictions

Cambridge Water's published level of service is to introduce a hosepipe ban (now a temporary ban on water use) on average not more than once in 20 years.

The introduction of the Flood and Water Management Act (FWMA) 2010 effectively superseded water companies' powers to ban hosepipe usage as set out in the Water Industry Act 1991, section 76 by allowing them a wider range of temporary water use restrictions that can be implemented without recourse to a drought order. The FWMA makes provision for applying restrictions to all or part of a Company's area. It also provides the opportunity for companies to apply concessions, and to make exemptions for certain activities. The Water Use (Temporary Bans) Order 2010 provides more detail on types of usage, exemptions and conditions relating to companies' new powers.

The estimated range of savings as estimated by UKWIR research[7] is between 5-9.5% of domestic demands, however experiences from the 2011-12 drought indicate that savings could be in excess of 10%.[8]

[7] Drought and Demand: Modelling the impact of Restrictions on Demand during Drought, UKWIR 07/WR/02/3

The Company will follow the requirements of the FWMA, and the UKWIR Code of Practice[9] when considering temporary water use restrictions, particularly with regard to: the way in which representations will be dealt with; a proportionate response to the prevailing drought conditions; and communication with customers. These areas are discussed in more detail below.

6.2.2.1 Representations

Cambridge Water plans to allow a period of 21 days within its implementation programme for receiving and responding to representations on temporary use restrictions. This period is considered appropriate as, once the decision has been made to impose restrictions, the process should be as swift as possible, in order to gain maximum benefit, whilst allowing ample time for reviewing any representations received. This is in line with the guidance set out in the UKWIR *Code of Practice and Guidance on Water Use Restrictions*.[10]

The process for making representations, and the time allocated for this, will be stated in the notices published by the Company to advertise the proposed restrictions. Notice of our intention to implement restrictions will be published on our website and in at least two local newspapers. From the date the notice is published on our website we will allow a minimum of 14 days for representations to be submitted to us. We will consider and respond to representations within a further 7 days making a total of 21 days for implementation of the restrictions. The effects of the representation period have been built into our communications plan – see Section 10.0, and the timing and triggers for drought actions, in Section 5

Representations received from individuals or groups will be considered by the Drought Management Team in a fair and even-handed manner. To ensure transparency, details of the representations received, the consideration given, the decision reached, and the reasons behind the decision, will be communicated, not only in writing directly to the individual or group making the representation, but also to the general public through regular and timely updates on the Company's website.

6.2.2.2 Activities Covered by Restrictions

The FWMA 2010 has increased the range of uses of water that can be controlled by water companies without referring the decision to the Secretary of State. The extended scope of the power in section 76(2) of the WIA 1991 (as amended by section 36 of the FWMA 2010) is as follows:

"Only the following uses of water may be prohibited –

a. watering a garden using a hosepipe;

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[8] Understanding the impacts of drought restrictions 14/WR/01/13, UKWIR, 2013
[9] Managing through drought: Code of practice and guidance for Water companies on water use Restrictions – UKWIR 14/WR/33/6, 2013
[10] Managing through drought: Code of practice and guidance for Water companies on water use Restrictions – UKWIR 14/WR/33/6, 2013

b. *cleaning a private vehicle using a hosepipe;*

c. *watering plants on domestic or other non-commercial premises using a hosepipe;*

d. *cleaning a private leisure boat using a hosepipe;*

e. *filling or maintaining a domestic swimming or paddling pool;*

f. *drawing water, using a hosepipe, for domestic recreational use;*

g. *filling or maintaining a domestic pond using a hosepipe;*

h. *filling or maintaining an ornamental fountain;*

i. *cleaning walls, or windows, of domestic premises using a hosepipe;*

j. *cleaning paths or patios using a hosepipe;*

k. *cleaning other artificial outdoor surfaces using a hosepipe."*

The Water Use (Temporary Bans) Order 2010 provides a definition of "using a hosepipe", which *"includes the following -*

a. *drawing relevant water through a hosepipe from a container and applying it for the purpose;*

b. *filling or partly filling a container with relevant water by means of a hosepipe and applying it for the purpose."*

It should be noted that, whilst these activities using a hosepipe, as defined by the legislation, are banned, gardens can still be watered using a bucket or watering can, using stored rainwater (in a water butt) or by reusing greywater, from a bath or washbasin.

For clarification, watering a "garden" includes the following: domestic gardens; parks; lawns; grass verges; sports and recreation fields; allotments; and any other green space.

6.2.2.3 Implementation of Restrictions

The UKWIR CoP on applying water restrictions recommended 4 fundamental principles for good drought management;

1. Ensure a consistent and transparent approach
2. Ensure that water use restrictions are proportionate
3. Communicate clearly with customers and the wider public/users
4. Consider representations in a fair way

Our previous drought plan indicated a lead time of 9 weeks for the implementation of temporary water use restrictions. This was based on a timetable for seeking internal Board approval and giving notice to customers once the trigger had been breached. This timeline has been reviewed and significantly reduced to reflect a more agile approach. It is proposed that a lead time of 2 weeks is required to allow internal communication and Governance and external communication with the Environment Agency and neighbouring water companies. A period of 3 weeks will then follow for publication of the notice and receipt and consideration of representations. This reduces the period to 5 weeks from the previous 9.

We will give notice of our intention to introduce a ban, and the terms of the ban, including any concession, exemptions and phasing, in a minimum of 2 local newspapers and on our website; www.cambridge-water.co.uk. The notice will clearly state the proposed date of commencement and the period and method for making representations. The notice is a formal and legal requirement which must take a certain format and contain certain information. As such, it needs to be published in full in appropriate media. However, we will also use other channels of communication to make customers aware of the proposed ban and provide plain English versions to describe what it means for them, and highlight concessions and exemptions.

Whilst our Company specific drought triggers will indicate the timing for the consideration of restrictions, we will liaise with neighbouring water companies and the Environment Agency to determine where others may be in the application of their own drought triggers leading to consideration of a temporary use ban. Experience and feedback following the 2011-12 drought shows that a consistent regional approach from water companies to implementing restrictions in terms of timing, concessions and exemptions helps to ensure clear and concise customer communication. Where possible we will endeavour to coordinate the approach to implementing restrictions across Company areas by using consistent messages.

Any applied restrictions will be proportionate to the nature of the water supply situation and the water savings that will result. Current legislation allows for a water Company to impose restrictions within an area smaller than its overall area of supply; however, our approach is to apply restrictions across our whole supply area. As our water supply network is highly integrated, and demand profiles similar across the area, there is no benefit to be gained from a more localised approach. Our approach is consistent with the single water supply zone definition as used in our Water Resources Management Plan (WRMP), and we believe it will prove the least complicated for our customers.

6.2.2.4 Phased Introduction of Restrictions

The FWMA allows companies to implement restrictions using a phased approach; however, after consideration of this we have concluded that a single phase introduction of a temporary water use ban is most equitable for our customers.

The introduction of restrictions will not be taken lightly, and only implemented when a serious shortage of water poses a threat to customers' security of supply. Therefore the most beneficial effect will be seen from full use of the FWMA powers. A ban will

also follow an extended period of appeal for restraint to customers, in which many activities, such as lawn watering will already have been suppressed or curbed. These appeals for restraint have historically led to the greatest reductions, and we would expect to see upwards of a 5% reduction in demand from garden watering during the summer months, allowing for the reductions already seen in recent years as a result of increasing meter penetration among domestic customers.

A single phased approach using the full powers of the legislation will ensure maximum water savings are achieved by communicating a clear message to our customers. We believe this approach will also provide a fair and consistent approach to all of our customers, and ensure that the restrictions are easier to understand. The approach is consistent with that taken by neighbouring water companies in their current drought plans.

6.2.2.5 Concession and Exemptions

Under current legislation ompanies have the power to make concessions and exemptions. Having initially discounted this as being impracticable given the size and nature of our supply network we have reviewed the results of the of the 2011-12 drought surveys[11] regarding concessions and exemptions, and would propose the following based on discussions with neighbouring companies prior to their implementation of restrictions in the past;

- Blue badge holders will be included as Discretionary Universal Exemptions to the restrictions
- The use of a hosepipe to fill or maintain a pond containing fish will be included as a Statutory Exception

We will also carefully consider other exceptions for the watering of outdoor plants, and implement any of these in a manner consistent with neighbouring water companies.

Other examples of exemptions that may be considered could include; vulnerable customers; those demonstrating water reuse technologies for watering using a hosepipe; or where it is felt to be in the best interests of the community.

A number of activities under the restricted categories are already exempted:

a. **Watering a garden using a hosepipe**. The use of hosepipes is exempted under the legislation for; agricultural land, commercial use for the growing of crops, fruit, vegetables and other plants; temporary flower displays, land used for National Plant Collections

b. **Cleaning a motor vehicle using a hosepipe**. Excludes public service vehicles, and goods vehicles as defined by legislation.

[11] (UKWIR 14/WR/01/13)

c. **Watering plants on domestic or non-commercial premises using a hosepipe**. Exemptions are for plants in outdoor pots and in the ground, undercover in public authority or commercial premises, plants grown or kept for sale or commercial use, plants as part of a national collection or flower display

d. **Cleaning a private leisure boat using a hosepipe**. Exemptions in legislation for vessels used in course of a business, vessels made accessible to the public, cleaning any area of a private boat enclosed by a roof and walls other than doors and windows.

e. **Filling or maintaining a domestic a swimming pool or paddling pool**. Exemptions for, where necessary during the course of construction, using a hand held container filled directly from a tap, where it is designed constructed or adapted for use in medical treatment, used for decontaminating animals from infection or disease, used in the course of veterinary treatment, in which fish or aquatic animals are being reared or kept in captivity.

f. **Drawing water using a hosepipe for domestic recreational use** (includes use for water slides or other similar domestic equipment, by adults or children). No exemptions to this category

g. **Filling or marinating a domestic pond using a hosepipe**. Exemptions include filling or maintaining a pond in which fish or other aquatic animals are being reared or kept in captivity

h. **Filling or maintaining an ornamental fountain**. Exempt are fountains on or near a fish pond whose purpose is to supply sufficient oxygen to the water to maintain fish health.

i. **Cleaning walls or windows of domestic premises using a hosepipe**. Exemptions are cleaning activities for health and safety reasons, and likely to be removing risk to animal or human health and safety, or the prevention and control of causative agents of disease.

j. **Cleaning paths or patios using a hosepipe**. Exemptions are cleaning activities for health and safety reasons, and likely to be removing risk to animal or human health and safety, or the prevention and control of causative agents of disease.

k. **Cleaning other artificial outdoor surfaces using a hosepipe**. Exemptions are cleaning activities for health and safety reasons, and likely to be removing risk to animal or human health and safety, or the prevention and control of causative agents of disease.

We recognise that the implementation of temporary bans may have an impact on some commercial trade activities. Whilst hand washing and domestic window cleaning using a hosepipe or water fed pole is banned, these activities can continue, using water from a bucket. Nurseries and garden centres can be affected by a loss of trade, and we will work closely with trade bodies, such as the Horticultural Trade Association and the Turfgrass Growers Association to minimise the impact, by early

communication and consultation. We will collaborate to emphasise to customers that watering of plants and lawns is only banned using a hosepipe, and to support available alternatives such as water butts and drought resistant plants.

6.2.2.6 Communications

Any decision to introduce temporary restrictions will be made in consultation with the Environment Agency, and neighbouring water companies to ensure a consistent approach across the region. The frequency of these meetings and communications will be increased as a drought situation develops, and joint communications and press releases will be issued, where deemed appropriate for the situation.

Whilst the emerging drought situation may differ for each Company in a region, and the timings for implementation of restrictions will depend on the local situation, we will endeavour as far as is practicable, to provide a consistent message to customers. We would expect a National Drought Management Team to be convened for any regionally significant drought and for this to be a primary forum for the alignment of communications and activity by those companies involved.

We will follow the principles laid down in the *Code of Practice and Guidance on Water Use Restrictions*[12] when considering how to implement temporary use restrictions, to ensure that our proposals are consistent, proportionate and clearly communicated, and that representations are considered fairly. Any proposal to introduce a temporary restriction will be advertised on the Cambridge Water website www.cambridge-water.co.uk and in at least two local newspapers, as set out in legislation. A variation, or subsequent lifting, of the restrictions will be similarly advertised. The timing of any restrictions will be aligned with neighbouring companies wherever possible.

All actions taken during the process for the implementation of restrictions will be recorded, to provide an audit trail. Any complaints received will be dealt with through the Company's normal complaint handling procedure. Further details of the Communication Plan are included in Section 10.

6.2.2.7 Ordinary Drought Orders (Non-Essential Use Restrictions)

The Company's published level of service for the Cambridge region is to introduce restrictions on non-essential usage not more than once in every 50 years. Ordinary Drought Orders allow water companies to further restrict non-essential water use at commercial and institutional premises and are more wide-ranging than the ones introduced under the provisions of the Water Use (Temporary Bans) Order 2010. Provision for drought orders is contained in the Water Resources Act 1991, Section 73 and 74, and requires application to and approval from the Secretary of State, who must be satisfied that a 'serious deficiency of supplies in an area' exists, by 'reason of an exceptional shortage of rain'

[12] Managing through drought: Code of practice and guidance for Water companies on water use Restrictions – UKWIR 14/WR/33/6, 2013

The range of purposes to which drought orders apply is set out in the Drought Direction 2011[13]. These are;

- Watering outdoor plants on commercial premises
- Filling or maintaining a non-domestic swimming pool or paddling pool
- Filling or maintaining a pond for ornamental use
- Operating a mechanical vehicle washer
- Cleaning any vehicle boat aircraft or railway rolling stock
- Cleaning non domestic premises
- Cleaning a window of a non-domestic building
- Cleaning industrial plant
- Supressing dust
- Operating automatic cisterns in unoccupied or closed buildings

As highlighted in Section 6.1 above, we expect that drought orders will only be needed under unprecedented drought conditions. The decision to apply for drought orders would not be taken lightly; hence it is one of the later actions in the management plan and is likely to be needed only in the more severe drought scenarios. Although drought orders can be made in respect of a number of different drought management actions, we would not expect to require an ordinary drought order for any other purpose than the restriction of non-essential use. Before embarking on the process to extend restrictions to the non-domestic sector we would ensure that our powers available under the FWMA 2010 had been fully exercised. In view of the timescale involved in preparing an application and granting an order, of between 3-6 months, the timeliness of the application is paramount. For example, the need for a Drought Order would be considered in advance in readiness for the potential continuation into a third dry winter and preparatory work for such an application undertaken.

The stages required to implement a drought order are as follows:

1. ***Preparing and lodging an application*** - Publication of advertisements in the press is followed by an application to the Secretary of State, including reasons for requiring the drought order, supporting evidence and information. A period of 7 days is allowed for objections to be made.

2. ***Hearings or inquiries*** - The Secretary of State will hold an enquiry or hearing if any objections are received. A 7 day period is required for the Company to advertise the hearing.

3. ***Implementation*** - Once approved, the Company must again advertise the implementation of the granted drought order.

[13]https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/182606/droughtdirection2011.pdf

It is not possible to be any more specific here on exemptions and concessions, as the range of drought order restrictions will vary according to the specific circumstances of a particular drought; nevertheless, the Company will follow the requirements of the relevant legislation and guidance; in particular, the Defra publication Drought Permits and Drought Orders[14] and the principles laid down in the Code of Practice for Water Restrictions[15] in order to ensure that our proposals are consistent, proportionate and clearly communicated, and that any objections are considered fairly.

6.3 Supply-side Actions

The supply options presented in this plan have been reviewed since the 2012 drought plan, as a result of operational changes and actions arising from the 2011-12 drought. The options included remain those that optimise the use of existing licences, as this is currently sufficient to manage expected drought sequences. During the 2011-12 drought, we initiated one of our supply side options earlier than required, as other sources included in normally available deployable output were not available at the time. This option has consequentially been removed from our plan is replaced.

At the time of publication the Company is in the process of reviewing its WRMP prior to publication of a draft plan in 2018, and as part of this is screening further options to maintain future security of supply. Some of these options may be proposed as future drought options if they are deemed required to maintain sufficient headroom in deployable output, or as drought permits where the development of these is deemed a necessary approach. (For instance if conditions, restrictions or reductions are made to existing licences.) The need for drought permits and of considering additional drought options will depend on the review of deployable output, and reductions to this, as a result of licence changes and proposed reductions to deployable output arising from the Environment Agency Sustainable Catchments programme and future NEP requirements.

6.3.1 Deployable Output

At the present time the Company can demonstrate headroom in its licensed deployable output, both against average daily demand and against estimated peak week demand. The current Water Resources Management Plan (WRMP14) indicates a surplus over the next 25 years.

However, the deployable output available to the Company in the WRMP is calculated on the basis of abstraction licences, as granted by the Environment Agency and the volume of water that these currently allow us to abstract. Some elements of the Company's abstraction licences are time-limited until 2018, and the WRMP currently includes these by applying the 'presumption of renewal' under which these have previously been renewed. If these licences are not renewed on the same terms, or the full quantities available restricted in any way, we may need to consider replacing this loss to permanent deployable output with temporary drought permits to provide additional supplies during drought periods. This would constitute a material change in

[14] Drought permits and drought orders, Defra, May 2011, www.gov.uk
[15] Managing through drought: Code of practice and guidance for Water companies on water use Restrictions – UKWIR 14/WR/33/6, 2013

circumstances, and would require a further revised drought plan to be produced within 12 months from the publication date of this plan.

Other uncertainties which may have a detrimental effect on deployable output could arise as a result of the impact of abstractions on the environment, as determined by the National Environment Programme in the form of Sustainability Changes, and by Water Framework Directive (WFD) standards to be assessed and implemented through the Environment Agency Sustainable Catchments Programme. Climate change could have further impact; however, recent vulnerability assessments for the WRMP have indicated this is likely to be relatively minor in terms of available yields at sources, which are constrained, in the main, by licenced quantities.

Whilst safeguarding the Company's full licensed capability remains a primary aim, and uncertainty around potential future reductions a concern, this plan has been developed on the basis that we will retain current licence capability for the duration of five years from publication. If any changes become more certain in the interim, we will discuss these with the Environment Agency to determine if they constitute a material change to circumstances that would trigger an earlier review and revision of the plan.

The uncertainties arising from environmental consideration are discussed in more detail in section 12.

6.3.2 Maintaining Existing Sources

Management procedures are in place to ensure that, under normal conditions, boreholes, pumping & treatment plant and storage reservoirs are maintained to reduce the risk of outage during drought periods. Based on the Company's ability to withstand previous droughts, and taking account of the current headroom demonstrated in the Company's supply/demand balance, other engineering options to reinforce security of supplies (e.g. the development of satellite sources) have not been considered at this stage. However, in the light of the uncertainties outlined above, the Company recognises the importance of constantly reviewing and updating this plan, to reflect the latest situation. Hence, the options identification underway for WRMP19 will be used to assess the suitability of supply side options identified as future drought options. The drought options described in Appendix D are the feasible supply options currently available to the Company until this process has been completed.

During the consideration of supply side options in the 2011-12 drought, and in the light of certain planned operational changes, one of the drought management decisions taken at the end of 2011 was to implement the supply-side option in the previous plan to re-commission Horseheath Pumping Station. This source had been taken out of service some years ago following a *Cryptosporidium* failure. As part of our feasibility studies we reassessed the potential risks at the site in line with water quality guidance, and whilst this risk had reduced, the treatment at source was enhanced to deal with the residual risk. Although the relevant drought trigger level had not been breached, this action was a cost-effective way of maintaining security of supply during future droughts. Since the Horseheath supply side option is now permanently available it has been removed from the list of options for this plan.

6.3.3 Bulk Supplies

The Company receives and supplies small quantities of water by means of cross border and bulk supplies to Anglian Water, and from Anglian Water and Affinity Water. The maximum volume that we can currently import from Anglian Water is 0.05Ml/d, and we can export agreed volumes of up to 0.25 Ml/d and 0.37 Ml/d to Anglian water and Affinity water respectively. These imports and exports are subject to the usual commercial agreements and would not be expected to change other than the transfer volumes may fluctuate with demands. There is little scope for these to be optimised or enhanced to provide additional supplies during a drought, as it would normally affect the neighbouring companies in a similar manner.

The Company has the facility to provide both Anglian and Affinity Water with slightly larger transfers of water at other locations which are not subject to formal agreements for water resources purposes. These can be made available if required, but this is on a best endeavours basis if the Company believes the water is not required to supply its own customers. These emergency drought supplies would not be relied on by neighbouring companies in a serious drought, but may be available in the short term whilst other options are implemented. Continuous review and updates on the position and availability of transfers will be part of the communications plan with other water companies.

6.3.4 Drought Orders and Permits

Drought Permits and Orders are management actions that allow water companies additional flexibility to manage water resources for water supply. Drought orders that have a supply side benefit can be those that prohibit, limit or allow modification by us, or the Environment Agency to discharge, take or supply water to specific locations. Due to the nature of our supply system we have not identified any appropriate drought orders other than that for the restriction of non-essential use as described in section 6.2.2.7 for demand actions.

For clarity, and to demonstrate compliance with the Drought Plan (England) Directions 2016, the only permits or approvals that we rely on in this drought plan are the non-essential use bans (NEUBs) described in section 6.2.2.7. We work on the basis that these have a lead in time of three months.

6.3.5 Potential Drought Permit Sites

Drought permits can be granted by the Environment Agency under the Water Resources Act 1991, Section 79a (as amended by EA 1995) to allow companies to take additional water from sources, by the modification or suspension of conditions on an abstraction licence. This plan does not include the option for the Company to improve its supply capability by taking additional water, as it is not considered a realistic option at this time. Whilst a number of our abstraction licences are under review for potential changes as a result of the AMP6 National Environment Programme, these would not be in effect until 2020. The option to convert any of the future restricted volumes into supply options will be determined alongside the review of supply options being undertaken for the WRMP19. Any conclusions arising will be

incorporated into future revisions of the drought management plan. In the meantime, we have the licensed volumes available to us for abstraction, without the requirement for drought permits. We would expect any futures changes to deployable output as a result of licence changes to be offset by additional supply options, or by drought permits to access the previously licenced volumes. Our environmental assessment of the actions in this plan has determined that the risk of environmental impact from these is considerably lower than would be expected from any drought permits.

As discussed in Section 6.3, we expect to maintain access to the licenced deployable output currently available and in our WRMP14 in order to effectively manage an extended drought sequence. We have however, identified potential risks to our surplus of supply over demand as a result of time limited licences and the Environment Agency Sustainable Catchment programme. The impact of this on our abstraction licences is currently uncertain; however we have undertaken an assessment of the level of risk to licences, which is presented in Appendix F.

Any changes that are made to licences a result of more stringent environmental conditions may provide potential drought permit options to access the previously available volume of supply. However, where the Sustainable Catchments programme has identified a risk of Deterioration of WFD standards as a reason for reduction, the use of these has been assessed in our Environmental Assessment. Whilst these licences will not require a drought permit we will ensure that there is no Deterioration in WFD status from increasing use, except in circumstances in which Article 4.6[16] of the WFD might be applicable.

Whilst we understand the likely performance of our sources in historic drought conditions, the Source Reliable Outputs (SRO) studies apply the UKWIR analytical approach and methodology to determine lowest allowable pumping water levels, which allows us to extrapolate performance for lower groundwater levels. At a number of sites, abstraction would be constrained by a Deepest Advisable Pumping Water Level (DAPWL), however the UKWIR approach indicates that at some other sources, the peak yield achievable in dry conditions could exceed the licenced volumes. In the event of an extended drought – beyond 3 dry winters, these sources could be evaluated for appropriateness as drought permit applications to abstract additional supplies. With the current licences available this is not deemed necessary, and only an extended drought would provide sufficient data to determine the available additional yield as conditions worsened.

Any future drought orders, and drought permits other than restrictions on non-essential use, would be subject to obtaining the relevant permissions from the Environment Agency or Secretary of State, and would require comprehensive environmental justification and monitoring plans. Each site proposed would require an Environmental Assessment report to assess the potential impacts on the environment and mitigation measures to address any negative impacts identified.

This plan does not propose any drought permits.

[16] COMMON IMPLEMENTATION STRATEGY
FOR THE WATER FRAMEWORK DIRECTIVE (2000/60/EC) Guidance Document No. 20 Technical Report - 2009 - 027

6.3.6 Emergency Drought Orders

An emergency drought order would allow the Company to further prohibit water use through rota cuts, and to supply water by means of stand pipes or water tanks. It is clear from Defra guidance and customer research that this level of water restrictions would be unacceptable. The Company level of service for the risk of rota cuts or use of standpipes is on average less than once in 100 years. This is included only to recognise that circumstances beyond our control could possibly lead to an extremely serious drought of a magnitude not experienced in the UK occurring. In practice, if we had to resort to these measures, we would have implemented our emergency plan and would seek additional support under the Civil Contingencies Act to avoid rota cuts and standpipes being required.

7 Environmental Impacts

In order to ensure minimum environmental impact from our drought management actions, there is a requirement to monitor and assess the impact of these activities. The Environment Agency provides guidance on the recommended approach[17] which we have applied to our plan.

Our plan does not propose any supply side drought orders, drought permits or temporary water transfers; however our supply actions include the use of alternative sources of water to those normally used, under abstraction licences held by the Company.

7.1 Environmental Assessment

The likely impacts on the environment of implementing the supply actions within this drought plan have been assessed, in accordance with the guidance provided by the Environment Agency and in consultation with the appropriate competent authorities as required. This includes details of any likely changes as a result of our actions to water flows and levels, Water Framework Directive ecological status, designated sites, priority habitats and other protected areas. Designated sites include Sites of Special Scientific Interest (SSSIs), Special Areas of Conservation (SACs), and Local Nature Reserves (LNRs), which are indicated on Figure 11 showing proximity to Company abstractions. Water Framework Directive water bodies and assessment points are shown on Figure 12.

This drought plan includes an assessment of:

- Likely impact of implementing supply side options
- Likely impact from the increased use of existing licences
- Details of permits required to implement any options
- The risks of implementing any supply side option
- Monitoring and mitigation actions required for any drought management action

We do not consider that our actions in this plan would impact on cultural or heritage sites, the spread of non-native species, water quality or biodiversity under the NERC[18] Act 2006

We have considered the likelihood and frequency of drought management actions occurring, together with the level of environmental impact they may cause by assessing the available data and taking account of the sensitivity of receptors, such as designated or protected sites and features. Our assessments have wherever possible, followed the recommended approach in preparing an Environmental Assessment shown in Figure 13.

[17] Environmental Assessment for Water Company Drought Plans, EA, May 2016
[18] Natural Environment and Rural Communities Act

Figure 11. Location of Designated sites and licenced abstractions *(See Appendix B for key)*

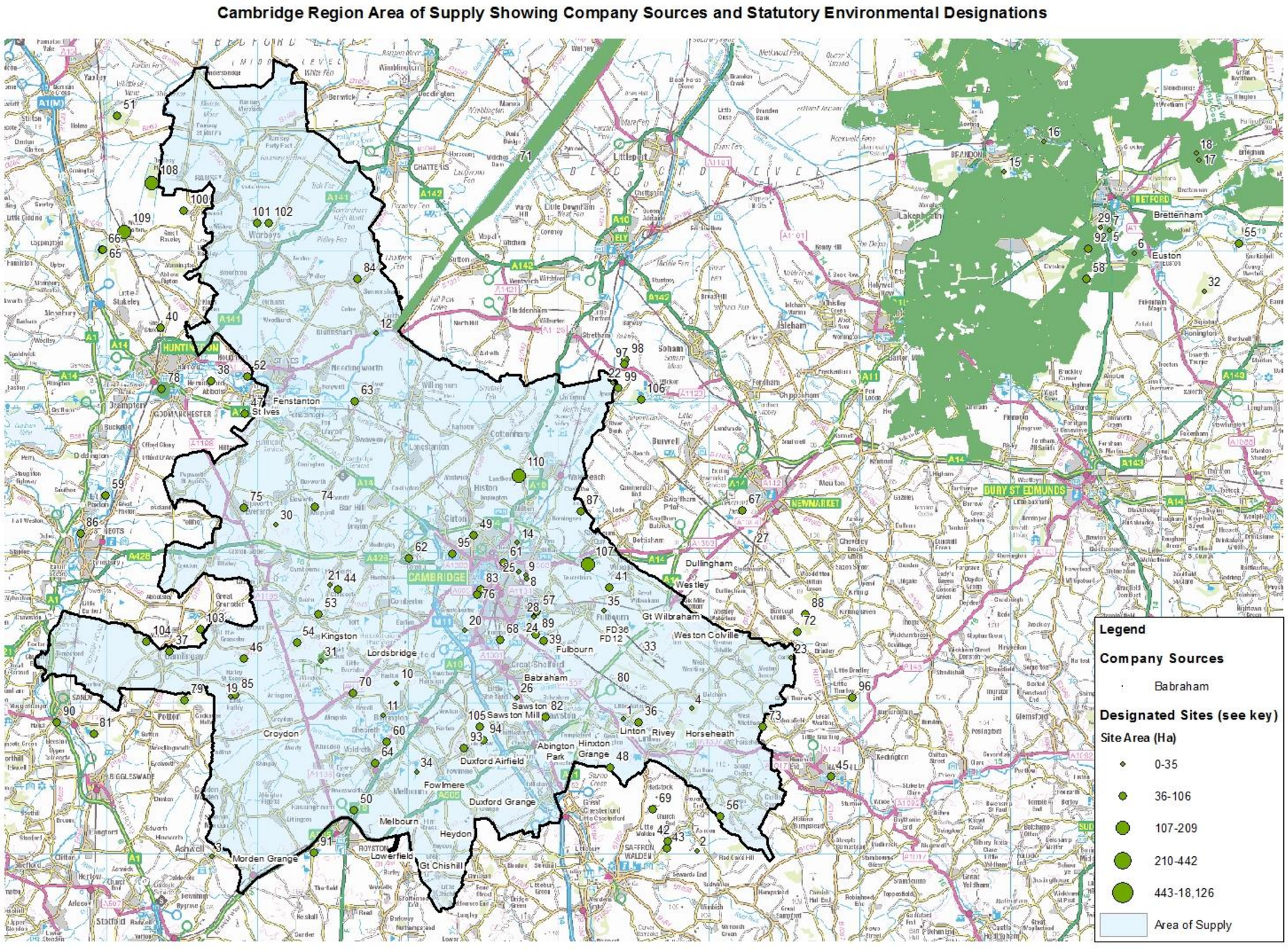


Figure 12. Water Framework Directive sites and licensed abstractions

Cambridge Region Area of Supply Showing Company Sources and Water Framework Directive Rivers and Monitoring Network

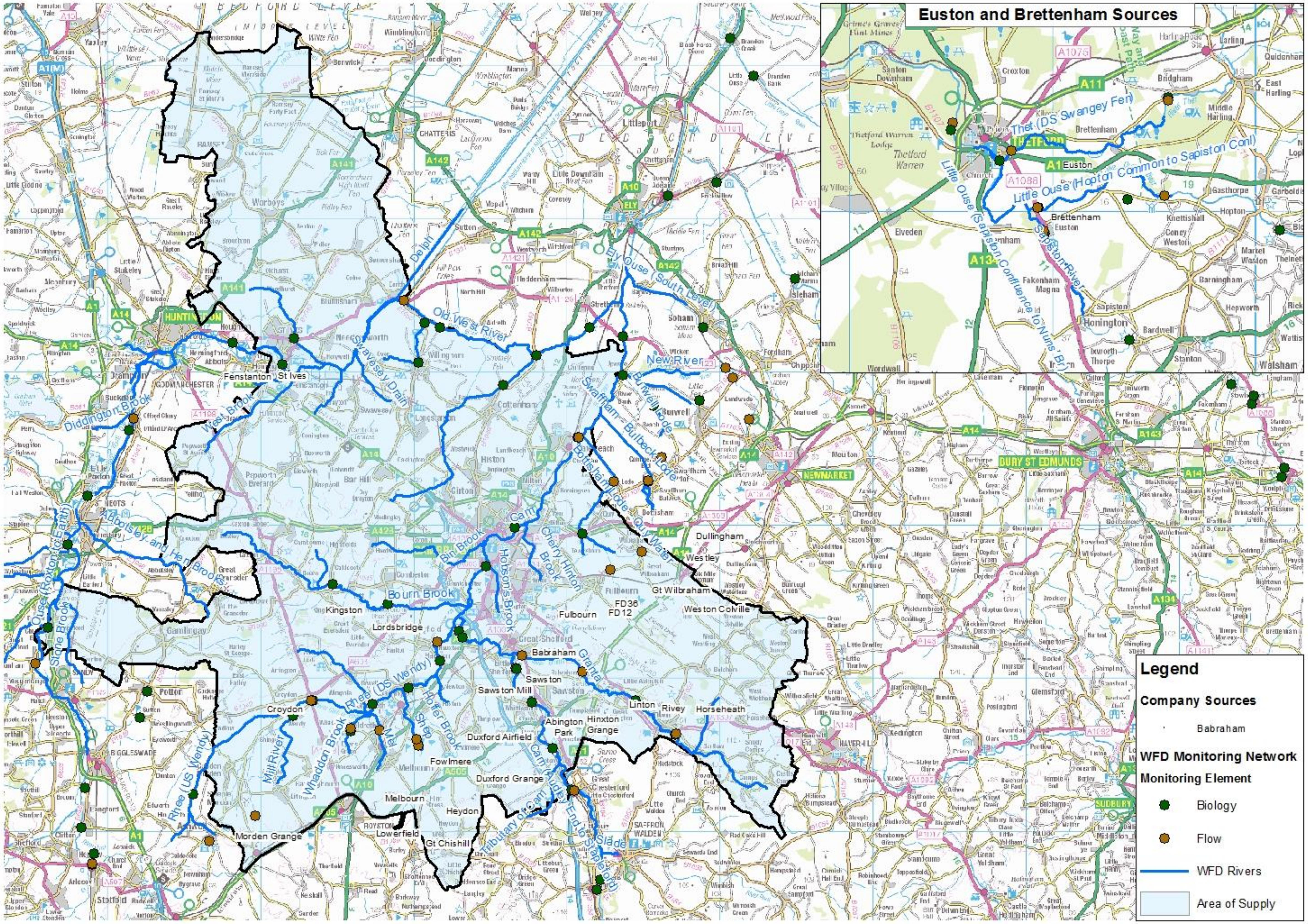
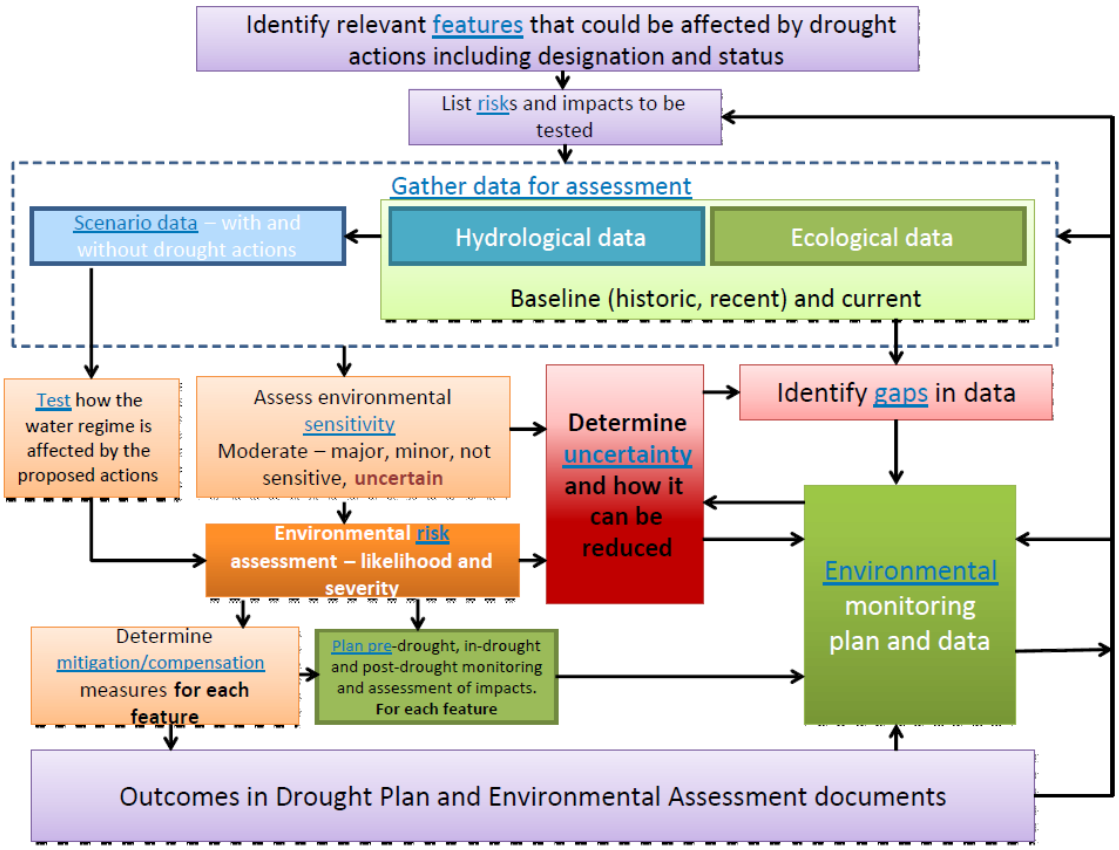


Figure 13. How to prepare an Environmental Assessment (EA guidance)

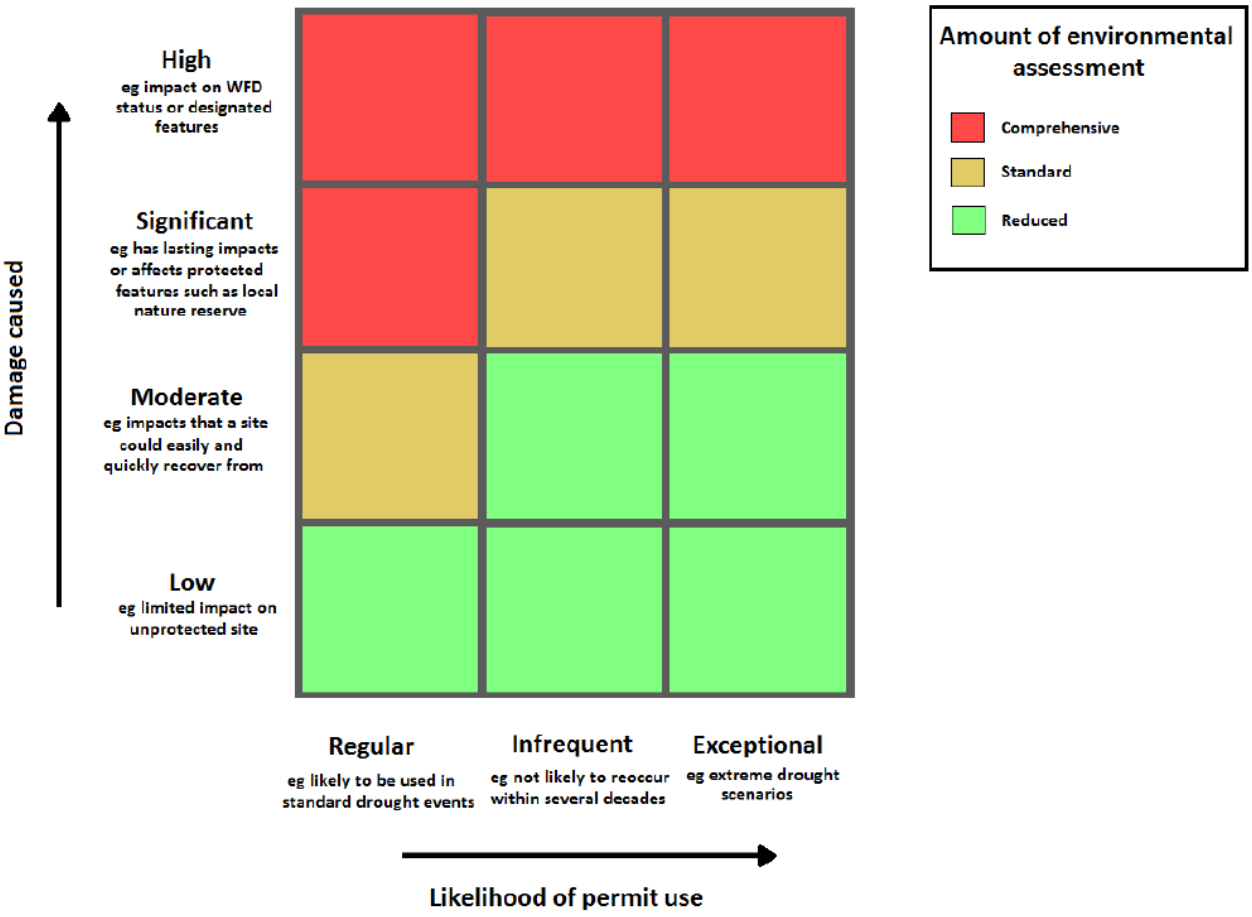


Source: Environmental Assessment for Water Company Drought Plans, EA, May 2016

7.2 Supply Side Option Assessment

The likely impact of each supply side option has been assessed according to the risk matrix shown in Figure 14. These assessments, together with any associated environmental monitoring or surveys, are discussed in the following sections, and summarised in Environmental Assessment forms in Appendix E.

Figure 14. Assessing the risk level of drought management options



Source: Environmental Assessment for Water Company Drought Plans, EA, May 2016

7.2.1 Option S1: Re-commission Fleam Dyke 12 Borehole

The source at Fleam Dyke 12 has been unused since 2013, when it was taken out of supply as a precaution following a bacteriological failure in the raw water. This source is a satellite borehole to the main Fleam Dyke 36 site and allows the full daily average licence to be abstracted in dry conditions, as the DAPWL at the Fleam Dyke 36 borehole is constrained by the presence of an adit.

The use of Fleam Dyke 12 will be within existing licenced quantities and enable the continued use of the maximum licence at Fleam Dyke throughout a drought. The EA RSA Programme has identified a potential impact from abstractions at Fleam Dyke on Cherry Hinton Brook. As part of its current 5 year National Environment Programme commitments, the Company has been undertaking flow and hydroecological investigations into the likely impact of abstractions at Fleam Dyke on the Cherry Hinton Brook, in order to inform our Options Appraisal for the NEP scheme. Initial

conclusions from these studies[19] are that the abstraction at Fleam Dyke is unlikely to be causing a significant reduction in flows in Cherry Hinton Brook, or impact the ecology in the upper reaches of the brook. No other abstraction sensitive designated sites have been identified in the vicinity of the source.

The Environment Agency Sustainable Catchments assessment has also identified Cherry Hinton Brook, River Granta, Bottisham Lode-Quy Water and Hobsons Brook as being potentially impacted by abstraction at Fleam Dyke. These investigations have been undertaken with the Fleam Dyke historic licence utilisation at around 80%. Abstracting the full licence at Fleam Dyke over an extended period could pose a minor risk of Deterioration to WFD status. See Environmental Assessment in Appendix F.

In drought conditions where the full licence was required to be utilised for in excess of 12 months, we would reintroduce the monitoring in Cherry Hinton Brook to understand any impact on the flows and ecology as a result of using our licence as this is where any impacts would be observed. Some additional and existing monitoring would be used at other waterbodies to determine more distant impact, and we would liaise with the EA to ensure the Lodes Granta support scheme was in operation.

7.2.2 Option S2: Re-commission Croydon PS

The Croydon source has been decommissioned since 2012, due to the treatment no longer being adequate, and this has been deducted from the deployable output figure which has been updated in the WRMP Annual Review, last published in 2016. The works would require an entire refit, and up to 12 months lead time has been allowed for the design and installation. This option utilises the existing abstraction licence and no drought permits would be required to abstract from the site.

There are no abstraction sensitive designated sites in the vicinity of the source, the nearest SSSI being more than 3km from the source, and as the abstraction is in the Lower Greensand, these features are highly unlikely to be affected. The EA identified no features that were likely to be impacted in the RSA programme for inclusion in NEP investigations.

The Environment Agency Sustainable Catchments assessment has identified Millbridge and Potton Brooks as being at Medium Risk of deterioration against WFD status. However Millbridge Common Brook was investigated by the EA, and no further actions were recommended to control abstraction to protect the biology, although it is being taken forward for AMP 7investigation into the risk of deterioration. To re-commission the source an assessment of deterioration will be required to determine any impact on flows, which should be completed in AMP7 prior to any need for this option. Any findings from the No Deterioration investigations will be reviewed and incorporated into a revised drought plan as necessary. Regardless, once this option is triggered and re-commissioning is initiated, an environmental monitoring programme of flows and groundwater levels for assessing any mitigation will be implemented in agreement with the EA.

[19] AMP6 RSA Options Appraisal: Cherry Hinton Brook 63684E R3 D1, ESI December 2016

7.2.3 Option S3: Re-commission Kingston PS

The source at Kingston was decommissioned in 2012, due to similar issues with the treatment as experienced at Croydon. The source deployable output has similarly been deducted from the deployable output figure which was updated in the WRMP Annual Review, published in 2016. The works would require an entire refit, and up to 12 months lead time has been allowed for the design and installation. This option utilises the existing abstraction licence and no drought permits would be required to abstract from the site.

There are no abstraction sensitive designated sites in the vicinity of the source, the nearest SSSIs are Eversden & Wimpole Woods and Kingston Wood being more than 3km from the source, and as the abstraction is in the Lower Greensand, these features are highly unlikely to be affected. The EA identified no features that were likely to be impacted in the RSA programme for inclusion in NEP investigations.

The Environment Agency Sustainable Catchments assessment has identified Bourn Brook as potentially being at risk from increased impact from groundwater abstraction. Bourn Brook has not been previously investigated under RSA or WFD programmes, so there could be a potential deterioration risk to WFD status. However, there would be no increase in abstraction over the licence utilisation in the assessment. Whilst no monitoring programme is envisaged or proposed, we would discuss this with the EA once the option was triggered and re-commissioning initiated.

7.2.4 Option S4: Re-commission St Ives PS

The St Ives source has been decommissioned due to a high risk from Cryptosporidium, requiring the installation of treatment and the construction of a building in which to locate the equipment. This option enables the daily licensed quantity to be abstracted from the source once treatment is in place, and no drought permits would be required to abstract from the site.

There are abstraction sensitive designated sites in the vicinity of the source, the nearest SSSIs less than 3km distant are Houghton Meadows and Hemingford Grey Meadows. In addition, the Ouse Washes, a RAMSAR site is over 9km from the source. However, The EA identified no features that were likely to be impacted in the RSA programme for inclusion in NEP investigations.

The Environment Agency Sustainable Catchments assessment has identified West Brook and the Ouse (Roxton to Earith) as features that could be impacted. The Ouse has been assessed under fully licensed conditions for the Habitats Directive, and there are no outstanding issues, therefore use of the St Ives licence would not have impact. West Brook has not been investigated under the RSA or WFD programme as there is no indication that low flows impact the ecology and WFD status. However, to re-commission the source an assessment of deterioration will be required to determine any impact on flows. Once this option is triggered and re-commissioning is initiated, an environmental monitoring programme for No Deterioration will be implemented in agreement with the EA.

7.3 Statutory Designated Sites

We have considered the environmental effects of this plan on designated sites, to which the following legislation applies:

- Conservation of Habitats and Species Regulations 2010 – Habitats Directive
- Wildlife and Countryside Act 1981 (as amended by the Countryside and Rights of Way Act 2000)
- Habitats Regulations Assessment (HRA) and Strategic Environmental Assessment Directive (SEA)
- Water Framework Directive, River Basin management Plans and UK Biodiversity Action Plan
- Other protected areas under international agreements such as Ramsar sites and non-statutory sites, such as local wildlife sites and reserves.

The results of the environmental assessments that include designated sites is presented in Appendix E

The sensitivity of sites to abstraction has been assessed under the Restoration of Sustainable Abstraction Programme (RSA) in conjunction with the Environment Agency, and continues to be assessed as part of the EA Sustainable Catchments programme. We have assessed the impacts of increasing abstractions within existing licenced quantities to inform our drought management decision making where this includes flexing abstractions within our published deployable output. This is discussed in section 8.3.2.

7.4 Habitats Regulations Assessment

The EU Habitats Directive, which seeks to safeguard Europe's natural heritage, was transposed into UK law by the Habitats Regulations 1994. The Regulations require a Habitats Regulations Assessment (HRA) to be undertaken to determine whether plans are likely to have a significant effect on European Sites, including Special Areas for Conservation (SACs), candidate SACS (cSACs), Special Protection Areas (SPAs) and Ramsar sites (Wetlands of international importance).

The Company has carried out the following HRA in fulfilment of its Habitats Regulations obligations.

There is one European Site which could be affected by Cambridge Water's drought plan, either alone or in combination with other plans and projects, and that is the East Wretham Heath area of the Breckland Special Area of Conservation (SAC). The Company's Thetford sources are located to the south of East Wretham Heath and, at the time that abstraction licences were originally granted for the sources, it was uncertain whether, and to what extent, abstraction would affect the water level. For

this reason, elements of the licences were made temporary, and a cessation condition incorporated, until such time as the likely effects were better understood.

As part of its 2004 application to renew the temporary licence elements, and to have the cessation condition removed, the Company commissioned a detailed study, which involved a programme of test pumping, monitoring and modelling. The study concluded that pumping at licensed quantities had a negligible effect on the meres at East Wretham Heath, and formed the basis of the Company's environmental assessment which accompanied its application. Following consultation with Natural England the Environment Agency approved the application, and granted a renewal of the temporary elements of the licences until 2015, following which they were further renewed until 2018. The cessation clause was also removed as part of the renewal process. As this clause was the primary reason for the temporary element of the licences being time limited, we would expect the licences to be renewed at the same quantities.

Therefore there is no significant effect on the Breckland SAC from these abstractions, and this has been accepted by the Environment Agency. This drought plan contains no proposals to exceed the current licensed capacity of the Thetford sources. Accordingly, the Company has determined that the plan is unlikely to have a significant effect on a European Site, and that an Appropriate Assessment, under the Habitats Regulations, is not required. This conclusion has been endorsed by Natural England.

However, the Environment Agency may require additional conditions to be applied for the licence renewal in 2018 as part of the different strategy and approach to time limited licences and any identification of deterioration risk arising from the Sustainable Catchments programme. This issue will be addressed at the time, and if necessary a material change may be required to this plan, if for example the full licensed quantities require drought permits in future.

7.5 Strategic Environmental Assessment

European Directive 2001/42/EC, otherwise known as the Strategic Environmental Assessment or SEA Directive, requires the "assessment of the effects of certain plans and programmes on the environment". Information and guidance on to how to comply with the Directive was published by the Office of the Deputy Prime Minister (ODPM), in its 2005 publication *A Practical Guide to the Strategic Environmental Assessment*. A subsequent UKWIR report[20], adapted the ODPM guidance for the water industry.

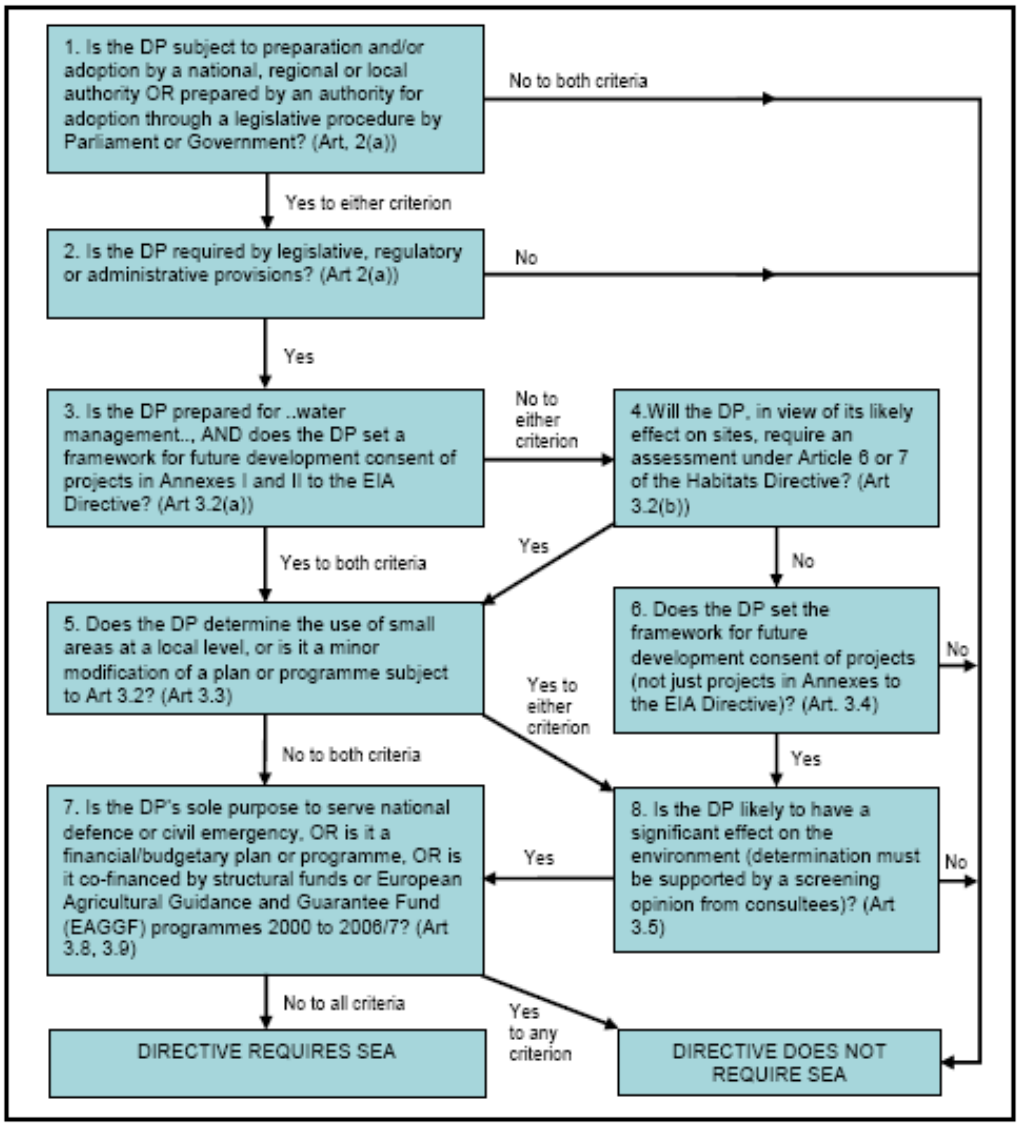
The decision-making process set out in the UKWIR report to determine whether plans require an SEA is presented in the form of a decision tree, which is reproduced as Figure 15.

Water companies, as responsible authorities, must determine if their drought plans fall within the scope of the SEA Directive. The Company has followed the UKWIR guidance, the decision tree, and the Environment Agency's drought planning

[20] Strategic Environmental Assessment – Guidance for Water Resources Management Plans and Drought Plans (07/WR/02/5), UKWIR 2007

guideline to arrive at an informed decision in this regard. The conclusions of the process are summarised below.

Figure 15. Decision Tree for Strategic Environmental Assessment (SEA)



The response to questions 1 and 2 is “yes”, as South Staffs Water is clearly an ‘authority’ within the meaning of the Directive, and the drought plan is a statutory requirement.

In response to question 3, although the drought plan is prepared for water management, it does not set a framework for future development consent of projects in Annexes I and II to the EIA Directive (Art. 3.2(a))

Question 4 asks whether the plan, in view of its likely effect on sites, requires an assessment under Article 6 or 7 of the Habitats Directive (Art. 3.2(b)). This question has been addressed in our environmental assessment and in Section 7.4 above and the Company has concluded, with the endorsement of Natural England, that no assessment is needed.

Question 6 seeks to determine whether the plan sets the framework for future development consent of projects (not just projects in Annexes to the EIA Directive) (Art. 3.4). The drought plan for the Cambridge region drought plan does not set the

framework for future development consent, and the answer is therefore “no” to this question.

Having followed published guidance it is the Company’s conclusion that a Strategic Environmental Assessment (SEA) is not required in respect of this drought plan.

7.6 NEP Investigations

7.6.1 Previous Investigations

As part of an agreed variation of its Thetford abstraction licences in 2005 the Company voluntarily surrendered part of its licence at Fowlmere, where an AMP3[21] environmental investigation had concluded that sustained high abstraction rates may have had a detrimental effect on the Fowlmere Watercress Beds SSSI. The Fowlmere mitigation measures also involve the continuing operation, by the Environment Agency, of its Rhee Support Scheme boreholes to support groundwater levels at the site. As a further concession at Thetford, the Company revoked its Rushford licence, recognising the environmental benefit of not developing the site for abstraction purposes. The Brettenham licence variation included the removal of certain restrictions, following the Agency’s acceptance of a detailed environmental impact assessment which concluded the licence variation would have no environmental impact on designated sites.

Investigations and final reports were completed in AMP4 for the Dernford Fen, Sawston Hall Meadows and Thriplow Peat Holes SSSIs. As a result of these, it was concluded that the impact of the Company’s abstraction regime on the ecology of the site, and on the flows of an adjacent chalk spring, was minimal, and the EA closed the investigations. No sustainability changes have been required as a result of abstraction impacts at Dernford Fen and Sawston Hall Meadows. However, as these assessments have been made on the basis of historic abstraction regimes, Natural England have requested that we have due regard to these sites where increased abstraction within existing licences is proposed in our drought plan. The sources that may impact these SSSIs are Duxford, Hinxton Grange and Sawston. This plan does not propose to increase abstraction at these sites above the historical quantities; however in the unlikely event this is required we will liaise with the EA and Natural England to identify the requirement for monitoring or mitigation as appropriate.

7.6.2 River Granta

The Company has undertaken investigations and options appraisal at this Biodiversity Action Plan (BAP) and Water Framework Directive (WFD) designated site during AMP3, AMP4 and AMP5 under the RSA programme. It was concluded that abstraction at Linton and Rivey Hill sources had an impact on flows at the site. A sustainability reduction of 3.5Ml/d across the two licences has been confirmed by the EA as necessary to mitigate the impact of abstraction, and this is included in our WRMP14, as a reduction to DO. This will be implemented by a Hands Off Flow

[21] Note – the term ‘AMP’ refers to a water industry regulatory 5 year planning period: hence, AMP3 refers to the period 2000/01 to 2004/05; AMP4 refers to the period 2005/06 to 2009/10; and AMP5 covers the period 2010/11 to 2014/15.

condition (HOF) on both licences, whereby abstraction is progressively reduced as gauged flows in the Granta reduce. These licence conditions will be in effect from 2020. It is expected that these conditions would be in force early in a drought sequence, and consequently reduced outputs will be available from these sources. However the reduction in supply will be offset by the utilisation of Horseheath PS, reintroduced into supply in 2016 following a No Deterioration assessment of the impact of this on WFD status. This source is operated under an existing licence, however, following discussions with the EA, flow and hydrogeological monitoring has been commenced as part of the re-commissioning to establish any additional impacts on flow in the tributaries of the Granta.

7.6.3 Nine Wells Local Nature Reserve (LNR) & Hobson's Brook

Investigations were undertaken at Nine Wells during AMP4 which concluded that Babraham PS has an impact on spring flows at the Nine Wells site, which can be susceptible to dry conditions. This impact has been quantified as a reduction in gauged flow rate at the springs that equates to 1.92Ml/d. For the completion of the NEP scheme and implementation, it is proposed that a licence condition and flow augmentation is put in place. This will be in effect from 2020, and is included as a reduction to DO in the WRMP14. Hobson's Brook is a WFD water body fed by the springs at Nine Wells, and the implementation solution for Nine Wells is expected to meet any flow deficits in Hobson's Brook. This will be subject to review following implementation of this scheme in 2020.

7.6.4 Cherry Hinton Brook

The NEP requirement for Cherry Hinton Brook in AMP6, was for an options appraisal; however, as there was limited flow and ecological information for the water body, the Company undertook to do further investigations to gather data. This was following a walk over survey that indicated multiple pressures other than abstraction in the reaches above the WFD monitoring point. Investigations were undertaken over a12 month period and have concluded that abstraction does not impact on flows in the upper reaches. Therefore it is unlikely that the indicative sustainability reduction of 1.2Ml/d will be applied, although this will need to be confirmed in subsequent Environment Agency NEP tables.

8 Drought Monitoring Plan

8.1 Overview

It is a requirement of the Water Industry Act 1991 for water companies to monitor the effect of drought and of the measures taken under the drought plan. In addition the Environment Agency Drought Plan Guidelines require an Environmental Monitoring Plan to monitor the impacts of drought actions and recovery following a drought.

This section outlines the monitoring in place and undertaken by both the Environment Agency and the Company to understand the effects of drought and the actions taken during a drought. It is the responsibility of the Company to undertake any additional monitoring to understand the effects on the environment of any of the drought actions that we implement.

8.2 Baseline Monitoring

As a drought progresses, and prior to any formal drought measures being instigated by the Company, normal communications with the Environment Agency and Natural England will be escalated, as outlined in the Communications Plan. We will provide the Environment Agency with a detailed weekly and monthly update of our water resources situation, via email communications and monthly meetings. Any operational concerns (such as high outage levels) which may impact on resource availability will be highlighted in the updates, in addition to the impacts of the drought itself. This will also include reporting on drought triggers, customer demands, any PR campaigns that are being formulated and any other pertinent data or information.

8.2.1 Meteorological and Hydrometric Monitoring

Regular monitoring of rainfall against a historic long term record is undertaken by the Company, which provides an indication of cumulative rainfall through the year. In addition to this we receive on a monthly basis weekly data for soil moisture deficit (SMD), and effective rainfall over the catchment area from the Met Office. This, in combination with groundwater monitoring provides a good indication of the likelihood of impending drought conditions. Rest water levels (RWLs) are recorded at 6 key drought monitoring sites on a monthly basis, and at all other sites where it is operationally practicable to do so – this accounts for 80% of our sources. The telemetry system provides daily pumping water levels at all sites, and the long term trends across all sites are monitored on a monthly basis.

The Environment Agency maintains a network of hydrometric and environmental monitoring for the purposes of protection and improvement of the water environment. This information is made available to water companies on request. This includes essential hydrology and ecological data of baseline conditions which the Company will require for much of its drought monitoring, and impact assessments. The EA has identified key sites for drought monitoring, included in the EA Drought Plan for the Anglian region, for which we would expect to share data in the event of a drought. Baseline data on the monthly water situation for the region is made available by the EA by means of a monthly report which also provides an outlook of conditions versus the long term average.

The Company also receives daily telemetry data from gauges at Nine Wells Springs, and the EA Babraham gauge for the River Granta, which have been identified as key monitoring points with specific flow requirements relating to Company abstractions. These are maintained and operated by the Company and the Environment Agency respectively.

8.2.2 Ecological Monitoring

The Environment Agency hold the most comprehensive monitoring network, including historical data for flow and ecology, at WFD assessment points and for designated sites which have been investigated for the RSA programme. We would use this baseline data as far as possible to inform our impact assessments for drought options. A number of exceptions where we have already begun additional monitoring to inform NEP or WFD schemes are;

- Tributary of River Granta (Bartlow) to monitor the flow and ecological impact of Horseheath PS
- River Sapiston, and Little Ouse, flow and ecological monitoring to support the environmental assessment for licence renewal of Euston and Brettenham sources
- Cherry Hinton Brook, flow and ecological monitoring during 2016 to support NEP Options Appraisal

We have prepared comprehensive Environmental Monitoring Plans that set out the pre drought, in drought and post drought monitoring that we would undertake to complement any existing EA monitoring and our own on-going monitoring programme, for those included above, and any other waterbodies identified in our Environmental impact screening. These are detailed in Appendices I through N.

8.3 Enhanced Monitoring Plan

When a drought sequence appears imminent, as indicated by regular monitoring, and in addition throughout a drought, the frequency of regular monitoring will be increased. Rest Levels at indicator sites will where practicable be assessed on a weekly basis as part of the regular drought management meetings, and sites vulnerable to water levels will be managed so that their deepest advisable pumping water level (DAPWL) is not exceeded. Pumping programmes and drought action timings will be adjusted according to the vulnerability of sources. We would begin to obtain MORECS data from the MET office on a weekly basis as the situation worsens and utilise MET office forecasts and regular EA updates to determine likely longer term drought scenarios as part of our drought management preparation.

The start of a drought sequence will prompt a data request to collate updated available flow and ecological data from the EA monitoring points in order to assess the impact of any drought options implemented. As our drought management plans progress and actions are implemented, further monitoring requirements will be

assessed and undertaken in conjunction with the EA to assess any impact of the drought options. In particular, specific OBH monitoring data will be requested from the EA to supplement the use of our own drought trigger levels.

The occurrence of a drought would trigger the resumption of data collection for sites investigated previously for the RSA (Restoring Sustainable Abstraction) programme. This would utilise existing monitoring boreholes and gauges, and would be agreed in advance with the EA and Natural England. In particular, the following measures would be considered at these sites previously investigated;

- Sawston Hall Meadows – log groundwater levels on and around the SSSI – (OBHs now operated by the EA)
- River Granta – log groundwater levels around the site, and log river flows at additional gauging stations or locations upstream in the catchment
- Dernford Fen – log groundwater levels on and around the SSSI
- Thriplow Meadows – log groundwater levels at existing EA boreholes
- Nine Wells – log flows downstream of gauge, and EA OBH

Again, this monitoring would be complemented by the monitoring proposed in our Environmental Monitoring detailed in Appendices I through N.

8.3.1 Supply Side Options

The supply side options listed in section 7.2 and summarised in Appendix D include the upgrading and re-commissioning of a number of sources, within existing licence constraints. Although no adverse environmental impacts on designated sites are envisaged from implementing these measures, the opportunity will be taken to monitor the effects of these actions.

Following our Environmental Assessment, we have identified the following monitoring that we consider to be appropriate for the supply options; summarised in table 5 below. Further details are found in Appendices I to K

Table 5. Supply side options environmental monitoring

Ref.	Supply option	Feature	Monitoring	Mitigation
S1	Re-commission Fleam Dyke 12	Cherry Hinton Brook GB105033042670	EA WFD assessment point – flow and ecology Upstream Flow and ecological monitoring (see Appendix I)	
		River Granta GB105033037810	EA flow gauge - Babraham	Lodes Granta support (EA)
		Hobsons Brook GB105033037620	Nine Wells outflow gauge – flow EA WFD assessment point – flow and ecology	Future augmentation (SSW)
		Bottisham Lode - Quy Water GB105033042700	None Required – level dependent, No risk of Deterioration	Lodes Granta support (EA)
		Fleam Dyke ABH and OBH level monitoring. New piezometers installed		
S2	Re-commission Croydon	Millbridge and Potton Brooks GB105033037820	Flow and ecological monitoring EA OBH monitoring or new piezometers installed	
S3	Re-commission Kingston	Millbridge and Potton Brooks GB105033037820	Flow and ecological monitoring EA OBH monitoring or new piezometers installed	
		Bourn Brook	Flow monitoring	
		OBH monitoring, or new piezometers installed		
S4	Re-commission St Ives	West Brook GB105033042730	Flow monitoring for No deterioration Assessment No Deterioration Assessment Habitats directive	
		Ouse Roxton to Earith) GB105033047921	Flow monitoring – EA Earith gauge	FL assessed. CAMS availability at Q34 (Earith)
		OBH monitoring, or new piezometers installed		

8.3.2 Increasing Abstraction Within Existing Licence Quantities

The Company's deployable output figure, as presented in our WRMP14 forms the basis for our progressive drought management actions before and alongside implementation of supply options. The deployable output is derived from our licenced abstraction rights. These licences are issued and regulated by the Environment Agency. The purpose of the RSA and NEP programmes is to assess the existing licences granted for any environmental impact from abstractions on protected or designated sites. This, in some cases will result in licence changes, reductions or conditions applied to abstractions, as discussed in Section 7.6.

The current status for the Cam Ely Ouse catchment, in which our licenced abstractions are located, is defined by the Environment Agency CAMS licencing strategy[22] as over licensed and over abstracted. This is on the basis that the groundwater balance indicates more water has been abstracted historically than is available. Hence, no further new licenced groundwater abstractions (consumptive) would be granted. The assessment is made on water resources available at low flows, typical of dry conditions. Environmental impacts are assessed at groundwater dependant designated sites, and by WFD compliance for surface water bodies where the groundwater abstractions may also impact. Any increases in overall abstraction could potentially lead to some temporary damage to the environment, and impact on River Basin Management Plan objectives. This potential risk has been assessed under the RSA & NEP programmes described in section 7.6, and more recently in the EA Sustainable Catchments programme.

The Sustainable Catchments programme has screened the likely impact of all abstractions on designated sites, WFD status and the likely risk of Deterioration to WFD status under a fully licenced scenario – under which all granted licences in the catchment are being used at full quantities.

Using the most recently available version of this assessment (January 2016), we have reviewed the likely sources where we may expect to require a greater volume than historically abstracted, and the sensitivity of environmental features to any increase. The results of our assessment are included in Appendix F, and summarised in table 6 below are those abstraction licences where the risk is sufficient to require some enhanced monitoring to determine the impact of increased abstraction.

[22] https://www.gov.uk/government/publications/cams-the-cam-and-ely-ouse-abstraction-licencing-strategy

Table 6. Summary of risk from use of existing licences

Source	Potential Increase in abstraction	% increase of licence EA assessment period)	Likelihood	Impact	Monitoring
Babraham	4.2Ml/d	>18%	High	Moderate	Monitor flow at Nine Wells
Brettenham	7.1Ml/d	>63%	Low	High	Monitor Flows in rivers Sapiston, Little Ouse, and Upper Little Ouse
Euston	2.4Ml/d	>30%	High	High	Monitor Flows in rivers Sapiston, Little Ouse, and Upper Little Ouse
Horseheath	1.9Ml/d	>83%	High	Moderate	River Grant flow, and Bartlow tributary flows
Linton	0.85Ml/d	>44%	Low	High	River Granta flows
Rivey	0.70Ml/d	>32%	Low	High	River Granta flows
Westley	6.83Ml/d	>60%	Low	Moderate	none required
Fleam Dyke	2.65Ml/d	>17%	High	Moderate	Flows in Cherry Hinton Brook; River Granta

Amongst other sources, in particular we do not intend to increase abstractions at Sawston, Duxford Airfield or Hinxton Grange above historical levels as there is a minor remaining risk of impact from these abstractions to designated sites. This was an issue of concern raised by of Natural England and the Environment Agency in the pre consultation on this plan. We do not expect to increase the annual average abstraction at Great Wilbraham as the EA also have commented that this may impact

another, non-designated site. The source may however be required to abstract at peak daily volumes during periods of high demand during a drought sequence. Similarly, the EA have commented on the increased use of Fleam Dyke licenced quantities, which is likely in a drought sequence, however the increase in volumes is relatively minor, and we will monitor the effect of this on flows at the relevant site, mindful that the natural effects of drought will also have an impact.

We are fully committed to the long term sustainability of water resources and minimising the impact on the environment from our actions. Droughts will however have some environmental impact that is beyond our control, and we have a duty to maintain supplies to customers. This drought management plan sets out the way in which we intend to do this, with the least environmental impact for our actions as is possible. The plan does not propose an overall or sustained long term increase in abstractions, but sets out how we intend to manage the available resources licensed to use, in the most effective manner.

8.4 Mitigation Measures

All of our supply options are within existing licences, which have all been reviewed under the RSA programme for impacts on sensitive or designated sites. Some of these licences are supported by existing river support schemes. Baseline, in drought and post drought monitoring will allow assessment of any unacceptable impacts. Where these are identified, mitigation will be to withdraw the drought action.

8.4.1 River Flows

There are two river support schemes, and a water transfer scheme licenced and operated by the Environment Agency, described in detail in the Agency's own drought plan, which mitigate impacts on low flows, and in some cases the effects of a drought.

The first support scheme is the River Rhee Groundwater Support Scheme, which comprises eight borehole sites that are used to support eight tributaries including three SSSIs – Ashwell Springs, Fowlmere Water Cress Beds and Thriplow Meadows. Some tributaries are supported annually, others only in dry or drought conditions. The second is the Lodes Granta Groundwater Development Scheme, which is comprised of six borehole sites used for supporting ten points of discharge to the Lodes and the River Granta. This scheme is designed to mitigate the effect of licenced abstractions during dry periods. The Lodes Granta scheme mitigates the impact of our licenced abstractions at Linton, Rivey and Horseheath. It does not protect against droughts in which the watercourse would naturally dry up.

Although most of the boreholes have been operated most years, neither scheme was designed to mitigate the effects of a severe drought. The abstraction licences for these are time limited, with a review date in 2018. Discussions with the EA have confirmed that these licences have been renewed. Whilst we would expect these to be available to support flows during dry conditions, the licences may may not be sufficient to fully mitigate the impacts of drought on river flows in combination with increased abstractions for water supply within existing licences. We will work closely

with the EA to monitor the effectiveness of these schemes during a drought by adapting our abstractions wherever practical, to minimise any impacts.

The EA also operate the Ely Ouse to Essex Transfer Scheme (EOETS) and the Great Ouse groundwater scheme (GOGS), which transfers surface water to Essex, supplemented by GOGS to provide additional water at low flows. This is of note as the operation of the scheme ensures flows in the Thet and Little Ouse are maintained at low flows, mitigating some of the impact from the Company abstractions at Thetford on surface water bodies. Although it is primarily a water resources transfer scheme, it is likely to support flows, the effectiveness of which will be monitored during a drought.

8.4.2 Environmental Impacts

All of the proposed drought actions, including supply side options, fall within the existing permits for abstraction, and therefore it is not considered necessary to proposed detailed mitigation measures. Nevertheless, we have assessed and screened the potential environmental impacts as a result of changing our abstractions to inform comprehensive environmental monitoring plans. Our Environmental Monitoring Plans shown in Appendices I through N have been compiled to ensure we monitor any change as a result of our planned measures, and can readily identify any areas where mitigation may need to be considered. These plans have identified any Protected Species that should be considered as part of any proposed mitigation measures.

Where drought measures or actions propose to increase abstractions within existing licences, we have undertaken an appraisal of the magnitude of risk in our Environmental Assessment in Appendix F, and propose an appropriate level of monitoring in our Environmental Monitoring Plans. The risk of Deterioration is low as any increases in abstraction are temporary measures and will be outside of the WFD RBMP assessment of deterioration of status.

8.4.3 Mitigation Measures

Our Environmental Monitoring Plans have identified proposed mitigation measures should the drought monitoring identify any adverse impacts as a result of implementing a drought action. These would be considered and implemented, depending on feasiability, and include, but are not limited to;

- Return to licensed abstraction, if there is evidence of ecological distress, and/or if reduced flows are considered to be having serious detrimental environmental consequences on affected water bodies

- Translocation of protected species (flora and fauna) to aid recovery from low flows/drying) due to abstraction.

- Fish rescue and relocation should fish become trapped above or below river structures or other barriers to connectivity

- Habitat modification to concentrate remaining flow within the stream channel.
- Consideration of requirements for installation of fish refugia within the watercourses.
- Habitat restoration to remedy any impacts that are observed to have occurred.

All of the above would be considered in consultation with the Environment Agency and other appropriate organisations.

8.4.4 Compensation

The monitoring and mitigation measures proposed and considered do not require further permits, approvals or compensation to third parties, until such time as a mitigation requirement is deemed to be necessary as a result of monitoring, and agreed as appropriate.

9 Drought Management

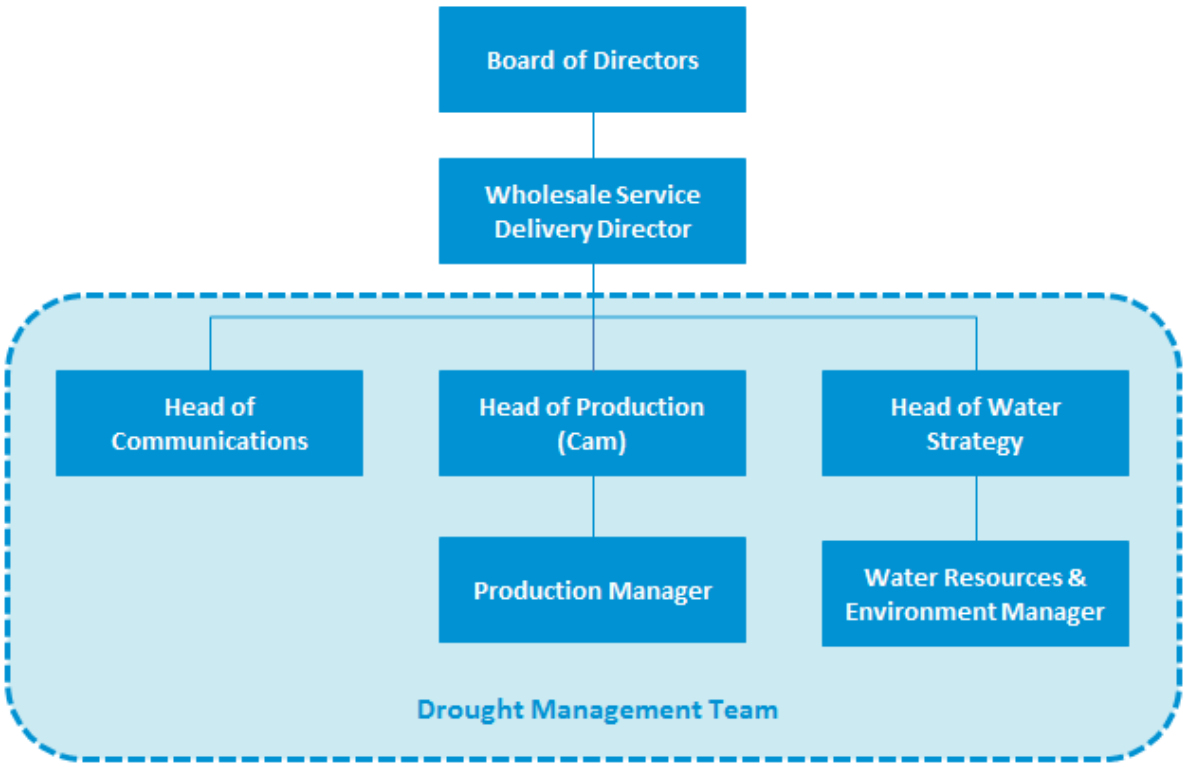
9.1 Management Structure

The management structure for formulating an action plan and approval of drought actions is shown below in Figure 16. The Drought Management Team may be convened prior to any formal drought proceedings, as deemed appropriate - for example, if the Environment Agency or other water companies in the region declare drought status - in order to provide a forum for drought related issues.

In the event of any drought action being contemplated the Company's Drought Management Team and Executive Director will consult with the Board of Directors to formulate an action plan which is appropriate for the specific circumstances. Key staff who may be required to implement any part of the plan will be briefed by the Drought Management Team at an initial joint meeting.

Regular weekly meetings will be convened as the situation develops, and a final debriefing held when normal operations resume. The Drought Management Team will decide at what point the drought has receded sufficiently for any imposed drought measures to be relaxed, and the timing and content of communications to customers and other stakeholders, advising that the situation has returned to normal.

Figure 16. Drought Management Structure

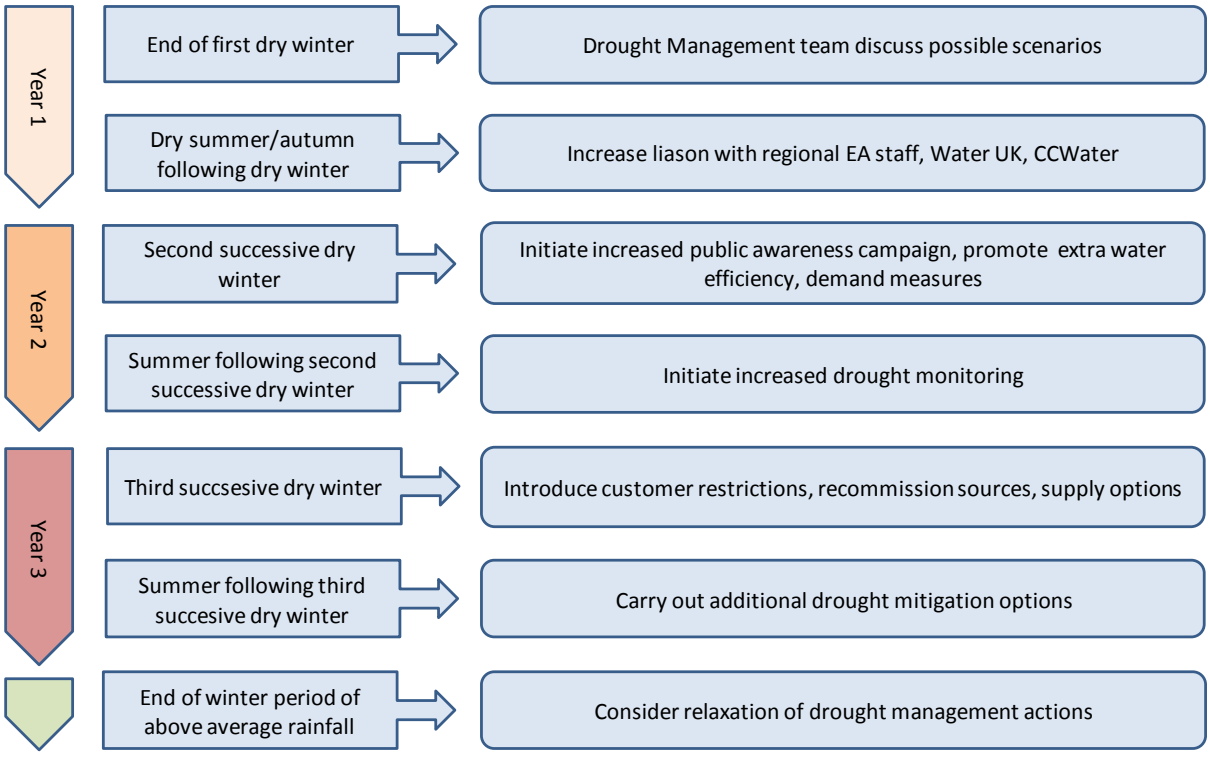


9.2 Drought management Actions

A likely time sequence of drought management actions, derived from experience of previous droughts, is set out in Figure 17 below, although the exact timing of individual actions will depend on the drought triggers listed in Table 4 in Section 5. How these actions will be combined into a communications strategy is described in Section 10.

A second successive dry winter is the trigger for initiating an enhanced public awareness campaign in the Cambridge water resources zone. The Drought Management team will consider the implementation of a range of successive measures, which are summarised in Figure 18 .Once a drought management team has been convened, all actions, meeting minutes and communications will be fully documented and recorded.

Figure 17. Typical time sequence of drought management actions



9.3 Roles and Responsibilities

In broad terms, the roles and responsibilities of the Drought Management Team are indicated in Table 7 below. The team will be expected to draw upon expertise elsewhere as required, and the designated Drought Manager will act as lead for coordination of drought communications.

Table 7. Drought Management Team Roles and Responsibilities

Role in Drought Management	Usual Job Role	Responsibilities
Head of Drought Management Team Board Liaison	Supply Director	Overall responsibility for management of drought. Reporting to the board of Directors. Approval of messages to the public
Drought Strategy Manager	Head of Water Strategy	Implementing and developing the drought strategy. Ensuring consistency with drought plan External stakeholder management (regulatory)
CAM Region Supply Manager	Head of Operations (Cam)	Control of the supply network Implementation of Supply side drought measures Integration of drought management and daily activity
Drought Resources Manager	Water Resources & Environment Manager	Technical Specialist to drought strategy Providing & recording data, drought monitoring and assessment
Drought Communications Manager & Public Relations Lead	Head of Communications	Co ordination of internal and external drought communications Liaison with internal & external stakeholders – customers, media, public relations management Implementing the drought communications strategy
Production Drought Manager	Production manager (Cam)	Implementation of drought strategies at production sites Management of Production resources Enhanced maintenance response

10 Communications Plan

10.1 Overview

Effective communications is an essential part of drought management, and we recognise the importance of keeping stakeholders and customers informed at all times, before, during and after a drought. The timing, accuracy, content and tone all affect the way in which a message is received. Choice of medium will impact the penetration of a particular message, but it may also influence the recipient's view as to its importance.

To reduce the load on the customer contact centre, key communications will be made through the media, via newspapers, radio, television and via our own channels, online outlets such as the Company website, social media and other direct customer contact (email, sms and mailings). Along with other specialised events and campaigns, these communications will aim to raise awareness of the need to reduce water demand, and the status of the Company's supplies.

Different audiences may be consulted at different times, via different channels, and this list is not exhaustive. Key contact lists are held and updated by the Communications Team. The key stakeholders and audiences for drought communications are covered in section 10.3 below.

The key components considered for the communications plan are;

- Audience
- Channels
- Message
- Frequency & timing

In the event that the drought has widespread impacts there may be regional or national co-ordination of communications via the Environment Agency or Water UK. The Company is committed to ensuring clear and effective communication with customers and stakeholders and will fully engage with any regional or national lead in this area. The implementation of regional or national co-ordination may precede the triggers for the Company's own Drought Plan actions, however, the Company will commit to engage in the process nonetheless.

10.2 Objectives

The main requirement of the Communications Plan is to ensure all stakeholders and customers are aware of the drought situation, and our actions before, during and after a drought. A key message that the Company is committed to conveying at all times is the need to use water wisely and efficiently, and this message will be conveyed through increased engagement with stakeholders and customers as a drought progresses, using a variety of methods as deemed appropriate by the Drought Management Team.

The objectives of the communications plan are to:

- Make the public aware of a developing drought situation and keep them informed of the measures that we are planning, explaining the need to save water and our efforts to encourage customers to help.

- Provide information on, and promote escalated water efficiency messages to mitigate restrictions, and reduce demand, lessening the likelihood of further restrictions.

- Inform customers of any restrictions that we may deem necessary to implement during a drought situation

- Manage the timing and targeting of communications as stages of a drought progress.

- Demonstrate a concise and consistent message relating to drought for all water consumers in the affected area, by working with neighbouring water companies and national groups.

10.3 Target Audiences

10.3.1 Key Regulatory Stakeholders

Under normal conditions the primary stakeholders for water resources related issues are Defra, the Environment Agency and Natural England, and contact takes place on a number of levels:

- ad hoc meetings between individuals at local level, to discuss specific topics (e.g. water resources plan, drought plan, business plan, media communications)

- quarterly meetings with other regional water companies' representatives, to discuss water resources planning at a strategic level

- six-monthly liaison meetings at Managing Director level

At these meetings any impending possibility of drought will be discussed as a matter of course, and the Environment Agency will be the initial organisation to announce any level of drought situation, both nationally and regionally.

These regular meetings are a forum for exchange of key information, and in the event of the possibility of drought, liaison is increased to an appropriate level. This may include increased regular updates between water resources and drought managers, the exchange of environmental data and liaison regarding key customer messages to ensure a consistent approach.
During a drought increased liaison will take place with the Environment Agency, including consultation over planned communication. The Company will provide the Agency with reports which detail trends in strategic borehole levels, pumped outputs, and peak demands, comparing them with previous drought sequences, along with its view of the current resource situation, and the future outlook.

10.3.2 Other Stakeholders

In addition to communications with the key stakeholders, the Environment Agency and Natural England, other key organisations will be contacted at appropriate stages, as follows:

- Consumer Council for Water (CCWater): at early stages of a drought, consulted at the start of the drought monitoring process, prior to customer communication and kept updated
- Neighbouring water companies: Affinity Water, Anglian Water
- Local authorities: as a drought progresses, to communicate enhanced water efficiency messages, and to provide details of impact of water use restrictions
- Ofwat: updates on Company actions throughout a drought situation to manage the impact of drought on its customers, and post drought review report.
- Water UK: regular updates on the water resources situation, communication with customers, and future prospects, monthly updates as a minimum.
- Other groups particularly affected by water restrictions: throughout as appropriate.

Other specifically targeted audiences are listed below. These include specific customer groups who will be targeted to respond to appeals for restraint to help reduce peak demand through a reduction in garden watering e.g. private householders, local authorities, University Colleges, and sports clubs.

10.3.3 Staff

Company staff, especially those in customer-facing roles, will be briefed on the latest water resources situation, and management actions taken, as the drought develops so that they can provide accurate information to customers. The customer contact centre will be provided with a questions and answers template of likely enquiries when a drought appears to be imminent and this will be regularly updated by the Drought Management Team as a drought situation develops. Briefings will take place on a regular weekly basis, and the Company's Board of Directors will be kept informed through formal monthly reports. Regular updates on the situation will be posted on the Company intranet, and circulated in regular and bespoke Company mailings by the Communications Team.

10.3.4 Domestic Customers

In normal circumstances customers receive regular information from the Company in a variety of ways, and part of this includes regular promotion of water efficiency. In a drought situation, customer contact will become increasingly proactive, reflecting the

current situation, and make increasing use of all media channels to emphasise the messages.

Customers can do much to help by taking simple steps, which together can save significant volumes of water, and as such it is important to obtain 'buy-in' of these stakeholders. Examples of savings include the installation of cistern devices in older style toilets, and garden watering by hand rather than by unattended hosepipe. The frequency of these 'save water' messages will be increased both through the usual routes such as mailshots and website updates, but in particular through increased use of media.

In the event that a temporary water use restriction is imposed additional communications will be made to ensure that customers understand what this means for them and know how to make representations.

10.3.5 Vulnerable Customers

The Company recognises that the implementation of certain drought actions may potentially cause hardship for vulnerable and sensitive customers. Vulnerable groups would particularly suffer if standpipes or rota cuts were introduced; however, this is considered to be a measure of last resort, with an expected frequency of less than 1 year in 100. Such a measure would entail a level of detailed planning similar to that set out under the Company's emergency planning procedures, for which a list of vulnerable groups is maintained. When considering drought actions, their likely effects on vulnerable groups will be assessed, and appropriate mitigation measures put in place. Specific targeted communication with these customers will be undertaken.

10.3.6 Business Customers

Business customers are encouraged to use water efficiently through the same communications as domestic customers; however, they generally have sound business incentives to use water wisely, and there is less scope for additional savings. During a drought situation, the Company would take the opportunity to engage with particular groups of business customers, including large users, to offer additional advice on how to mitigate the impacts of a drought through efficient use of water, thereby showing their own customers that they are 'doing their bit' whilst in a period of drought. The types of business customer considered for this type of activity would be:

- Garden centres
- Golf courses
- Market gardeners
- University colleges
- Large users of process water

We will encourage businesses to ensure they are as water efficient as possible in their own business activities, and to promote this both to employees and customers. Specific business activities that use water will be targeted with appropriate messages

specific to areas of use, this may be for example for a garden centre to promote water butts, and low use irrigation or watering systems to their own customers.

Post April 2017, eligible non-household customers will be able to choose who provides their retail water services. At this time we do not know how many non-household customers and in which sectors, may choose an alternative retailer. However as a wholesaler, our duty to promote water efficiency will remain and we would expect our promotion of water efficiency to continue, with the addition that messaging would also be sent via known retailers operating in our area of supply. Retailers may also have their own process and reasons for promoting water efficiency.

During a drought, and the requirement for enhanced communications, we would if necessary use the usual arrangements in place for data exchange between retailer and wholesalers to publicise and give notice of details of planned drought activities.

There is a single inset appointment in our area of supply; this is a variation for Anglian Water to supply a portion of the Northstowe development, not yet constructed, and for a relatively minor volume of water. We will communicate with Anglian Water with respect to this inset alongside other cross water company communications.

10.3.7 School Pupils

Schools represent an effective route for influencing water efficiency behaviour, both in normal and drought situations. During a drought, increased awareness campaigns will be directed at schools to inform and provide the appropriate access to water efficiency and saving devices and advice. We will enhance our on-going schools engagement programme to impart these messages.

10.4 Messages and Activities

The precise nature and format of communications will depend on the situation, and the use of the most appropriate method will be determined by the Drought Management Team, in response to any Environment Agency advice, the regional situation and in conjunction with messages from other water companies.

Messages need to be clear, consistent and kept to a manageable number to ensure maximum understanding and impact with the audience. The messages will be primarily determined by the status of operations (as triggered by monitoring) and then tailored to the individual audience and channel.

A key message to be conveyed and reinforced is the need to use water wisely, and any or all of the methods defined below may be used to achieve this.

- General ‘use water wisely’ messages.
- ‘Use water wisely in the garden’ messages.
- Advice on using water wisely in the household.
- Free issue of hippo and hog water saving devices for use in toilet cisterns.
- Free issue of water saving packs.

- Promotion of water efficiency and free provision of water efficiency devices at superstores such as supermarkets, DIY stores and garden centres.
- Publicity events to raise awareness of water efficiency
- Water industry communications through Water UK.
- Joint initiatives with other organisations and water companies to promote water efficiency
- Issue of press releases to the local press.
- Focused features and articles
- Adverts and interviews, contributions to local television interviews and reports.
- Regular updates on the drought situation
- Information and updates on the current status of our water resources.
- Temporary water use restrictions notification and awareness
- Non-essential use restrictions communication and consultation
- Information on applications for drought permits and emergency drought orders.

10.5 Communications Channels

A significant number of channels are available to communicate with the key audiences. These are a mixture of owned, earned and paid for. A number of the channels are already routinely used by the water company to communicate with audiences – the frequency and timing of these would be altered to respond to the situation. Others are not regularly used and would be adopted to amplify the message being communicated.

The following list is an overview of the categories of channels the plan would use according to need. The individual details of channel are not listed as these will be constantly changing.

- Meetings/face to face/1:2:1
- Customer website - www.cambridge-water.co.uk
- Social media – the company has Twitter, Facebook and LinkedIn profiles
- Editorial via traditional media – local newspaper print and radio or TV broadcast
- Advertising – local newspaper print, radio and TV broadcast, livery, outdoor,
- SMS/text messaging – using database of customer mobile phone details
- Email – using database of customer emails
- Direct customer contact via: Call centre; on the ground staff (customer liaison; specialist roles/teams (education, water efficiency, catchment management), etc)
- Mailings – regular billing cycle and bespoke mailings
- Events
- Stakeholder owned channels

10.6 Drought Communication Protocol

The drought triggers indicated in Section 5, link into the level of enhanced communications activity, the timing of which has been determined by the effective implementation of measures in historic drought events as they have progressed. The

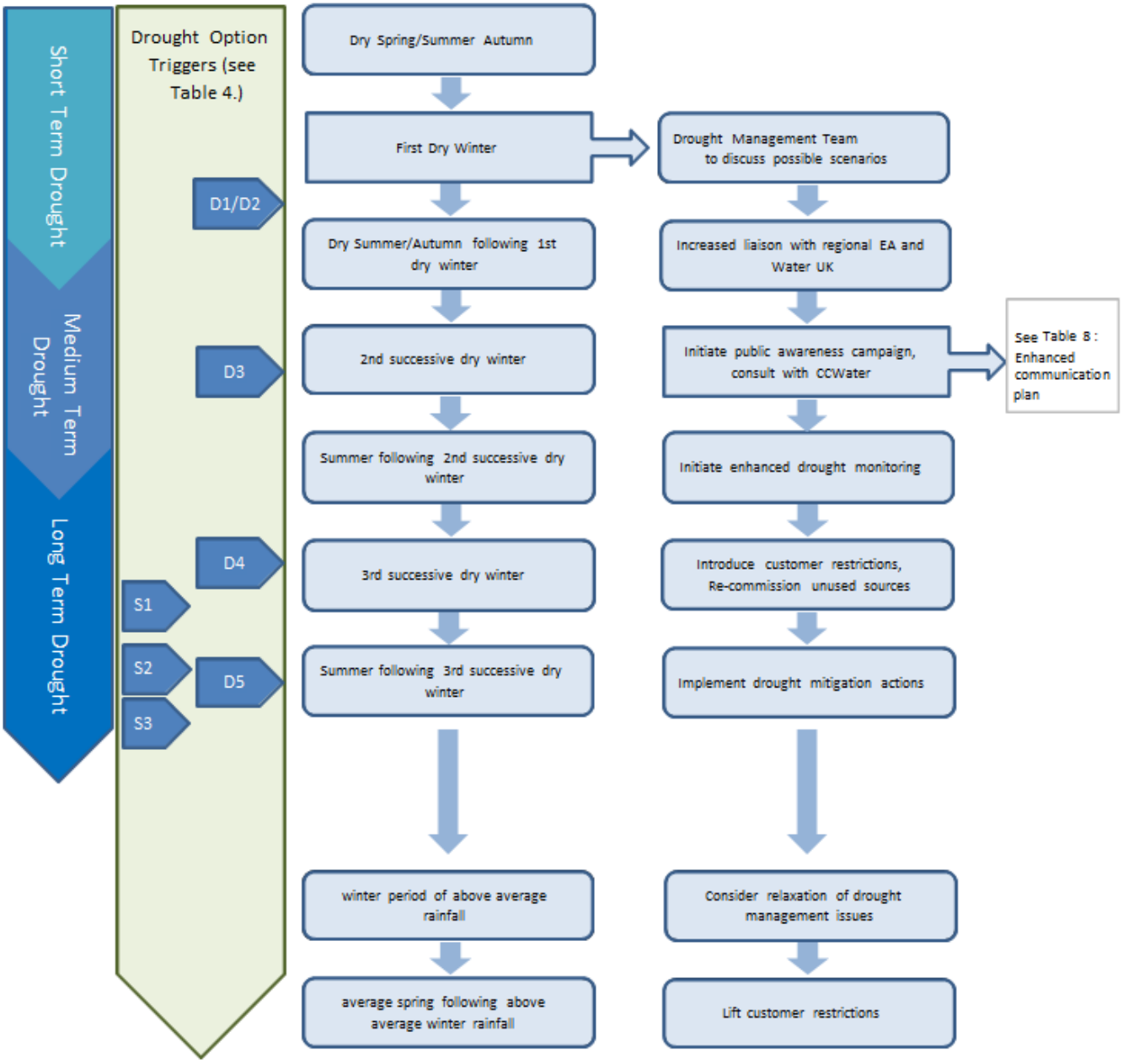
range of successive communications measures, messages and themes as a drought situation progresses is summarised in Table 8 below.

Once a second dry winter and the on-going monitoring of drought indicators has triggered the need for initiating an enhanced public awareness campaign in the Cambridge Water Resources Zone, the level of communications activity is progressively increased, as per Figure 18. The timing of communications and messaging is not prescriptive as it will be dependent on the actual nature of a drought sequence, and its geographical coverage, however the drought management triggers that link to consideration of communications activities are indicated in table 4 in Section 5.

Table 8. Enhanced Communication Plan

Approx timing	Operational status	Message theme
	Normal above drought monitoring triggers	Monthly updates on groundwater levels and rainfall Proactive water efficiency awareness and education
Triggers D1-D2	**Drought monitoring** drought monitoring triggers approaching-downward trend	Weekly situation assessment and status – reporting at supply meetings, EA liaison commenced Proactive water efficiency awareness and education – website, media
Trigger D3	**Drought management** initial drought monitoring triggers breached	Weekly situation assessment and status updates – all available channels. Consideration of enhanced campaigns and options assessed by Drought Management Team. Joined up stakeholder messaging with regional stakeholders-EA, water companies, Water UK
Trigger D4	**Serious drought management** drought triggers breached, continuing downward trend and outlook	Daily situation assessment and status updates – consultation and liaison with appropriate stakeholders. Further regular appeals to reduce demand Enhanced public relations and media campaigns Communication and consultation on Temporary Use Ban
Depends on recovery	**Drought cessation** Drought triggers returned to normal levels, recovering trend	Situation assessment and status updates – consultation and liaison Express gratitude for customer's efforts – reinforce use water wisely messaging. Relaxation/withdrawal of ban Proactive water efficiency awareness & education

Figure 18. Drought triggers and communications activities



10.7 Monitoring Communication Activities

The drought situation, and the effectiveness of communication measures, will be constantly monitored throughout the normal and enhanced communication process, and decisions to develop or modify successive actions will be made accordingly by the Drought Management Team. In particular the number of access hits on the relevant sections of the website will be used to determine the effectiveness of the

online campaign, and requests for water efficiency services, packs and information will also be monitored.
Activity via social media accounts will also be monitored and use as an indication of the effectiveness of these channels of communication.

10.8 Lessons Learned From Previous Droughts

Communications activity during previous drought situations has proved to be both successful and effective. We will take on the learning points from previous droughts, together with the Environment Agency's general recommendations, and will incorporate these into subsequent action plans. In particular we undertake to:

- improve lead times to ensure all communications and updates are made in a timely fashion to stakeholders, and seek their feedback throughout the process.

- engage with the Agency and neighbouring regional water companies to ensure consistent key messages throughout all drought-themed advertising, and wider communications.

- provide clarity and consistency regarding those uses of water covered by actual and potential restrictions.

- liaise with suppliers, contractors and other third parties to ensure a consistent and joined up approach to using water wisely.

- hold timely workshops or briefing sessions with key stakeholders to update them on actions and seek feedback.

- Ensure the flow of information for customer centre staff to appraise customers of the current situation and any likely effects of restrictions.

11 The End of a Drought

11.1 Identifying the End of a Drought

The end of a drought can be defined as when the risk of impacts from drought is no greater than during a normal year, and where normal conditions have continued for a period of time. Each drought sequence is different, and there can be no hard and fast rules by which to determine the end of a drought, but the Company will use the observations and data captured in its drought management tool to inform its decisions. This will be used to complement the Environment Agency position on drought status.

The relevant Company indicators will comprise; the amount of effective rainfall, compared with long-term average (determined from the MORECS data provided by the Met Office); and borehole levels at drought indicator sites and other sources, compared with long-term average (determined from our own observations and records). We would expect the end of a drought to be when all of these indicators have returned to long term average levels, or that a sufficient number of key indicators are showing a trend approaching long term levels, supported by meteorological outlooks with some certainty attached.

The Company will not declare that a drought is over until it has consulted with the Environment Agency to confirm the latest water resources situation, and an agreed regional message from all other water companies involved can be communicated. It is important in a prolonged drought to ensure sufficient sustained recovery in resources can be determined prior to declaring the end of a drought. This will be communicated to customers in accordance with the Communications Plan described in Section 10. The cessation of drought management actions may be dependent on the stage to which they have progressed: in particular for supply side options with long lead times it may be appropriate for the action to continue to completion. However, we are committed to removing any restrictions on customer use through temporary use bans or ordinary drought orders as soon as is reasonably practical.

11.2 Post-Drought Actions

Should a drought event occur, the Company will carry out a timely post-drought review, which will examine the effectiveness of its drought plan in specific areas, including the following;

- Environmental modelling during and after drought – was it appropriate?
- Drought management actions – were they successful, and what was their cost?
- Performance of sources – did deployable output meet expectations?
- Demand measures – what was their quantifiable effect in reducing demand?

- Were any strategic investments made which might have a material effect on other plans (e.g. the WRMP)?

We will work closely with the Environment Agency and with other key stakeholders to produce our review. We will carry out our review within 3 months after the end of a drought, and we will produce a “lessons learned” report within 3 months after that. This will be followed, within a further 12 months, by a monitoring report on actions identified and taken.

The Drought Plan Direction 2016 prescribes the actions that water companies need to take to maintain and revise their drought plans, depending on the circumstances. Under normal procedures the Company will review its drought plan annually, whether or not a drought has occurred within that time. If there has been a material change of circumstances, or where experience during a drought event has revealed inaccuracies in its plan – or, in any event, as directed by the Secretary of State or within 5 years – the Company will revise its plan, in line with the process and timetable set out in legislation and other guidance.

12 Conclusions

The threat of drought is never far away in the East of England, where average rainfall is the lowest in the country. Climate change may also increase the risk of more frequent and severe drought events in the future, as rainfall quantities and patterns change. Balancing the needs of the environment and the public water supply during a drought is not easy and, before contemplating any actions they may wish to take to conserve supplies, water companies need to give due consideration to the consequences of those actions. This plan demonstrates the options that we can consider and the actions we would take in the event of a drought as severe as those on the historical record.

12.1 Summary

A successful drought plan should be based on effective communications among stakeholders; not only in the formulation and structure of the plan itself, but also in the way any proposed drought actions are broadcast.

The proportionality and timeliness of any actions are also paramount, in order to minimise environmental effects: a drought management plan should therefore rely on robust trigger mechanisms for action.

The Cambridge region drought plan is built on a sound knowledge of the Company's water resources, its key installations, and its customer base. We have a successful record of managing previous droughts, and our latest plan takes full account of those experiences, and of lessons learned. The process we have followed in preparing this plan aligns with the latest published guidance, including pre-consultation with regulators and other bodies, reviews of drought triggers and actions, environmental studies, and scenario planning.

We are confident that this is a robust drought plan, which proposes a timely and sustainable drought management approach, and thereby meets the expectations of all stakeholders.

To summarise, this plan

- Sets out the actions and measures that we will put in place to mitigate the effects of a range of possible future droughts. The actions and measures have been determined through experience gained, and lessons learned, in managing previous droughts. Full consideration has been given to the possible effects of any drought action on customers, and on the environment, and none of the actions proposed will be taken lightly.

- Recognises that no two droughts are the same, and offers a flexible approach to drought management that can be tailored to suit the prevailing situation, and adjusted as a drought sequence progresses.

- Offers a sustainable approach, which enables a supply demand balance to be maintained in the event of a drought with the least risk to the environment by

fully utilising our licenced abstractions and not resorting to drought orders or permits which would cause environmental impact.

- Identifies uncertainty in the future availability of our abstraction licences as a means to manage droughts. Once this uncertainty is addressed and the impact of the Environment Agency Sustainable Catchments programme can be determined a revised Drought Plan will be developed if required.

12.2 Uncertainty in the Drought Plan

This drought plan provides a framework for managing a drought with the least environmental impact and least recourse to restrictions, drought orders and permits. We have assessed risks to the environment from the range of drought management actions proposed and believe these to be minimal. Our plan makes use of the current available abstraction licences granted by the Environment Agency, and at the time of publication there is some uncertainty surrounding the outcomes of the EA Sustainable Catchments programme and subsequent review of licences, in particular those that are time limited, and where the recent historical use has been a small proportion of the licence.

We have produced this plan on the basis of maintaining the licenced volume currently available to us, and as published in the current WRMP14. Alongside an assessment of the risk of deterioration from using licences, we believe this plan provides a robust approach to drought management, with the least risk to the environment and least impact to customers.

At the time of publication, we are beginning pre consultation on our next WRMP. The revised WRMP will review the Company's Deployable Output figures, and will assess additional supply options, including the potential for these to be drought supply side options, or drought permit sites. This will include any change to the Company's abstraction licences arising from the Sustainable Catchments review and approach to renewal of time limited licences. The publication of a revised WRMP may result in a material change to circumstances affecting this drought plan, which would in turn trigger a review of the plan.

Appendices

Appendix A: Draft Drought Plan Pre-consultation Responses

Cambridge Water Drought Plan - Pre-Draft Consultation

CCWater response - November 2016

Thank you for inviting us to comment on your current drought plan ahead of revising it for formal consultation and submission to the Secretary of State by 31 March 2017. CCWater would like your revised drought plan to:

- Follow the principles set out in the Water UK/UKWIR Code of Practice on Temporary Use Restrictions, demonstrating an understanding of the impact of any measures on different customer groups and how these impacts have informed its approach.

- Reflect customers' priorities and preferences in relation to the actions that a company plans, including showing evidence of relevant research and how the results have been used.

- Explain the company's strategy for engaging with domestic customers, including its strategies for both managing drought and promoting water efficiency in non-drought times. We would expect companies to be aware of the risks of communication during a drought and to utilise a wide range of methods of communication. We note that the current plan includes information on engaging with domestic customers, including the vulnerable, business customers and schools. We welcome this approach and we assume it will continue.

- Show evidence of engagement and reflect the views of relevant stakeholders, such as Government departments, other water companies, NGOs, business and the agriculture sector.

- Outline what would happen in an emergency drought situation, such as when supplies might be interrupted/subject to rota cuts or standpipes.

- Be clearly written and accessible. There does not appear to be a customer friendly non-technical summary for the Cambridge region, like there is for the South Staffs region. Was one made available and, if not, can this be produced this time round along with accompanying customer leaflets? We would like an opportunity to comment on any such documents during development.

Environment Agency

Daniel Clark
Water Resources and Environment Manager
Cambridge Water
90 Fulbourn Road
Cambridge
CB1 9JN

BY EMAIL ONLY

Date: 25 August 2016

Dear Daniel

Response to your drought management plan pre-consultation letter

Thank you for consulting the Environment Agency for information and advice regarding the preparation of your draft drought plan. This letter provides our formal response to your pre-consultation request for information. We will be pleased to continue any discussions on your draft drought plan as you develop it.

Water companies should follow the water company drought plan guideline when preparing their draft drought plans. This is available from: https://www.gov.uk/government/collections/how-to-write-and-publish-a-drought-plan. Further information is available in supporting guidance documents hosted on the Defra Huddle: https://www.huddle.com/. For login details or any problems with access, please contact Defra directly at water.resources@defra.gsi.gov.uk.

We would also expect you to consider all relevant statutory requirements including the new Defra Directions, published 22 July 2016.

The key points we would like you to consider are:

- The sequencing of drought actions - you should plan to implement customer restrictions and demand interventions prior to any drought permit/order application, or clearly explain why you do not think this is appropriate.

- How you will engage in an effective way with your customers and stakeholders in a drought. You should consider how you will plan to avoid the risk of confusion for customers in neighbouring water operators' areas where drought actions may be different. It will be important for you to liaise with neighbouring water companies during the pre-consultation period to ensure communications in a drought are as coordinated as possible.

- An appropriate range of drought scenarios to ensure your plan is robust. Specifically, we strongly encourage you to plan for more severe drought events that are of longer duration and lower rainfall than those in the historic record. The *Drought Plan and WRMP Links* guidance has now been published on the Defra Huddle and provides further information on the interactions between the two plans and consideration of plausible droughts.

- A broad range of potential drought options. Your current drought plan includes limited supply side alternatives, including the Horseheath source, which you are proposing to use as part of the River Granta RSA solution.

- An assessment of the effect that your plan will have on Water Framework Directive status or potential. You should consider the effects your actions might have on environmental objectives and measures set out in River Basin Management Plans. We are aware of your concerns about the implications of our evolving approach to Sustainable Catchments and would encourage you to consider the potential impacts of reductions to deployable output in your scenarios. Specifically, you should consider whether the increased use of any licence would cause deterioration under the Water Framework Directive.

- The requirements for environmental monitoring and assessment needed to support your draft plan. You should ensure that details of your environmental monitoring programme are included in your drought plan. Where gaps are identified you should liaise with us to confirm what additional monitoring is required and agree the best sites for further monitoring. Supplementary guidance on environmental assessment and WFD has now been published and is available on the Defra Huddle (*Environmental Assessment for Water Company Drought Plans*).

- The prioritisation of the use of supply side sources to minimise the impact of abstraction on environmentally sensitive sites. In particular, in order to protect Dernford Fen SSSI and Sawston Hall Meadows SSSI, we seek to limit the use of Sawston and Hinxton Grange sources to historical limits during drought periods. In order to protect Thriplow Peat Holes SSSI, we seek to limit the use of Duxford to historical limits during drought periods. Of lower priority, because of the lack of SSSI status, we would seek to protect the flow in the upper reaches of the Little Wilbraham River by limiting the use of the Gt Wilbraham and Fleam Dyke sources during drought periods.

- The potential non-renewal or renewal with significantly reduced quantities of the Environment Agency's groundwater support scheme abstraction licences, specifically the Rhee and the Lodes Granta licences. Changes in these licences would have impacts on South Staffs abstraction licences.

- Natural England (NE) must be consulted if any of your proposed drought actions may affect a designated site. A Habitats Regulations Assessment (HRA) must be undertaken if a drought action could affect a SAC, even if the drought action occurs in the winter months. Early liaison with NE and ourselves is important to agree the requirements for environmental assessments at these sites.

- How you would manage small import/export agreements that you have in place with neighbouring companies. You should ensure there is a common understanding of operation in both companies' drought plans, particularly where there is no formal arrangement.

We will ensure our own drought plan for Cambridgeshire and Bedfordshire reflects the changes you make to your drought plan. As discussed at our recent meeting (16/08/16), we hope to be able to confirm whether we will renew the licences for our environmental support schemes by December 2016.

We look forward to working with you as you develop your new drought plan. Please let us know if there is any data and evidence you need in order to write your drought plan and when it is required. Sarah Hainie will be your lead contact throughout this process.

Yours sincerely

John Giles
River Basin Account Manager

Customer Panel Pre-consultation Review of Cambridge Water Drought Plan:

Summary text received by Panel Chair, as agreed at Panel meeting of 10 October 2016

The South Staffs and Cambridge Water Customer Panel was invited to take part in a pre-consultation review of the draft Plan. The Panel thought it unlikely that customers would find fault with the levels of service proposed and frequency of restrictions, but questioned whether the forecasts were based on historic records and took adequate account of the possibility of deteriorating weather patterns because of global warming.

The Panel challenged aspects of the presentation of the draft Plan, the proposed period of notice before a hosepipe ban, and the methods outlined for communicating with customers in the event of drought. Concerning presentation, suggestions were made for increasing the clarity of graphics and the Panel offered to give feedback on any later version of the Plan designed for public consumption. In response to the challenge about the notice period, the Company has changed the draft to reduce the total period from 9 weeks to 5 weeks. Regarding communications in time of drought, the Panel felt that the previous Plan had been inadequate in relying on the website and newspapers. In practice the Company has also resorted to radio and TV, but the Panel urged use of social media, SMS and email, where possible accompanied by information to customers about their usage.

In response to the Company's concern about possible confusion arising from uneven application of drought measures by neighbouring water companies, the Panel's view was that different policies were reasonable for different catchment areas and that the existence of usage bans nearby might stimulate welcome additional water saving. Finally the Panel challenged the Company to consider for the future a lower tariff option for customers willing to have their supply interrupted in the event of drought.

From: Paul Hammett [redacted] Sent: Tue 16/08/2016 16:47
To: Daniel Clark
Cc: [redacted]
Subject: Cambridge Water (South Staffs Water, Cambridge region) Drought Plan - Pre-draft consultation

Daniel
Thanks for your letter dated 3 August inviting comments on your proposed approach for producing your next company drought plan (to be submitted to Defra by 31 March 2017).

We have appreciated the closer working relationship between or organisations since the last drought conditions experienced in 2010-12 and farmers now have a better understanding of the Breckland aquifer that they share as a resource with Cambridge Water.

As you develop your ideas for the content of your next company drought plan, I would be grateful if you could take account of:

- The increasing importance of the Anglian aquifer to local food production and national food security
- Pressures being placed on all licence holders arising from WFD 'no deterioration' issues
- Arising from the above, the lack of clarity in how groundwater dependent farmers will be subject to (and respond to) future statutory s57 restrictions and voluntary restrictions (that have been common in past dry years)
- Opportunities arising from initiatives such as WRE to trade/share water, including during times of shortage
- As you know, agricultural need is seasonal and highly variable depending on current weather and soil moisture deficits (making access to groundwater during droughts particularly important for crop yield and quality)

We will be happy to further discuss these issues as your planning process develops

Regards

Paul Hammett
National specialist (water resources)

From: Ramsay, Anne (NE) [redacted] Sent: Fri 19/08/2016 15:55
To: Daniel Clark
Cc:
Subject: South Stafordshire Water - Cambridge Region drought plan pre draft consultation
Message | HPRM: FW: Restoring Sustainable Abstraction Programme

Daniel

Thank you for your letter dated 3rd August regarding the pre-draft consultation. Natural England notes that you will base the detail of the new draft plan on the current drought plan and that you do not consider the plan to be subject to the Strategic Environmental Assessment (SEA) Directive 20001/42/EC. Can you confirm that this is based on the conclusions made in the current drought plan in section 4.1.2.2.

I am keen to discuss further with you 3 sites (Dernford Fen SSSI, Sawston Hall Meadows SSSI and Thriplow Peat Holes SSSI) that have been highlighted through the RSA process where there is a risk of increased abstraction beyond historic abstraction rates during drought periods as detailed in Julie Barker's email attached.

I am on leave until the 5th September but would be happy to discuss further on my return

Regards

Anne
Anne Ramsay
Lead Advisor – Fresh water for East of England
Bedfordshire Team
Natural England
[redacted]

Appendix B: List of Key Environmentally Sensitive Sites

Map Label	Name	Area (ha)	Designation(s)
1	Alder Carr	7	SSSI
2	Ashdon Meadows	1	SSSI
3	Ashwell Springs	0	SSSI
4	Balsham Wood	35	SSSI
5	Barnham Cross Common	69	LNR
6	Barnham Heath	79	SSSI
7	Barnhamcross Common	69	SSSI
8	Barnwell	3	LNR
9	Barnwell II	4	LNR
10	Barrington Chalk Pit	97	SSSI
11	Barrington Pit	4	SSSI
12	Berry Fen	15	SSSI
13	Blagrove Common	5	SSSI
14	Bramblefields	2	LNR
15	Breckland Farmland	13392	SSSI
16	Breckland Forest	18126	SSSI
17	Brettenham Heath	234	NNR
18	Bridgham & Brettenham Heaths	442	SSSI
19	Buff Wood	16	SSSI
20	Byron's Pool	4	LNR
21	Caldecote Meadows	9	SSSI
22	Cam Washes	167	SSSI
23	Carlton Wood	10	SSSI
24	Cherry Hinton Pit	13	SSSI
25	Coldham's Common	49	LNR
26	Dernford Fen	10	SSSI
27	Devil's Dyke	40	SSSI
28	East Pit	13	LNR
29	Elm Road Field, Thetford	5	SSSI
30	Elsworth Wood	7	SSSI
31	Eversden and Wimpole Woods	67	SSSI
32	Fakenham Wood and Sapiston Great Grove	201	SSSI
33	Fleam Dyke	12	SSSI
34	Fowlmere Watercress Beds	40	SSSI
35	Fulbourn Fen	27	SSSI

36	Furze Hill	6	SSSI
37	Gamlingay Wood	48	SSSI
38	Godmanchester Eastside Common	30	SSSI
39	Gog Magog Golf Course	88	SSSI
40	Great Stukeley Railway Cutting	35	SSSI
41	Great Wilbraham Common	24	SSSI
42	Hales and Shadwell Woods	15	SSSI
43	Hales Wood	8	NNR
44	Hardwick Wood	15	SSSI
45	Haverhill Railway Walks	14	LNR
46	Hayley Wood	52	SSSI
47	Hemingford Grey Meadow	1	SSSI
48	Hildersham Wood	8	SSSI
	Histon Road	1	SSSI
	Holland Hall (Melbourn) Railway Cutting	3	SSSI
	Holme Fen	269	SSSI; NNR
	Houghton Meadows	5	SSSI
	Kingston Amenity Area	2	LNR
	Kingston Wood and Outliers	47	SSSI
	Knettishall Heath	92	SSSI
	Langley Wood	32	SSSI
	Lattersey Field	12	LNR
	Limekiln Close (and West Pit)	3	LNR
	Little Heath, Barnham	46	SSSI
	Little Paxton Pits	127	SSSI; LNR
	L-moor, Shepreth	7	SSSI
	Logan's Meadow	1	LNR
	Madingley Wood	15	SSSI
	Mare Fen	16	LNR
	Melwood	1	LNR
	Monks Wood	156	NNR
	Monks Wood and The Odd Quarter	169	SSSI
	Newmarket Heath	279	SSSI
	Nine Wells	1	LNR
	Nunn Wood	10	SSSI
	Orwell Clunch Pit	2	SSSI
	Ouse Washes	2514	SSSI
	Out and Plunder Woods	39	SSSI
	Over and Lawn Woods	45	SSSI

	Overhall Grove	17	SSSI
	Papworth Wood	9	SSSI
	Paradise	2	LNR
	Park Wood	55	SSSI
	Portholme	106	SSSI
	Potton Wood	85	SSSI
	Roman Road	12	SSSI
	Sandy Warren	16	SSSI
	Sawston Hall Meadows	7	SSSI
	Sheep's Green and Coe Fen	17	LNR
	Somersham	9	LNR
	St Denis Church	0	LNR
	St. Neot's Common	33	SSSI
	Stow-cum-Quy Fen	30	SSSI
	Ten Wood	18	SSSI
	The Beechwoods	10	LNR
	The Riddy	8	LNR
	Therfield Heath	147	SSSI; LNR
	Thetford Heaths	271	SSSI
	Thriplow Meadows	3	SSSI
	Thriplow Peat Holes	12	SSSI
	Traveller's Rest Pit	2	SSSI
	Trundley and Wadgell's Woods, Great Thurlow	79	SSSI
	Upware Bridge Pit North	2	SSSI
	Upware North Pit	1	SSSI
	Upware South Pit	1	SSSI
	Upwood Meadows	6	SSSI; NNR
	Warboy's and Wistow Wood	44	SSSI
	Warboys Claypit	13	SSSI
	Waresley Wood	54	SSSI
	Weaveley and Sand Woods	62	SSSI
	Whittlesford - Thriplow Hummocky Fields	56	SSSI
	Wicken Fen	254	SSSI; NNR
	Wilbraham Fens	62	SSSI
	Woodwalton Fen	209	SSSI; NNR
	Woodwalton Marsh	1	SSSI
	Worts Meadow	6	LNR

Appendix C: Drought Management Options – Demand

Option Name	Trigger(s)	Savings - Average	Savings - Peak	Location	Implementation timing	Permissions Required & Constraints	Risks
D1: Extra promotion of water efficiency	Rest level at any 3 of 6 indicator sites below average and falling; and >55mm recharge deficit	0.1 Ml/d	0.1 Ml/d	Whole Supply Zone	2 weeks lead time Effective spring to summer	None	None. Limited scope for savings
D2: Enhanced leakage reduction	Rest level at any 3 of 6 indicator sites below average and falling; and >55mm recharge deficit	1.0 Ml/d	1.0 Ml/d	Whole Supply Zone	4 weeks lead time Effective spring to autumn	None	Limited scope for savings, but depends on antecedent conditions. Acquisition of required resource, maintaining savings over longer term

D3: Appeals for restraint	Rest level at any 3 of 6 indicator sites below average and falling; and >120mm recharge deficit	3.0 Ml/d	3.0 Ml/d	Whole Supply Zone	2 weeks lead time Effective spring to autumn Continues until RWLs return to average at more than 3 indicator sites and recharge deficit is less than 120mm.	None	
D4: Temporary bans on water use	Rest level at any 3 or more indicator sites reaches **RWL1** trigger level; and >180mm recharge deficit	5.0 Ml/d	5.0 Ml/d	Whole Supply Zone	2 weeks lead time prior to publication of notice of prohibition on website. 21 days from notice of prohibition to implementation, to allow for a minimum of 14 days to make and consider representations Effective spring to autumn Continues until RWLs	Board Approval; stakeholder consultation, consideration of representations	

					return to average at more than 3 indicator sites and recharge deficit is less than 180mm.		
D5: Restrictions on non-essential use	Rest level at any 3 or more indicator sites reaches **RWL5** trigger level; and >260mm recharge deficit	5.0 M/d	5.0 Ml/d	Whole Supply Zone	Board approval; Drought Order Application to Secretary of State. 3 months lead time including 28 days for SoS decision following date of application, duration up to 6 months with 6 monthly extensions available.	Board Approval; application to Secretary of State, stakeholder consultation, consideration of representations	

Appendix D: Drought Management Options – Supply

Option Name	Trigger(s)	Savings - Average	Savings - Peak	Location	Implementation timing	Permissions Required & Constraints	Risks
S1: Re - commission Fleam Dyke 12 PS	Rest level at any 2 or more indicator sites reaches **RWL2** trigger level; >180mm recharge deficit	3.0 Ml/d	3.2 Ml/d	Whole Supply Zone	6 months lead time; initiate November following 3rd dry winter, implement following Spring (March) Effective throughout year	None – already licenced source	WFD No deterioration for unused source. NEP Investigations. See Environmental Assessment
S2: Re-commission Croydon PS	Rest level at 3 or more indicator sites reaches **RWL3** trigger level; >180mm recharge deficit	2.0 Ml/d	2.5 Ml/d	Whole Supply Zone	12 months lead time; initiate January following 3rd dry winter, implement early following Winter (November)	None – already licenced source Board approval for expenditure Possible planning requirements	WFD No deterioration for unused source. See Environmental Assessment. Treatment requirements
S3: Re-commission Kingston PS	Rest level at 3 or more indicator sites reaches **RWL4**	1.0 Ml/d	1.0 Ml/d	Whole Supply Zone	12 months lead time; initiate April following 3rd dry winter, implement following	None – already licenced source Possible planning	WFD No deterioration for unused source. See Environmental

	trigger level; >180mm recharge deficit				Spring (March)	requirements	Assessment. Treatment requirements
S4: Re-commission St Ives PS	Rest level at any 3 or more indicator sites reaches **RWL5** trigger level; and >260mm recharge deficit	1.6 Ml/d	4.6 Ml/d	Whole Supply Zone	10 months lead time; initiate August following 3rd dry winter, implement following Spring	None – already licenced source Board approval for expenditure Possible planning requirements	WFD No deterioration for unused source. See Environmental Assessment.

Appendix E: Environmental Impact Assessment of Drought Management Options

Action to increase water supply (including timescale and time of year	Summary of likely environmental impacts; features considered	Risk to the environment (L. M, H) & how assessed	Baseline information used	additional monitoring requirements	mitigation methods	Impact on other activities	Details of permits and permissions required
Increase abstraction at Brettenham within licence above recent actual volumes. As required, all year/peak demands	GB10503304307: Sapiston River – Risk of Deterioration (u/s inGB105033043090) GB105033043090: Little Ouse (Sapiston Confluence to Nuns' Br) - Risk of Deterioration AP12: Upper Little Ouse and Chalk unit (in GB105033043100) – Risk of Deterioration AP13: River Thet and Chalk unit – Risk of Deterioration (link to E Wretham Heath Habitats Dir) – no issues	High. Assessed on basis of WFD Deterioration risk (EA Sustainable catchments, Jan 2016)	RSA investigations EA WRGIS EA WFD Compliance points	Flow monitoring in Sapiston-AWS AMP6 programme continuation. Flows in Lt Ouse Flows in Upper Lt Ouse at Euston Bridge against flow target 94l/s Programme of flow and ecological monitoring	GOGS to support river flows: Upper Lt Ouse Potential additional augmentation from Brettenham Agricultural licences reduced: Lt Ouse, Sapiston	none	new augmentation discharge licences
Increase abstraction at Euston within licence above recent actual volumes. As required, all year	GB10503304307: Sapiston River – Risk of Deterioration (u/s inGB105033043090) GB105033043090: Little Ouse (Sapiston Confluence to Nuns' Br) - Risk of Deterioration AP12: Upper Little Ouse and Chalk unit (in GB105033043100) – Risk of Deterioration	High. Assessed on basis of WFD Deterioration risk (EA Sustainable catchments, Jan 2016)	RSA investigations EA WRGIS EA WFD Compliance points	Flow monitoring in Sapiston-AWS AMP6 programme continuation. Flows in Lt Ouse Flows in Upper Lt Ouse at Euston Bridge against flow target 94l/s Programme of flow and ecological monitoring	GOGS to support river flows: Upper Lt Ouse Potential additional augmentation from Brettenham Agricultural licences reduced: Lt Ouse Sapiston	none	new augmentation discharge licences
Increase abstraction at Westley within licence above recent actual volumes. As required, all year/peak demands	AP7: River Snail (link to Chippenham Fen Habitats Dir.) - no issues GB105033042700: Bottisham Lode - Quy Water -no flow issues GB105033042780: New River (link to Wicken Fen Habitats Dir.) -no issues GB105033042710: Swaffham - Bulbeck Lode – Risk of Deterioration	Moderate. Assessed on basis of WFD Deterioration risk (EA Sustainable catchments, Jan 2016)	RSA investigations EA WRGIS EA WFD Compliance points	Flows in Swaffham - Bulbeck Lode	Lodes Granta river support Scheme: Swaffham Bulbeck Lode, River Granta		n/a
Increase abstraction at Fleam Dyke within licence above recent actual volumes. As required, all year	GB105033042670: Cherry Hinton Brook – Flow compliance to support ecology AP2: River Granta and Chalk unit – Risk of Deterioration impacting on flow targets set GB105033042700: Bottisham Lode - Quy Water – not flow dependant GB105033042710: Swaffham - Bulbeck Lode – Risk of Deterioration GB10503303762: Hobson's Brook – Risk	Moderate. Assessed on basis of WFD Deterioration risk (EA Sustainable catchments, Jan 2016)	AMP4 NEP Investigations EA WRGIS EA WFD Compliance points	Continuation of 2016 flow & ecology monitoring in Cherry Hinton Brook monitoring in River Granta at Babraham gauge Flows in Swaffham - Bulbeck Lode gauged flows at Nine Wells additional monitoring u/s of Hobsons Brook	Lodes Granta River support Scheme: Swaffham Bulbeck Lode, River Granta Use as preference to Babraham increased abstraction Agricultural licences reduced: Granta	none	n/a

	of Deterioration						
Increase abstraction at Babraham within licence above recent actual volumes. As required, all year	Hobson's Brook (GB105033037620) – Risk of Deterioration	Moderate. Assessed on basis of WFD Deterioration risk (EA Sustainable catchments, Jan 2016)	AMP4 NEP Investigations EA WRGIS EA WFD Compliance point	gauged flows at Nine Wells additional monitoring u/s of Hobson's Brook	Reductions in abstraction equivalent to proposed licence change. Agricultural licences reduced	Amenity at Nine Wells LNR	n/a
Increase abstraction at Horseheath within licence above recent actual volumes. As required, all year/low flows	River Granta (GB105033037810) Risk of deterioration	Moderate. Assessed on basis of WFD Deterioration risk (EA Sustainable catchments, Jan 2016)	AMP 3 & AMP4 NEP Investigations, AMP6 implementation EA WFD Compliance point	Flows at Babraham gauge Flows and ecology upstream of EA river support discharge - Bartlow	Maintain flow target 26l/s at Babraham gauge. EA Lodes Granta scheme in operation Potential augmentation from Horseheath or Linton. Reductions to abstraction at Linton & Rivey.		new augmentation discharge licences
Increase abstraction at Linton within licence above recent actual volumes. As required, high flows	River Granta (GB105033037810) Risk of deterioration	High. Assessed on basis of WFD Deterioration risk (EA Sustainable catchments, Jan 2016)	AMP 3 & AMP4 NEP Investigations, AMP6 implementation EA WFD Compliance point	Flows at Babraham gauge	Maintain flow target 26l/s at Babraham gauge. EA Lodes Granta scheme in operation Abstraction reductions at low flows as per AMP6 NEP proposal. Use Rivey & Horseheath abstractions in preference		
Increase abstraction at Rivey within licence above recent actual volumes. As required, high flows	River Granta (GB105033037810) Risk of deterioration	High. Assessed on basis of WFD Deterioration risk (EA Sustainable catchments, Jan 2016)	AMP 3 & AMP4 NEP Investigations, AMP6 implementation EA WFD Compliance point	Flows at Babraham gauge	Maintain flow target 26l/s at Babraham gauge. EA Lodes Granta scheme in operation Abstraction reductions at low flows as per AMP6 NEP proposal. Use Horseheath abstraction in preference		
Re-commission Fleam Dyke 12. Spring after RWL2 exceeded	GB105033042670: Cherry Hinton Brook – Flow compliance to support ecology AP2: River Granta and Chalk unit – Risk of Deterioration impacting on flow targets set GB105033042700: Bottisham Lode - Quy Water – not flow dependant GB105033042710: Swaffham - Bulbeck Lode – Risk of Deterioration GB10503303762: Hobson's Brook – Risk of Deterioration	Moderate. Assessed on basis of WFD Deterioration risk (EA Sustainable catchments, Jan 2016)	AMP4 NEP Investigations EA WRGIS EA WFD Compliance points	Continuation of 2016 flow & ecology monitoring in Cherry Hinton Brook monitoring in River Granta at Babraham gauge Flows in Swaffham - Bulbeck Lode gauged flows at Nine Wells additional monitoring u/s of Hobson's Brook	Lodes Granta River support Scheme: Swaffham Bulbeck Lode, River Granta Use as preference to Babraham increased abstraction Agricultural licences reduced: Granta		

Re-commission Croydon. Winter after RWL 2exceeded	GB105033037820: Millbridge and Potton Brooks – Risk of Deterioration	Low. Assessed on basis of WFD Deterioration risk (EA Sustainable catchments, Jan 2016)	WFD Hydrology Programme EA WRGIS EA WFD Compliance points	Flow and GW Monitoring	HOF conditions to SW abstractions		
Re-commission Kingston. Spring after RWL2 exceeded	AP5: Bourn Brook – Risk of Deterioration	Low. Assessed on basis of WFD Deterioration risk (EA Sustainable catchments, Jan 2016)	WFD Hydrology Programme EA WRGIS EA WFD Compliance points	Flow and GW Monitoring to determine deterioration in Woburn Sands			
Re-commission St Ives. Spring following RWL5 exceeded	GB105033042730: West Brook – Risk of Deterioration GB105033047921: Ouse (Roxton to Earith) - no issues (Habitats Dir)	Low. Assessed on basis of WFD Deterioration risk (EA Sustainable catchments, Jan 2016)	WFD Hydrology Programme EA WRGIS EA WFD Compliance points	Flow and ecological monitoring programme: West Brook Flow monitoring	HOF flows Q34 at Earith Flow Augmentation at Fenstanton PS	Marinas in vicinity - levels	new augmentation discharge licences

Appendix F: Assessment of Environmental Risk from Increased use of licenced abstractions

Licence	Source Name	Deployable output (Ml/d)	Annual Average licensed quantity (Ml/d)	Increase in 10 Yr daily Average	Increase to 10Yr Ave DO utilised (Ml/d)	Increase to 2016 Daily Average	Increase to 2016 DO utilised (Ml/d)	Increase in EA Assessment period	Increase to EA assessment DO utilised (Ml/d)	Increase to 1995 Daily Average	Increase to 1995 DO utilised (Ml/d)	MAX Increase to DO utilised (Ml/d)	drought vulnerable DAPWL	Drought Vulnerbaility beyond No. of dry winters	Impact of licencsed use	Likelihood of need	Potential Damage Caused	Level of Environmental Assessment Req.
6\33\28\G\50	Abington Park	1.00	1.00	30%	0.30	48%	0.48	18%	0.18	0%	0.00	0.48		3	None	Regular	Low	Reduced
6\33\28\G\7	Babraham	9.09	9.09	37%	3.40	22%	2.00	46%	4.14	44%	4.04	4.14		2	Medium	Regular	Moderate	Standard
6\33\44\G\221	Brettenham	11.34	11.34	47%	5.38	19%	2.19	63%	7.11	78%	8.86	8.86		2	High	Infrequent	High	Comprehensive
6\33\34\G\203	Dullingham	3.60	4.50	50%	1.79	63%	2.27	57%	2.05	10%	0.36	2.27	Y	1	Medium	Regular	Low	Reduced
6\33\30\G\191	Duxford Grange	3.41	3.41	6%	0.19	8%	0.28	6%	0.19	34%	1.16	1.16	Y	3	None	Regular	Low	Reduced
6\33\30\G\167 (&167)	Duxford	4.56	4.56	16%	0.73	32%	1.45	1%	0.02	-1%	-0.04	1.45	Y	3	None	Regular	Low	Reduced
6\33\42\G\107	Euston	8.00	8.00	44%	3.51	11%	0.89	30%	2.39	35%	2.77	3.51		1	Medium	Regular	High	Comprehensive
6\33\30\G\26	Fowlmere	3.60	3.60	11%	0.39	19%	0.67	17%	0.62	17%	0.59	0.67		3	None	Regular	Low	Reduced
6\33\30\G\192	Gt Chishill	1.06	1.15	6%	0.07	20%	0.21	0%	0.00	3%	0.04	0.21	Y	1	None	Regular	Low	Reduced
6\33\34\G\123	Gt Wilbraham	5.67	5.67	32%	1.83	48%	2.73	3%	0.16	32%	1.84	2.73		3	None	Regular	Low	Reduced
6\33\30\G\169	Heydon	1.13	1.13	-1%	-0.02	7%	0.08	9%	0.10	17%	0.19	0.19		3	None	Regular	Low	Reduced
6\33\28\G\52	Horseheath	2.30	2.30	91%	2.10	80%	1.85	83%	1.90	100%	2.30	2.30		3	Medium	Regular	Moderate	Standard
6\33\28\G\12	Linton	1.93	1.93	42%	0.81	45%	0.87	44%	0.85	42%	0.80	0.87		1	Low	Regular	High	Comprehensive
6\33\30\G\193	Lowerfield	3.41	3.41	10%	0.33	30%	1.03	6%	0.19	3%	0.10	1.03		3	None	Regular	Low	Reduced
6\33\30\G\156	Melbourn	7.94	7.94	31%	2.43	13%	1.00	35%	2.80	12%	0.93	2.80	Y	1	Medium	Regular	Low	Reduced
6\33\30\G\171	Morden Grange	1.50	2.27	25%	0.37	61%	0.91	7%	0.11	9%	0.14	0.91	Y	3	None	Regular	Low	Reduced
6\33\28\G\51	Rivey	2.20	2.20	36%	0.78	23%	0.51	32%	0.71	22%	0.48	0.78		1	Low	Regular	High	Comprehensive
6\33\28\G\13 (&38)	Sawston	1.49	1.49	30%	0.44	22%	0.32	22%	0.33	97%	1.44	1.44		1	None	Regular	Low	Reduced
6\33\34\G\110	Westley	11.39	11.39	47%	5.39	41%	4.68	60%	6.87	59%	6.76	6.87	Y	2	High	Infrequent	Moderate	Standard
6\33\34\G\179	Weston Colville	2.92	3.65	18%	0.53	9%	0.26	26%	0.74	13%	0.38	0.74	Y	3	Low	Regular	Low	Reduced
6\33\34\G\179	Fulbourn	1.49	1.49	23%	0.34	25%	0.37	16%	0.24	14%	0.21	0.37	Y	2	None	Regular	Low	Reduced
6\33\27\G\39	Hinxton Grange	5.77	5.77	6%	0.32	8%	0.48	1%	0.07	34%	1.96	1.96		1	None	Regular	Low	Reduced
6\33\34\G\24	Fleam Dyke	15.57	15.97	29%	4.48	30%	4.63	17%	2.70	32%	5.02	5.02	Y	2	Medium	Infrequent	Moderate	Standard
Supply side options																		
6\33\26\G\20	St Ives	1.62	4.72	100%	1.62	100%	1.62	100%	1.62	100%	1.62	1.62		3	Low	Exceptional	Low	Reduced
6\33\32\G\20	Kingston	1.00	1.00	71%	0.71	100%	1.00	23%	0.23	8%	0.08	1.00	Y	1	Low	Infrequent	Low	Reduced
6\33\30\G\27	Croydon	1.99	1.99	57%	1.13	0%	0.00	34%	0.67	33%	0.66	1.13		3	Low	Infrequent	Low	Reduced
6\33\34\G\24	Fleam Dyke 12	3.27	3.27	included in Fleam Dyke above									included in Fleam Dyke above					

Appendix G: Drought Vulnerability Assessment – Minimum Modelled Groundwater Levels

ABH Source	OBH	Minimum observed OBH GWL (mAOD)	Minimum observed ABH RWL (mAOD)	Year of minimum modelled GWL (mAOD)	Rainfall scenario	Minimum modelled ABH RWL with correction (mAOD)	DAPWL (mAOD)
Abington	TL54/102	20.61	19.92	1921	3	19.07	-17
Babraham	TL45/017	12.28	11.05	1921	2	10.24	-4.5
Brettenham	TL88/013	12.58	11.35	1921	2	10.01	-5.75
Croydon	TL35/001	18.08	17.6	1979	3	13.66	-3.91
Dullingham	TL65/043	9.85	8.66	1976	1	4.80	-26.2
Duxford Grange	TL44/240	20.18	18.98	1932	3	17.32	6.68
Duxford	TL44/048	19.10	19.22	1921	3	17.42	14.5
Euston	TL88/013	12.61	12.72	1921	1	12.73	11.2
Fleam Dyke 12"	TL55/133	8.84	5.49	1948	2	5.02	-8.8
Fleam Dyke 36"	TL55/133	8.84	6.70	1948	2	5.18	-9
Fowlmere	TL44/293	18.29	18.51	1960	3	13.52	12.5
Fulbourn	TL45/017	12.28	8.11	1921	2	6.78	4.4
Great Chishill	TL44/234	25.9	25.11	1974	1	21.79	-4.19
Great Wilbraham	TL55/144	10.02	5.39	1997	3	4.99	-9.4
Heydon	TL44/238	22.52	23.21	1922	3	18.40	10.3
Hinxton Grange	TL54/002	20.89	20.46	1976	1	20.15	6
Kingston	TL35/004	12.13	12.86	1947	1	10.54	-9.9
Linton	TL54/028	21.11	28.11	1989	1	27.17	-15.5
Lowerfield	TL44/234	25.32	27.87	1922	3	22.30	17.9
Melbourn	TL44/427	20.85	19.70	1942	1	18.81	-0.82
Mordon Grange	TL34/007	39.23	37.24	1922	3	36.48	27
Rivey	TL54/001	35.93	32.93	1976	1	30.89	-38
Sawston	TL54/006	19.65	14.79	1976	1	14.03	0
Westley	TL55/009	8.99	8.00	1912	2	5.22	-14.6
Weston Colville	TL65/042	11.38	11.38	1919	3	0*	-14.38

Note: The hindcast modelling identified 13 sources at which average demand and/or peak demand could be vulnerable in a worst case scenario drought. The worst case scenario drought can be defined as the period over which the lowest groundwater elevation would occur. Hindcast modelling has been undertaken for a one, two and three year drought period. The lowest groundwater minima from the one, two or three year modelling periods has been used to define the worst case scenario.

Appendix H: Potentially Vulnerable Sources Using Average Demand Conditions

Source	DO using observed data (Ml/d)	DO using hindcast data (Ml/d)	Peak Yield using observed data (Ml/d)	Peak Yield using hindcast data (Ml/d)	Annual licence (Ml/d)	Vulnerable
Abington	1.00 (Annual licence)	1.00 (Annual licence)	>18 (DAPWL)	>18 (DAPWL)	1.00	No
Babraham	9.09 (Annual licence)	9.09 (Annual licence)	12.30 (DAPWL)	11.80 (DAPWL)	9.09	No
Brettenham	11.34 (Annual licence)	11.34 (Annual licence)	>20 (DAPWL)	>20 (DAPWL)	11.34	No
Croydon	1.99 (Annual licence / treatment capacity)	1.99 (Annual licence / treatment)	>3 (DAPWL)	>3 (DAPWL)	1.99	No
Dullingham	3.60 (DAPWL option D)	3.50 (DAPWL option D)	3.70 (DAPWL, option C)	3.60 (DAPWL option C)	4.50	Yes
Duxford Grange	3.41 (Annual licence)	3.05 (DAPWL, Option D)	3.60 (DAPWL option C))	3.05 (DAPWL, option C)	3.41	Yes
Duxford	4.56 (Annual Licence)	4.08 (DAPWL)	6.22 (DAPWL)	4.08 (DAPWL)	4.56	Yes
Euston	8.00 (Annual licence)	8.00 (Annual licence)	>12 (DAPWL)	>12 (DAPWL)	8.00	No
Fleam Dyke 12"	3.27 (Annual licence)	2.90 (DAPWL)	>4.00 (DAPWL, option C)	>4.00 (DAPWL, option C)	3.27	No
Fleam Dyke 36"	12.30 (DAPWL)	11.62 (DAPWL)	12.30 (DAPWL)	11.62 (DAPWL)	12.61	Yes
Fowlmere	3.60 (Annual licence)	3.60 (Annual licence)	7.35 (DAPWL at 12.5m AOD)	7.35*	3.60	No
Fulbourn	1.49 (Annual licence)	0.76 (DAPWL)	1.77 (DAPWL, Option C)	0.76 (DAPWL, Option C)	1.49	Yes
Gt. Chishill	1.06 (DAPWL, option C)	0.92 (DAPWL, option C)	1.06 (DAPWL, option C)	0.92 (DAPWL, option C)	1.15	Yes
Gt. Wilbraham	5.67 (Annual licence)	5.67 (Annual licence)	13.00 (DAPWL, BHs 1/2)	13.00 (DAPWL, BHs 1/2)	5.67	No
Heydon	1.13 (Annual licence)	1.13 (Annual licence)	2.80 (DAPWL)	2.80 (DAPWL)	1.13	No
Hinxton Gr	5.77 (Annual licence)	5.77 (Annual licence)	16.3 (maximum monthly output)	16.3 (maximum monthly output)	5.77	No
Kingston	1.00 (Annual licence)	0.50 (pump cut-out) 1.00 (Annual licence)[1]	>5 (DAPWL)	>5 (DAPWL)	1.00	Yes
Linton	1.93 (Annual licence)	1.93 (Annual licence)	>10 (DAPWL)	>10 (DAPWL)	1.93	No
Lowerfield	3.41 (Annual licence)	3.41 (Annual licence)	9.5 (DAPWL, option C)	5.0 (DAPWL, option C)	3.41	No
Melbourn	7.94 (Annual licence)	7.94 (Annual licence)	9.15 (DAPWL, option D)	7.94 (DAPWL, option C&D)	7.94	Yes
Mordon Grange	1.5 (pump capacity)	1.39 (DAPWL)	1.5 (DAPWL, option C)	1.39 (DAPWL, option C)	2.27	Yes
Rivey	2.2 (Annual licence)	2.2 (Annual licence)	>4 (DAPWL)	>4 (DAPWL)	2.20	No
Sawston	1.49 (Annual licence)	1.49 (Annual licence)	3.15 (DAPWL)	3.15 (DAPWL)	1.49	No
Westley	11.39 (Annual licence)	5.1 (DAPWL)	11.39 (DAPWL)	5.1 (DAPWL)	11.39	Yes
Weston Colville	2.7 (DAPWL, option D)	1.28 (DAPWL, option D)	2.92 (DAPWL, option C)	1.28 (DAPWL, option C & D)	3.65	Yes

Appendix I: Cherry Hinton Brook Environmental Monitoring Plan

This technical Appendix is available on request

Appendix J: Little Ouse, River Thet & Sapiston Environmental Monitoring plan

This technical Appendix is available on request

Appendix K: River Granta Environmental Monitoring Plan

This technical Appendix is available on request

Appendix L: Bottisham Lode Environmental Monitoring Plan

This technical Appendix is available on request

Appendix M: Hobsons Brook Environmental Monitoring Report

This technical Appendix is available on request

Appendix N: Millbridge Common Brook Environmental Monitoring Report

This technical Appendix is available on request

Appendix O: Glossary

Term or acronym	Definition
BAP	Biodiversity Action Plan
CCWater	Consumer Council for Water
CoP	Code of Practice
DAPWL	Deepest Advisable Pumping Water Level
Defra	Department of Environment, Food and Rural Affairs
DMA	District Meter Area
EA	Environment Agency
FWMA 2010	Flood and Water Management Act 2010
HRA	Habitats Regulations Assessment
LNR	Local Nature Reserve
Ml/d	Megalitres per day
MORECS	Meteorological Office Rainfall and Evaporation Calculation System
NE	Natural England
NEP	National Environment Programme
Ofwat	The Water Services Regulation Authority (formerly the Office of Water Services)
PY	Peak Yield
RSA	Restoration of Sustainable Abstraction
RWL	Rest Water Level
SAC	Special Area of Conservation
SEA	Strategic Environmental Assessment
SoS	Secretary of State
SRO	Source Reliable Output
SSSI	Site of Special Scientific Interest
UKWIR	United Kingdom Water Industry Research
WFD	Water Framework Directive

WIA 1991	Water Industry Act 1991
WRA 1991	Water Resources Act 1991
WRGIS	Water Resources Geographical Information System
WRMP	Water Resources Management Plan