Affinity Water

Your local supply, on tap

Our Plan for Customers & Communities

Draft Water Resources Management Plan

May 2013

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Asset Management document control sheet

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CEO Foreword

We are pleased to present our first Draft Water Resources Management Plan (dWRMP or Plan) as Affinity Water, the company formed in 2012 following the unification of three water supply companies.

Our vision is to be the leading community-focused water company in the UK, understanding the local needs of the communities we serve in our three regions and ensuring that our service reflects the priorities of our customers.

This Plan is being published to seek the views of our customers on our water resources planning strategy and investment. We are proposing a range of measures across our eight water resource zones to ensure the security of water supplies is maintained into the future whilst reducing the environmental impact of our operations and improving the resilience of our infrastructure to cope with climate variations.

A key challenge for our business will be how we adapt to the reduction in our abstractions from a number of our groundwater sources to improve flows and environmental habitats in local chalk streams. We have agreed sustainability reductions of 77 Ml/d with the Environment Agency in our Central and Southeast regions. These reductions represent nearly 6% of our resource base. This Plan is substantially different from our previous plans as we no longer have a surplus of resources and it means we have to replace lost resources by reducing leakage and working with customers to reduce consumption through metering and promoting water efficiency or developing new resources and bringing in new supplies.

We have been proactive in engaging with the water industry regulators to ensure that there is consistency between this WRMP and our next Business Plan to be submitted to the price regulator, Ofwat, in 2014. Incorporation of customer views is fundamental to both plans so we will be consulting in a variety of ways through this spring and summer.

We have also worked closely with other water companies in the South East of England to explore the potential for sharing regional water resources in the interests of resilience, sustainability, cost and energy efficiency. This work has been valuable and we have used the outcomes of collective modelling work to inform our Plan.

Our Plan will result in substantial changes to our operations and carries additional risk which means it is essential we work in partnership with our customers to reduce water consumption through compulsory metering of most households by 2020, water efficiency initiatives and leakage reduction. We will also continue to make best use of existing resources whilst improving resilience to severe drought following the experience of the ‘wettest drought on record’ in 2012; the unprecedented summer rainfall averted what could have been the worst drought in living memory.

We are committed to providing high quality customer service and take this opportunity to ask our customers and stakeholders to let us know if they agree with our Plan and support the level of service offered. Please let us have your views.

Richard Bienfait
Chief Executive Officer, Affinity Water Ltd.

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Summary of our Plan for Customers & Communities

We have prepared our draft Water Resources Management Plan (dWRMP or Plan) in accordance with published guidance to ensure that we meet the water supply needs of our customers over the next 25 years. We have taken account the views of Government, our regulators and most importantly our communities and we have been proactive to ensure that there is consistency between this Plan and our next Business Plan to be submitted to the price regulator, Ofwat, in 2014.

Our customers have some of the lowest water bills in England, whilst having one of the highest per capita consumption. We understand that customers will not welcome increased bills, and have considered this as we have developed our Plan.

We set ourselves the objectives of improving resilience whilst reducing the environmental affects of our operations and meet Government aspirations by reducing demand.

We have developed our plan using eight water resources zones covering our three separate regions, Central, East and Southeast as they have different requirements.

Our plan considers the challenges of high levels of existing consumption coupled with forecasts of increases in population of between 14% and 30% and housing growth. Conversely our resource base is reducing from the affects of climate change.

Another key challenge is how we adapt to the reduction in our abstractions from a number of our groundwater sources to improve flows and environmental habitats in local chalk streams. We have agreed sustainability reductions of 77 Ml/d with the Environment Agency in our Central and Southeast regions. These reductions represent nearly 6% of our resource base.

We have forecast both our supply capacity and the demand of our customers and this shows we have a supply / demand deficits in two of our regions, Central and Southeast and five of our eight water resources zones. We have undertaken a rigorous assessment of options to meet those deficits.

We have also worked closely with other water companies in the South East of England to explore the potential for sharing regional water resources in the interests of resilience, sustainability, cost and energy efficiency. This work has been valuable and we have used the outcomes of collective modelling work to inform our Plan.

Our Plan includes a balanced range of options to:

- **Reduce leakage** across most of our water resource zones;
- Assist customers to **reduce domestic consumption** by minimising waste and using water wisely;
- Continue to **extend household metering** as a fair means of charging and to reduce demand;
- Make **best use of our existing water supplies**;
- Continue to **work with our neighbouring water companies** in providing cross-border water transfers.

Our Plan will result in substantial changes to our operations and carries additional risk which means it is essential we work in partnership with our customers to reduce water consumption

through compulsory metering of most households by 2020, water efficiency initiatives and leakage reduction. We will also continue to make best use of existing resources whilst improving resilience to severe drought following the experience of the 'wettest drought on record' in 2012; the unprecedented summer rainfall averted what could have been the worst drought in living memory.

In the immediate five years, from 2015 to 2020 we expect our Preferred Plan will achieve:

- A saving of **20Ml/d** in leakage at a cost of £11.3 million.
- Over **36Ml/d** of demand reductions from compulsory metering by automated meter reading in five of our six water resource zones in the Central region; the total cost for metering in all size of our regions is £95 million.
- Around **4Ml/d** from water efficiency, in addition to the benefits of the combined domestic metering and water efficiency programme; this will cost £5.1 million.
- An extra **1Ml/d** from our existing licences, by increasing the amount we abstract without causing damage to the environment. These options also give us an extra 8Ml/d during peak conditions at a cost of £2.2 million.
- An additional **21Ml/d** of water that we will buy from our neighbouring water companies to make sure we have enough to meet the needs of our customers, rising to 31Ml/d during peak conditions. This will cost £12.9 million.

We will also invest in the order of £11Million to reinforce our network to enable us to change the way we transfer water to communities where we will be reducing our abstractions.

Finally we have assessed the cost of increasing our resilience against severe drought which will cost £15.5Million between 2015 and 2020.

We will identify efficiencies in how we deliver out investment programmes to minimise the impact on bills, whether for this Water Resources Management Plan or the ongoing maintenance of our assets so that we can maintain flexibility and continue to offer best value solutions for our customers and communities.

We will be seeking views of our customers and stakeholders on the cost-benefit of our Plan and investment proposals between May and August 2013.

Table of Contents

Table of Figures

List of Tables

1 Background

1.1 Need for Water Resources Management Plan

Water companies in England and Wales are required by law to produce a water resources management plan (WRMP) every five years. The Plan must set out how a water company intends to maintain the balance between water supply and demand over a 25-year period. The Plan has been compiled in accordance with the Water Resources Planning Guideline developed by Government and water industry regulators. It also takes account of and supports Government policy and aspirations for providing secure, sustainable and affordable water supplies to customers.

This Draft WRMP has been published for consultation with our customers, statutory consultees and other stakeholders. It is the first WRMP produced by Affinity Water covering our entire company water supply area; in the past, as three individual companies, we produced separate Plans for each of our three separate geographic regions.

Implementation of solutions required in our agreed final WRMP will underpin our next regulatory Business Plan, to be submitted to the economic regulator Ofwat, who will determine our future water charging price limits.

Alongside compliance with water industry regulations, we are adhering to the following objectives within our WRMP:

- To meet the water supply needs of our customers over the next 25 years;
- To work closely with other water companies in our region to share water resources;
- To ensure that our water abstractions are sustainable and do not damage the environment;
- To reduce leakage from underground water pipes where the savings justify the expenditure and to meet customer expectations;
- To promote water efficiency to support customers and as an aid to reducing demand;
- To extend customer water metering, where cost beneficial, in the interests of fair charging and reducing demand;
- To take account of potential future uncertainties including climate change and higher environmental standards;
- To make best use of existing resources whilst maintaining water quality at all times.

To meet our WRMP objectives, we are:

- Consulting with customers to ensure that our plan takes account of your views;
- Engaging with water industry regulators and statutory consultees.

We aim to compile a balanced plan including a range of option types to provide flexibility and to avoid concentration of risk – we aim to reduce leakage, work with customers to reduce their domestic consumption of water and promote metering as a fair method of charging which reduces demand.

1.2 Plan structure

This Plan explains how we have estimated the quantity of water available for supply over the next 25 years and how we have forecast demand from our customers over the same period. We have then compared the supply and demand figures and investigated options for meeting the future deficit.

Our Plan comprises a summary, the main Plan document, data tables and a series of supporting Technical Reports.

We have included in our Plan allowances for reductions in abstractions from some existing groundwater sources where investigations indicate that such abstractions cause a reduction in summer river flows with a consequent negative environmental impact on local water habitats.

Our potential options to balance supply and demand include schemes to reduce leakage, install more customer meters and encourage better use of water with minimal wastage. These are consistent with Government aspirations to reduce per capita water consumption.

We have also identified possible schemes to provide additional water resources from groundwater, surface water and transfers.

We have taken an active role in the Water Resources in the Southeast (WRSE) project working with the Environment Agency and five other water companies to assess strategic water supply opportunities across the region. The WRSE supply / demand modelling process, encompassing potential options and cross border supplies from all the water companies, has been a crucial component in the development of our plan.

This Plan also describes the customer and stakeholder consultation process which is fundamental to our decision-making in setting our water resources strategy and in developing our Business Plan. Feedback from customers will influence where we target expenditure.

Figure 1 describes the components of our WRMP and their relationships with each other.

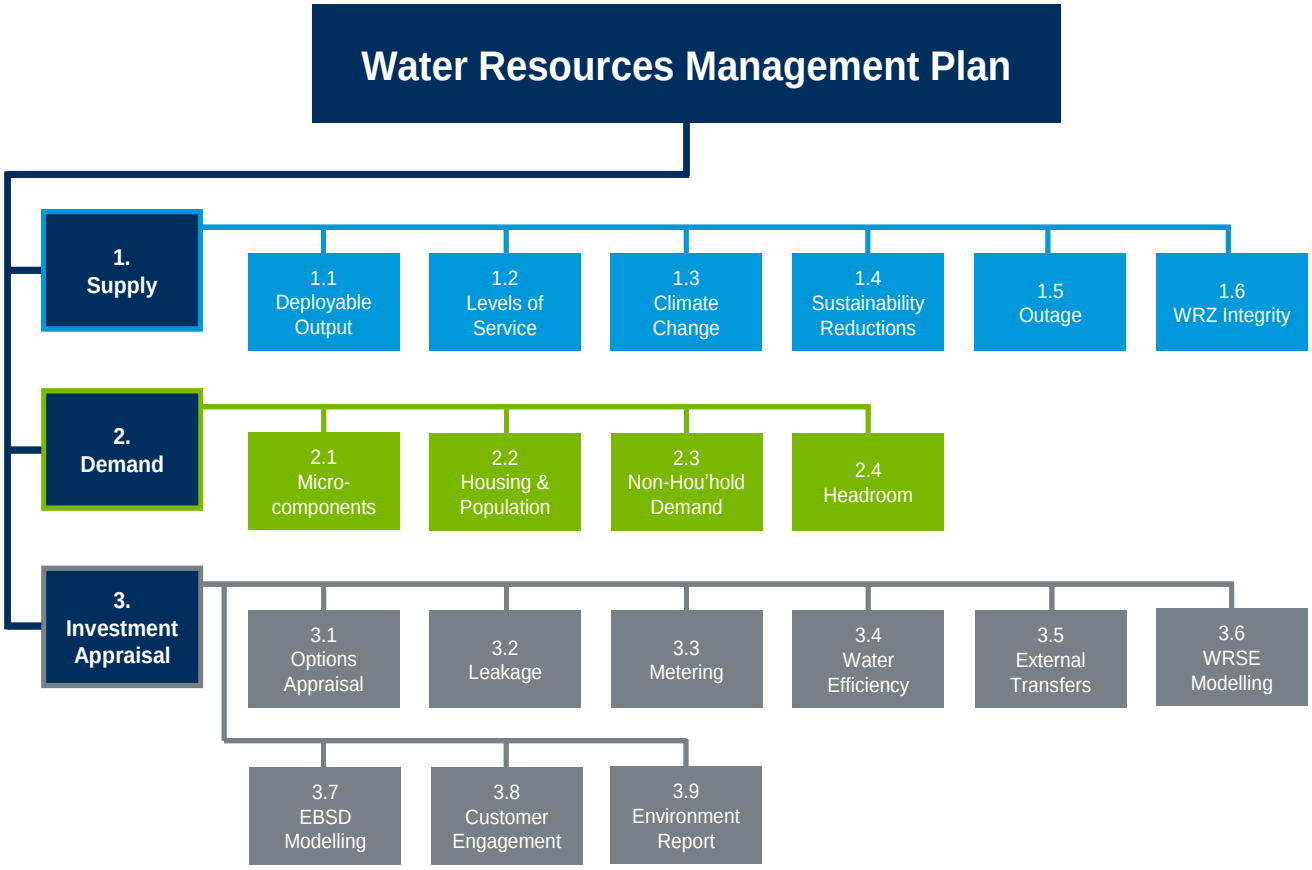

Figure 1: Components of our WRMP

This WRMP is supported by:

- An Environmental Report describing the Strategic Environmental Assessment undertaken to assess the impacts of our development options;
- Full results and conclusions from the detailed studies undertaken to produce this plan; these are compiled into separate Technical Reports as listed in this Plan's Appendix A. Reference is made to each Technical Report in relevant sections of this plan;
- Tables submitted to the Environment Agency with full Plan data;
- The published WRSE Reports (February 2013).

1.3 Timeline

The timeline for our main WRMP activities is shown in Figure 2. We plan to publish our report by 17 May 2013 and the consultation period will be open for 12 weeks until 12 August 2013.

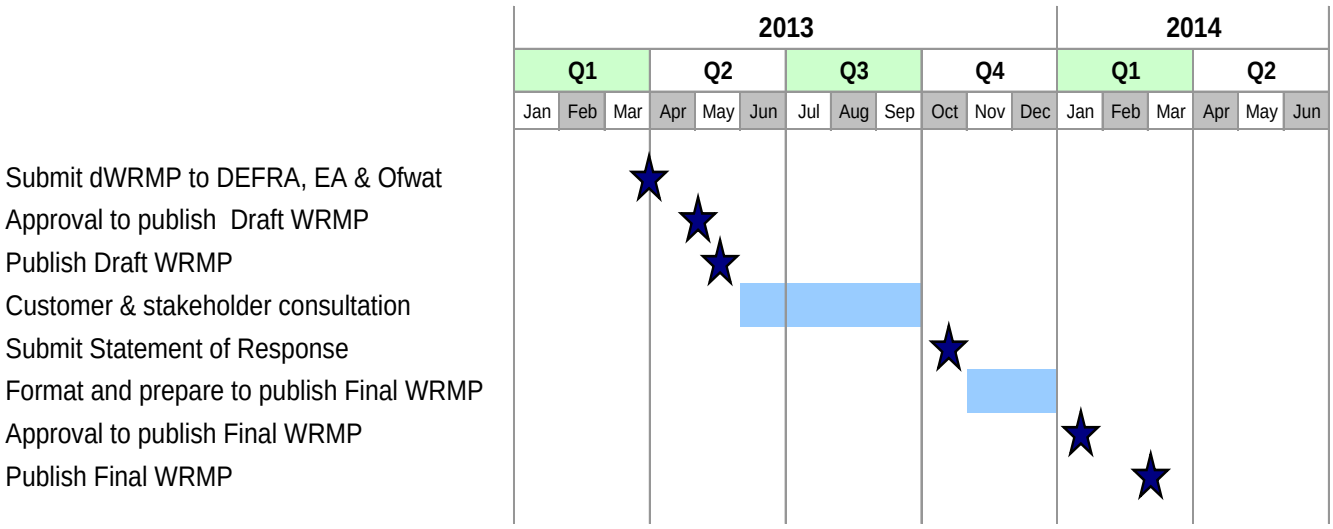

Figure 2: Timeline for WRMP process

1.4 Customer feedback

We invite our customers to submit comments on any aspect of our Plan. These can be sent to DEFRA as follows:

Email: water.resources@defra.gsi.gov.uk

Post: Secretary of State for Environment, Food and Rural Affairs
Water Resources Management Plan Consultation
3rd FLOOR NOBEL HOUSE
17 SMITH SQUARE
LONDON
SW1P 3JR

Alternatively if you would prefer to send your comments to us, we will forward a copy to DEFRA on your behalf. In this case responses may be sent to:

Email: WRMP.Consultation@affinitywater.co.uk

Post: FAO: Water Resources Planning Team
Affinity Water Ltd.
Tamblin Way
Hatfield
Hertfordshire
AL10 9EZ

We will be notifying a wide range of key stakeholders and interest groups that our Plan is published for consultation, as listed in Appendix B: *List of Stakeholders and Consultees*. We also contacted these organisations during our pre-consultation stage in 2012.

You may request a copy of our Plan, a summary of our Plan and the associated Tables from our website via the link below:

www.affinitywater.co.uk/futureplans

Paper copies of our Plan and supporting documents are available for inspection at our offices at the above address or by post on request. A schedule of the Technical Reports which support our Plan as listed in Appendix A can be viewed on our website; copies can be requested on CD from the postal or email address above.

1.5 Key consultation questions

Our Plan presents our preferred strategy to balance supply and demand and to ensure security of water supply until 2040 and beyond. We also explain the resilience of our plan and its sensitivity to climate change, drought and other factors. There are a number of key questions on which we are particularly keen to seek your views.

1.5.1 Our Preferred Plan

Our Preferred Plan balances the challenges we face, proposed improvements in our performance and what we need from you against the overall cost.

How well do your think our Preferred Plan achieves this?

1.5.2 Leakage

We are proposing to spend more on repairing pipes than is cost effective for the volume of water saved.

Do you agree with this approach?

Weather conditions can have a significant impact on the level of leakage, should our targets be altered to reflect this?

1.5.3 Sustainability Reductions

To enable local river environments to improve we propose replacing or reducing abstraction from those sources likely to be impacting on them. This could increase customers' water bills by around £10.

Are you willing for bills to rise to enable this to be achieved?

1.5.4 Water Efficiency and Metering

We think metering is the fairest way to pay for water. We also think we need to do more ourselves and to help everyone else in being more efficient in the use of water. To do this we propose a compulsory metering programme. The cheapest way to meter is achieved via street by street installation, whilst promoting water efficiency.

Do you agree?

1.5.5 Drought resilience

The 2012 drought highlighted the need for us to invest £15.5M to improve the security of water supplies in the case of future severe water shortage in South East of England.

Should this investment be made?

In section 3.5, we explain the different ways we have sought feedback from customers as we have developed our plan.

We have received customer answers to our specific questions as well as a range of general comments; quotes from these are included throughout this Plan.

> “Please let me know what the follow-ups to your plans are. I would be interested in hearing about them”

2 Affinity Water Supply Area

2.1 Summary

We supply drinking water to approximately 3.5 million people and 1.4 million properties in the Southeast of England.

Our supply area comprises three distinct geographic regions, as shown in Figure 3:

– ***Central*** provides water to north London and extends into rural parts of Essex, Hertfordshire and Buckinghamshire, with a population of 3.2 million people;

– ***Southeast*** provides water to the towns of Folkestone and Dover, together with surrounding rural areas including Romney Marsh and Dungeness, with a population of 160,000 people;

– ***East*** provides water to north east Essex including the towns of Harwich and Clacton on Sea, with a population of 156,000 people.

Figure 3: Map of Affinity Water supply area

2.2 Water resources

We currently have 130 groundwater sources, four river intakes on the River Thames, one impounding reservoir and 12 bulk supply imports from neighbouring water companies.

Approximately 65% of our water is from groundwater sources and the rest from surface water. We also provide bulk supply exports to three water companies (reference Technical Report 3.5: *Water Company & Third Party Bulk Transfers*).

Our major water sources and trunk mains for transferring water across our regions are shown in Figure 4, Figure 5 and Figure 6.

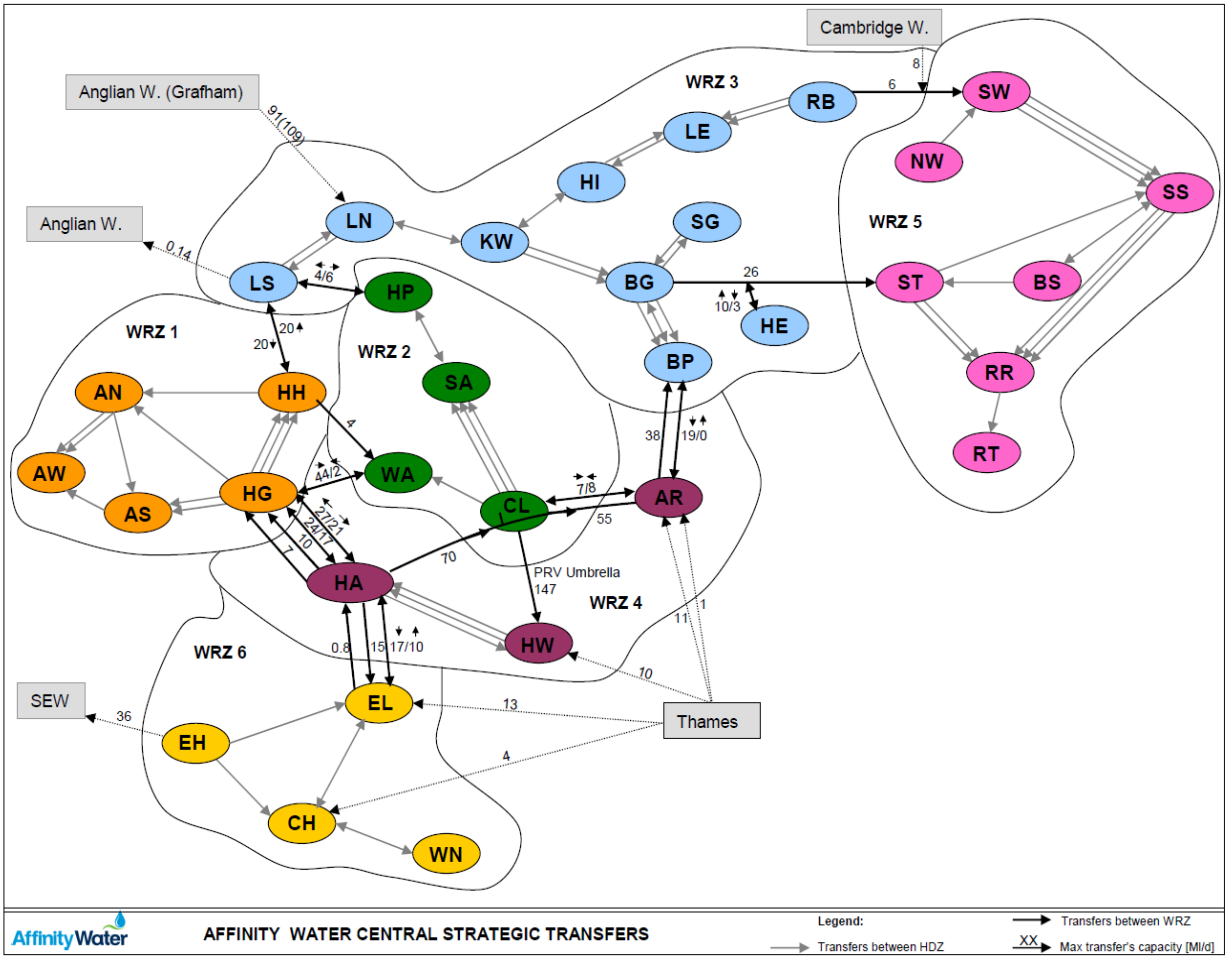

Figure 4: Map of sources and transfers in Affinity Water Central

Our Central region abstracts 60% of its water supply from groundwater sources with boreholes abstracting from chalk and gravel aquifers, 40% from surface water sources and imports from neighbouring water companies: Thames Water, Anglian Water and Cambridge Water. We also export water to South East Water and Cambridge Water.

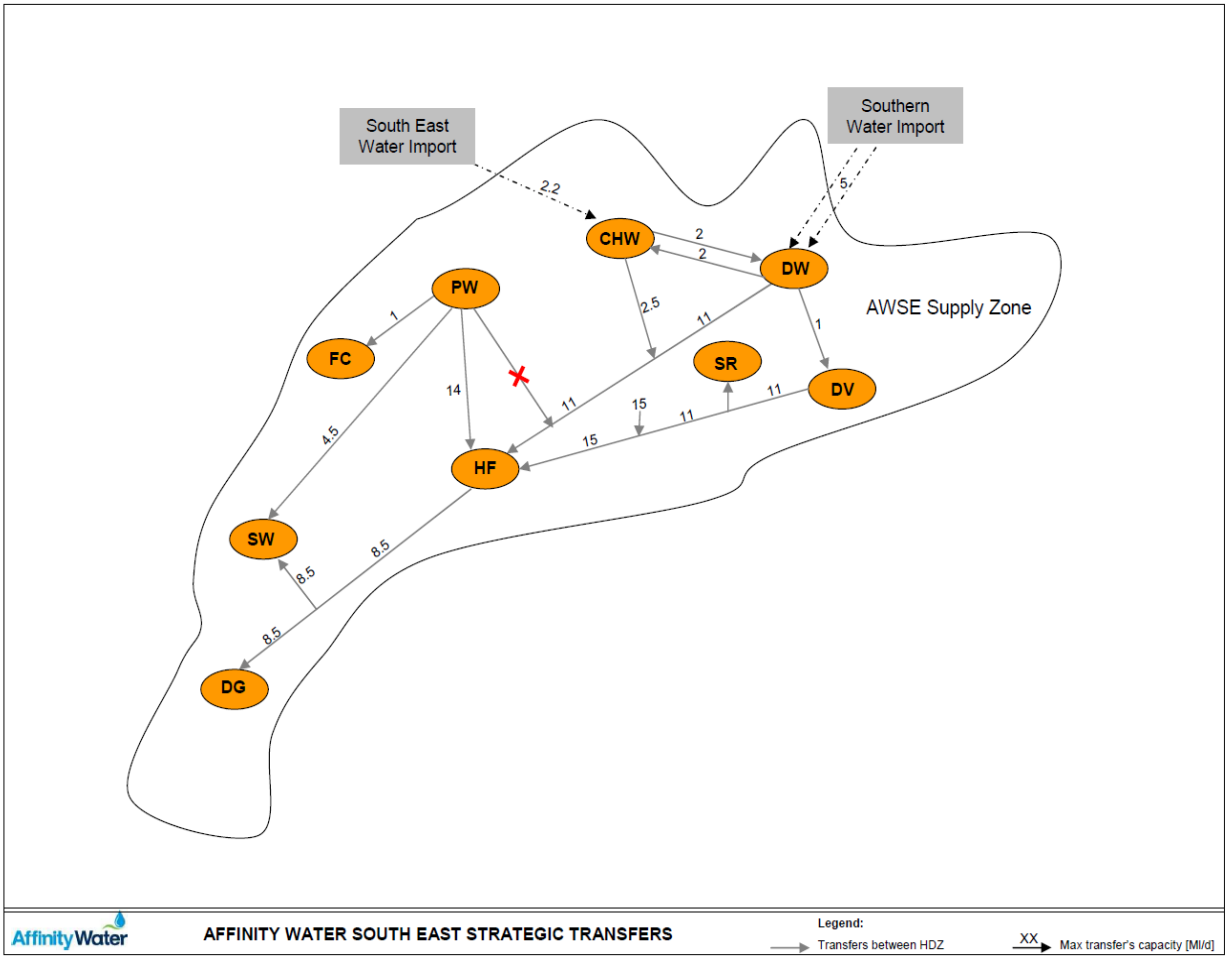

Figure 5: Map of sources and transfers in Affinity Water Southeast

Our Southeast region abstracts 90% of its water from chalk and greensand groundwater boreholes with a minor component from the Denge gravels; small amounts of water are also imported from South East Water and Southern Water.

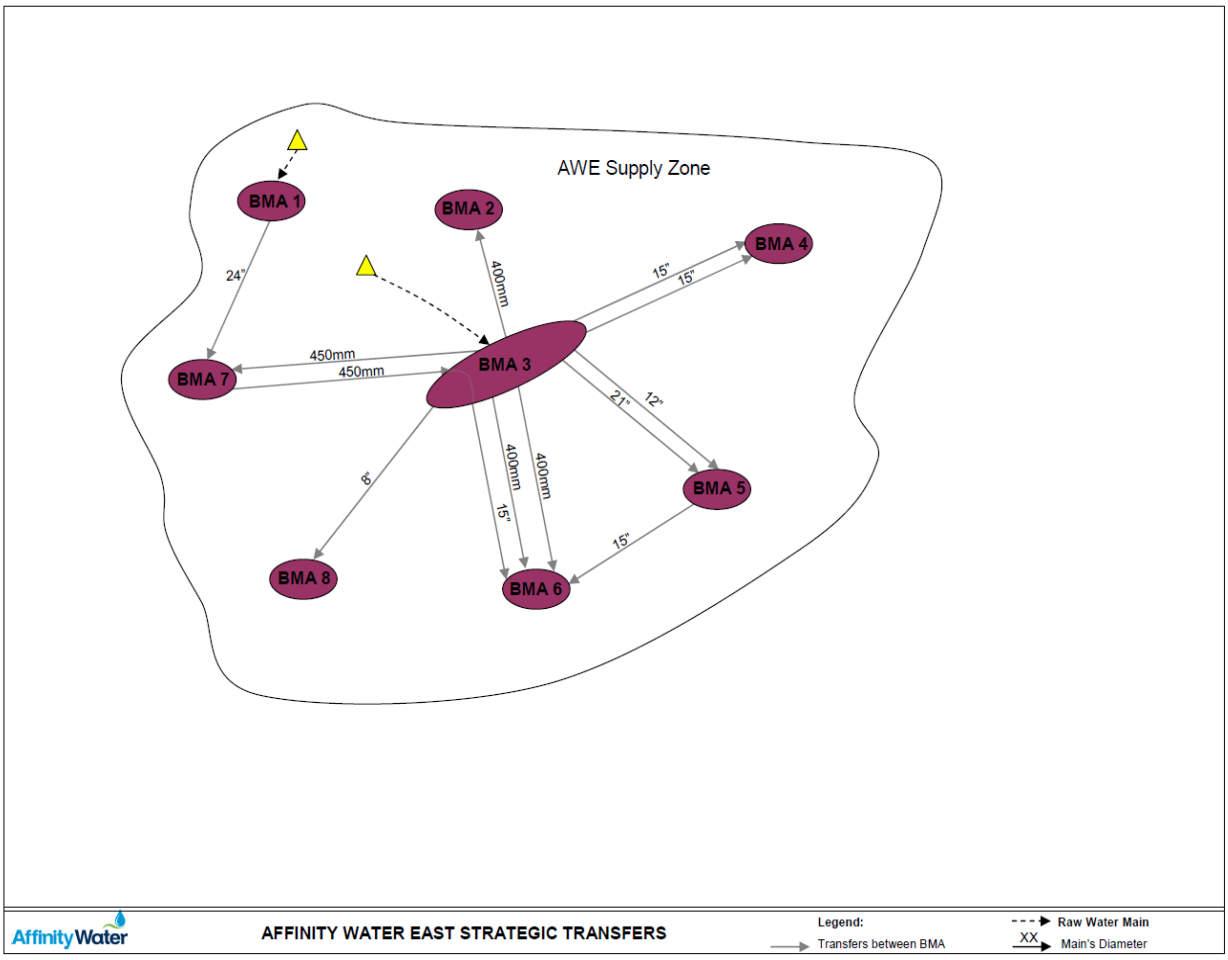

Figure 6: Map of sources and transfers in Affinity Water East

Our East region normally takes 100% of its water supply from groundwater sources but can also import water from our nearby reservoir which is jointly owned with Anglian Water.

Although we operate all water supply facilities in our area, other providers can be granted licences by the regulator, Ofwat; currently there are no other drinking water licence holders. Sewage services are provided by other companies, although we bill some of our customers for those services on their behalf.

An indicative diagram showing how water is transferred from source to customer is shown in Figure 7.

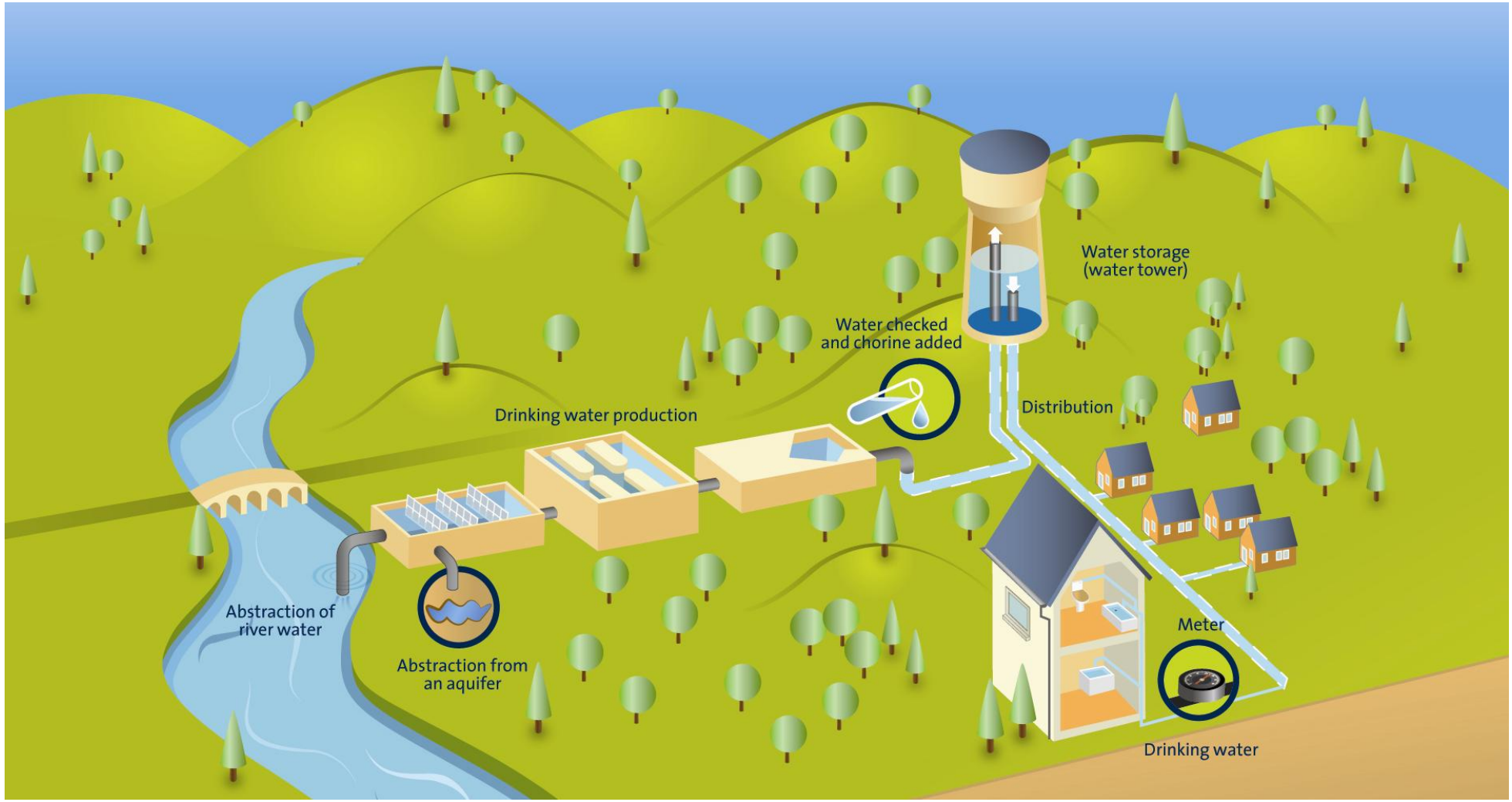

Figure 7: Supplying water to our customers

3 Our planning approach

3.1 Water resource zones

Our supply area is divided into eight water resource zones (WRZs) which are broadly integrated areas where customers are supplied by a common pipe network from a number of local water sources. There are also water transfers between zones to permit operational flexibility.

Water resource zones are created to facilitate assessment of the supply / demand balance. We may not be able to transfer water from all sources to all customer areas due to limitations on pipe work, pumping stations or other infrastructure. Pumping water over longer distances is also very energy intensive so it is not cost effective to create fully integrated water networks over a large area. We assess our supply / demand balance at the WRZ level and at the integrated regional and company-wide areas.

The WRMP Guideline defines a water resource zone as 'the largest possible zone in which all resources, including external transfers, can be shared and, hence, the zone in which all customers will experience the same risk of supply failure from a resource shortfall'. We have undertaken a review of our networks to ensure that our zones meet this definition.

Our zones are shown in Figure 8.

Figure 8: Map of water resource zones

Each of our two smaller regions, East and Southeast, operate as an independent resource zone.

Our Central region is divided into six water resource zones. In our previous WRMP, we used a division into three zones but we have reverted to six to facilitate assessment of likely sustainability reductions; these are reductions in source outputs agreed with the Environment Agency where water abstractions are considered to be having an impact on environmental habitats.

Sustainability reductions will result in closure of local water sources so investment will be required in those areas (reference Technical Report 1.6: *Water Resource Zone Integrity*).

Our water resource zones also define our communities. These community links were established to ensure that we continue to provide effective delivery of services at a local level. In particular, we want to ensure that the two outlying zones (East and Southeast regions) retain their identities within the unified company.

As part of the WRMP process, we are inviting all customers to comment on our proposals from their own local perspective.

3.2 Affinity Water policies

3.2.1 Levels of service

3.2.1.1 Introduction

Water supply levels of service are a measure of the likelihood of applying restrictions on customers during drought conditions. Our current target values are as follows:

- Temporary use ban – 1 in 10 years;
- Drought permits for additional abstraction and Drought Orders to reduce essential use – 1 in 20 years;
- Emergency Drought Order to increase abstraction that may harm the environment – 1 in 50 years;
- Emergency Drought Order to deploy standpipes – 1 in 50 years.

> “Environmental issues are becoming very important with more frequent drought spells and flooding”

We explain our analysis in the Technical Report 1.2: *Levels of Service Hindcasting*.

As part of this WRMP process, we are consulting with customers to consider whether we should change our current target levels of service. Reducing the likelihood of supply restrictions would require us to develop options to make more water available in drought periods so would incur development costs.

3.2.1.2 Temporary use bans

We have assessed the actual level of service we have provided against current target Levels of Service and confirm that temporary use bans have been applied at the frequency of 1 in 10 over the last 30 years (in 1991, 2006 and 2012).

3.2.1.3 *Drought permits*

We have only once applied restrictions on non-essential use, in 1991; therefore we conclude that the frequency of application of drought orders is better than 1 in 20.

3.2.1.4 *Emergency drought orders*

Our hindcasting assessment shows that estimates of return period for severely low groundwater levels in our trigger observation wells are very sensitive to small variances in rainfall records. Hindcasting for the rainfall data series since 1920 indicates that the level of service for our three observation wells ranges between 1 in 1088 to 1 in 64. However, this rainfall observation data has a standard error of 3% and taking this into account indicates a range of between 1 in 272 and 47. Rainfall data prior to 1920 has an error of up to 30% which would result in a range of level of service from less than 1 in 10 to over 1 in 1,000.

The conclusion of this assessment is that the current assessment of 1 in 40 years return event for unprecedented drought conditions is conservative and a 1 in 50 year return event is more reasonable.

It should be noted that our emergency drought order trigger is predicated on drought levels lower than previously recorded and, in practice, this means that it is not possible to predict the actual behaviour of the chalk and abstraction at levels lower than this. Accordingly it is not possible to correlate the levels of service of rainfall and groundwater at the drought trigger observation boreholes with operational behaviour of abstraction points.

An alternative interpretation in assessing the severity of drought resilience is to consider the difference in frequency of dry year events relating to severe events. The most severe drought we have experienced in operational memory is a two winter drought with an aggregate rainfall of 60%. Our hindcasting assessment has verified that the frequency of imposing restrictions under severely low conditions is 1 in 10.

Our drought assessment of a third dry winter with groundwater levels lower than historically recorded suggests we would see unprecedented drought conditions. We have estimated the loss of resource that is likely under those conditions and considered the investment that would be required to replace that resource. In this way the necessity to implement restrictions associated with severe conditions will be deferred from following two dry winters to three dry winters and this corresponds to a change in level of service for drought trigger 3 relating to a Temporary Use Ban from 1 in 10 to a 1 in 40 event. By inspection, an unprecedented event will be of lesser frequency and this is estimated at 1 in 100 which in practical terms is a random extreme and exceptional event. We have described our proposals in section 9.5.5.

We are of the opinion that the use of standpipes is no longer an appropriate drought response as it is not compatible with regulatory water quality requirements. Our initial customer feedback is also strongly opposed to the use of standpipes; the majority of customers believe that standpipes are unacceptable in a modern civilised society. We consider that standpipes would only be deployed as a last resort in the event of a civil emergency.

3.2.1.5 *Our analysis of the 2012 drought and resilience proposals*

The drought in 2012 highlighted two issues: firstly, concern about the impact of the new temporary use ban restrictions on non-households and the livelihood of small businesses in particular; secondly, we were facing the prospect of unprecedented drought if we saw a third dry winter.

We have listened to our customers and their views on these two issues. Customers supported a change in the way restrictions were implemented, and we have been working with our fellow water companies to review the industry Code of Practice on the implementation of restrictions. We are planning to introduce a difference in timing of restrictions such that non-households are affected later than our domestic customers. This will help small businesses in particular, and give them more time to prepare for restrictions if they are eventually imposed. Our Drought Management Plan was updated in 2012 and takes account of this change.

In our pre-consultation on this Plan, we asked customers if they wanted us to invest more to reduce the potential impact of severe drought.

We have investigated what this would mean in terms of improvements to our sources and the ability to transfer water from areas that will be less affected by severe drought to areas that will be more affected. We have made improvements in the flexibility and resilience of our transfer system in recent years; this is reflected in increases in deployable output for this Plan.

Because of this, the additional investment required to mitigate the risk of a third dry winter drought is estimated at £15M capital expenditure and £0.5M annual operational expenditure for the duration of the drought.

We are asking our customers in this Plan if they want us to make this investment to enhance the level of service we provide in severe drought. Please refer to Technical Report 1.2: *Levels of Service Hindcasting*.

3.2.2 Leakage

3.2.2.1 Introduction

In the next planning period, we will have a supply deficit in five of our eight water resource zones and will therefore commit more resource to reduce leakage levels. Our programme of leakage reduction is challenging and will fulfil the following objectives:

- A continuous reduction in leakage over the 10 year period from 2015 to 2025;
- Control of leakage year-on-year below a predetermined leakage target;
- A cost beneficial approach to target setting and reaching levels of leakage wanted by our customers;
- Continual improvement towards increasing efficiency in managing and controlling leakage;
- Open and continuing dialogue with our customers on potential changes to service levels or the impact of leakage operations in the pursuit of lower leakage levels.

> “One of the greatest problems is leaks in old pipes. The customer should not be penalised for things which are the company's responsibility.”

3.2.2.2 Leakage management and control

Management and control of leakage is primarily achieved by active leakage control (ALC), which is the detection of non-visible leaks, as well as optimised pressure control to reduce the flow from any live leaks and reduction in bursts and the early repair of leaks. This is combined with accurate reporting of our performance to ensure efficient delivery of regulatory targets.

Over 800 District Metered Areas (DMAs) covering in excess of 80% of our network and customers are monitored on a daily basis in order to review performance and identify potential leakage. Software tools are used to assess flow and pressure in these areas and significant changes identified. Minimum night flows (MNFs), the means by which leakage is quantified, are assessed and leakage levels are calculated daily.

> "I think customers who ring you to tell you of a leak in their area should be rewarded somehow"

3.2.2.3 Continuous improvement of our leakage programme

The lessons learned from our Automated Meter Reading (AMR) metering trial of 6,000 properties in our Southeast region will be used in integrating leakage processes with the selective AMR metering programme. A new works management system that is being implemented over the next year will fully integrate detection and repair activities and together with more detailed activity cost information and quicker reporting will reduce waste while maintaining service levels.

3.2.2.4 Customer support for our leakage programme

We are acutely aware that many of our customers and stakeholders react adversely to leakage and we will improve our understanding of this.

Over 900 responses were received to our Draft Water Resources Management Plan (draft WRMP) pre-consultation, which was a mix of qualitative comments and quantitative data. Our dialogue with customers tells us that a majority of 75% feel we should increase the rate at which leaks are fixed on our network but when asked about willingness to pay for this to happen the majority, 69% are not prepared to see an increase in their water bill to address this.

> "Leaks should be fixed immediately"

We have evaluated the responses we have received and taken account of stakeholder views in preparing this technical report. Where the majority of customers have expressed a preference on leakage in support of our plans (according to the pre-consultation feedback), we will maintain this position in our forward planning.

Where opinions are divided and where complex patterns have emerged resulting in no clear majority view, we will carry these issues forward to the draft WRMP consultation phase which takes place after publication of the draft Plan and will run for 12 weeks to late August 2013.

We will use a mix of methods to engage with our customers including quantitative online panel surveys, willingness to pay studies and qualitative focus groups.

During this phase we will define the issues in more detail and provide greater and better information to enable customers to take a view on the issues and provide their feedback on our plans. Using this process we will gain clarity on a majority view from our customers.

Consultation topics will explore significantly reduced repair times for visible leaks (even if uneconomical). We will test customer acceptability for a range of options, for example finding and fixing 95% of accessible visible leaks within 24 hours (especially during times of drought). We will also ask customers to consider regional leakage targets and changes to the process of dealing with customer leaks.

3.2.2.5 Leakage target setting

It is important that we have a balanced investment programme to manage the supply / demand deficit. Relying solely on high levels of leakage reduction presents significant risks to our customers if these cannot be achieved in a sustainable and cost beneficial manner.

We will ensure a continually reducing leakage level through the careful monitoring and response to leakage outbreaks and the natural rate of rise of leakage encountered together with controlled implementation of leakage reduction measures from one leakage level to another.

In order to remain below an upper limit for leakage in all conditions, we will need to control leakage to much lower levels during benign weather periods. Equally we may need to reduce leakage in drought conditions to meet the expectations of our customers. Under both of these transient conditions, leakage operations may be sub-economic. Having a flexible approach to leakage may also conflict with DEFRA's aspiration that leakage should not rise; however, we consider this will be necessary at times to be able to adapt to seasonal and annual weather conditions, whilst seeking to be as efficient as we can in our operations.

> "More emphasis on leaks and wastage"

3.2.3 Metering

3.2.3.1 Introduction

Our three operating areas have implemented metering in accordance with local conditions, where we had the necessary approvals.

- Our Southeast region was designated an area of water scarcity in 2006 and we have now completed our programme of compulsory metering with 93% of properties being fitted with a meter.
- In our East region optant meter take-up has been high and we now have 74% of households metered.
- In our Central region, we have a current policy of optant metering following a period of metering on change of ownership between 2005 and 2010; we now have 42% of households metered.

The proportion of households with meters in each of our three regions is shown in Figure 9.

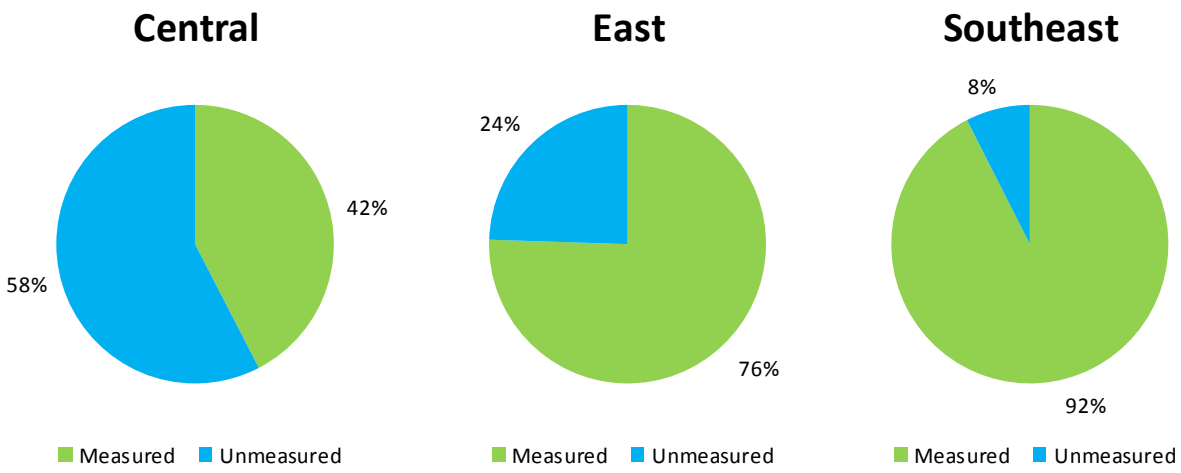

Figure 9: Household metering in Affinity Water's three regions

All three of our regions remain designated as 'serious water stress' areas so we have considered the cost benefit of compulsory metering as part of our modelling and development of our draft Water Resources Management Plan.

With sustainability reductions and the effects of climate change further diminishing water supplies, there is a substantial requirement to reduce abstraction to achieve the balance between supply and demand.

Against this backdrop, demand is on the rise, in part due to a growing population predicted to rise by 14% within the next 25 years. This is in addition to our customers currently having one of the UK's highest per capita consumption (PCC) figures.

During our most recent phase of stakeholder engagement, we received over 900 responses to our draft WRMP pre-consultation. The majority of customers agreed:

- That having a meter installed would affect the amount of water they use (67%).
- They consider meters as the fairest way to pay for water (75%).
- The concept of a volumetric stepped tariff is majority supported (67%).
- While opinion was divided on the likelihood of a meter saving them money, nonetheless 77% believe a compulsory metering programme should be universal rather than limited to areas of severe water scarcity only.

> "People should be trying to cut down their water usage to help the long term environment"

As the majority of customers have expressed a preference for compulsory metering across all zones we have adopted this approach in our proposals.

Whether we will transfer customers directly from the unmeasured tariff to a measured tariff or introduce transitional tariffs that offer customers an adjustment to their metered bill will be addressed in our Business Plan for PR14.

There have been a number of different tariff trials carried out across our regions, aiming to encourage a reduction in consumption. Generally, customers have not responded positively to

these trials. At this time it is not proposed to implement any specific new tariffs for measured household customers but we remain committed to trying to develop new tariffs that will incentivise our customers to reduce their demand for water.

The compulsory metering activity we carried out in our Southeast region over the last seven years has provided a wealth of experience in metering at both the strategic and on-site levels. Although it is accepted that there are significant differences between the regions, the knowledge we gained still provides a good foundation for our Plan, as set out in this document, for metering of the wider Affinity Water area and the Central region in particular.

Analysis carried out by industry specialist consultants Tynemarch shows a reduction of more than 16% in consumption was achieved as a direct result of the compulsory metering programme in our Southeast region. Given the caveats surrounding this achievement we have used a value of 13.6% reduction as the basis for modelling purposes for the Central region although higher values have also been used for sensitivity testing.

Affinity Water has chaired the Water UK Metering Strategy Network for the last two years and is therefore at the forefront of metering know how in the UK. This involvement adds further to the knowledge base that has been used in developing this strategy. The metering costs and savings entered into our Economics of Balancing Supply and Demand (EBSD) model have been derived using the latest UKWIR metering cost benefit analysis (CBA) optimisation software, an output of the Water UK group, described in detail in the appendices of this report.

3.2.3.2 Compulsory metering experience in Southeast region

Our Southeast region started the AMP4 period in 2005 in a resource deficit position and it was this that supported the proposal to carry out a significant metering programme in the region.

The programme commenced with optant and change of hands metering in April 2005. This, as expected, was found to be inefficient and far more costly than a focused street by street approach. In March 2006, our Southeast region achieved water scarcity designation and this allowed us to begin a selective and compulsory metering programme that planned to achieve in excess of 90% domestic meter penetration within ten years. The current meter penetration is 92% and the programme is considered to be complete. The meters installed were all dumb meters although some have subsequently been equipped with an AMR unit to enable remote reading. Internal and difficult to read meters in particular will all be equipped with a remote read AMR unit before the end of AMP5.

The metering programme has provided significant experience from strategic level through to on-site practices that is now being used in our AMP6 planning for metering in our Central and East regions.

3.2.3.3 Southeast region metering trials

During the compulsory meter installation programme the company carried out a number of trials including:

1. Smart Communications

We have trialled the use of regular personalised consumption information on water use in the town of Lydd. A quarterly information sheet was included with customers' bills advising on their water use, average water use for similarly occupied properties, costs of typical water usage including wastewater and energy costs. The information sheets received praise from the industry and regulators and generally positive comments from customers, but the impact on

demand was small. Our post-trial analysis suggests that Lydd's population were already relatively low volume users, hence why the impact on demand was small and the trial was not as directly successful as we had hoped. However, we believe there is merit to investing in our network and information systems to be able to provide customers with better data about their usage, particularly in areas where consumption is higher than average, to assist customers in reducing their demand.

2. Stepped Tariff

A two tier stepped tariff was trialled in two areas, Lydd and Cheriton with approximately 980 properties in each area being put onto the tariff. The remaining properties in each area remained on the standard measured tariff. An initial base volume of water was calculated for each property individually, based on occupancy, to derive the 'essential' water cost. Subsequent water use was then charged at a different rate. Despite a significant step between the 'essential' water cost (75% of the standard measured tariff) and the 'discretionary' cost (double the standard measured tariff), there was no measureable reduction in demand.

3. Retrofit

The retrofit trial involved a water audit of 200 properties with selective water efficient devices being fitted on demand for free. The devices included:

– Eco-beta toilet siphon break;
– Hippos;
– Save-a-flush bag;
– Tap Magic spray;
– Aerated low flow showerheads.

A pre and post trial questionnaire was used to identify customer appetite for saving water and whether they considered the outcome positive or otherwise.

4. Deferred meter

This trial was set up to measure the change in water consumption that takes place when a meter is installed onto an unmeasured property. One thousand unmeasured properties had a meter fitted although they were left on unmeasured charges. Consumption was then recorded for a year before they were all transferred onto a measured tariff for a further year of recording. The trial will complete at the end of March 2013 and findings will be published.

5. Small area metering

This trial involved installing loggers on small DMA area meters where downstream properties were approximately 50% metered. The purpose was the same as for deferred metering above in identifying the change that occurs when an unmeasured property is metered. The trial will complete at the end of March 2013 and findings will be published.

3.2.3.4 Impact of metering on Southeast's distribution input

As the metering programme drew to a close, industry specialist consultants Tynemarch were engaged to carry out a study to look at the impact of the meter installations on the demand for water in the region.

Their report sates:

> *The analysis comparing the measured consumption of selective meters to the estimate of unmeasured consumption shows a reduction of 26%. The calculations use post-maximum likelihood estimates (MLE) where the balance error has been reconciled. Confidence limits have not been developed for this estimate. There is significant uncertainty in the actual reduction given the limited data regarding unmeasured consumption.*
>
> *This estimate is higher than reported in similar studies regarding the impact of metering; a recent estimate of 15% was obtained from the extensive tariff trials at Wessex Water.*
>
> *An alternative view can be obtained by constructing a water balance which progressively separates the components of consumption until the consumption can be identified of a set of properties which begin as unmeasured in 2005 and are now measured. This approach uses pre-MLE data.*
>
> *The results from this analysis indicate a consumption reduction with a central estimate of 33% and a range of 16% to 50% assumed to be to a 95% confidence interval.*
>
> ***We consider it reasonable to conclude that the reduction in consumption for properties metered between 2005 and 2011 is at least 1.8 Ml/d or 16% of corresponding 2005 consumption based on the available data.***

3.2.3.5 Fixed Network AMR trial in Folkestone

A fixed network trial on 6,000 domestic properties has been set up in one of the DMAs in Folkestone, using Homerider AMR technology. The existing dumb charging meters have all been retrofitted with an AMR 'TRAK' unit that transmits 15 minute water use data via Repeaters fitted onto nearby lamp-posts to Data Collectors for onward transmission to web based servers.

This data frequency provides an excellent opportunity to identify leakage both on supply pipes and on our distribution assets as well as being of day to day operational use. At this time the data is only being used for our own internal purposes, but it is possible that a future phase of the trial may share the data with customers as part of a water efficiency initiative.

3.2.4 Water efficiency

3.2.4.1 Introduction

Our water efficiency programme will be a pivotal part of measures (including metering and wastage reduction) that will reduce overall customer consumption.

We recognise that some of our communities have the highest unmeasured per capita consumption (PCC) in the country and we face a major challenge to support our customers in reducing demand. We consider this to be the right approach in addressing the supply deficits we face over the next 25 years, as well as meeting government aspirations for companies with above average consumption to fall to below national average levels.

Our customers have indicated support for movement towards reducing the demand for water as part of a coherent demand management programme that will include metering, water efficiency, leakage reduction and pressure management to achieve our goal.

A key factor to be taken into account in developing our water resources management strategy is our customer's future demand for water, and to what level this can be influenced by water efficiency activities. Prior to 2010, there was a realisation that while water companies were delivering ad-hoc activity to encourage customers to save water, there was a perception that there was no underlying strategy to influence customer consumption. This coincided with a lengthy sustained period of increasing PCC, driven by the increasing availability of water using appliances (dishwashers, pressure washers, pumped power showers etc) and the changing behaviours of customers.

The unchecked increases in PCC led central government to review the situation and a water efficiency target (WET) was introduced for the first time. This activity based target began in April 2010 and set the goal for water companies to achieve a one litre per day reduction in consumption for each household.

We have achieved our WET each year since the target began.

3.2.4.2 Customers feedback on Water Efficiency

During the last phase of our stakeholder engagement programme we received over 900 responses to our draft WRMP pre-consultation: a mix of qualitative comment and quantitative data. When asked to respond to our plans for water efficiency, customers gave this feedback:

- That while customer views are divided about the value in receiving more frequent bills (only 47% value this), a majority of 69% believe access to more information about their water use would be of value and 59% believe this would influence their behaviour.
- That their behaviour in water use would be affected by the installation of a meter (67% agreed)
- The majority of respondents (87%) agreed they would use water saving devices were they supplied with them.
- There was a high degree of interest in the supply of discounted water efficient white goods (72%).

We have evaluated the responses we have received and taken account of stakeholder views in preparing this technical report.

Where the majority of customers have expressed a preference in support of our water efficiency activity plans (according to the pre-consultation feedback) we will maintain this position in our forward planning.

> "People need incentives to make small changes"

Where opinions are divided and where complex patterns have emerged resulting in no clear majority view, we will carry these issues forward to the draft WRMP consultation phase which takes place after publication of the draft plan and will run for 12 weeks to late August 2013.

Beyond 2015, we propose to step up our plans to reduce water demand in response to customer feedback and in line with government aspirations to do so. The need for this is acute,

as in our Central region we currently have a high weighted average PCC of 166 litres / person / day (compared to the national average of 147 PCC) and we want to demonstrate a long term commitment to reducing PCC. In our East and Southeast regions we have seen the benefit of a higher penetration of metering as weighted average PCCs are 114 and 134 respectively.

The benefits of reducing PCC for our long term supply / demand balance, the communities we serve and environments we operate within mean that our plans will require a more coherent approach in terms of bringing the focus of our different demand options (metering, water efficiency, leakage and pressure management) together.

3.3 Future challenges

3.3.1 Population and housing growth

Our population has increased by approximately 150,000 over the past four years up to the current total of 3.5 million. It is forecast to grow by almost 500,000 (14%) over the next 25 years to 3.9 million in 2040.

The corresponding growth forecast in housing indicates that we will have 300,000 additional houses by 2040 to give a total of 1.62 million. Clearly, additional population results in additional demand for water, and meeting this requirement is one of the key components of this WRMP. (Refer to Technical Report 2.2: *Household Demand Forecast*.)

3.3.2 Sustainability reductions in source outputs

3.3.2.1 Legislation

The Environment Agency is responsible for issuing licences for water abstractions from both groundwater and surface water. It also has the power to amend existing licences where abstraction is impacting on the environment.

In the last 25 years, there has been greater awareness of the benefits of protecting the environment and ensuring that our rivers and other water habitats are maintained in good condition.

In response to European and national legislation, the Agency introduced the National Environment Programme (NEP) to ensure that water companies meet European and national targets related to water. The NEP is a list of environmental improvement schemes which water companies include in their five-yearly Business Plans. The NEP includes requirements for water companies to undertake improvement schemes, or where more evidence is required, to investigate a particular problem.

> “I think it's important that people start to realize that water comes from somewhere - it's not literately ON TAP as we would like to believe”

The European Water Framework Directive (WFD) includes measures to control abstraction pressures and promote efficient and sustainable water use. The implementation of the WFD created new requirements for the protection of water resources.

The Agency, in consultation with Natural England, currently has an ongoing programme of review of water abstractions in relation to impacts on:

- Sites protected by the EU Habitats and Wild Birds Directive;
- Sites of special scientific interest (SSSI);
- Biodiversity Action Plan sites;
- Sites of local importance;
- Water bodies that are failing to meet the environmental objectives set by the WFD.

> I think we should care more about the environment and save water.

From its reviews, the Agency publishes lists of possible reductions of water abstraction termed **sustainability reductions**.

3.3.2.2 EA sustainability reductions

For our water supply area, the Agency has issued a list of potential sustainability reductions under three headings: 'confirmed', 'likely' and 'unknown'. The 'confirmed' and 'likely' reductions have been agreed for inclusion in our Plan, in accordance with the Water Resources Planning Guideline. This results in a loss of over 77 Ml/d from our existing groundwater sources (over 6% of the output). The 'unknown values' are in excess of 200 Ml/d. There are also further potential reductions relating to river catchments not yet reviewed by the Agency. A summary of the reductions notified to date is given in Table 1.

Sustainability reductions	Average DO Ml/d	Peak DO Ml/d
Planned ('confirmed' & 'likely')	77.70	67.24
Possible ('unknown' value)	224.49	266.84
Grand Total	**302.19**	**334.08**

Table 1: Sustainability reductions in our operating area

It can be seen that sustainability reductions are the biggest challenge in our water resource planning. (Refer to Technical Report 1.4: *Sustainability Reductions*.)

3.3.2.3 Our investigations

We have been working with the Agency for more than 20 years on numerous low river flow investigations. In our Business Planning period 2005-2010, under the National Environment Programme (NEP), we investigated sites potentially affecting 66.4 Ml/d of water abstractions and the conclusions of the studies resulted in an agreed loss of 14.83 Ml/d of licensed abstraction (i.e. 22% of the amount investigated). This reduction is included in the 77 Ml/d described above.

> Helpful to understand environmental impact on river and streams

For the 2010-2015 period, under the current NEP, we are required to investigate five river catchments in our Central region (see Figure 10) where our groundwater sources have a combined water abstraction capacity of 388 Ml/d, compared to a total groundwater resource base of 597Ml/d.

During the same period, we have been investigating sustainability reductions in the Little Stour catchment in conjunction with Southern Water and South East Water. Figure 11 shows where our investigation is taking place. The total capacity of this catchment is 17Ml/d, compared to a total groundwater base of 53.8Ml/d.

Progress to date on each catchment is described below.

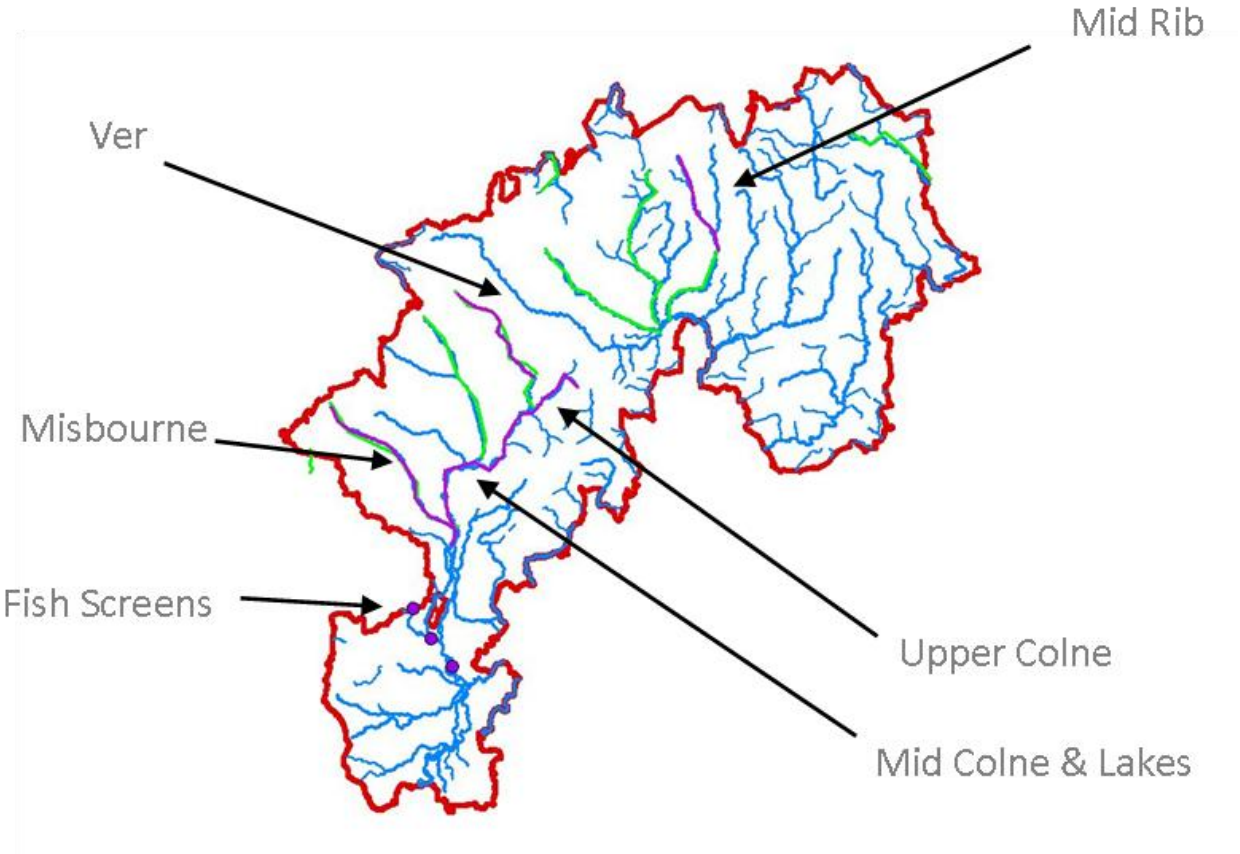

Figure 10: River catchment investigations 2010 – 2015, Central region

1. Upper River Colne

The River Colne rises in Colney Heath and flows southwest through rural areas before entering the urban area of Watford. It receives a significant proportion of its flow from chalk groundwater and is defined as a chalk stream/river. It is also influenced by surface water inflows from tributaries and run-off from urban areas.

The study required investigation into 13 sources. Field investigations and monitoring have been carried out and the final report will be submitted to the Agency by March 2014. Possible abstraction reductions in the Agency's 'unknown' category amount to 118 Ml/d.

2. Middle Colne and Lakes

This study area covers 8km of the River Colne between the Gade and Denham Green; it includes the Mid Colne Lakes which are a series of 18 lakes formed following gravel extraction. Parts of the area are designated as Sites of Special Scientific Interest (SSSIs). Initial investigations undertaken by the Agency had identified a number of abstractions that were suspected of impacting on river flows and lake levels.

Field investigations are being undertaken on the effects of nine sources and new observation boreholes are being drilled and monitored. The final report will be submitted to the Agency in March 2014. Possible abstraction reductions in the Agency's 'unknown' category amount to 88 Ml/d.

3. River Ver

The River Ver is a groundwater-fed chalk stream located within the Upper Colne catchment in Hertfordshire. It has a high conservation value, as well as recreation values and a record of cultural history in the landscape. The study area covers a 13.2km length of the river and includes seven of our groundwater sources. There was an abstraction reduction from one source implemented in 1993.

Four of our sources have been shown to affect river flows. An appraisal of options is being undertaken for completion by December 2013. Planned abstraction reductions of 15.66 Ml/d have been agreed with the Agency.

4. Mid Rib

The River Rib is predominantly a groundwater-fed chalk stream characterised by narrow, steep sided shallow channels with a history of low flows during dry summer months. The study area includes a 12.3km length of the river and covers three of our groundwater abstraction sites.

From the detailed monitoring undertaken, it has been concluded that there is a minimal impact on low flow ecology from groundwater abstractions. The final assessment report is being considered by the Agency. There are currently no planned abstraction reductions.

5. River Misbourne

The River Misbourne is a chalk stream, rising at Mobwell and joining the River Colne at Denham, a distance of 28km. It is flanked by locally and nationally important sites and throughout its course has varied and valuable habitats. Previous studies concluded that abstractions in the upper catchment were lowering the groundwater table and water levels in Great Missenden Abbey Park lakes. Although abstractions were reduced, there were further concerns raised about effects on the conservation and amenity value of the river. Planned abstraction reductions of 5.0 Ml/d have been agreed with the Agency.

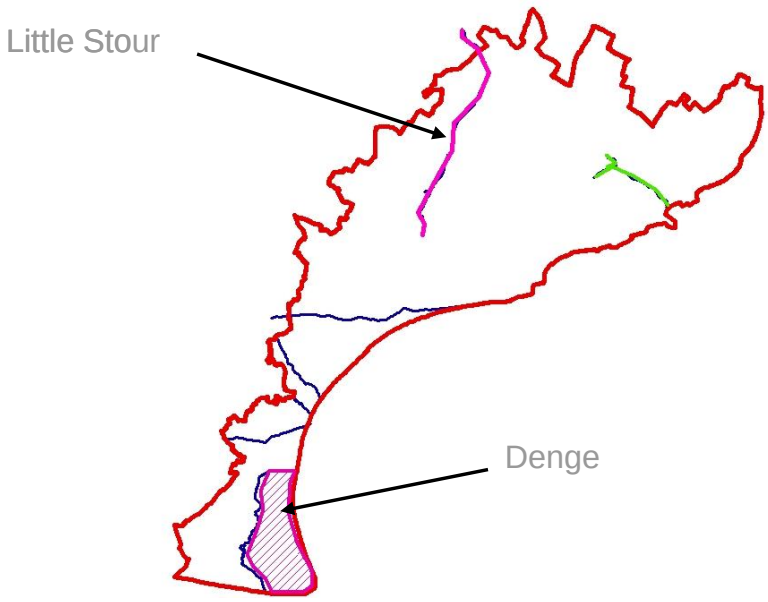

Figure 11: River catchment investigations 2010 – 2015, Southeast region

6. Little Stour

The Little Stour options appraisal scheme is evaluating options to mitigate groundwater abstraction related low flow impacts, identified in the previous investigations. This is a joint project between ourselves, Southern Water and South East Water. Work is still in hand and a final solution has yet to be determined. For the purposes of the draft Water Resources Management Plan, we have agreed with the Environment Agency a possible sustainability seduction of 4.9Ml/d at average and 5.69Ml/d at peak, which has been used in the Water Resources in the South East (WRSE) and Economic Balance of Supply and Demand (EBSD) modelling. We consider that the actual reduction may well be lower than this, and is likely to be supplemented with in-river improvements. We plan for this scheme to be completed in time for the solution to be included in our final Water Resources Management Plan.

Further details on each of our investigations can be found in the Technical Report 1.4.1: *AMP5 NEP Progress and Summary of PR14 Schemes*.

3.3.2.4 Further sustainability reductions

In addition to the changes proposed as part of our current investigations, further sustainability reductions have been discussed with the Agency in relation to environmental studies which we are proposing for inclusion in the next Business Planning period (2015-20) as follows:

- River Beane – Planned reduction of 18.18 Ml/d;
- River Mimram – Planned reduction of 15.47 Ml/d;
- Upper River Lee – Planned reduction of 10.49 Ml/d;
- River Gade – Planned reduction of 6.4 Ml/d;
- Hunsdon Meade – Possible reduction of 9.0 Ml/d;
- Hughenden Stream – Planned reduction of 1.6 Ml/d.

Details of proposals can be found in Technical Report 1.4: *Sustainability Reductions*.

3.3.3 Climate variability

There has been much publicity in recent years about climate variability with awareness that more extremes in rainfall and drought have occurred. Over the past 13 years we have experienced:

- The second wettest year since records began in the UK (2012);
- The wettest winter for 120 years (2000);
- The driest winter for 140 years (2010/11).

> "You need to take more water from rivers at flood times than you do, and provide storage to fill on these occasions."

Climate variability has a major impact on forecasting water supply availability and an additional impact on forecasting water demand. We have evaluated and taken account of both aspects in our draft WRMP (reference Technical Report 1.3: *Assessment of Climate Change Impacts on Deployable Output*).

The latest national climate projections were published by DEFRA in 2009. Those projections are used as a basis for the assessment of potential impacts on water resources in accordance with the WRMP Guideline. The projections include a large number of scenarios covering a range of values for rainfall and temperature changes. This enables us to study the potential impact of the scenarios on our water supply availability and on demand forecasts.

3.3.4 Pollution of water sources

In the past, we have experienced pollution of some of our sources from urban, industrial and agricultural supplies. We have undertaken pollution risk assessments of our groundwater catchments and incorporated results into Drinking Water Safety Plans on which monitoring requirements and risk mitigation are based. In some catchments, we have also detected herbicides and pesticides in some water samples (especially metaldehyde which is the active ingredient in slug pellets used by farmers to protect crops).

We employ catchment monitoring officers who undertake catchment monitoring and pollution prevention tasks for both groundwater and surface water catchments.

We are planning to continue our catchment management programme into our next five-year Business Plan and, as a result, we are not forecasting any permanent reduction of source deployable outputs from pollution. We include in our outage and headroom assessments, allowances for temporary loss of supply based on historic assessment of actual incidents over the past five years.

We have additional safeguards against loss of water supply from our River Thames sources due to river pollution incidents. Our agreement with Thames Water allows us to take emergency supplies from two Thames Water reservoirs (up to 3,650 Ml per annum) in the event of River Thames contamination.

3.4 Planning forecasts

Our base year for supply and demand data is 2011/12, which is the most recent full year for which data is available prior to preparation of this draft WRMP.

In accordance with the WRMP Guideline, we have calculated and shown in this document the following planning forecasts:

– Dry year annual average;

– Dry year critical period.

We review our supply / demand balance under average climate conditions (termed a normal year) and under dry year conditions. For the dry year, we calculate average daily demand values and peak daily demand values; the peak values are typically for the 7-day period with the highest demand during the dry year. This normally occurs in the summer when temperatures are at their highest. Demand in the peak week is often 25% to 35% higher than the annual average.

We have also assessed our Minimum Deployable Output as an additional scenario, which is when water levels are at their lowest, generally after summer, while demand is still generally high.

The planning scenarios are consistent with those used in the Water Resources in the South East (WRSE) modelling which was undertaken with the Environment Agency for ourselves and the five other water companies operating in the South East of England (see section 3.5.3).

3.5 Consultation

3.5.1 Customer consultation methods

3.5.1.1 Background

Our vision is to become the leading community-focused water company. In 2012, we instigated a customer consultation programme to gain a clear picture of the current and future expectations of our customers for their water service. The various elements of our consultation that we have undertaken to date are described below; feedback from these channels is summarised in Technical Report 3.8: *Engaging Customers in Future Planning*.

3.5.1.2 Investing for Your Community

In autumn 2012, we published *Investing for Your Community – a Consultation* which initiated our community engagement programme and asked for customer views on expectations for future water supply services. The document asked for feedback to inform preparation of our Strategic Direction Statement in 2013 and included a pre-consultation section for this draft WRMP and associated Strategic Environmental Assessment.

We also used Investing for Your Community to structure the workshops we held in the community.

The publication invited comment by post, by email or via the online discussion board on our website.

3.5.1.3 Have your say

We have set up a discussion forum on our website to capture both qualitative and quantitative feedback on our plans. An interactive questionnaire was available to gain specific feedback on key topics and on a number of the primary documents including Investing for your Community and our Strategic Environmental Assessment Scoping Report, both of which are available to read on our website.

3.5.1.4 Postal consultation with stakeholders

In October 2012 we wrote to our statutory consultees and regulators to consult them on our plans. We also wanted to extend the consultation more widely so we sent a further 900 letters to representative bodies. These included local environmental interest groups, MPs, MEPs, parish councils, local and district councils, social welfare bodies, commercial organisations and other public representative bodies. For some groups we enclosed the Investing for your Community consultation document and in all cases we included our postal, email and online feedback channels.

3.5.1.5 Postal consultation on our Strategic Environmental Assessment Scoping Report

We sent around 200 letters inviting feedback about our Strategic Environmental Assessment Scoping Report which forms part of the WRMP process. Our statutory consultees received the full report and others received notification including details of contact and feedback channels.

3.5.1.6 Drop in events

We arranged ten drop in events during October-December 2012 in our local communities across our regions to offer customers the opportunity to drop in and talk to us about any aspects of our plans. The drop in events were promoted widely through local press advertising, news events and our website.

3.5.1.7 Focus groups

Between October and December 2012, we conducted ten independently run customer focus groups seeking qualitative feedback on our plans. In one group we consulted small and medium sized enterprises in the sports and leisure sector, reflecting concerns raised by the group during the 2012 drought, and, in another, we consulted environmental stakeholders. The remaining eight groups were for our domestic customers, covering a demographic and geographic range of our customer profile.

3.5.1.8 Online panel

We have set up an independently operated online panel of 2,000 customers across our three supply regions. The sample group reflects our customer profile, and is intended to provide us with a statistically significant number of quantitative responses to questions we pose. We plan a

> “Interesting to be asked by my water supplier for my opinion”

regular programme of consultation with the panel to explore key issues arising from all sources of consultation.

3.5.1.9 Billing booklet

We send out over 900,000 booklets with water bills each year informing domestic customers about a variety of aspects of the service they receive from us. This year we have included a section on our plans and invited feedback throughout the year via post, email and our website.

3.5.1.10 Environmental forum

During November 2012 we launched an environmental forum to give voice to the views of environmental groups representative of customers and government bodies impacted by our operations. The second meeting took place in February 2013. As the forum develops, we intend to debate key issues and options with delegates at these events to gain input to our plans.

3.5.1.11 One to ones

We also have numerous contacts on a day-to-day basis with local environmental groups, regulators and public bodies.

3.5.1.12 Customer Challenge Group

We have established an independent Customer Challenge Group (CCG), which is now a requirement of Ofwat, to ensure that customer views inform preparation of our 5-year Business Plans. The role of the group is to:

– Review the company's stakeholder engagement process and the evidence emerging from it;
– Challenge the phasing, scope and scale of work required to deliver outcomes;
– Advise us on the effectiveness of our engagement and on the acceptability to customers of our overall Business Plan and bill impacts.

The group was formed in July 2012, is independently chaired and meets regularly.

3.5.2 Customer consultation feedback

3.5.2.1 Focus groups

The first phase researched the views of domestic and small commercial customers as well as environmental stakeholders on the four customer expectations published in *Investing for Your Community – a Consultation*:

– Making sure our customers have enough water;
– Supplying high quality water you can trust;
– Minimising disruption in your community;
– Providing a value for money service.

The aim of the study was to collect information about attitudes, opinions and preferences that will assist in understanding customer issues including those related to the WRMP. The first stage of the study used focus groups to gain the views of domestic customers and small and medium commercial customers; stakeholder views were captured from a workshop.

Key responses relating to the WRMP were that customers wanted us to:

– Stop abstraction where damage is occurring;
– Act to reduce consumption, provide free water efficient appliance fittings and advice to customers;
– Reduce leakage;
– Install meters systematically in water stressed areas provided it is cost-beneficial.

There was a divided response over increasing bills to reduce the frequency of applying restrictions between 'under all conditions' and 'no change'. We will seek to explore this during further consultation.

3.5.2.2 Customer Challenge Group

The Chair of our CCG has provided the following feedback:

> *"The Customer Challenge Group (CCG) has taken a keen interest in the draft WRMP, as it underpins the Business Plan that Affinity Water will submit to Ofwat. Affinity Water colleagues have provided several briefings to the CCG, and CCG members provided their thoughts on the consultation process. The CCG has been presented with the results of the pre-consultation engagement and looks forward to seeing the views expressed in those results carried forward into the draft WRMP consultation."*

3.5.3 Coordination with Water Resources in the South East Group

The Water Resources in the South East Group (WRSE) was set up to review how the six regional water companies should utilise the strategic water resource in the most efficient and effective way. Along with the five other water companies, we provided data on our water availability and our forecast customer demand to facilitate modelling of regional resource needs in the next 25 years. We also provided details of all options for meeting any water deficits. The cost data from all water companies and the modelling approach to date has been subject to independent review.

> "Enough rain falls in this country to provide for everyone's needs; it just needs capturing"

Our input to the WRSE process has included engagement with the Environment Agency, Ofwat, DEFRA, the Consumer Council for Water and Natural England, as well as with other companies to explore options for best use of resources across the South East.

The WRSE modelling is described in section 9.3.

3.5.4 Consultation with other water companies

We have held discussions with all our neighbouring water companies. Our Eastern region, in East Anglia, is not part of the WRSE area.

These discussions explored the potential to create new cross-border supplies between companies as well as to vary existing agreements for water supply imports and exports from or to our operating area. Such water trading can offer the most efficient way of sharing regional resources for the benefit of all customers.

Our discussions with Anglian Water also considered the use of our shared assets and existing transfer arrangements.

Further details of these discussions can be found in Technical Report 3.5: *Water Company & Third Party Bulk Transfers*.

3.5.5 Consultation with water industry regulators

We have worked closely with all of our regulators, and in particular the Environment Agency, in the development of our Plan. Detailed discussions have taken place with regard to sustainability reductions and during the various stages of development of our potential options for meeting supply / demand deficits.

When we published our previous Water Resources Management Plan in 2010, we considered the effect of future sustainability reductions but as they were not agreed with the Environment Agency at that time, we were unable to plan investment to replace the lost resource and this also meant we could not justify a compulsory metering programme. Since then, we have worked closely with DEFRA, the Environment Agency and our fellow water companies, in particular in the WRSE project, to agree how we can plan properly for this risk in this Plan. DEFRA and the Agency in particular have supported and challenged our desire to ensure our Plan takes proper account of potential sustainability reductions.

As a result, we have included sustainability reductions in the baseline supply / demand forecast of this Plan. This means we are able to identify investment needs and consult with our customers on the cost.

3.5.6 Consultation with local interest groups and other stakeholders

We included local interest groups and community organisations in our customer consultation programme described in Section 3.5.1 above.

Consultation has also taken place as part of the Strategic Environmental Assessment (SEA) work (see section 3.6 below). We engaged with the three statutory environmental consultation bodies (English Heritage, the Environment Agency and Natural England) together with a number of non-statutory consultees including county and district councils, wildlife trusts, and recreation/amenity groups.

3.6 Strategic Environmental Assessment

As we are planning to accommodate both an increasing population and source sustainability reductions, our draft Plan demonstrates investment is needed to overcome a supply demand deficit and therefore assesses development options. A Strategic Environmental Assessment (SEA) is required, which must adhere to a regulatory assessment and consultation process.

We undertook a baseline assessment to identify the key receptors that could be affected by the implementation of potential options. The receptors include people, habitats and species, water bodies including rivers, landscape character and heritage features.

The baseline assessment was used to assess the environmental impacts that would be expected to occur on the unconstrained options. Options with a greater environmental risk were screened out as part of the assessment, alongside options that had high technical risks. The output matrix used a traffic light coding system, where the highest risk options (red) were removed from further assessment. The green (low) and amber (moderate) options were taken forward onto the feasible options list.

A summary of the baseline environment was presented in the Scoping Report, along with the proposed methodology for the SEA. The Scoping Report was issued to statutory and other consultees with comments on the proposed SEA approach being returned in December 2012.

The SEA was undertaken on all of the feasible options. The baseline was assessed in terms of the sensitivity to an option. We then assessed the potential impacts that could be expected to occur during the construction and operation of each option. An environmental risk level was assigned to each option based on the sensitivity of the environment and the scale of the potential effects likely to occur. This environmental risk level was used within the model to allow the selection of alternative environmental scenarios as part of selecting the Preferred Plan.

Further environmental assessment was undertaken on the base plan to identify whether there were cumulative effects between the individual options and whether further model iterations or mitigation would be required to reduce the risk of significant effects from the Plan. The Environmental Report provides the results of the SEA, together with recommendations to improve the environmental outcomes and monitor the effects of the plan. A Habitats Regulation Assessment (HRA) has also been completed for the Preferred Plan.

Details of the SEA inputs to the development options assessment are described in Section 9.5.3. Full details of the SEA, which includes review of this Draft WRMP, are described in Technical Report 3.9: *Environmental Report*.

4 Water available for supply

4.1 Introduction

Each of our three regions has its own sources of supply as indicated in Figure 6, Section 2.2. As described earlier, our Central region is divided into six water resource zones which have their own water sources and are supported by inter-zone transfers. Our East and Southeast regions each comprise a single water resource zone.

The majority of our water comes from groundwater and the Chalk aquifer (approximately 60%), which provides large amounts of natural storage. The remainder comes from surface water, but we have limited storage with only about 10% of total resources from surface water reservoirs.

Although the three regions are geographically separated, there is potential to establish links by cascading water transfers via neighbouring water companies' pipe networks. Such an approach has been explored in our future options assessment particularly in the context of the WRSE work (linking our Central and Southeast regions) and in discussions with Anglian Water (linking our Central and East regions).

> "We need a "National Grid" for water, and I would very much like to see this come into play. It would help balance water supply throughout the UK"

Water availability from our sources is limited to the volumes specified in abstraction licences and by the capacity of our networks, pumping stations and treatment works. However, it will also potentially vary depending on climatic conditions.

After prolonged periods of rainfall, river and groundwater levels will typically be high allowing maximum water abstraction; under drought conditions, water levels will be at their lowest and may limit abstraction.

For planning purposes, our source outputs are assessed in relation to two climate scenarios as follows:

– Normal year – how much water is available under average climate conditions;
– Dry year – how much water can is available in a year with low annual rainfall.

Outputs under dry year conditions are assessed as three values:

– An average daily amount for the whole year;
– A peak daily amount over a critical period when demand is at its highest (typically the peak seven day period);
– A minimum daily amount when water sources are at their most stressed condition (this would normally be when natural water levels are at their lowest at the end of a dry summer).

Our supply demand planning assessment is based on the dry year scenario in accordance with the standard water industry approach.

4.2 Deployable Output of existing sources

Deployable output (DO) is the term used to define how much water can be abstracted reliably from a source during a dry year and delivered into supply. It is measured in mega litres per day (Ml/d). We evaluate DO as an average over the whole year (known as average DO or ADO) and during critical periods (typically a seven day period) when demands are at their highest (known as peak DO or PDO).

Our surface water sources in Central region comprise four intakes (one supplying WRZ4 and three supplying WRZ6) on the River Thames operated under the Lower Thames Operating Agreement; the Agreement stipulates that Thames Water, who abstract much greater quantities of water, have to maintain minimum river flows. Our abstractions therefore have no river flow constraints affecting DO. We have made operational changes and improvement in treatment capacity at these works with a consequent increase in DO values.

We also jointly own with Anglian Water one surface water reservoir source which supplies our East region (WRZ8). This source of water is governed under the ARD Reservoir Order of 1967. The DO of this source has been reduced due to water treatment constraints. As joint owners, we are entitled to 50% of the output but, under a short-term agreement, we currently take 30% of the total output, allowing Anglian to take 70% under a ten-year rolling Bulk Reservation Agreement signed in 2010.

We have a further agreement with Anglian Water for a shared supply from another surface water reservoir to our Central region (WRZ3). This source of water is governed under the Great Ouse Water Act of 1961 and provides a supply of 91Ml/d at average and 109Ml/d at peak. We share the cost of operating and maintaining the reservoir, treatment works and pipeline that brings water from Huntingdonshire into our operating area, to the north-east of Luton. The supply arrangement was subject to a judicial review in 1998, which confirmed our supply capacity is maintained under all conditions, therefore no allowance is made in our plan for loss of output during drought but we do take account of the effect of climate change in our Plan.

Our groundwater source DO assessment is based on review of pumped outputs against long term hydrological records (observing, for example, how groundwater levels have varied and how much water was able to be abstracted under such varied conditions). We have records of groundwater levels back to the 1960s and have estimated levels for key aquifers back to pre-1900 by using rainfall data as an input to a groundwater recharge computer model. (Refer to Technical Report 1.1: *Deployable Output Assessment*.)

In our previous WRMP, we reported on our assessment of groundwater DO values based on groundwater levels which were at their lowest during the dry year 2005/06. We have now experienced another dry year in 2011/12 following which we have assessed groundwater level data to see whether 2011/12 represents a more extreme case. In general across our aquifers, the 2005/06 water levels were more extreme although at a few sources, 2011/12 levels were lower. At these sources, we have reviewed and, where appropriate, modified the DO values.

We have also re-assessed groundwater source DOs where there have been new works undertaken or operational changes made.

In summary, our average and peak DO values for our own sources within each water resource zone are shown in Table 2. Changes in outputs since the previous WRMP are also shown and are fully explained in the Technical Report 1.1: *Deployable Output*.

The values in Table 2 *exclude* bulk transfer imports from other water companies.

WRZ	Average deployable output (ADO) Ml/d	Peak deployable output (PDO) Ml/d	Change in ADO (Ml/d) from WRMP 2009	Change in PDO (Ml/d) from WRMP 2009	Key Reasons for Changes
1	136.78	172.25	-2.00	-9.19	Reduced availability from aquifer
2	180.36	213.47	-4.23	-0.39	Termination of temporary abstraction licences
3	171.93	188.52	-2.03	5.87	New abstraction licences and adjustments in source performance
4	241.00	245.00	36.00	5.36	Net increase in output at surface water sites
5	70.77	73.38	-0.45	-4.37	Net reduction in abstraction licences
6	201.70	262.20	10.01	39.38	Net increase in output at surface water sites
Sub-total (Central region)	1002.54	1154.82	37.30	36.66	
7 (Southeast region)	52.30	60.93	1.15	-4.16	Adjustments in source performance and sustainability reductions
8 (East region)	38.55	52.75	-2.14	-3.6	Amendments to loan agreement with Anglian Water
Company Total	**1093.39**	**1268.50**	**36.31**	**28.90**	

Table 2: Zonal deployable output values

We have made no changes to our Levels of Service relating to drought conditions since the previous WRMP so there is no related impact on our DO assessments.

4.3 Existing water transfers

We have arrangements with six neighbouring water companies for the bulk supply import of treated water to our water resource zones (WRZs) and with four of the companies for bulk supply exports in different locations (reference Technical Report 3.5: *Water Company & Third Party Bulk Transfers*); details are listed in Table 3.

ID	Donating Company	Receiving Company	Average Ml/d (max)	Peak Ml/d (max)
1	Anglian	Affinity WRZ3	91.0	109.0
2	Thames	Affinity WRZ4	10.0	10.0
3	Thames	Affinity WRZ4	0.2	0.2
4	Thames	Affinity WRZ4	2.0	2.0
5	Thames	Affinity WRZ2	2.2	2.2
6	Cambridge	Affinity WRZ3	0.31	0.31
7	Affinity WRZ5	Cambridge	0.04	0.04
8	Affinity WRZ5	Essex & Suffolk	0.1	0.1
9	Affinity WRZ6	South East	36.0	36.0
10 **	South East	Affinity WRZ7	2.0	2.0
11 **	Southern	Affinity WRZ7	1.33	4.0
12	Affinity WRZ8	Anglian	8.1	8.1

*** Agreements have expired but remain operational pending the outcome of WRSE modelling and our draft Plan consultation.*

Table 3: Existing water import and export arrangements

We also have 36 emergency cross-border transfer connections with neighbouring water companies.

Although these are not used routinely and thus do not contribute to deployable output assessments, they do provide additional resilience to our water supply network in case of emergencies.

4.4 Future reductions in deployable output

4.4.1 Sustainability reductions

We have agreed with the Environment Agency the following sustainability reductions which apply to our groundwater abstraction sources in four of our eight zones. Table 4 shows the average and peak sustainability reductions by water resource zone.

Water Resource Zone	Reduction Average DO Ml/d	Reduction Peak DO Ml/d
1	-13.00	-8.15
2	-14.66	-5.82
3	-45.14	-47.58
Sub-total (Central region)	-72.80	-61.55
7 (Southeast region)	-4.90	-5.69
Company Total	**-77.70**	**-67.24**

Table 4: Groundwater abstraction sustainability reductions

The reductions affect 16 of our sources with eight sources being shut down and eight having reduced outputs. We are planning to achieve reductions of 50Ml/d in the first five years of the period, with the remainder to be completed by 2025.

Further possible reductions of 216 Ml/d have been listed in the Agency's 'unknown' category and could affect future WRMPs. We will continue to work closely with the Agency to explore their future requirements.

4.4.2 Other reductions

We do not forecast any future reductions to our DO associated with pollution incidents.

4.5 Impact of climate change

Assessment of the impact of climate change on source outputs has been based on the latest climate change projections published by DEFRA (UKCP09 scenarios). We employed specialist consultants to take samples from the 10,000 UKCP09 scenarios and to forecast the range of impacts on groundwater levels (reference Technical Report 1.3: *Assessment of Climate Change Impacts on Deployable Output*). A vulnerability assessment was undertaken to assess which sources were vulnerable to climate change. An appraisal was then made of the impact of the varied groundwater levels on the quantity of water which could be abstracted from those sites vulnerable to climate change.

In our Central region, mid-range climate change values for groundwater sources resulted in a reduction in output at 19 of our sources. Our surface water abstraction licences from the River Thames do not include any flow or other constraints as Thames Water is responsible for maintaining minimum flows in the river; there are therefore no climate change impacts on our abstractions.

In the East region, climate change impacts have been assessed for the surface water reservoir we share with Anglian, concluding that there would be no impact on the water available. Groundwater sources in the area are not considered to be sensitive to climate change due to groundwater levels being significantly higher than borehole pump levels in the confined chalk aquifer. Nominal allowances, as used for the previous WRMP, of 1% reduction in output have been made for our chalk sources.

In the Southeast region, climate change impacts have been assessed using the East Kent groundwater model resulting in reductions at seven of our sources.

For all of our water resource zones, the 50th percentile estimate of climate change impacts has been used for our DO assessment and the range from the worst case to a best case has been used in the headroom analysis to evaluate the uncertainty. Table 5 identifies the reduction in Average and Peak DOs in each of our WRZ that will be realised by 2035 as a result of climate change.

Water Resource Zone	Reduction in Average DO Ml/d	Reduction in Peak DO Ml/d
1	-2.54	-6.94
2	-4.49	-4.34
3	-4.61	-4.38
4	0	0
5	-0.40	-0.95
6	-8.50	-9.10
Sub-total (Central region)	-20.54	-25.71
7 (Southeast region)	-5.10	-6.18
8 (East region)	-0.30	-0.42
Company Total	**-25.94**	**-32.31**

Table 5: Climate change reductions

We are proposing further assessments of climate change impacts on our Central and East regional groundwater sources in consultation with the Agency. The results from our Technical Reports will be refined using the Agency's groundwater models to demonstrate the impact on each source. We do not expect to make significant changes to climate change impact values but the additional work will improve the robustness of our findings to date. Updated values will be available for our final WRMP.

4.6 Outage allowances

Outage is a measure of the temporary loss of output from a source due to planned events such as equipment maintenance or due to unplanned events such as power failure or raw water quality deterioration. Applying an outage allowance to source outputs ensures a realistic assessment of overall water supply capability.

We have made significant improvements in outage reduction as a result of our current programme of investment to prevent flooding at 29 sites. Our programme will be completed in 2014. We have reflected these improvements in our outage assessment.

Since our last WRMP, we have improved routine logging of source downtime to gain detailed records of the type and duration of outage events. These records (available since 2009 for WRZ1-6 and since 2011 for WRZ7 and WRZ8) have been used in our statistical models to forecast future outage.

Outage records for all groundwater and surface water sources and for transfers into each zone were applied to a probability model using specialist risk assessment computer software. Distributions were assigned to each event and then summed to give an outage forecast for each source works. A model was created for each resource zone, with source outages being summed to give a total outage value for the resource zone. Table 6 summarises the outage allowances for each water resource zone. The full analysis can be found in Technical Report 1.5: *Outage*.

Water Resource Zone	Average DO Outage Ml/d	Peak DO Outage Ml/d
1	5.82	7.36
2	6.31	4.83
3	14.59	13.77
4	6.28	4.56
5	2.76	2.6
6	6.05	6.7
Sub-total (Central region)	41.81	39.82
7 (Southeast region)	2.02	1.58
8 (East region)	0.99	0.85
Company Total	**44.82**	**42.25**

Table 6: Outage figures by Water Resource Zone

4.7 Treatment works losses

Our deployable output values take account of treatment works losses so no further deductions are required. We have explained our analysis in the Technical Report 1.1.1: *Surface Water Deployable Output Assessment*.

5 Water demand

5.1 Our approach

Customer demand comprises water use by households and non-households (commercial and industrial). A further split is undertaken between measured (metered) properties and unmeasured; the split is relevant because we know the consumption of measured customers from meter readings. We also know from experience that metered households use, on average, less water than unmeasured; this is due to a greater awareness of minimising wastage.

We measure the quantities of water supplied from all our treatment works using flowmeters. We are also able to measure flows within our pipe networks at the entry points to district meter areas, which are local zones covering urban areas, towns and villages. These flows are monitored continuously and enable us to constantly assess changes in demand and the need to vary our source outputs.

For household customers with meters, cumulative flows are taken from meter readings which are typically taken every 6 months. For larger commercial customers meter readings are taken more frequently and in the case of the largest customers, flows are logged continuously. For other elements of demand, including unmeasured customers (those without a meter), we have to estimate demand.

Other components of demand are leakage from the pipe network between our sources and customers' properties and minor elements such as builders' temporary supplies from standpipes and operational use such as flushing of hydrants. We describe these components in Section 5.4.

For this WRMP, we need to assess how water demand may change over the next 25 years. Our base year for the assessment is 2011/12 which is the most recent full year from which we can use actual data for water supplied and customers billed. We estimate future demand by reviewing how each component of demand in the base year may change in future years. For household consumption, we use a micro-component approach: assessing how much water a customer uses for each purpose, e.g. clothes washing, personal washing, and how such usage may change in the future.

Initially we produce a baseline supply demand assessment which applies forecast changes to household and non-household demand, including population increase. The assessment includes application of our existing policies on water efficiency, leakage and metering. For any water resource zone in deficit, we then analyse a range of potential options to eliminate the deficit.

Details of our assessment approach are described below.

5.2 Household customer consumption

5.2.1 Introduction

We know the annual consumption of measured households from meter readings. We also produce estimates of current average unmeasured household consumption for each of our water resource zones using our unmeasured consumption monitor; this comprises a group of

customers who have had meters installed for our survey purposes but which are not used for charging.

The range of consumption values for household occupants is shown on Figure 12, which shows the number of households for each step of consumption in our Central region. The distribution profile around the mean PCC for our East and Southeast regions is similar. This demonstrates that there is considerable variation in actual consumption across households. Although we use average values for our planning purposes, we are aware that customer needs and behaviours do vary.

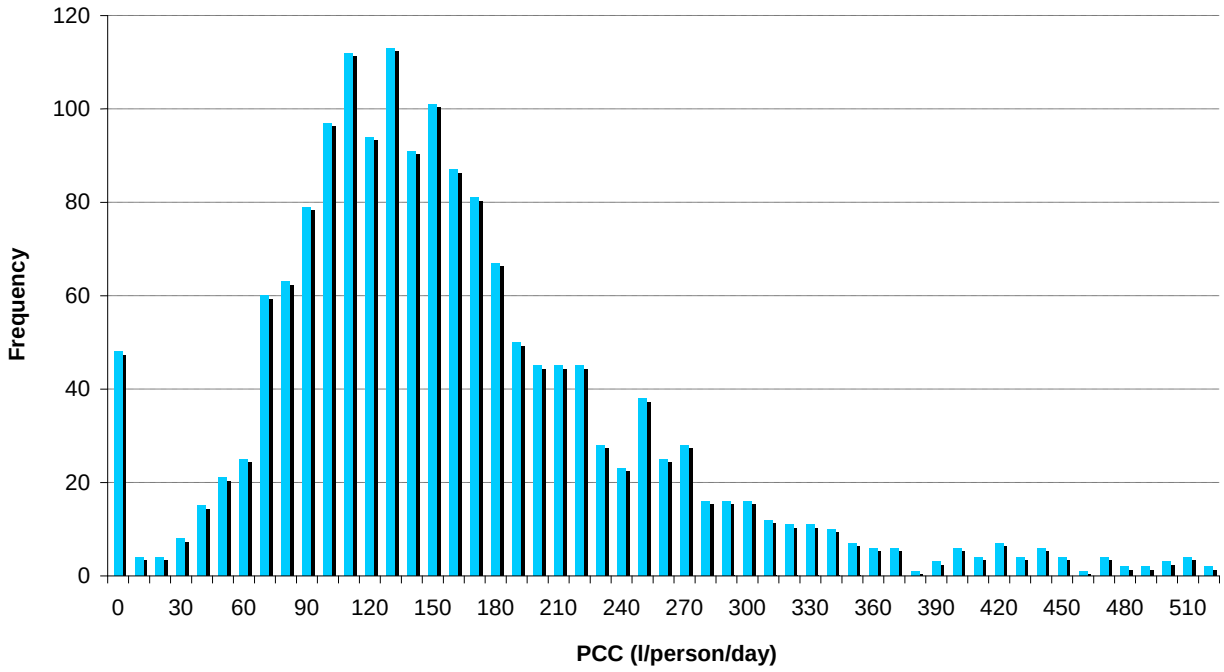

Figure 12: Variation in household consumption, Central region (2011/12)

Where we have a meter on a supply we measure the volume used over a period of time (usually a year) to reveal average household and non-household use.

We then convert the household property consumption to a quantity per person by using an average household occupancy value (the average number of people occupying each property). Demand is then quoted as litres per person (or per head) per day; this is termed per capita consumption (PCC).

5.2.2 Micro-components

To assist in forecasting future changes in PCC, we use a standard water industry approach termed micro-component analysis whereby consumption is assessed under the following component headings:

– Toilet flushing;

– Clothes washing;

– Dishwashing;
– Personal washing (baths and showers);
– External use;
– Miscellaneous (cooking, cleaning, drinking, hand washing and teeth brushing).

Quantities used under the headings above depend on customer water usage so we undertook a survey of a sample of customers to ask questions on frequency of use against each heading. We sent out over 20,000 questionnaires across our three regions. The results from over 5,250 customer responses were assessed against five property categories using the ACORN system which assigns properties to socio-economic categories based on property type and location. Volumes used for each item are taken from published industry data.

The final assessment stage is to forecast how water usage will change over the next 25 years. We make predictions about future changes, such as an increase in the proportion of metered customers and increased installation and use of more efficient dishwashers and washing machines. We have included an allowance in our forecast demand for the impact on demand from climate change in accordance with the Water Resources Planning Guideline and DEFRA's Climate Change and the Demand for Water report 2003.

The plots in Figure 13 and Figure 14 show the change in water consumption for each micro-component of water use for measured and unmeasured customers respectively. The figures reflect the fact that metered (measured) customers use less water than unmeasured customers.

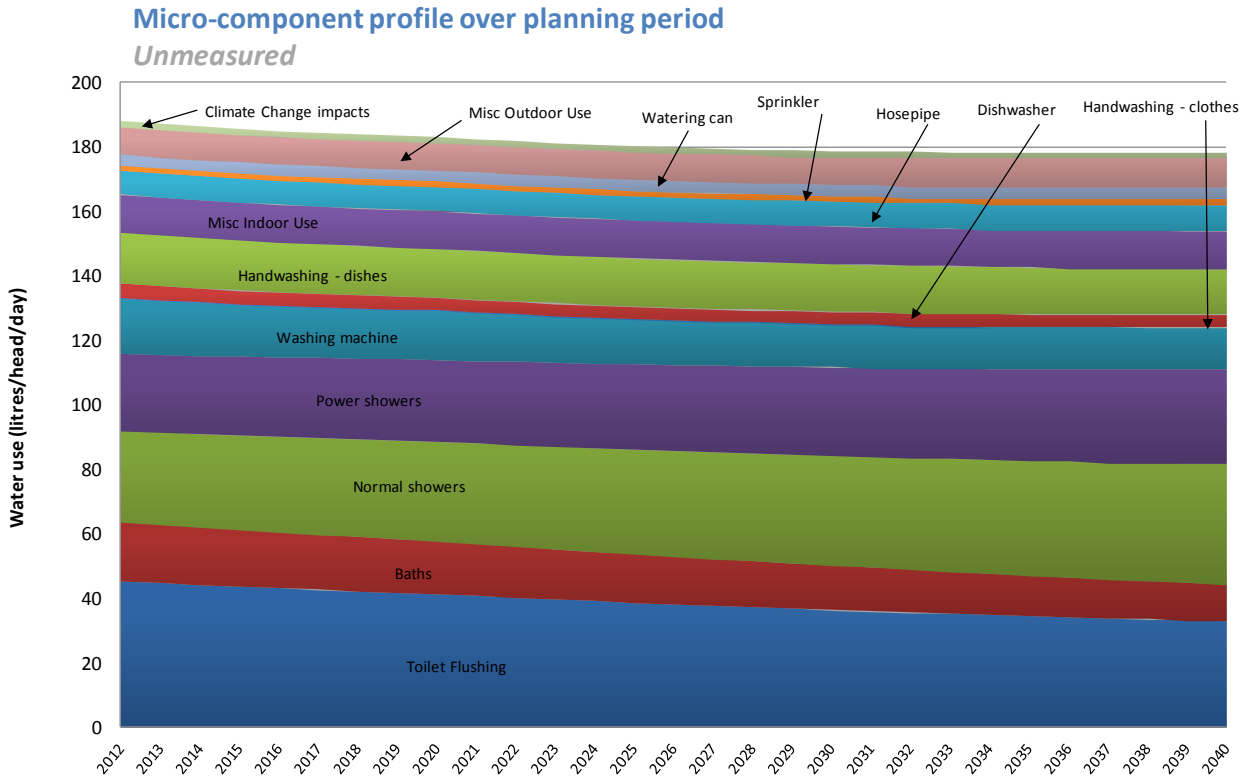

Figure 13: Micro-component profile (unmeasured households)

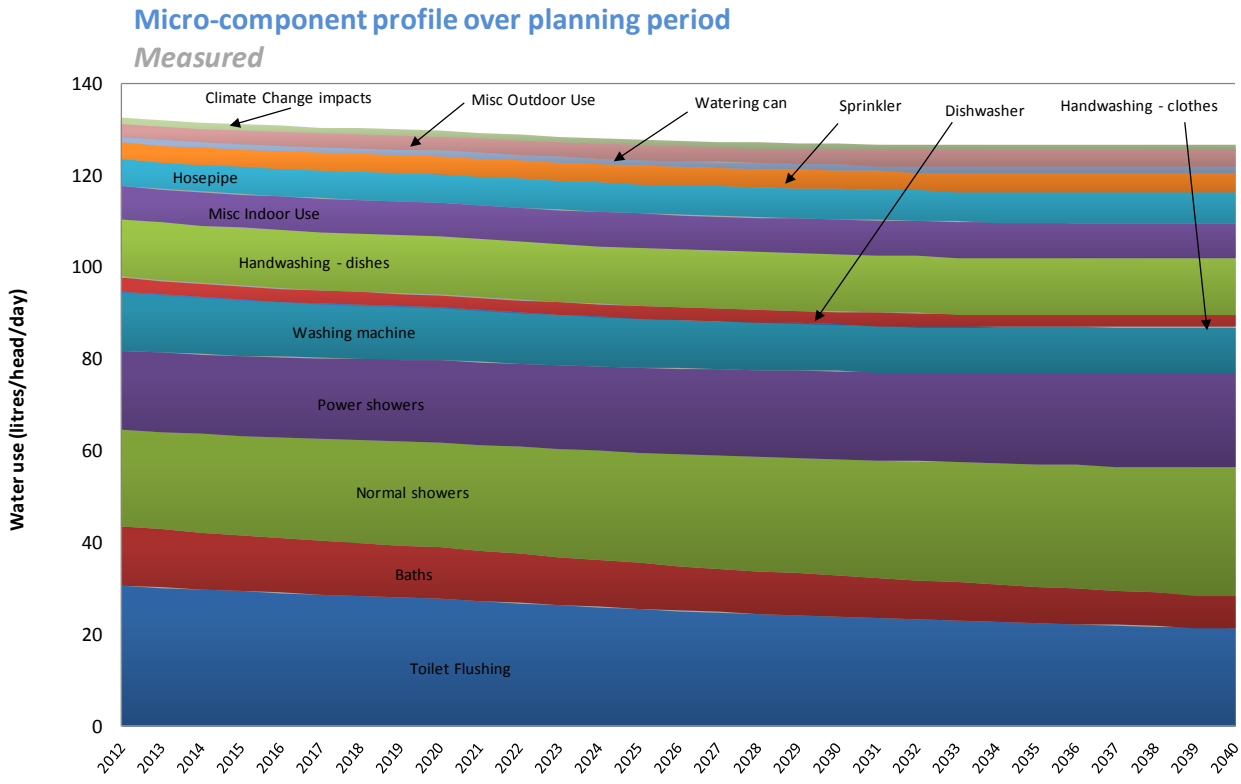

Figure 14: Micro-component profile (measured households)

Key reasons for the change in each micro-component over the planning period are as follows:

- Toilet flushing (frequency 4.71 flushes/person/day from DEFRA research): reduction in average cistern size as new houses use smaller cisterns and customers replace old cisterns with new.
- Personal washing (showers and baths): reduction in use of baths, increase in use of showers; increased installation and use of power showers.
- Clothes washing: reduction in washing machine water demand as new machines use less water (some clothes washing by hand continues).
- Dishwashing: reduction in dishwashing machine water demand as new machines use less water (some dishwashing by hand continues).
- Outdoor water use (includes hosepipes, sprinklers, watering cans, pressure washers): small increased ownership and use of certain devices.
- Miscellaneous indoor use (includes cooking, cleaning, drinking, hand washing, teeth brushing): no change forecast from base year.

Full details of our micro-component analysis can be found in Technical Report 2.1: *Micro-component Analysis*.

We calculate the total household consumption by applying the micro-component PCC values to the forecast population for each year of our plan for measured and unmeasured household customers in each water resource zone.

5.2.3 Population and households

Population and household forecasts were produced by Experian for ourselves and eight other water companies.

Experian obtained data from local authorities on planned housing projections, from the Office for National Statistics (ONS) on population estimates and from analysis of the population Census 2001. Forecasts included:

– Total population;
– Household population;
– Communal population (e.g. care home residents);
– Households;
– Household occupancy.

Experian derived three sets of forecasts for each of our eight water resource zones as follows:

– Trend-based projections – based on a combination of ONS population projections (2010) and Department for Communities and Local Government (DCLG) household projections;
– Local authority plan-based projections;
– Most-likely projections – Experian's view of the most-likely scenario which concludes that the trend-based population forecast will be achieved but with reduced levels of house building.

We reviewed the Experian results to determine which of the three sets of forecasts should be used for our draft WRMP.

Our review comprised a comparison of the forecasts with projections undertaken for the previous WRMP (2009) and with actual numbers of new properties connected for water supply over the past six years. We also re-based the household property figures to our actual household numbers for all three regions from our billing records for 2012, to adjust for unoccupied and multi-occupancy properties, as well as special supplies such as building water, horse troughs and garages. We then applied the annual increase in property numbers from the Experian report.

Our review of the Experian results concluded that the local authority **plan-based** housing and population projections should be used for our demand forecasting. This approach is consistent with the WRMP Guideline and reconciles with our actual numbers of new housing connections over the past six years. A sensitivity check on the potential effect of using the trend-based figures was also undertaken as part of the supply demand modelling.

It is important that we consider the growth of population in our regions as well as the number of new properties that we expect to be built during the planning period. This is necessary as elements of our micro-component analysis relate to the frequency of use per household, such as the use of dishwashers and washing machines, and customer supply pipe leakage, while others relate to the frequency of use per person, such as personal washing and toilet flushing.

Further details of our analysis can be found in the Technical Report 2.2: *Domestic Housing and Population Forecast*.

The population forecast for each water resource zone is shown in Table 7.

Water Resource Zone	Current Population	Total Population forecast by 2040	% Increase
1	319,576	339,166	6%
2	421,535	445,901	6%
3	690,233	861,246	25%
4	917,813	1,055,719	15%
5	284,659	320,977	13%
6	515,281	570,837	11%
Sub-total (Central region)	3,149,097	3,593,846	14%
7 (Southeast region)	158,651	175,144	10%
8 (East region)	160,663	168,834	5%
Company total	3,468,411	3,937,825	14%

Table 7: Current and forecast population numbers

The household forecast for each water resource zone is shown in Table 8.

Water Resource Zone	Current Number of Properties	Total Number of Properties forecast by 2040	% Increase
1	128,530	145,339	13%
2	163,473	184,189	13%
3	261,869	352,789	35%
4	328,397	417,140	27%
5	110,693	1,346,70	22%
6	191,540	229,332	20%
Sub-total (Central region)	1,184,502	1,330,205	24%
7 (Southeast region)	68,884	82,864	20%
8 (East region)	68,630	77,560	13%
Company Total	**1,322,016**	**1,623,883**	**23%**

Table 8: Current and forecast number of households

5.3 Non-household (commercial and industrial) customer consumption

In our previous WRMP, we assessed non-household demand in relation to regional gross value-added (GVA) output, which is a measure of productivity forming part of the national gross domestic product calculation; we also compared demand with historic employment figures. The forecast at that time indicated a slight decrease in future non-household demand. For this WRMP, we have repeated the analysis with actual data to 2011/12.

Having reviewed the historic demand against actual GVA and employment data we have established that there is no significant correlation between economic activity and water demand. We are also aware that in recent years many non-household customers have implemented schemes to make significant reductions in water use, both in response to our water efficiency advice and to economic conditions in particular. There is now less scope for future reductions on such a scale as indicated by recent demand which has remained stable. We maintain a dialogue with our larger use customers but, with the continuing uncertainty over economic conditions, there is no clear picture emerging of future changing non-household demand.

In light of the above we conclude that non-household demand will remain unchanged over the 25-year planning period. This allows for potential increased population, increased employment and increased economic activity to be balanced by further improved water efficiency across industry so that demand remains broadly stable.

Figure 15 illustrates the forecast in relation to historic demand since 1998/99 for our Central region (reference Technical Report 2.3: *Non-household Demand Forecast*).

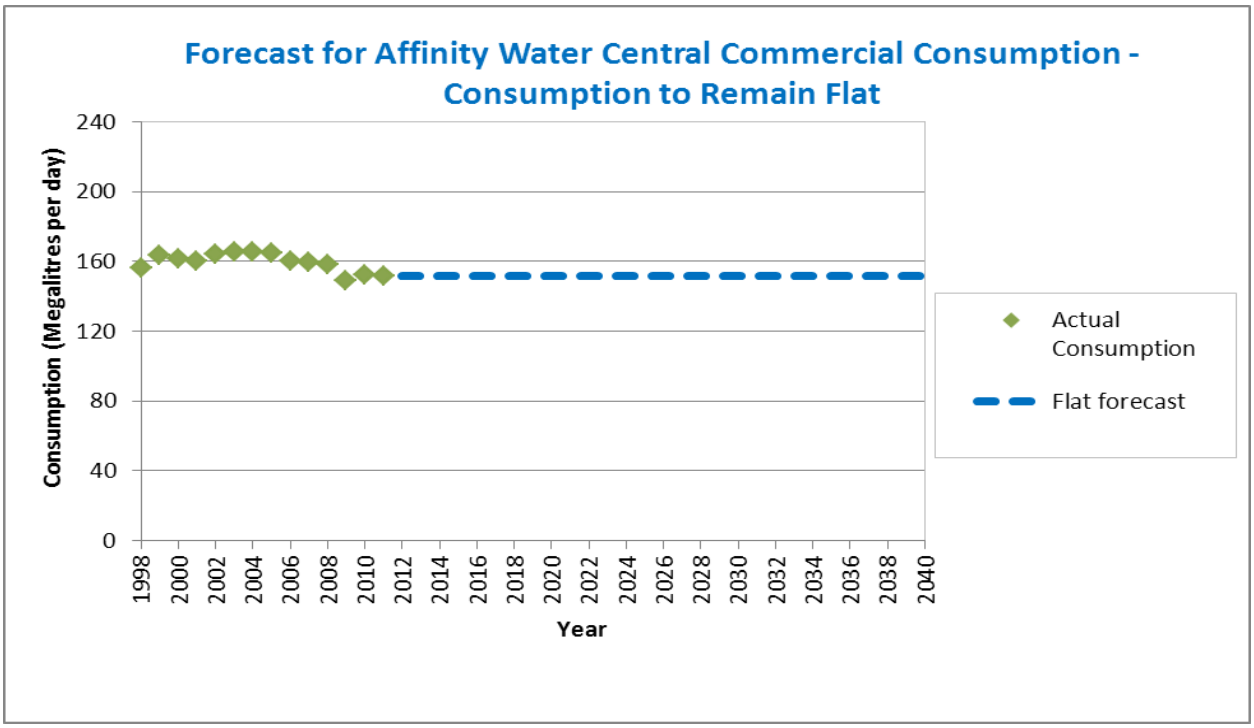

Figure 15: Non-household consumption forecast

The various industrial sectors which comprise our non-household customers are shown in Figure 16.

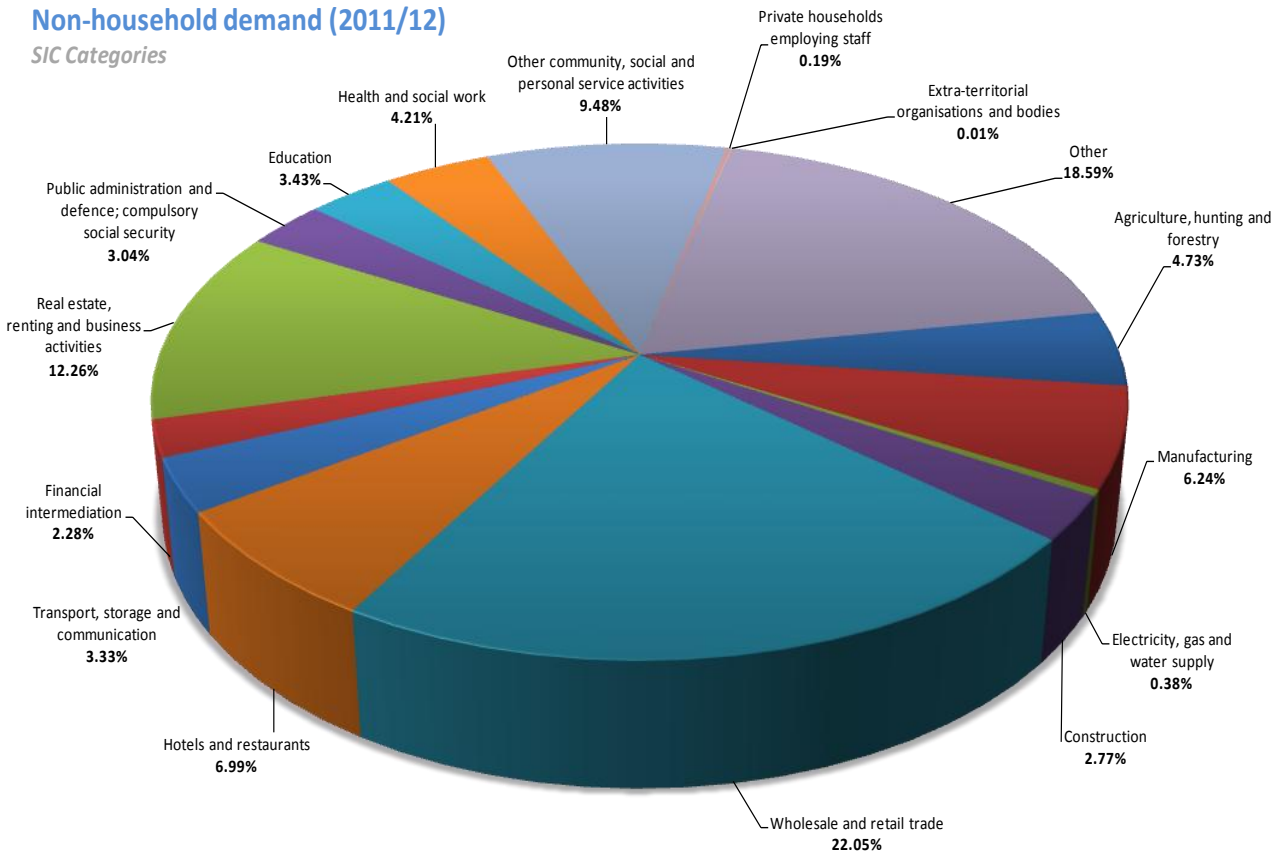

Figure 16: Categories of non-household demand (2011/12)

5.4 Leakage and other components of demand

5.4.1 Leakage

5.4.1.1 Introduction

Leakage in the base year (2011/12) for the whole company area was 170Ml/d. We consider that 2011/12 was a benign year in terms of climate with no extremes, such as prolonged hot dry weather or prolonged freezing conditions, causing ground movement and a consequent high incidence of pipe bursts. We therefore need to adjust our 2011/12 leakage value to produce an appropriate base year value for our dry year supply / demand balance.

Table 9 shows our actual measured leakage in 2011/12, our current target and our baseline values for the planning period.

We have included options for reducing leakage as part of managing the supply / demand balance.

Region	Leakage 2011/12 Ml/d	Leakage Target Ml/d	Baseline leakage for draft WRMP planning Ml/d
Central	158.45	185.00	185.00
East	4.29	5.10	4.29
Southeast	7.45	7.70	6.78
Company	**170.19**	**197.8**	**196.07**

Table 9: Leakage performance by region

Our zonal leakage figures are given in Section 5.6.3, Table 11.

5.4.2 Other components of demand

Our assessment of other components of demand, comprising operational use (such as hydrant and mains flushing) and water taken unbilled (which includes water taken legally for fire fighting purposes and water that is taken illegally), reflects the last assessment carried out for our Annual Return in 2012.

Region	Operational Use Ml/d	Water taken legally unbilled Ml/d	Water taken illegally unbilled Ml/d	Total Ml/d
Central	0.60	8.20	1.15	9.95
East	0.02	0.16	0.01	0.19
Southeast	0.06	0.20	0.01	0.27
Company	**0.68**	**8.56**	**1.17**	**10.41**

Table 10: Other components of demand

5.5 Demand forecast scenarios

The starting point for our demand forecast is the base year represented by our most recent outturn data. This ensures that the current metered and unmeasured household numbers and commercial customer numbers are up to date.

The base year for our assessment is 2011/12. The base year demand is adjusted to simulate dry year demand as described below.

The key scenarios used in our demand forecasting are the:

– Dry year annual average;

– Dry year critical period.

5.6 Base year assessment

5.6.1 Normal and dry year forecasts

For the base year 2011/12, we have records from our billing system of the number of customers supplied, the water delivered to metered customers and the overall quantity of water supplied from all our sources.

We calculate the quantity of water delivered to unmeasured customers using our water monitors extrapolated from samples of unmeasured customers who have meters installed to allow us to monitor their consumption but who are not charged on the basis of those meter readings.

We also identify other components of water use, such as flushing of mains or builder supplies from standpipes and calculate that the balance is leakage.

We have amended our estimated household occupancy rates by using the latest estimate of population from the studies described in Section 5.2.

We have separate occupancy rates for the following household types: unmeasured; measured (new properties), measured (optants) and measured (excluding new properties and optants). Optants are those customers who have been fitted with a meter at their request and tend to have a lower than average occupancy.

The numbers of household and non-household properties for the base year exclude empty properties which have had no demand for water.

2011/12 represents a normal year in terms of demand. The forecast dry year demand has been estimated by using factors applied to the actual 2011/12 data.

Although groundwater levels were very low following two dry winters, there were no prolonged periods of hot dry weather triggering high water use by customers and consequently there were no demand restrictions applied.

5.6.2 Peak forecasts

We have applied a peaking factor to average demand in each water resource zone based on an analysis of historic demand and weather parameters, including temperature, rainfall and soil dryness.

5.6.3 Summary of base year data

Demand components which remain stable over the planning period are summarised in Table 11.

Water Resource Zone	Non-household consumption Ml/d	Leakage Ml/d	Minor components Ml/d
1	11.88	19.58	1.13
2	18.91	28.31	1.33
3	31.45	30.21	2.17
4	45.66	36.98	2.64
5	17.44	15.06	1.02
6	34.32	21.29	1.66
Sub-total (Central region)	159.66	158.45	9.95
7 (Southeast region)	11.50	7.45	0.27
8 (East region)	6.22	4.29	0.03
Company Total	**177.38**	**170.19**	**10.25**

Table 11: Summary of base year data for our WRZ

5.7 Demand forecasts

The demand forecasts for each water resource zone are shown at Dry Year Annual Average in Figure 17 and at Dry Year Critical Period in Figure 18.

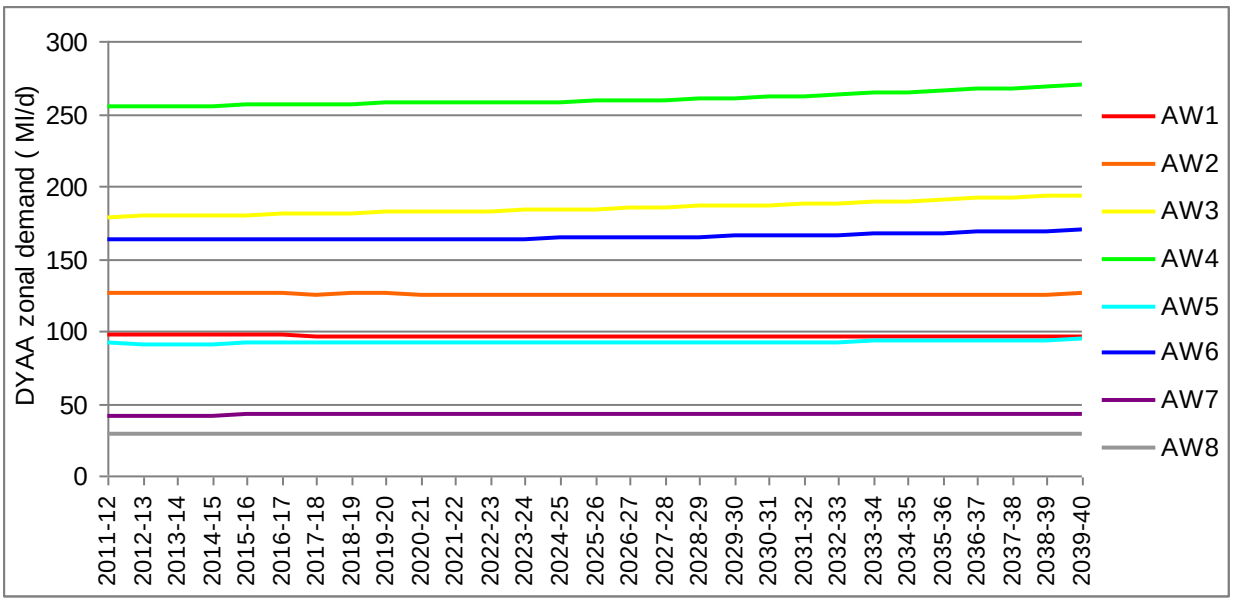

Figure 17: Dry Year Annual Average Demand Forecast for WRZ1-8

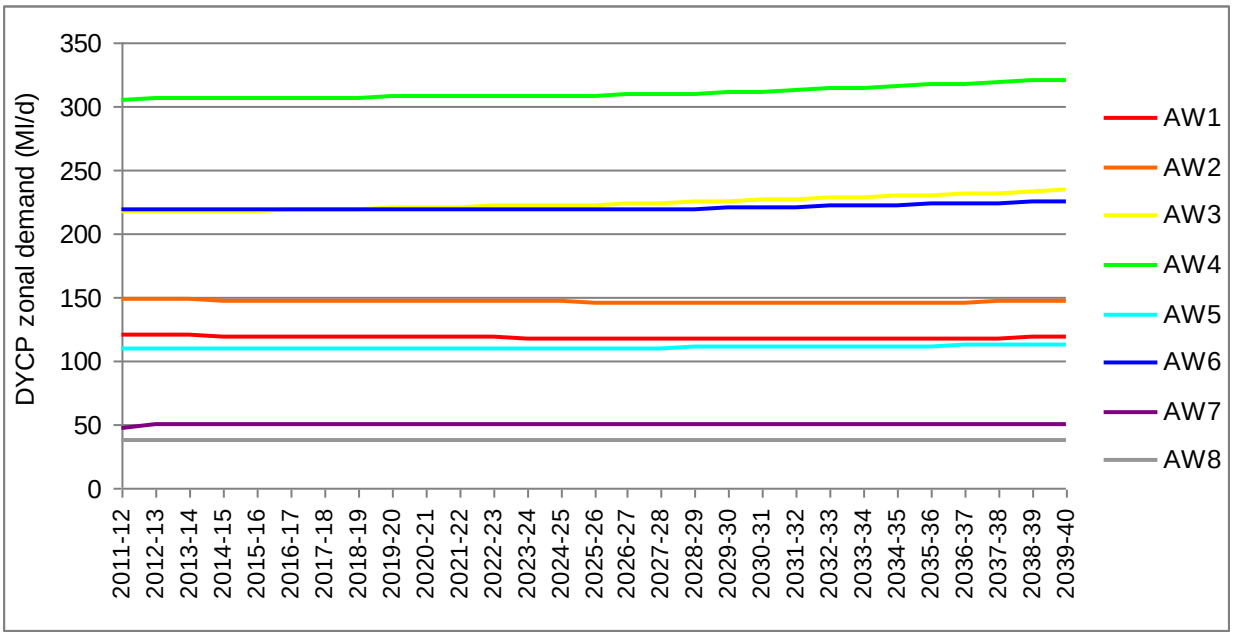

Figure 18: Dry Year Critical Period Demand Forecast for WRZ1-8

6 Headroom

6.1 General

There are inevitably uncertainties in forecasting supply and demand values over a 25-year period. Actual demands could exceed our assumptions or water supply availability could be reduced by more extreme climate variability or changes in environmental standards. We therefore include an allowance known as target headroom between our forecast demand and our supply capability.

6.2 Target Headroom

Our target headroom assessment uses the current best practice risk modelling approach (as undertaken for our previous Water Resources Management Plan for our Central, WRZ1-6, and Southeast regions, WRZ7) in accordance with the standard water industry methodology. Uncertainty values are assigned for each water resource zone for both water supply and water demand forecasts as follows:

- Bulk transfer imports from other water companies;
- Water availability from our own sources;
- Loss of treatment works output due to source pollution – this has been assessed as a loss of supply whilst additional treatment is installed to deal with the pollution;
- Impact of climate change on source outputs;
- Demand forecast uncertainties.

The Water Resources Planning Regulations specify that no allowance should be made for the uncertainty associated with sustainability reductions.

The uncertainties for each component are defined as probability distributions and combined using a computer model (using proprietary computer software).

The outputs from the assessment are in the form of Ml/d values for each water resource zone corresponding to different probabilities of occurrence.

We have selected an increasing level of risk over time on the basis that for the current year, we have no time available to respond to uncertainty so the risk should be 99%; in future we can accept a lower level of risk so over time we allow the percentile to reduce to 75% which results in a lower Target Headroom.

The final target headroom profiles for our company at Dry Year Annual Average and Dry Year Critical Period are shown in Figure 19 and Figure 20 respectively. We have used the values labelled ‘linear’ in our modelling in order to prevent artificial changes in the demand + headroom forecast.

Our analysis is detailed in Technical Report 2.4: *Headroom*.

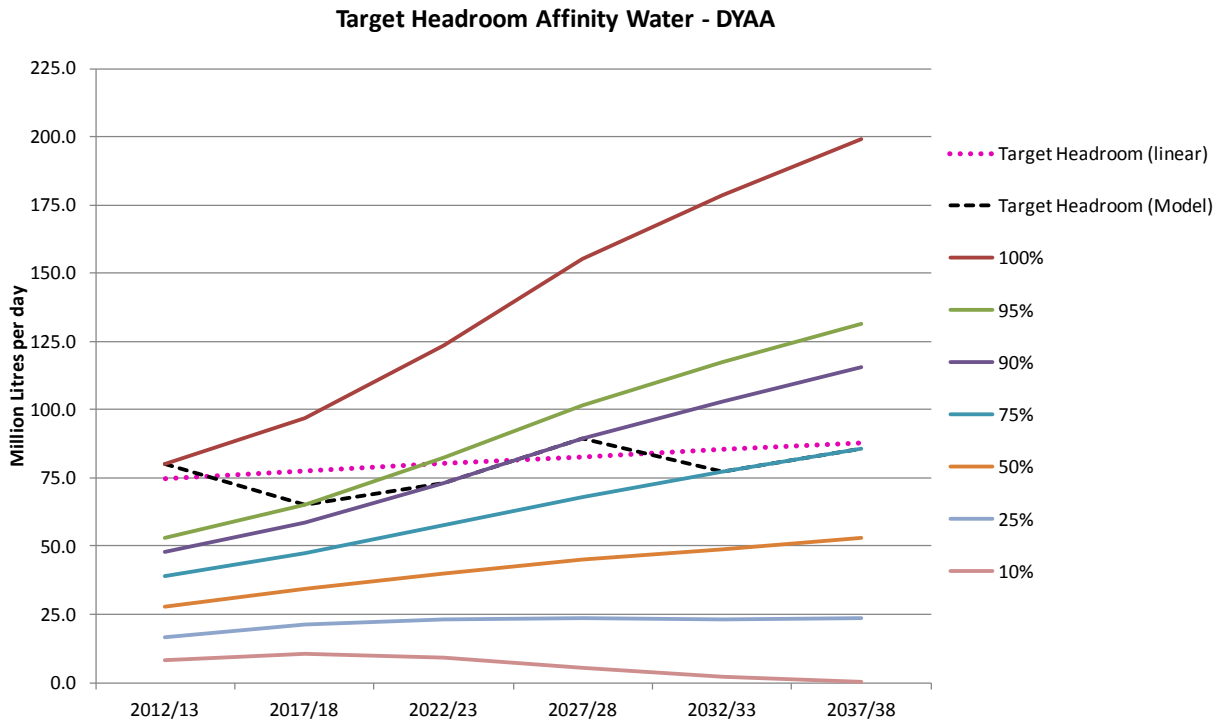

Figure 19: Company target headroom profile for dry year annual average

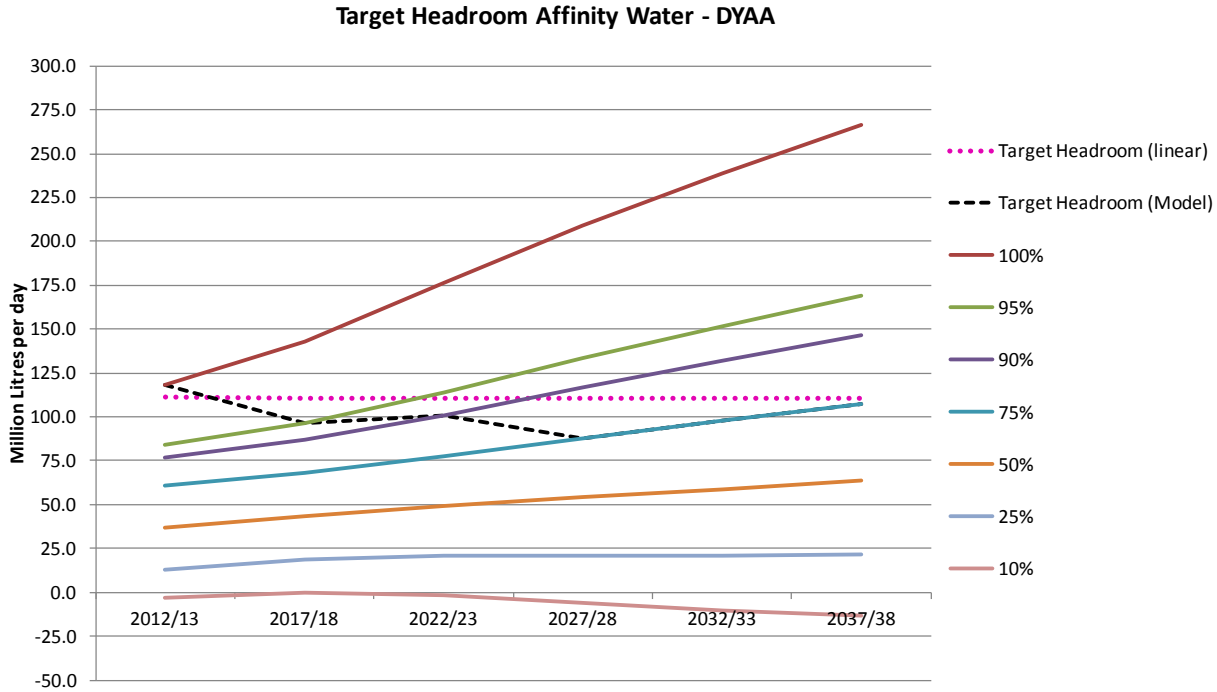

Figure 20: Company target headroom profile for dry year critical period

7 Supply / demand balance

7.1 Approach

We compare our water available for supply with the forecast demand and include the planning allowance known as target headroom to give flexibility in case actual demand exceeds our forecast.

Our company level supply / demand balance for all water resource zones, without sustainability reductions, at Dry Year Critical Period is illustrated in Figure 21.

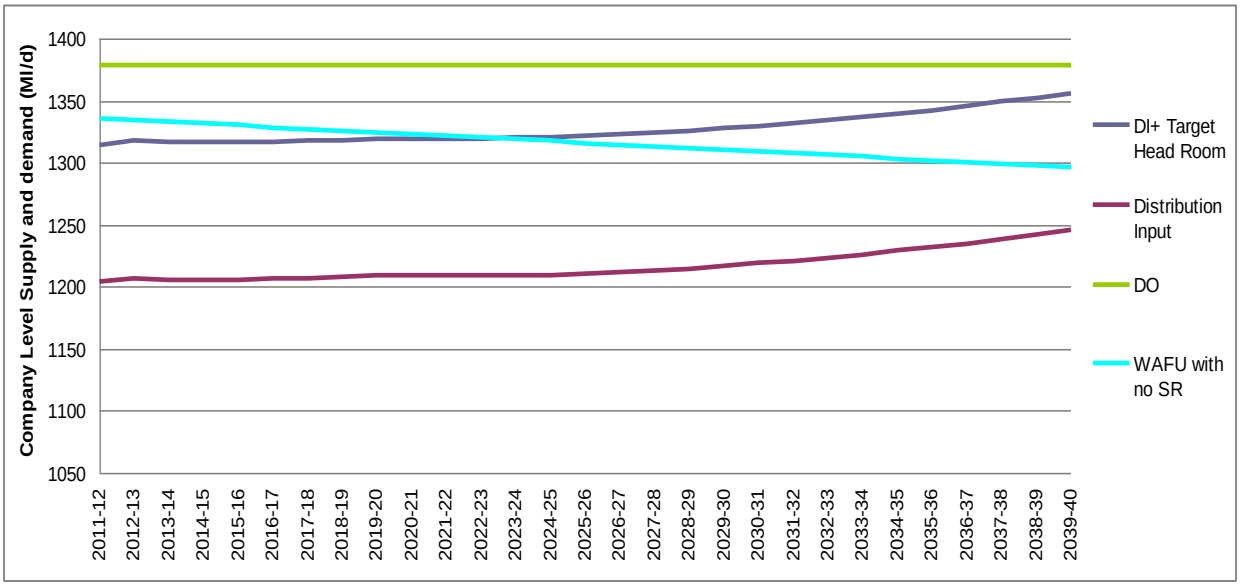

Figure 21: Supply & demand graph for Affinity Water, without sustainability reductions

Our supply / demand balance is calculated by:

	Deployable output (DO)
Minus	**Climate change impacts**
Minus	**Sustainability reductions (SR)**
Minus	**Outage and process losses (water available for use, WAFU)**
Minus	**Water demand (distribution input, DI)**
Minus	**Target headroom**

Where **supply** is less than **demand**, there is a **deficit** which must be overcome by developing options to reduce demand or increase supply.

7.2 Constrained and unconstrained balances

7.2.1 Introduction

We show the supply / demand balances at Dry Year Critical Period for each of our three regions in the following graphs:

– Figure 22 shows WRZ1 – 6, our Central region;

– Figure 23 shows WRZ7, our Southeast region;

– Figure 24 shows WRZ8, our East region.

We have illustrated the supply / demand balances with sustainability reductions (the 'constrained' balance) and without sustainability reductions (the 'unconstrained' balance) to demonstrate the major impact of those reductions which apply in our Central and Southeast regions.

7.2.2 Our Central region supply / demand balance

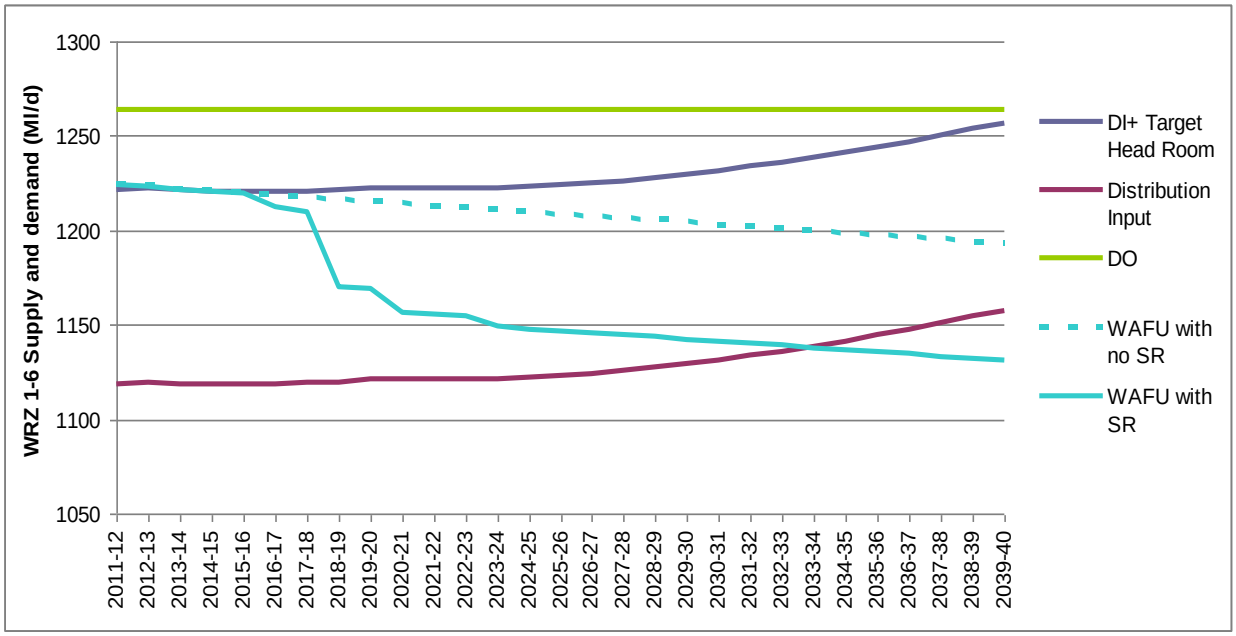

Figure 22: Supply / demand balance graph for Central, WRZ1-6, DYCP

7.2.3 Our Southeast region supply / demand balance

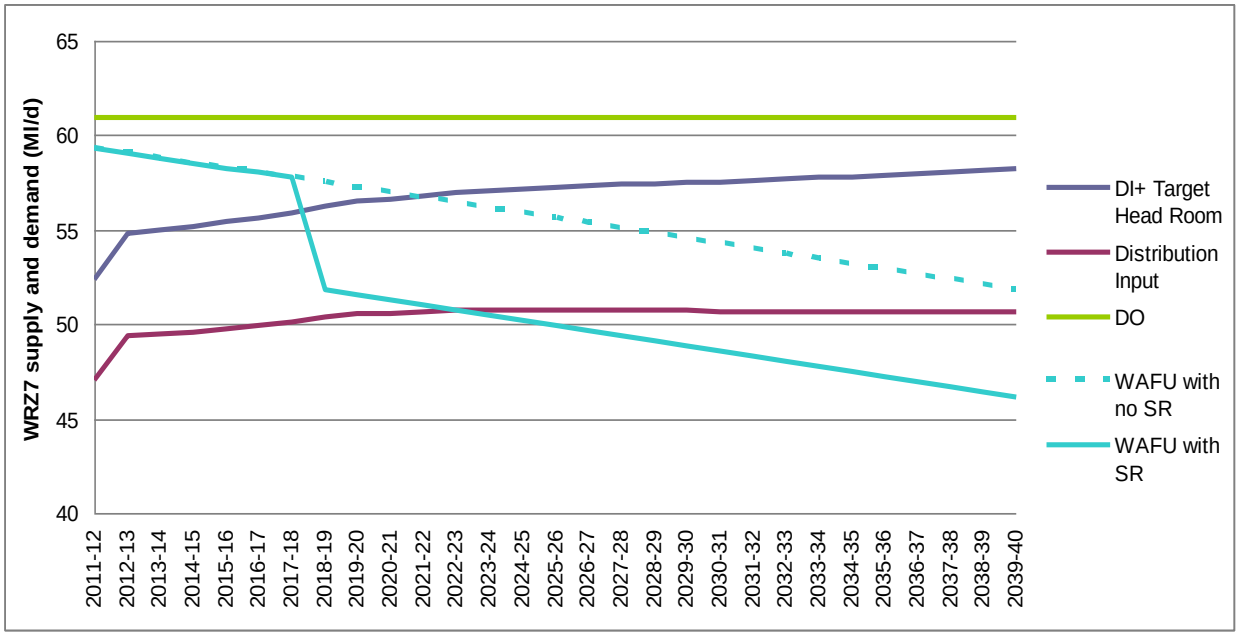

Figure 23: Supply / demand balance graph for Southeast, WRZ7, DYCP

7.2.4 Our East region supply / demand balance

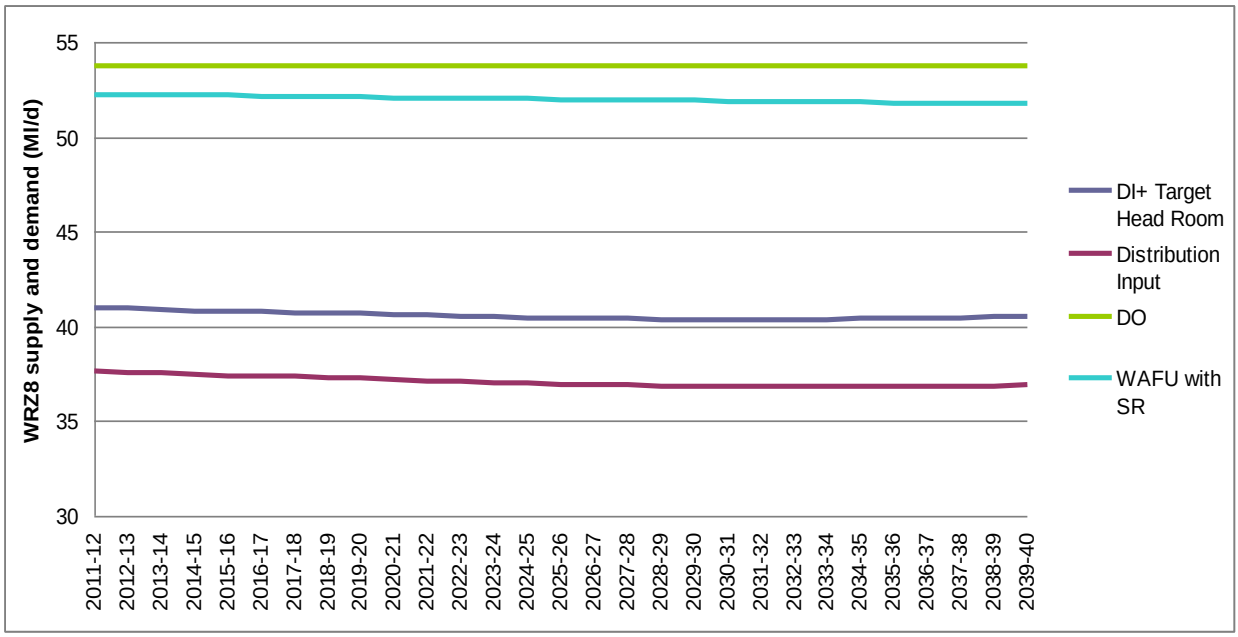

Figure 24: Supply / demand balance graph for East, WRZ8, DYCP

7.3 Final supply / demand balance 2015 – 2040

Figure 25 shows the supply / demand balance for Affinity Water as a whole, combining the regional balances to give the overall deficit that this draft WRMP must solve for the 25-year planning period. The deficit is between the light blue 'Water Available For Use with Sustainability Reductions' line and the purple 'Distribution Input plus Target Headroom' line.

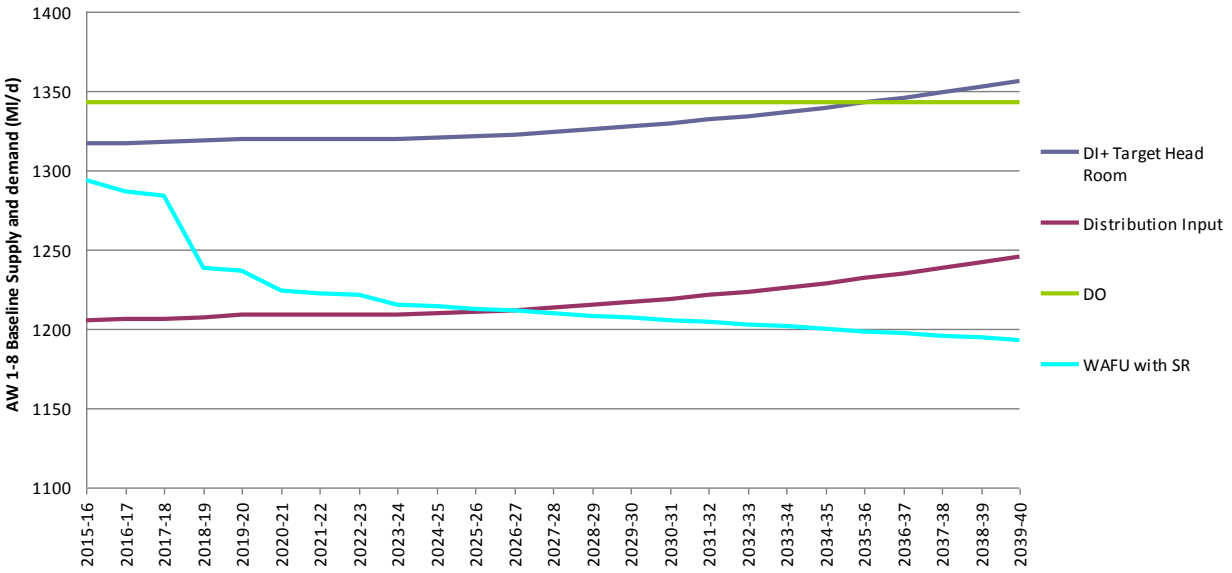

Figure 25: Final supply / demand balance for Affinity Water

Our baseline supply and demand assessments show that with the planned sustainability reductions, we have deficits in five of our eight water resource zones; our East region, WRZ8, does not have a supply deficit. At the end of the planning period, the total deficit is **166.2Ml/d**. Our options appraisal to resolve these deficits is described Section 8.

Our analysis shows that without the planned sustainability reductions, we have deficits in four water resource zones, although the deficit is much less. The total deficit at the end of the planning period without sustainability reductions is forecast to be **59.6Ml/d**.

Sustainability reductions remains a key element of our Plan and we will discuss the options with our customers during the consultation period.

The following sections of our draft Plan explain our approach to the resolution of supply deficits in our Central and Southeast regions. As our East region remains in surplus throughout the planning period, we explain the service offering for our customers in WRZ 8 in section 10.3.8.

8 Options appraisal

8.1 Approach

There is an established approach in the water industry for identifying, evaluating and selecting options for meeting water resource needs. Our approach is based on current best practice guidance, shown in Figure 26, which is divided into the following stages:

- **Stage 1 Unconstrained options** – compile a list of possible options which are technically credible but which have not been assessed for any constraints on development. This is termed the unconstrained options list.
- **Stage 2 Feasible options** – undertake a screening process on the list of unconstrained options and create a shorter list of feasible options which are studied in more detail and compared in terms of environmental impact, development and operational costs and long-term value, involving an economic assessment to establish the least-cost options.
- **Stage 3 Programme appraisal and environmental assessment** – assess alternative combinations of options against the requirements of Strategic Environmental Assessment (SEA) and Habitats Regulation Assessment (HRA).
- **Stage 4 Preferred programme and final supply / demand balance** – select the preferred programme of options for the company's water resources strategy.

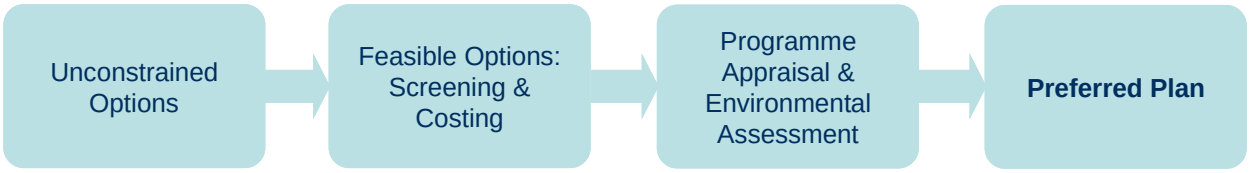

Figure 26: Components of our options appraisal

As our East region is in surplus for the whole planning period, we have not undertaken an options appraisal as we do not need to increase water availability or reduce consumption to maintain the supply / demand balance. Our East customers have a very low PCC and therefore further reductions in consumption are unlikely. The following sections of this draft Plan therefore apply to our Central and Southeast regions, both of which have supply deficits.

Our work to address Stages 1 and 2 is explored in Technical Report 3.1: *Options Appraisal*. Stage 3 is explored in our Technical Report 3.9: *Environment Report*, while our Preferred Plan is explained in Section 10 of this Plan.

8.2 Stage 1 – Unconstrained options

The unconstrained options list was created for our Central and Southeast regions by considering the full range of potential demand reduction methods and all realistic ways of providing increased water availability. The final list comprised options of the following types.

Demand side options:

- Water efficiency;
- Local water reuse (grey water reuse, rainwater harvesting, etc);
- Leakage;
- Metering and new tariffs.

Supply side options:

- Bulk transfer imports from other water companies or third party borehole owners;
- Transfers between our water resource zones;
- Surface water, including increased river abstractions and new reservoirs;
- Groundwater, including increasing output from existing sources, developing new boreholes and enhancing aquifer storage;
- Effluent reuse and desalination.

Other options:

- Catchment management (to reduce water quality constraints on existing sources);
- Licence trading and other third party options.

The number of options of each type presented at the unconstrained stage is shown in Table 12.

Option types	Number of unconstrained options
Water efficiency	112
Local water reuse	8
Leakage	68
Metering	20
Tariffs	23
Bulk transfer imports	60
Inter-zone transfer	12
Surface water	42
Groundwater	94
Effluent reuse	7
Desalination	12
Treated water storage	2
Catchment management	2
TOTAL	**462**

Table 12: Summary of unconstrained option types

The unconstrained options process is further explored in the Technical Report 3.1.1: *Unconstrained Options Study*.

8.3 Stage 2 – Feasible options

8.3.1 Screening process

A detailed screening process was applied to the unconstrained options to create the feasible options list.

Acceptable options were reviewed against each of three risk categories (technical, environmental and political) to identify potential constraints to development. Each option was marked as having no major concerns, some potential major constraints or significant issues likely to prevent successful development.

The screening eliminated water supply options where increased abstractions from rivers or groundwater aquifers were likely to have a detrimental environmental impact. Such impacts included unacceptable reduction in river flows, aquifers already deemed to be over-abstracted, existing river water quality concerns and other effects on water-reliant habitats.

The number of options of each type presented at the screening stage is shown in Table 13.

Option types	Number of feasible options
Water efficiency	30
Local water reuse	0
Leakage	41
Metering	24
Tariffs	0
Bulk transfer imports	31
Inter-zone transfer	11
Surface water	8
Groundwater	26
Effluent reuse	3
Desalination	2
Treated water storage	0
Catchment management	0
TOTAL	**176**

Table 13: Summary of feasible option types

The constrained options screening process is further explored in Technical Report 3.1.2: *Option Screening and Constrained Options Methodology*.

8.3.2 Option development

Each feasible option was developed further by producing an outline design and undertaking appraisal of:

- Water supply yield;
- High level environmental assessment, including potential environmental impacts during construction and operation as well as mitigation requirements and opportunities for environmental enhancement;
- Development and running costs;
- Social and environmental costs;
- Carbon emissions;
- Potential development constraints;
- Programme for implementation.

Full details of each option are recorded in the option dossiers; refer to Technical Report 3.1.3: *Constrained Option Dossiers*.

The Environment Agency was consulted during the unconstrained options and constrained options development stages and provided useful feedback to assist the process. Particular assistance was given on the likelihood of additional water being available for abstraction from groundwater aquifers and rivers.

8.4 Economic appraisal of demand management options

8.4.1 Introduction

In order to develop options for leakage and metering for use in our EBSD modelling, it has been necessary to carry out a separate economic appraisal.

The detail of this work is summarised in sections 8.4.2 and 8.4.3, and further detailed in Technical Report 3.2: *Leakage Strategy Report* and Technical Report 3.3: *Metering Strategy & Cost Benefit Analysis*.

8.4.2 Leakage

8.4.2.1 Short Run Economic Level of Leakage

We have reviewed our short run Economic Level of Leakage (ELL) against current leakage levels and target as part of our on going updating process to ensure we are operating at or below economic levels. The method of calculating the short run ELL and sustainable ELL (SELL), where environmental and social costs pertaining to maintaining leakage volumes and leakage management activities are taken into account, follows Ofwat guidelines and industry best practice.

Table 14 sets out the results of the short run ELL and SELL analysis for each region when compared to the current leakage targets. The current company target is 5% and 8% below the short run ELL and short run SELL respectively.

Region	ELL (Ml/d)	SELL (Ml/d)	AMP5 leakage target (Ml/d)
Central	195.54	204.65	185.00
East	5.50	5.50	5.10
Southeast	6.85	7.85	7.70
Company	**207.89**	**218.00**	**197.80**

Table 14: Regional ELL and SELL results

We are setting leakage levels over the next 15 years to be challenging but sustainable, and therefore may be sub-economic. Table 15 sets out the target levels per region.

Region	AMP5 leakage target (Ml/d)	AMP6 leakage target (Ml/d)	AMP7 leakage target (Ml/d)
Central	185.00	167.0	155.0
East	5.1	5.1	5.1
Southeast	7.7	5.7	4.7
Company	**197.8**	**177.8**	**164.8**

Table 15: Future Regional Leakage Targets

We will ensure a continually reducing leakage level through the careful monitoring and response to leakage outbreaks and the natural rate of rise of leakage encountered together with controlled implementation of leakage reduction measures from one leakage level to another.

8.4.2.2 Leakage Detection and Repair Costs

The leakage detection and repair costs used to derive the cost relationships were averaged across each region before application to District Meter Areas (DMA) and Water Resource Zones (WRZ). There is therefore a lower confidence when comparing local WRZ ELL and SELL values and water resource zone leakage levels than at the regional level.

In our drive to improve efficiency across all operational areas, we are now putting in place systems that allow us to collect cost data at the sub zone level. This will improve the accuracy of water resource zone ELL and SELL values and will improve the associated statistical confidence ranges. Further uncertainty from the use of environmental values from third parties including the Agency's own data (including the Benefits Assessment Guidance) are catered for by using upper and lower band estimates around the mid point data. Our own information from the National Environment Programme of studies is used to re-evaluate the associated environmental and social costs where applicable.

8.4.3 Demand management: metering

8.4.3.1 Metering Cost Benefit Analysis: Central Region

We evaluated responses received during the pre-consultation phase and took these into account in preparing our draft WRMP, SEA and accompanying technical reports.

A cost benefit analysis (CBA) has been carried out using the latest UKWIR methodology to determine the optimal metering solution for the compulsory metering programme in the Affinity Water Central region.

The model has been developed specifically to meet the latest regulatory requirements and includes analysis of the following elements:

- Meter and data capture procurement
- Meter replacement
- Meter installation
- Meter reading
- AMR communications, Capex and Opex
- Back office system
- Programme costs
- Leakage
  - Internal leakage
  - Supply pipe leakage
  - Network leakage
- Level of demand and diurnal demand profile
- Dealing with customers
- Carbon
  - Direct
  - Embedded

Details of our modelling approach are included in our Technical Report 3.3: *Metering Strategy & Cost Benefit Analysis*.

8.4.3.2 Results

The results of our modelling show that:

- Both dumb and AMR compulsory metering programmes are beneficial when compared to the base case.
- AMR is beneficial when compared to dumb if the marginal cost of water is closer to the long run marginal costs rather than the short run marginal cost.
- The 5 year programme appears to be more cost effective than the 10 year programme. This is not currently totally clear from the model as it is affected by issues with meter reconciliation.

Table 16 compares the benefits of dumb meters against AMR technology to illustrate the cost benefits, repeated from the Technical Report 3.3: *Metering Strategy & Cost Benefit Analysis*.

Summary comparing Dumb meter scenarios (5/10 years) and AMR meter scenarios (5/10 years) against the Base Case

With short run marginal cost of water (£127.14)

			5 year				10 Year			
		Base	Option 3	Option 4	Benefit 5yr Dumb against Base	Benefit 5yr AMR against Base	Option 6	Option 7	Benefit 5yr Dumb against Base	5yr AMR against Base
WRZ	Units	Case	Dumb	AMR			Dumb	AMR		
1	£m	150	141	142	9	8	128	130	21	20
2	£m	197	196	191	1	6	177	178	20	19
3	£m	293	275	278	17	15	271	268	22	25
4	£m	435	409	413	26	22	417	421	17	13
5	£m	118	111	112	7	6	113	114	5	4
6	£m	217	204	206	13	11	208	210	9	7
TOTAL	**£m**	**1,409**	**1,336**	**1,342**	**73**	**67**	**1,315**	**1,321**	**94**	**87**

With (indicative) long run marginal cost of water (£1000)

			5 year				10 Year			
		Base	Option 3	Option 4	Benefit 5yr Dumb against Base	Benefit 5yr AMR against Base	Option 6	Option 7	Benefit 5yr Dumb against Base	5yr AMR against Base
WRZ	Units	Case	Dumb	AMR			Dumb	AMR		
1	£m	204	181	179	23	24	164	162	40	41
2	£m	268	251	240	17	28	227	224	41	44
3	£m	458	398	391	59	67	384	378	74	80
4	£m	590	525	520	65	71	538	533	52	57
5	£m	160	143	141	18	19	146	145	14	15
6	£m	339	295	289	44	49	303	298	36	41
TOTAL	**£m**	**2,019**	**1,793**	**1,761**	**226**	**258**	**1,763**	**1,740**	**256**	**279**

Table 16: Cost benefit analysis of metering technologies

9 Development of our Preferred Plan

9.1 Our approach

There are four key components in building our Preferred Plan:

- Undertake economic analysis, initially using the WRSE model and then using our own optimisation model, to find the costs of alternative planning scenarios and to compare results from the WRSE modelling with our Base Case plan;
- Understand the risks and uncertainties of selected options and check that they meet the objectives of our plan;
- Compare the results of the economic modelling with customer preferences to ensure that selected options are consistent with customer views;
- Ensure that the Preferred Plan meets the Strategic Environmental Assessment (SEA) objectives.

In developing our Preferred Plan, we have sought to:

- Work with our customers to reduce household consumption in line with Government's Guiding Principles for water resources management planning;
- Reduce abstraction from existing sources where it is considered to be damaging the environment;
- Share resources with neighbouring companies and third party licence holders, as adopted by the Water Resources in the South East (WRSE) strategic modelling;
- Derive a flexible approach to option development to maintain the principles of a least cost investment programme;
- Promote resilience by having a balanced programme of investment that does not rely on a single option type.

9.2 Economic appraisal of feasible options

Least cost modelling was undertaken by the WRSE group to cover all water resource zones operated by the six water companies in the South East of England (reference Technical Report 3.6: *Water Resources in the South East Modelling*).

In parallel with the WRSE assessment, we undertook our own least cost modelling to enable us to investigate options in more detail, to include customer preferences and to understand the risks in the Preferred Plan. We explain our approach in Section 9.4.

Key aspects outside the scope of the WRSE modelling were assessments of:

- Water company customer views or preferences;
- The views and preferences of local interest groups;
- Commercial costs of water transfers between water companies;
- Non-monetary environmental impacts of options;

– Secondary company-specific benefits of options, such as water supply resilience;
– Whether least cost options represented best value for our customers.

9.3 WRSE least cost modelling

The WRSE regional modelling provided results on strategic options for eliminating the regional supply demand deficit. The WRSE model used data from the six regional water companies on existing water resource outputs and forecast water demand to produce a supply / demand balance.

For water resource zones with a supply demand deficit, it then utilised data on a range of scheme options to eliminate the deficit; options included water supply and demand management schemes able to provide more water or to reduce demand. The model was also able to modify quantities taken from existing sources and quantities transferred between water resource zones to produce a least cost combination of options over the 25-year planning period. The WRSE modelling software operates in a similar way to our own modelling software.

The WRSE modelling compared 10 initial scenarios with a range of forecasts for future water demand, sustainability reductions and other variables. These scenarios used data supplied by the participating water companies that was submitted at the end of 2012.

Some of the scenarios excluded potential water resource options which the Environment Agency considered as high risk because of possible environmental impacts (which may prevent particular new resources from being developed).

Further scenarios with local changes were then run at the request of water companies; results from the additional runs are not included in the current WRSE report. A core set of options was selected from the modelling results as being important to a South East Strategy. Further alternative options were then proposed by some WRSE members based on their own experience and judgment.

Details of the WRSE modelling can be viewed on the website at www.wrse.org.uk. The current WRSE report is available at:

http://www.wrse.org.uk/sites/default/files/WRSE_report_19Feb2013.pdf

A summary of outputs relating to us and how the WRSE outputs have influenced our draft Plan are included in our Technical Report 3.6: *Water Resources in the South East Modelling*.

9.4 Our least cost modelling

9.4.1 Introduction

We undertook an appraisal of the feasible options using a least-cost computer model based on specialist software. The model is programmed to read our water supply availability and water demand forecasts for each of the 25 years from 2015 and to assess whether there is a deficit between supply and demand in each of our eight water resource zones. The model then selects the least-cost approach in each of the zones with a supply / demand deficit (for both

annual average and peak periods). Details of each option, including capital development costs and operational running costs, are included in the model. The normal year supply / demand forecast is used to calculate the variable Opex.

Our modelling methodology, outputs and assessment are included in Technical Report 3.7: *Economics of Balancing Supply and Demand Model Development, Commissioning & Use*.

The function of both the WRSE and our modelling is to identify the least cost solution to ensure that any deficit is met in every planning scenario in every year of the 25-year appraisal period. The model determines on an annual basis whether an option should be implemented and, in the case of supply schemes, how much of the available water is utilised. The cost is optimised using the capital and fixed operational costs and the variable operational costs calculated from the amount of water supplied.

Our modelling included updated information from that used in the WRSE modelling as follows:

- Changes in the availability of bulk supply transfers from neighbouring water companies as agreed with each of those companies;
- The opportunity to assign realistic costs to bulk supply options (the WRSE modelling did not take account of commercial payments to be made between water companies);
- Refinement of minimum deployable output values to differentiate between the dry year annual average scenario and a more severe drought event (known as the “third dry winter”);
- Offering more leakage options to explore our customers’ views of the “emotional level of leakage”;
- Changes to the metering option costs based on refinements of our data.

We also asked the WRSE to undertake a model run based on our latest data refinements to compare with and validate our base case model results to determine consistency (WRSE reference K13).

9.4.2 Aligning our model with WRSE

The WRSE team ran a model scenario at our request that closely represented the available options, following detailed discussions with our neighbouring water companies about the bulk transfer options. We felt this was necessary as the WRSE modelling programme took longer than envisaged due to the number of scenarios and complexity of the problem the model was solving. During that time, companies were iterating towards their Preferred Plan so the availability of transfers had changed; for example the maximum total bulk supply available from a neighbour regardless of the number of transfer options offered to the model.

As explained in section 9.4.1, and in more detail in the Technical Report 3.7: *Economics of Balancing Supply and Demand Model Development, Commissioning & Use*, we have identified the parameters that are different in our model but sought to replicate the investment programme of K13 as our ‘Base Case’ to show how the WRSE has influenced the decisions in our Plan.

We have analysed the investment programme generated by our EBSD modelling and compared it with WRSE’s K13 scenario. Table 17 shows the number of options selected by type in the WRSE K13 scenario and our Base Case.

75% of the options selected within the WRSE K13 case are also selected with in our base case scenario. There are a further 6 options which are variations of the same option type (for example, 5 year compulsory metering and 5 year community integrated metering with demand management). If these are included then there is an 84% alignment of chosen options.

Summary of number of options	K13	Base case
Leakage Schemes	18	18
Water Efficiency	18	20
Metering	5	4
Groundwater	16	16
Network Constraint Removal	2	4
Inter Company Transfers	1	1
Reservoirs	0	1
Regional Transfers	8	7

Table 17: Comparison of WRSE K13 and our Base Case

9.5 Programme appraisal and environmental assessment

9.5.1 Risk

In order to ensure that our Preferred Plan met the objectives of the WRMP, we included a risk assessment process to evaluate alternative scenarios. The risk factor categories are shown in Table 18 along with the maximum score available in each category (the higher the score, the higher the risks associated with that scenario).

Risk Factor	Description of Risk	Risk Factor Maximum Score
Reduces PCC	Does the option mix encourage a reduction in PCC to meet Government objectives? Failure to reduce PCC may result in a challenge to our plan from regulators and Government.	**25**
Range of Options	Is the set of options a balanced mix? Where a given solution is too dependent on particular options or option types, e.g. large proportion of groundwater and no metering, there is over-exposure to risk in delivering the benefits and limited flexibility.	**25**
Drought Resilience	All schemes offered to the model should operate during normal Levels of Service operations, but do schemes provide any additional resilience during a drought, and therefore benefits in addition to meeting supply / demand deficits?	**25**
Delivery	Is the scheme difficult to promote making delivery uncertain? Examples include accuracy of cost, environmental concerns, planning requirements or dependency on third parties.	**25**

Table 18: Risk factors and maximum score

We used a simple 5 x 5 matrix of severity and likelihood to rank the overall risk of our Base Case, Preferred Plan and key alternative scenarios. The results are presented in Section 10.2.6.

9.5.2 Customer preferences

As described in Section 3.5, we have been consulting with customers to understand their key concerns and preferences.

Feedback to date has shown a strong signal that most customers believe that **metering is the fairest way to charge for water used**, but customers are less supportive of a compulsory metering programme which did not apply to the whole company area.

> "Metered water is much fairer - why should I subsidise big families?"

Our customers are very aware that **water meters help to reduce consumption** and that, for many, their water bills reduce as a result. However, there is recognition that for some customers a water meter may not be the cheapest option (for example, large families or customers with specific medical needs), and that they would like us to explore an appropriate transition programme before compulsory metering is rolled out. This could include different types of tariffs to assist customers in need.

Customers have also told us that the environment is important to them, but so is **having the water they need, at the right quality and quantity**. There is support for water efficiency programmes to help reduce consumption, which might include the provision of water butts for the garden.

> "We save 200 gallons of rain water in water butts; the overflow tops up my garden pond"

Customers believe that **more should be done to address leakage**. Our customers acknowledge that a meter might help them identify internal plumbing leaks or leaks on their supply pipe, but it would be important for customers to be rewarded for swift action as opposed to being penalised for leaked water.

> "The infrastructure has been woefully neglected in the past"

We believe that it is important to reflect the views of our customers in our Plan, and have used their preferences in the development of our Preferred Plan. This is described in Section 9.7.2.

9.5.3 Strategic Environmental Assessment

The WRMP Guideline recognises the need to include a Strategic Environmental Assessment (SEA) in formulating the Preferred Plan together with cost, risk and other deliverability issues. Initially an SEA scoping report was produced and sent to a wide range of Stakeholders. Comments were received and incorporated in our further analysis.

As part of the options appraisal described in Section 8, we undertook a detailed SEA of all options. The process we have followed is described below:

- Individual options have been appraised against SEA objectives and specific criteria covering magnitude and extent, short and long term impacts and without and with mitigation. The results are recorded in a summary matrix.
- An overall SEA risk category for each option is provided for modelling input (excluding consideration of the carbon footprint objective which is fully covered in environmental costs). Three simple categories: 'high', 'moderate' and 'low' have been developed. An option might be graded 'high' risk if it presents significant impacts on a designated site or feature.
- This list has been compared to the Agency's "red list" to consider whether further amendments to the risk level were required.
- It is recognised that stakeholders are likely to ask if a viable plan be formed without including the 'high' risk options. We have run a scenario in our model excluding the 'high' risk options to determine the impact on overall cost (see Section 9.6). The results have been assessed in terms of meeting other Plan objectives.
- Our Base Case, other scenarios and the Preferred Plan have been assessed within the SEA using both the individual options matrices and cumulative impact assessments. The results have been used to identify specific options which should be removed from our economic modelling to see if alternative options would be better. The first level of cumulative assessment has looked at in-combination effects within the company options selected and the second level of cumulative assessment includes sources outside our area where they provide supplies to us.

It is important that we show how the SEA has influenced the development of our Preferred Plan. We have explained this in Section 9.7.3.

Full details of the SEA and Habitats Regulation Assessment are described in Technical Report 3.9: *Environmental Report*.

9.5.4 Consideration for downstream costs

During the course of the WRSE modelling work, the revised Water Resource Planning Guideline introduced the requirement to include the additional cost of any downstream costs in our draft WRMP. However, it is not possible to account for all downstream costs until the Preferred Plan mix of schemes to maintain security of supply is designed.

Accordingly, we determined that an estimate should be included of 10% of the capital expenditure and that more accurate definition of schemes would take place after the draft WRMP is published ready for final plans. We have applied this principle to our Preferred Plan.

9.5.5 Improving our resilience

2012 saw the 'wettest drought on record', in that following two dry winters we planned to see unprecedented drought conditions by the autumn of 2012. However, UK weather conditions can be fickle, and instead we saw one of the wettest summers on record. This meant the drought did not worsen and, indeed, groundwater stocks are now back to above normal levels

after an above average winter recharge season. Nevertheless, we had a near miss and had we seen unprecedented drought caused by a third dry winter, we would have had to apply for drought orders to restrict essential use of water.

During our pre-consultation process, customer feedback has been divided with some groups being happy with the occasional use of restrictions on demand and others asking us to ensure these are not required in future.

We have agreed with all other water companies that we will delay the application of a Temporary Use Ban on our non-household customers in future to minimise the impact on the livelihoods in particular from small businesses but that alone will not prevent future severe droughts occurring.

We described our current levels of service in section 3.2.1 and we have explored the frequency of dry years relating to severe events. Our experience during 2011 and 2012 led us to investigate options to improve our resilience and delay the need to implement restrictions on water use from after two dry winters to after three dry winters. To maintain supplies in a severe drought would require us to invest to increase the capacity of our system and in particular to be able to transfer more water to areas that will be most affected by severe drought. We have developed proposals that we have included in our Preferred Plan and will seek to consult with customers to understand if they wish us to make this investment.

The details of the investment required to maintain supplies to customers in the event of a third dry winter is detailed in our Technical Report 1.2.1: *Drought Planning for Third Dry Winter Scenario*.

This work identifies six capital investment projects and the purchase of a supply from one of our neighbouring companies. The major component of the investment projects is an additional pipeline within WRZ3 to transport more water from west to east and so that we can utilise a greater proportion of our imported supply from Anglian Water during times of drought. We propose that an investment of £15 million one-off capital expenditure and £0.5 million annual operational expenditure during each drought year is required to mobilise a series of projects listed in Table 19.

Scheme	Option Type	Benefit Ml/d	One-off Capex Cost
Re-commission source in WRZ5	Source Optimisation	4.00	£200k
Group licence in WRZ5	Licence Change	2.33	£50k
New pipeline between WRZ3 & WRZ5	Bulk Transfer	8.00	£250k
Reinforcement west-east in WRZ3	Bulk Transfer	10.00	£8,000k
Reinforcement in WRZ1	Bulk Transfer	8.00	£1,200k
Increased booster capacity in WRZ4	Bulk Transfer	3.50	£215k
Purchase third party licence for WRZ5	Purchase Source	4.00	£5,000k
Total		**39.83**	**£14,915k**

Table 19: Investment schemes to reduce restrictions during drought years

9.6 Scenario Testing

9.6.1 Introduction

In accordance with Section 8.0 of the Water Resources Planning Guideline, we are required to test the robustness of our Plan. We are directed to consider changes to supply and demand forecasts, the main risks (for example, sustainability reductions) and to demonstrate that a very risk adverse Preferred Plan has not been selected.

Our least cost plan is unconstrained, allowing our model to freely choose the options to manage the deficits throughout the planning period.

We have iterated a large number of sensitivities as the options data has improved. Figure 27 identifies the scenarios we have analysed in the iteration of the Preferred Plan, whilst considering customer preferences and environmental impacts. Section 9.6.4 discusses the results of these scenarios.

The scenarios described in our draft Plan is not an exhaustive list; as we have improved our data and modelling processes we have undertaken many others that are not recorded here. We believe the scenarios listed in our draft Plan are the most relevant to show how we have tested the flexibility and resilience of our proposals.

We have developed our Preferred Plan as a result of this scenario testing, and we will consult with customers on the components of investment.

Further details and analysis of our scenario testing are provided in Technical Report 3.7: *Economics of Balancing Supply and Demand Model Development, Commissioning & Use*.

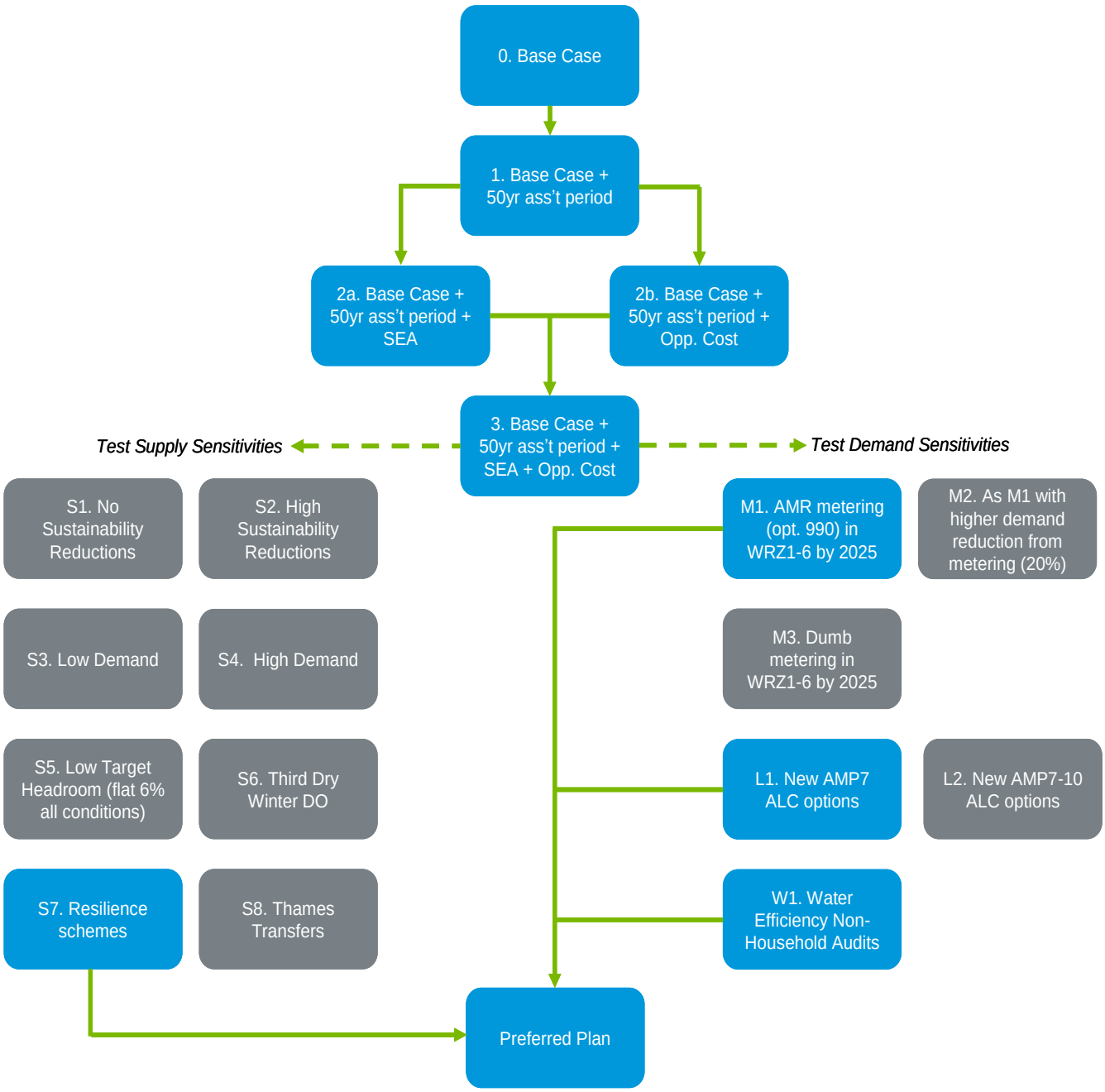

Figure 27: Scenario testing of our draft WRMP

We have not considered a sensitivity with respect to climate change. Our assessment of climate change concludes that it has an impact of around 2% on our water availability. Our surface water sites are not affected by climate change (the River Thames) and our groundwater sites are tested in sensitivity S6 as we explore the potential impact of a third dry winter on groundwater levels. We also consider that our target headroom adequately covers the risk of climate change.

9.6.2 Description of the core scenarios we have tested

9.6.2.1 Scenario 0: Base Case

Our Base Case attempts to replicate the WRSE model K13 run. Earlier WRSE cases have not been re-run with the latest company data, which could derive alternative investment plans. K13 has used the most up-to-date information and accounts for bulk transfer discussions that have taken place between us and our neighbouring water companies.

The WRSE model runs with both the planning period and assessment period set at 25 years; we have reflected this in our model setup. Critically, we have also decided to assume the marginal cost of the "donor" for external transfers, in an attempt to show alignment with the WRSE model. Due to commercial confidentiality, we do not know the exact marginal cost of the donating company, so we have used the marginal cost of our bulk supply import from Anglian Water because this water is our most expensive source that can be transferred readily in large volumes to most of our zones, either directly or by substitution. We believe this is consistent with the approach taken in WRSE where up to 20% of zonal capacity is treated as variable.

Our model is therefore free to choose the least-cost investment plan to satisfy the supply / demand deficits in our operating area.

9.6.2.2 Scenario 1: Base Case + Longer Assessment Period

The next step in iterating towards our Preferred Plan is to run the original Base Case with a longer assessment period. Running with a 50-year assessment period ensures that costs that are incurred after the end of the planning period are accounted for in the investment programme. For example, if an option with a multi-year Capex profile was chosen in 2039, only a year's worth of costs would be included in the investment plan with a 25-year assessment period. If the same option was selected when running with a 50-year assessment period, all costs associated with it would be included in the investment programme. As a result of the longer assessment period, different options could be selected to derive the least-cost investment plan.

As with the original Base Case, our model is free to choose the least-cost investment plan.

9.6.2.3 Scenario 2a: Base Case + Longer Assessment Period + SEA

We have undertaken a thorough Strategic Environment Assessment of our options. The outcome is to grade each option as high risk, medium risk or low risk with respect to the environment. The methodology and risk assessments can be found in the Technical Report 3.9: *Environment Report*. We wanted to test the sensitivity of our investment plan to the removal of the 'high' risk options, so, for this scenario, we excluded them from the available options list.

There were no other excluded options, allowing our model to freely choose the least-cost plan for this sensitivity.

9.6.2.4 Scenario 2b: Base Case + Longer Assessment Period + Opportunity Cost

We are supportive of the principles of the WRSE approach to marginal cost of transfers. The existing transfer arrangements we have in place with neighbouring water companies suggests that there is a degree of opportunity cost that the receiving company pays. The commercial arrangements differ from transfer to transfer. Where we have existing commercial arrangements, we have assumed they will continue. Options that increase capacity of an

existing transfer are assumed to cost the same per unit of water as the existing commercial arrangements. For new options, we have used the commercial rates offered by the donating company. In the absence of any rates proposed by the donor, we have assumed an inclusive opportunity cost of 60% of the donating company's Large User Tariff.

Our model is free to choose the least-cost investment plan in this sensitivity.

We note that we may be able to negotiate better commercial positions, which we plan to do while we consult with customers about our Preferred Plan.

9.6.2.5 Scenario 3: Base Case + Longer Assessment Period + Opportunity Cost + SEA

Some of the options classified as 'medium' or 'low' risk under the SEA were bulk transfers from other companies. As we consider that the opportunity cost of bulk transfers is a more realistic outcome than an assumed marginal cost, we tested the sensitivity of the investment plan by running our model with the 'high' risk options excluded together with the opportunity cost approach as described in case 2b.

With the exception of the 'high' risk options, the model was otherwise free to select the least-cost plan.

9.6.3 Description of the additional sensitivities we have tested

Scenario 3 represents the case on which we have tested other sensitivities. We applied different factors affecting the supply / demand balance and demand management options to determine the impact on the investment programme.

9.6.3.1 Scenario S1: No Sustainability Reductions

Whilst we have agreed the volume of sustainability changes ('confirmed' and 'likely') with the Environment Agency for inclusion in our draft WRMP, we wanted to share with our customers the effect of having no sustainability reductions. The expected result is a much smaller investment programme, as we would not need to replace the agreed abstraction reductions of 77Ml/d (around 6% of DO).

9.6.3.2 Scenario S2: High Sustainability Reductions

We have debated a higher level of sustainability reductions with the Environment Agency, which remain 'unlikely'; however, further sustainability changes could be notified. We have suggested reductions totalling approximately 100Ml/d (which includes the 77Ml/d already agreed). We wanted to run our model to show the impact of the higher level of reductions. It was also important to exclude the 'high' environmental risk options as we needed to exclude options where potential sustainability reductions would render the options invalid. As demonstrated in the equivalent WRSE scenario, this would significantly increase the investment required to manage the supply / demand deficit.

> "How water is stored and collected from the environment will be critical over the next decades"

9.6.3.3 *Scenario S3: Low Demand*

As our customers become ever more aware of the environment and the increasing cost of living, it is possible that average consumption could reduce regardless of any demand management measures that we could introduce. We have assumed that a reasonable demand reduction due to this increased awareness is 2.5% off the baseline demand. We have maintained the same level of headroom as the baseline supply / demand balance in this sensitivity to prevent substitution of demand and risk allowance. This is likely to reduce the investment required, with a corresponding impact on bills.

9.6.3.4 *Scenario S4: High Demand*

Our baseline demand assumes plan-based population growth of 14%. We have run this sensitivity to test the impact of trend-based population growth on the investment plan – this is population growth of 30%. Due to this significant increase, we have also re-run our headroom model to derive a new target headroom for this sensitivity. This is likely to increase the investment required, although there may be no impact on bills as there will be more people paying bills.

9.6.3.5 *Scenario S5: Low Target Headroom*

We have compared our baseline target headroom position with respect to the companies who have participated in the WRSE. While we consider our target headroom to be a robust and accurate reflection of the level of risk we could experience during the planning period, we have re-run our investment model with a fixed 6% on demand for all conditions. This is likely to reduce the investment required, but represents a smaller risk margin that is not supported by our detailed analysis.

9.6.3.6 *Scenario S6: Third Dry Winter DO*

The second consecutive dry winter in 2011/12 led us to experience groundwater levels in some of our sources that were lower than historic recorded levels. We have reassessed the expected levels that we might experience in a third dry winter and have tested this scenario to understand the additional investment required.

9.6.3.7 *Scenario S7: Resilience Schemes*

Our drought management experience in 2012 gave us the opportunity to develop schemes to improve our resilience to drought and a potential third dry winter. Our assessment identifies that just two schemes will provide increased resilience to drought and third dry winter conditions. This sensitivity forces our model to select the programme of schemes described in Table 19 with a total one-off investment value of £15M and annual operating costs of £0.5M while having a free choice on the remaining options.

9.6.3.8 *Scenario S8: Thames Transfers*

We have discussed transfers with Thames Water (refer to Technical Report 3.5 *Water Company and Third Party Bulk Transfers* for details). Very recently, Thames Water declared a small deficit at the beginning of their planning period. We have run this scenario which supplies us with a reduced transfer in our WRZ4 for the first two years of the planning period to compare the costs of Thames Water accelerating their programme with our own modelling. The full transfer is available from 2017.

9.6.3.9 *Scenario M1: Community Integrated AMR metering in WRZ1-6 by 2025*

Our Base Case scenarios can freely select metering options. Customers have also told us that they believe metering is the fairest way to charge for water, but they wish it to be equitable so that all customers have a meter installed. We believe that we will derive efficiency in a mandatory metering programme if we install meters on a street-by-street basis. We have therefore constrained our model by forcing it to select the community integrated automated meter reading (AMR) option in all of our Central WRZs by 2025. It was free to choose when to start each WRZ, but must finish (i.e. full benefit must be delivered) by 2025.

> "I am already on a water meter and it has helped me save money and water, everyone should have one"

9.6.3.10 *Scenario M2: As M1 with Higher Demand Reduction (20%)*

Our analysis derives that customers in properties that are metered use, on average, 13.6% less water than customers who live in unmetered properties. We believe that greater reductions in consumption could be achieved, particularly with our community integrated metering option, as we can provide more frequent consumption data to our customers. This option could also help identify supply pipe and internal pipe work leakage much more quickly. We are currently operating a small trial of AMR technology in our Southeast region and the results to date are positive.

9.6.3.11 *Scenario M3: Dumb metering in WRZ 1-6 by 2025*

The majority of existing meters in Affinity Water are dumb meters, i.e. meters that need to be read manually. We believe that AMR represents best overall value for customers, as we would be able to offer an enhanced service as a result of the technology. All meters need to be replaced after around 15 years so, should we install AMR as part of a compulsory programme, we would commit that all metered customers would have an AMR meter the next time we need to replace their existing meter. However, we felt it was important to show customers the impact of installing dumb meters, which are slightly cheaper to purchase than AMR meters.

9.6.3.12 *Scenario L1: New AMP7 ALC Options*

We developed leakage options for each WRZ for the WRSE modelling for delivery in AMP6 (the investment period 2015-2020). We have since developed additional options for leakage reduction in AMP7 (2020-2025). There is a level at which it costs more to manage leakage than it does to provide the equivalent water through other means: this is called the sustainable economic level of leakage (SELL). As we go beyond this SELL, we get closer to our 'background level of leakage' and the costs start to increase rapidly. However, customers think we should do more to reduce leakage, so we have developed this sensitivity to show the impact of these extra options. We are continuing to validate our cost data which, currently, has been extrapolated to price these levels of leakage reduction that have not been achieved in our operating area before.

9.6.3.13 *Scenario L2: New AMP7 – 10 ALC Options*

Expanding on the sensitivity described in Section 9.6.3.12, we wanted to offer the model more options for leakage reduction in AMP7 through to AMP10 (2035 to 2040). Our cost data has a greater margin of error when we seek to define larger leakage reduction programmes further into the future and we continue to analyse our data to reduce this risk.

9.6.3.14 Scenario W1: Increased Water Efficiency

DEFRA's Guiding Principles ask water companies to consider implementing demand reduction measures where the costs may outweigh the benefits. We wanted to share with our customers and stakeholders the impact of a programme that requires water efficiency schemes to be selected. This scenario includes audits for commercial customers and the supply of water efficient devices to domestic customers.

9.6.4 Results of Scenario Testing

We have run the scenarios and sensitivities described in Sections 9.6.2 and 9.6.3. As described in Section 9.4, our model seeks to derive the least-cost programme of options that will meet the supply / demand deficit within the given constraints, such as metering in all water resource zones.

Our model also considers the cost of abstracting, treating and distributing water from our own sources and compares that with new options, as it may be cheaper to deliver an option than to supply water from an existing source.

Our water available for use (WAFU) is calculated from our baseline deployable output (DO), which includes bulk transfers from neighbouring companies, less the impacts of climate change, sustainability reductions and outage.

The costs over and above WAFU represent the investment programme of options that we need to resolve the deficit in the supply / demand balance.

The total investment programme comprises three main components of cost of the options:

- Capital expenditure, or **Capex**. This generally relates to money spent to deliver a project, such as constructing a new pipeline, building a reservoir or installing meters, and includes the purchasing of all materials, goods and services.
- Fixed Operational expenditure, **Fixed Opex**. This is the fixed part of the cost of operating and maintaining the assets that are built or installed with Capex, such as local authority business rates. It is a fixed amount of money each year.
- Variable Operational expenditure, or **Variable Opex**. These are costs that change dependent on usage, for example unit power costs to operate treatment works or charges to purchase water from a neighbouring water company to deliver to our customers. Our model determines how much water to use from different sources or from bulk transfer imports to maintain least-cost and then calculates the Variable Opex.
- Environmental and Social and Carbon costs.

Figure 28 shows the total comparative cost of each of the scenarios, including the cost of abstracting, treating and distributing water from our existing sources and external transfers, presented in ascending order.

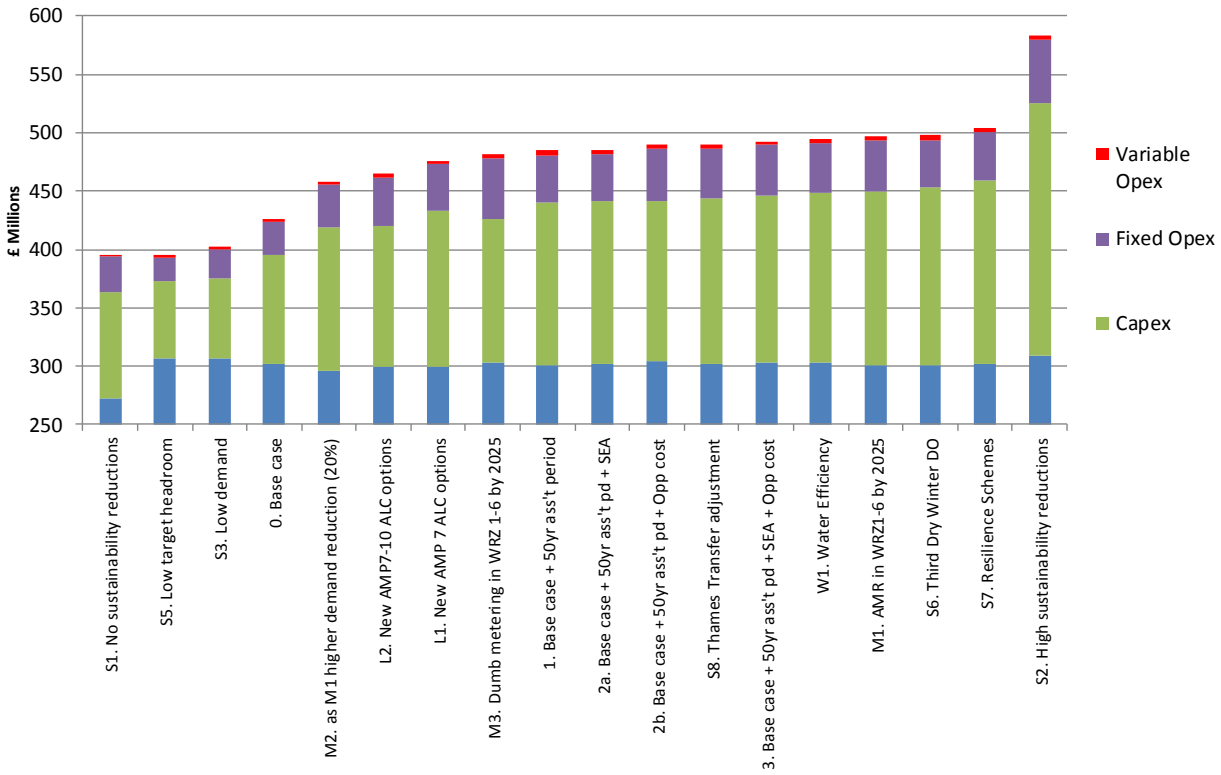

Figure 28: Comparative Total Cost of Scenarios

Figure 29 shows the value of the investment programme, excluding existing supply and transfer costs.

The scenarios are presented in the same order as in Figure 28; generally, the investment cost increases with each scenario. The main difference is Scenario S1, 'No Sustainability Reductions', where it is more economical to develop new schemes as part of an investment programme than to use existing bulk transfers.

It is important to note that the cost of the investment should not be assessed separately from the cost of existing WAFU, as there will be some instances where it is cheaper to develop new schemes than use existing sources. An example of this is bulk supplies from a neighbouring water company, where we pay a higher unit price for a given volume of water as well as the costs associated with moving that water to where it is needed.

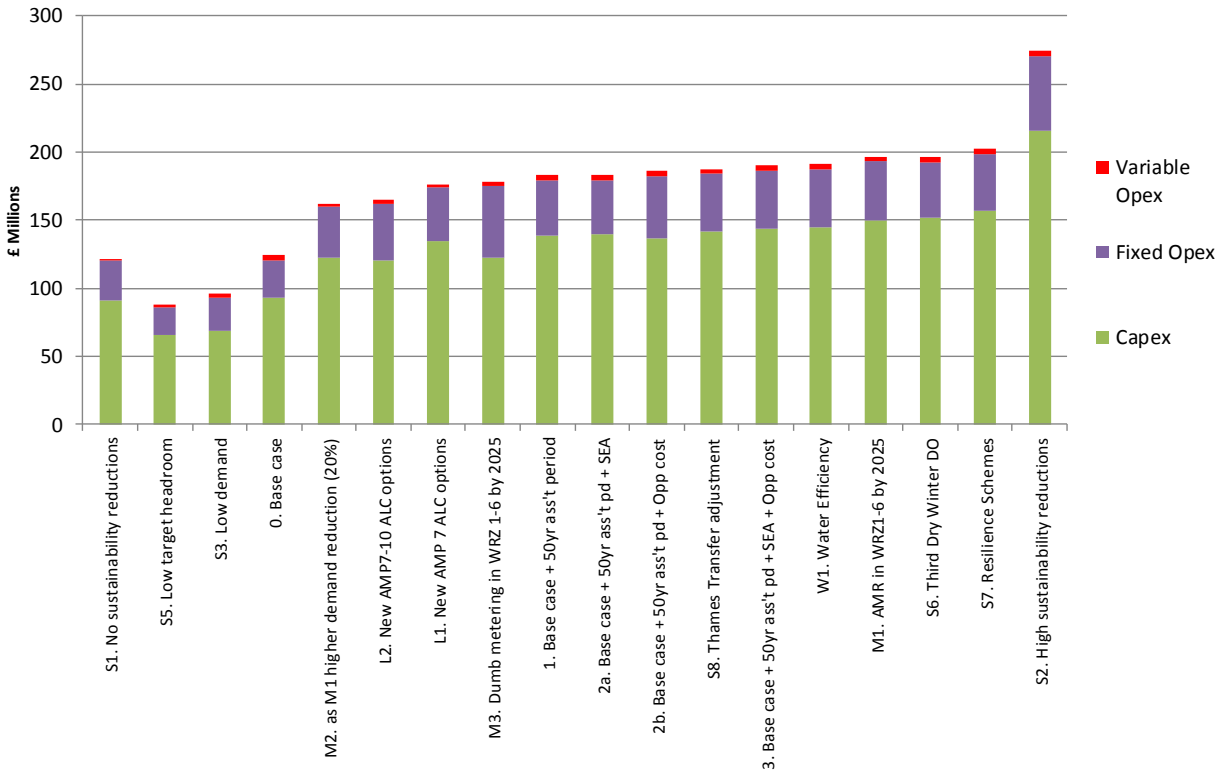

Figure 29: Comparative Investment Cost of Scenarios

9.7 Analysis of Scenarios

9.7.1 Real-world scenarios

We consider that Sensitivities S1 and S3 represent highly unlikely scenarios for our operating area. Whilst we will consult with our customers as to the acceptability of our proposals regarding sustainability reductions, we have planned for the 'confirmed' and 'likely' reductions in our Preferred Plan, and will plan for any further notified reductions to be implemented after 2020. Regarding a low demand scenario, we feel that the forecast growth in population and households in our regions prevents it from being a real option.

Further, the application of a flat profile in place of our detailed analysis to derive target headroom is a high risk strategy; thus we consider Sensitivity S5 highly unlikely.

At the other end of the scale, Sensitivity S2 of high sustainability reductions remains a possibility, but such reductions would not take effect until the 2025-30 planning period. We have therefore excluded the 'unknown' sustainability reductions.

It should be noted that scenario S8, Thames Transfers, puts WRZ5 into deficit in 2015, which cannot be resolved. This deficit occurs as all other available bulk transfers are deployed but are insufficient as other options cannot be mobilised swiftly enough to resolve the deficit. Therefore, as defined, this scenario is not a realistic option and has been excluded.

As described in Section 9.6.2, we iterated beyond the conditions that replicated the WRSE K13 run. We are highly unlikely to secure new bulk transfers at marginal cost and consider that Scenario 0, our Base Case, does not represent a real world scenario.

Further analysis of the scenarios and the details of scheme selection can be found in the Technical Report 3.7: *Economics of Balancing Supply and Demand Model Development, Commissioning & Use*.

The graph in Figure 30 shows the range of total investment costs of the remaining viable scenarios.

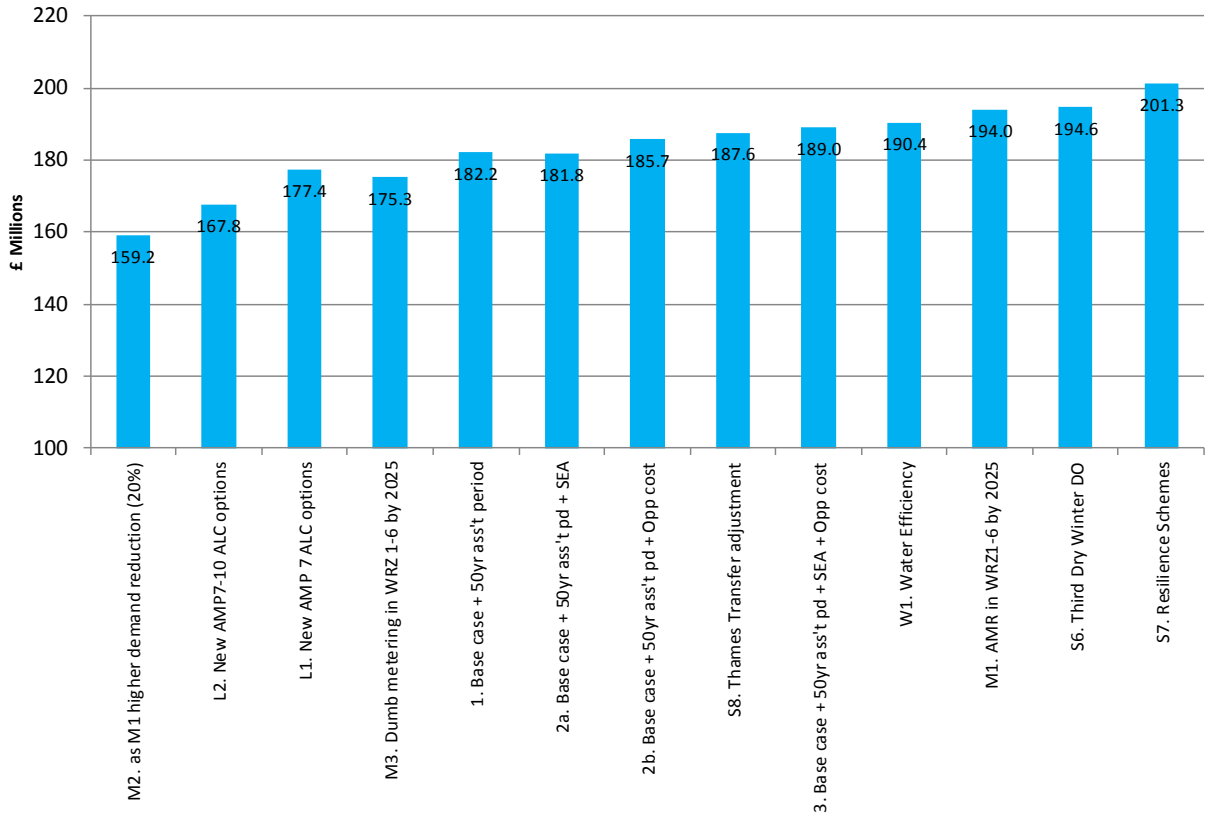

Figure 30: Comparative Total Investment Costs of Viable Scenarios

9.7.2 Consideration for customer preferences

Customers have fed back strongly that they would like any metering programme to be equitable, such that every customer had a meter, even where it is not least cost. Of the viable scenarios, the following do not result in metering in all water resource zones:

- 1, Base Case + 50 year assessment period
- 2a, Base Case + 50 year assessment period + SEA
- 2b, Base Case + 50 year assessment period + Opportunity Cost
- 3, Base Case + 50 year assessment period + SEA + Opportunity Cost

- L1, New AMP7 Leakage Options
- L2, New AMP7 – 10 Leakage Options
- S6, Third Dry Winter DO
- S7, Resilience Schemes

We remain hopeful that a compulsory metering programme would yield greater demand savings than we have previously forecast. We have recently completed our analysis of the effect of compulsory metering in our Southeast region, which has now reached 92% of households. The independent review of customer consumption concluded that savings of between 16% and 55% have been achieved with a high confidence at the lower end of this range. This is greater than our previous evidence when we used 10% in our last Plan, and 13.6% in this Plan and the options offered to WRSE.

We have now completed the installation of 6,000 domestic AMR meters as a trial in our Southeast region, and it is generating positive results. We have proved that the technology works and we are going to be able to provide more information to customers on their use in the future, both as part of their bills or through our website. There is a body of evidence to suggest that regular feedback has a positive effect on reducing consumption, even though our trial in Lydd was less successful than we had hoped (refer to 3.2.3.3).

As our trial went live earlier this year (2013), we do not feel there is sufficient evidence to proceed with a Plan of higher demand reductions. We propose to continue to monitor the Southeast trial, and will reflect our findings in our final WRMP. We believe this will allow us to maintain a flexible plan and offers the greatest likelihood that the benefits of metering will exceed the cost. We plan to share the outcomes of our trial with our customers in coming months.

9.7.3 Consideration for the environment and our SEA

In 2012, many of our groundwater sources fell to their lowest recorded levels. We updated our Drought Management Plan in response to these severe conditions, and developed a programme of options that would increase our resilience to drought. As we have worked hard over the past years to increase our resilience to environmental events such as flooding and drought, we believe that the schemes applied to sensitivity 9.6.3.7 represent value for money and would be a sound investment in our Preferred Plan.

Our analysis shows that the exclusion of options with ‘high’ environmental risk adds very little to the total cost of the scenario when compared to the Base Case. We consider that the costs of mitigating the environmental risks associated with the ‘high’ risk options would outweigh the small increase in the total investment where such options are excluded. We have therefore removed all ‘high’ risk options in the build-up of our Preferred Plan.

10 Our Preferred Plan for Customers & Communities

10.1 Overview

As we set out in Section 1, our objectives in the development of our water resources strategy were:

- To meet the water supply needs of our customers over the next 25 years;
- To ensure that our water abstractions are sustainable and do not damage the environment;
- To reduce leakage from underground water pipes where the savings justify the expenditure;
- To extend customer water metering, where economic, in the interests of fair charging and demand management;
- To promote water efficiency as an aid to reducing demand;
- To take account of potential future uncertainties including climate change and higher environmental standards;
- To work closely with other water companies in our region to share water resources.

To meet our WRMP objectives, we have shown that we have:

- Consulted with customers to ensure that our plan takes account of your views;
- Engaged with water industry regulators and statutory consultees.

We believe that our Preferred Plan has been developed in accordance with the objectives we set out and that it represents good value for money for our customers.

10.2 Preferred Plan Summary

10.2.1 Introduction

As we have a supply / demand deficit in five of our eight zones, we have developed our Preferred Plan in accordance with the Water Resource Planning Guideline and in considering customer views.

Our Preferred Plan is not the 'least cost' solution but we believe that it provides sustainable development and best value to customers. We look forward to discussing all aspects of the investment programme with our customers and stakeholders to determine whether any modifications should be made before we publish our final WRMP.

In the immediate five years, from 2015 to 2020, our Preferred Plan derives:

- A saving of **20Ml/d** in leakage through a number of methods;
- Over **36Ml/d** from compulsory metering by AMR in five of our six water resource zones in the Central region;
- Around **4Ml/d** from water efficiency, in addition to the benefits of the metering programme;

– An extra **1Ml/d** from our existing licences, by increasing the amount we abstract without causing damage to the environment. These options also give us an extra 8Ml/d during peak conditions;

– That we buy **21Ml/d** of water from our neighbouring water companies to make sure we have enough to meet the needs of our customers, rising to 31Ml/d during peak conditions.

We recognise the importance of flexibility and resilience in preparing our plan and in addressing the significant challenges and uncertainties we face.

We have considered the sensitivity of our plan to a number of factors and have chosen a Preferred Plan that is a balance of demand management and supply side measures, and therefore risk. In this way we have further options available in reserve should the preferred strategy options fail to deliver their designed benefits.

10.2.2 The impact on supply and demand

Our supply / demand balance for all zones prior to delivering our Preferred Plan is shown in Figure 31, showing again the size of the problem that we set out to solve.

We remain in deficit in each year of the planning period, with the deficit growing as demand increases due to population growth and the reduction in supply as a result of sustainability reductions and climate change.

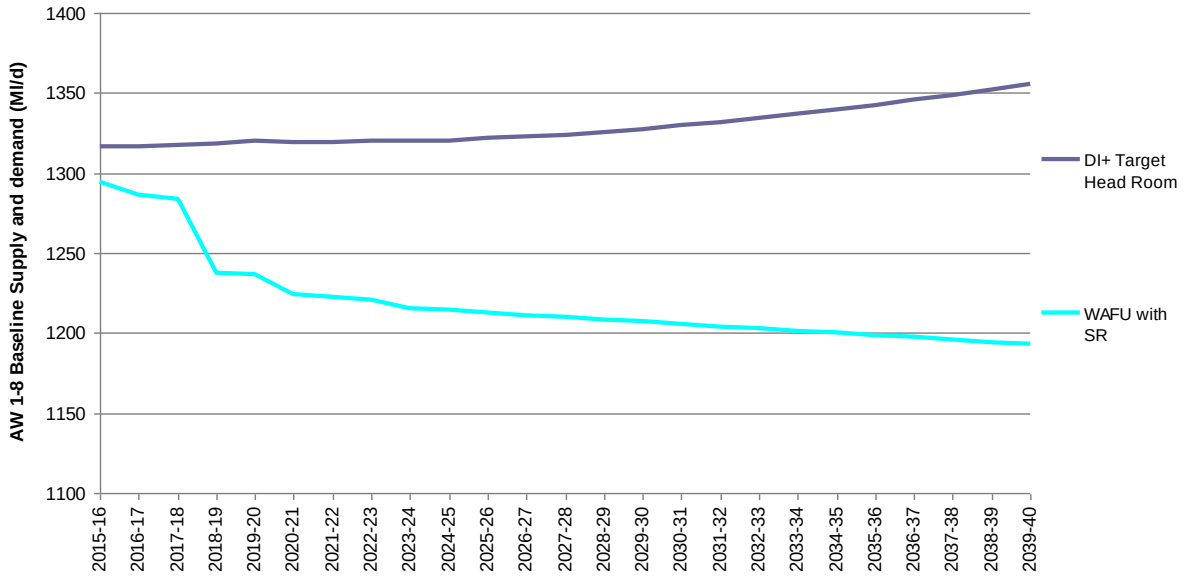

Figure 31: Supply / demand balance before our Preferred Plan

Figure 32 shows the impact of delivering our Preferred Plan on our company level supply / demand balance, showing that we do not move into deficit at any point during the planning period. Demand falls during the first ten years as a result of our metering and water efficiency programme, before reaching a plateau and increasing as population growth increases.

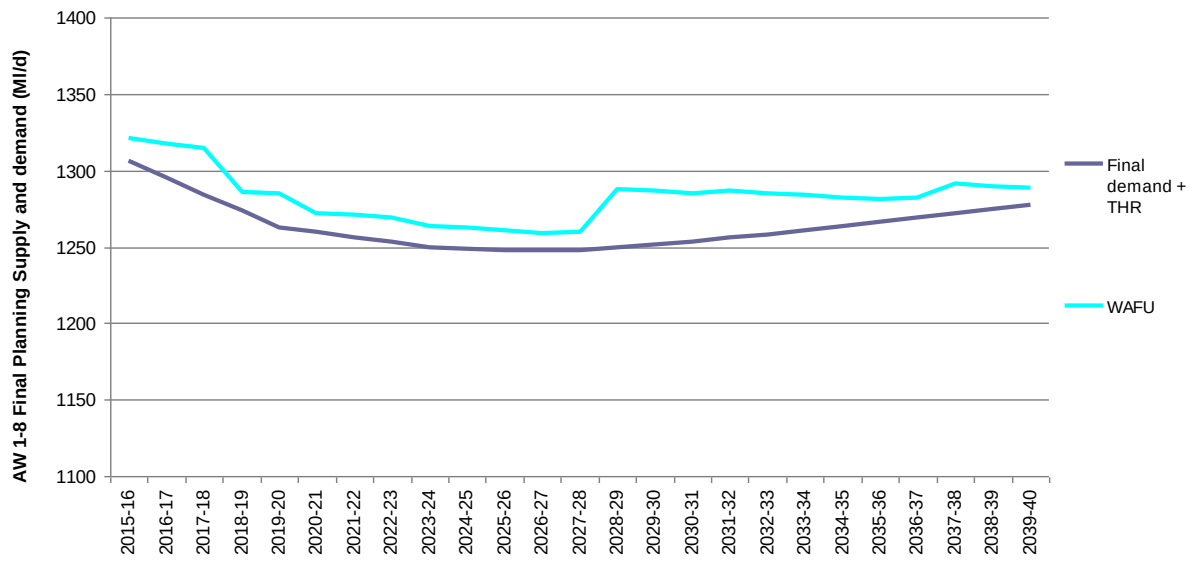

Figure 32: Supply / demand balance with our Preferred Plan implemented

10.2.3 The impact on PCC

Table 20 shows how per capita consumption (PCC) changes during the planning period as our Preferred Plan is implemented. We show the weighted average PCC, which takes into account the difference in PCC of our metered and unmetered customers. The change in our Central region is largely driven by our metering and water efficiency programme.

Water resource zone	2012 l/h/d	AMP5 by 2015 l/h/d	AMP6 by 2020 l/h/d	AMP7 by 2025 l/h/d	AMP8 by 2030 l/h/d	AMP9 by 2035 l/h/d	AMP10 by 2040 l/h/d
1	173.8	170.6	161.6	158.9	157.4	156.8	155.7
2	168.5	165.5	161.7	154.7	153.8	153.4	153.5
3	158.1	154.6	138.2	134.8	132.8	131.5	130.2
4	173.2	170.0	158.7	155.9	154.4	153.5	152.8
5	167.0	163.6	155.4	152.3	150.7	149.8	148.3
6	167.8	165.9	161.5	159.2	158.2	157.8	158.1
Central region weighted average PCC	167.9	164.8	154.9	151.4	149.8	148.9	148.2
7 (Southeast region)	133.7	132.8	131.1	128.9	127.8	127.3	126.9
8 (East region)	115.4	112.6	111.6	110.1	109.5	109.5	109.8
Company weighted average PCC	**163.9**	**161.0**	**151.9**	**148.5**	**147.1**	**146.3**	**145.6**

Table 20: Changes in NYAA weighted average PCC at the end of each quinquennium

10.2.4 Delivery of options during the planning period

The chart in Figure 33 shows the means by which 'new' water is being developed. Around 50% of the additional water in the first five years of the planning period is developed by demand management options, namely metering, water efficiency and leakage reduction programmes.

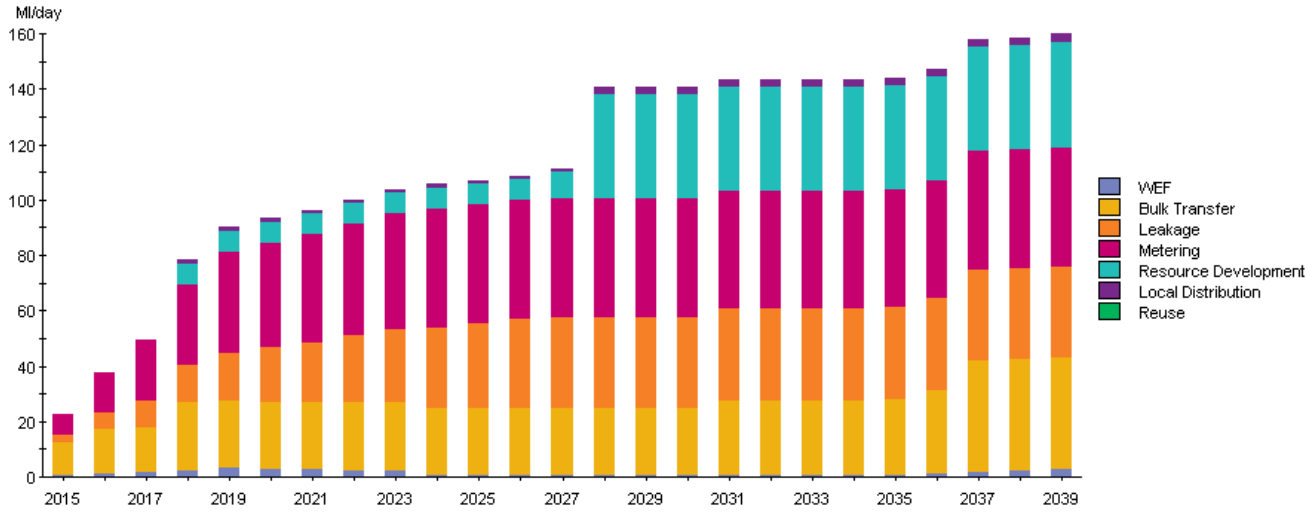

Figure 33: 'New' water provided by option type at DYCP

There is a significant increase in available capacity of our system in 2028. This arises from a single option that provides capacity during peak conditions only.

Table 21 shows the water developed (yield) derived by option type.

Option Type	Period	Yield at DYAA (Ml/d)	Yield at DYCP (Ml/d)
Leakage	2015-20	19.63	19.63
	2020-25	13.26	13.26
	2025-30	0.00	0.00
	2030-35	0.00	0.00
	2035-40	0.00	0.00
Metering	2015-20	36.59	36.59
	2020-25	6.21	6.21
	2025-30	0.00	0.00
	2030-35	0.00	0.00
	2035-40	0.00	0.00
Water Efficiency	2015-20	3.68	3.68
	2020-25	0.08	0.08
	2025-30	0.00	0.00
	2030-35	0.05	0.05
	2035-40	2.59	2.59

Option Type	Period	Yield at DYAA (Ml/d)	Yield at DYCP (Ml/d)
Supply (Ground & Surface Water)	2015-20	0.82	7.57
	2020-25	0.00	0.00
	2025-30	0.00	30.00
	2030-35	0.00	0.00
	2035-40	10.67	10.87
Network Improvements	2015-20	0.97	8.60
	2020-25	0.00	0.00
	2025-30	0.60	31.40
	2030-35	0.00	0.00
	2035-40	2.70	0.87
Bulk Transfers	2015-20	20.33	22.33
	2020-25	0.00	0.00
	2025-30	0.00	0.00
	2030-35	3.00	3.00
	2035-40	0.00	0.00

Table 21: Yield developed by option type in each quinquennium

10.2.5 The cost of our Preferred Plan

Table 22 shows the breakdown of total cost by component, including both the investment programme and all existing source supply costs, which also includes existing bulk supplies from neighbouring companies. The costs are shown in the five-year period in which they are incurred.

Total Expenditure, £ millions	AMP6 2015-20	AMP7 2020-25	AMP8 2025-30	AMP9 2030-35	AMP10 2035-40
Leakage	9.74	8.59	2.51	2.37	2.37
Metering	94.34	20.62	5.88	5.88	5.88
Water efficiency	5.12	0.81	0.00	0.02	2.58
Demand Management	**109.19**	**30.02**	**8.39**	**8.28**	**10.83**
Supply (ground & surface water)	2.11	4.90	6.93	3.16	13.37
Bulk transfers	29.08	18.63	20.50	29.07	25.42
Estimate of downstream costs	10.60	2.00	0.30	0.60	0.2
Total per AMP for Supply and Demand	**150.98**	**55.55**	**36.12**	**41.10**	**49.83**
Drought resilience	15.44	0.65	0.65	0.65	0.65
Total per AMP	**166.42**	**56.19**	**36.77**	**41.75**	**50.48**

Table 22: Summary of Preferred Plan costs

Our plan is not least cost as we think it is important we have a range of measures to balance the risk in delivery and benefit. We consider the provision of flexibility and resilience to maintain security of supplies to customers is of paramount importance. Overall we believe the additional social, environmental and economic benefits offered by our Preferred Plan offers best value to customers.

10.2.6 Comparing our Preferred Plan and the Base Case

Our Preferred Plan combines the Base Case from our economic analysis, the impact of the scenario testing, the results of our risk assessment, the initial conclusions and preferences from customer research and the results of our SEA.

As we believe our draft Water Resources Management Plan is subject to the Strategic Environmental Assessment Directive, we previously published our Scoping Document for consultation and we are publishing an Environmental Statement with this plan. This report shows how we have taken into account wider aspects of social and environmental pressures and costs and how this has affected the selection of supply and demand options and ultimately the range of investments we are proposing in our Preferred Plan. For example in overall terms a greater emphasis on demand management provides environmental benefits.

We compare in Table 23 the risk review of our Preferred Plan and the Base Case plan.

Risk Factor	Explanation	Base Case (Scenario 0)			Preferred Plan		
		Severity	Likelihood	Risk Score	Severity	Likelihood	Risk Score
Reduces PCC	Does the option mix fail to sufficiently reduce PCC to meet Government objectives?	2	2	4	1	2	2
Balanced Mix	Is the set of options a balanced mix?	1	1	1	1	1	1
Drought Resilience	Do schemes fail to provide additional resilience during a drought (e.g. third dry winter)?	3	3	9	2	3	6
Delivery	Is the scheme difficult to promote making delivery uncertain?	3	5	15	2	3	6
TOTAL				**29**			**15**

Table 23: Risk Score for Base Case and Preferred Plan

10.3 Results for each water resource zone

10.3.1 Water Resource Zone 1

Table 24 gives the Preferred Plan list of options for Water Resource Zone 1.

Option Type	ID	Option Name	Delivery Year
Leakage	651	Leakage reduction through increased ALC, 2Ml/d in AMP6	**2015**
Metering	990	Metering: community integrated AMR & water efficiency	**2015**
Water Efficiency	936	Water audits Commercials (non process)	**2015**
Water Efficiency	937	Water audits Commercials (process)	**2015**
Resilience	T02	Reinforcement in WRZ1	**2015**
Leakage	423	Leakage reduction - pressure management with new PRVs	**2016**
Leakage	949	Leakage reduction - subdivide large DMAs	**2016**
Supply	070	Source Optimisation in Ashridge	**2018**
Leakage	L14	Leakage reduction through increased ALC, 2Ml/d in AMP7	2022
Water Efficiency	567	Additional Water Efficiency for households	2035

Table 24: Schemes in Water Resource Zone 1

10.3.2 Water Resource Zone 2

Table 25 gives the Preferred Plan list of options for Water Resource Zone 2.

Option Type	ID	Option Name	Delivery Year
Leakage	651	Leakage reduction through increased ALC, 2Ml/d in AMP6	**2015**
Water Efficiency	936	Water audits Commercials (non process)	**2015**
Water Efficiency	937	Water audits Commercials (process)	**2015**
Leakage	950	Leakage reduction - subdivide large DMAs	**2016**
Leakage	423	Leakage reduction - pressure management with new PRVs	**2017**
Leakage	L14	Leakage reduction through increased ALC, 2Ml/d in AMP7	2020
Metering	990	Metering: community integrated AMR & water efficiency	2020
Supply	622	Mains reinforcement in Bushey	2028
Water Efficiency	567	Additional Water Efficiency for households	2035

Table 25: Schemes in Water Resource Zone 2

10.3.3 Water Resource Zone 3

Table 26 gives the Preferred Plan list of options for Water Resource Zone 3.

Option Type	ID	Option Name	Delivery Year
Leakage	651	Leakage reduction through increased ALC, 2Ml/d in AMP6	**2015**
Metering	990	Metering: community integrated AMR & water efficiency	**2015**
Water Efficiency	936	Water audits Commercials (non process)	**2015**
Water Efficiency	937	Water audits Commercials (process)	**2015**
Leakage	423	Leakage reduction - pressure management with new PRVs	**2016**
Resilience	T02	New pipeline between WRZ3 & WRZ5	2015
Resilience	T02	Reinforcement west-east in WRZ3	**2017**
Leakage	L14	Leakage reduction through increased ALC, 2Ml/d in AMP7	2020
Supply	076	Pipeline capacity upgrade in WRZ3	2021
Supply	502	Peak Licence Scheme in Hertford	2027
Water Efficiency	567	Additional Water Efficiency for households	2035

Table 26: Schemes in Water Resource Zone 3

10.3.4 Water Resource Zone 4

Table 27 gives the Preferred Plan list of options for Water Resource Zone 4.

Option Type	ID	Option Name	Delivery Year
Leakage	423	Leakage reduction - pressure management with new PRVs	**2015**
Leakage	651	Leakage reduction through increased ALC, 2Ml/d in AMP6	**2015**
Metering	990	Metering: community integrated AMR & water efficiency	**2015**
Supply	T01	Thames Water bulk transfer, 12Ml/d available in 2015 & 2016	**2015**
Water Efficiency	936	Water audits Commercials (non process)	**2015**
Water Efficiency	937	Water audits Commercials (process)	**2015**
Leakage	952	Leakage reduction - subdivide large DMAs	**2017**
Supply	706	Increase Thames Water bulk transfer to max capacity (17Ml/d)	**2018**
Water Efficiency	666	Airport water efficiency - Heathrow	2020
Leakage	L14	Leakage reduction through increased ALC, 2Ml/d in AMP7	2022
Water Efficiency	329	Dual Flush WCs for households	2035
Water Efficiency	567	Additional Water Efficiency for households	2035
Supply	840	Third party source in Uxbridge	2037

Table 27: Schemes in Water Resource Zone 4

10.3.5 Water Resource Zone 5

Table 28 gives the Preferred Plan list of options for Water Resource Zone 5.

Option Type	ID	Option Name	Delivery Year
Leakage	423	Leakage reduction - pressure management with new PRVs	**2015**
Leakage	651	Leakage reduction through increased ALC, 2Ml/d in AMP6	**2015**
Metering	990	Metering: community integrated AMR & water efficiency	**2015**
Water Efficiency	936	Water audits Commercials (non process)	**2015**
Water Efficiency	937	Water audits Commercials (process)	**2015**
Resilience	T02	Re-commission source in WRZ5	**2015**
Resilience	T02	Group licence in WRZ5	**2015**
Resilience	T03	Purchase third party licence for WRZ5	**2016**
Supply	104	Source Optimisation in Widford	**2018**
Supply	160	Source Optimisation in Hempstead	**2018**
Supply	169	Increase licence in Stansted	**2018**
Leakage	L14	Leakage reduction through increased ALC, 2Ml/d in AMP7	2020
Water Efficiency	567	Additional Water Efficiency for households	2035
Water Efficiency	666	Airport water efficiency - Stansted	2038

Table 28: Schemes in Water Resource Zone 5

10.3.6 Water Resource Zone 6

Table 29 gives the Preferred Plan list of options for Water Resource Zone 6.

Option Type	ID	Option Name	Delivery Year
Leakage	651	Leakage reduction through increased ALC, 2Ml/d in AMP6	**2015**
Metering	991	Metering: community integrated AMR & water efficiency	**2015**
Water Efficiency	936	Water audits Commercials (non process)	**2015**
Water Efficiency	937	Water audits Commercials (process)	**2015**
Leakage	423	Leakage reduction - pressure management with new PRVs	**2016**
Leakage	L14	Leakage reduction through increased ALC, 2Ml/d in AMP7	2023
Water Efficiency	567	Additional Water Efficiency for households	2035
Supply	752	Increased import from Thames Water	2036
Supply	005	Local Source Recommissioning	2039
Supply	173	Source Optimisation near Guildford	2039

Table 29: Schemes in Water Resource Zone 6

10.3.7 Water Resource Zone 7

Table 30 gives the Preferred Plan list of options for Water Resource Zone 7.

Option Type	ID	Option Name	Delivery Year
Water Efficiency	936	Water audits Commercials (non process)	**2015**
Water Efficiency	937	Water audits Commercials (process)	**2015**
Leakage	651	Leakage reduction through increased ALC, 2Ml/d in AMP6	**2018**
Supply	629	Local licence recovery	**2018**
Supply	626	Network improvement near Barham	**2018**
Supply	900	Dover Constraint Removal	**2018**
Supply	639	Southern Water Import Continuation	**2018**
Leakage	423	Leakage reduction - pressure management with new PRVs	2021
Leakage	L16	Leakage reduction through increased ALC, 1Ml/d in AMP7	2023
Leakage	955	Leakage reduction - subdivide large DMAs	2024
Supply	627	Local network improvement	2028
Supply	942	South East Water Import 3Ml/d	2031
Water Efficiency	329	Dual Flush WCs for households	2034

Table 30: Schemes in Water Resource Zone 7

10.3.8 Water Resource Zone 8

Whilst there is no supply / demand deficit in our East region, we commit to supporting our customers by:

– Providing a water meter, installed free of charge, if they opt to have one;

– Offering water efficient products, free of charge;

– Maintaining our assets to ensure security of supply.

10.4 Resilience and flexibility

Our operational system has high resilience in that we currently have a diversity of water sources from both groundwater and surface water together with an interconnected pumping network. This means that our customers have low vulnerability to operational failure events or single year droughts that affect surface water dominated systems, but longer term low rainfall events can still result in the need to impose restrictions on use.

We are currently investing to improve the security of our system and our trunk main network in particular to reduce the effect of a major burst on supplies to customers. The drought in 2012 showed us that some of our customers would like us to invest further to reduce the likelihood of restrictions particularly where these would affect local businesses and the livelihoods of our

customers. We therefore plan to bring in new resources to compensate for reduced output capacity caused by drought and improve the capacity of our system to transfer water to the more drought vulnerable zones. These measures will mean our customers are less at risk from extended drought and in particular 'a third dry winter'. Our operational flexibility and resilience could also be significantly affected by the proposed reductions in abstraction we have agreed with the Environment Agency. This means we will lose 6% of our resource base in our Central and Southeast regions. Replacing that water by reducing demand means we are placing a greater reliance on customers continuing to use less water in dry weather and drought conditions in particular so we will be working hard to improve our partnership with customers to sustain savings in all conditions.

We recognise we need to continue to reduce leakage not only where it economic to do so but to meet the expectations of our customers. We propose to reduce leakage steadily over the period of our plan and at a pace that will enable us to verify the increasing cost of reducing leakage as we progress. We will review our proposed investments annually and where leakage remains cost-effective or cost-beneficial compared to other options to balance supply and demand we will amend our plan to include additional leakage reductions. This means our plan will remain flexible and reflect best value as we proceed.

Reducing abstraction at sixteen of our sources also means we will be reinforcing our network to transfer more water to replace lost local supplies. We will also be working with the Environment Agency and the Drinking Water Inspectorate to ensure that we maintain and indeed improve resilience by reducing abstraction under average conditions to benefit the environment but retain peak capacity which has much less effect on the environment but this would enable us to retain operational flexibility in the event of drought or emergencies and so we can maintain water quality in all areas as we use more surface water compared to groundwater.

10.5 Carbon

We have calculated the carbon footprint of our baseline for 2012 to 2040 and the affect of our Preferred Plan.

The results are shown in Table 31 and Figure 34 but do not account at this stage for the affect of any downstream mainlaying required within zones or the investment that would be needed to improve our drought resilience against a third dry winter.

	AMP6	AMP7	AMP8	AMP9	AMP10
Carbon saved, tonnes	-57,429	-54,801	-54,181	-40,175	-44,480

Table 31: Tonnes of carbon saved in each quinquennium of the planning period

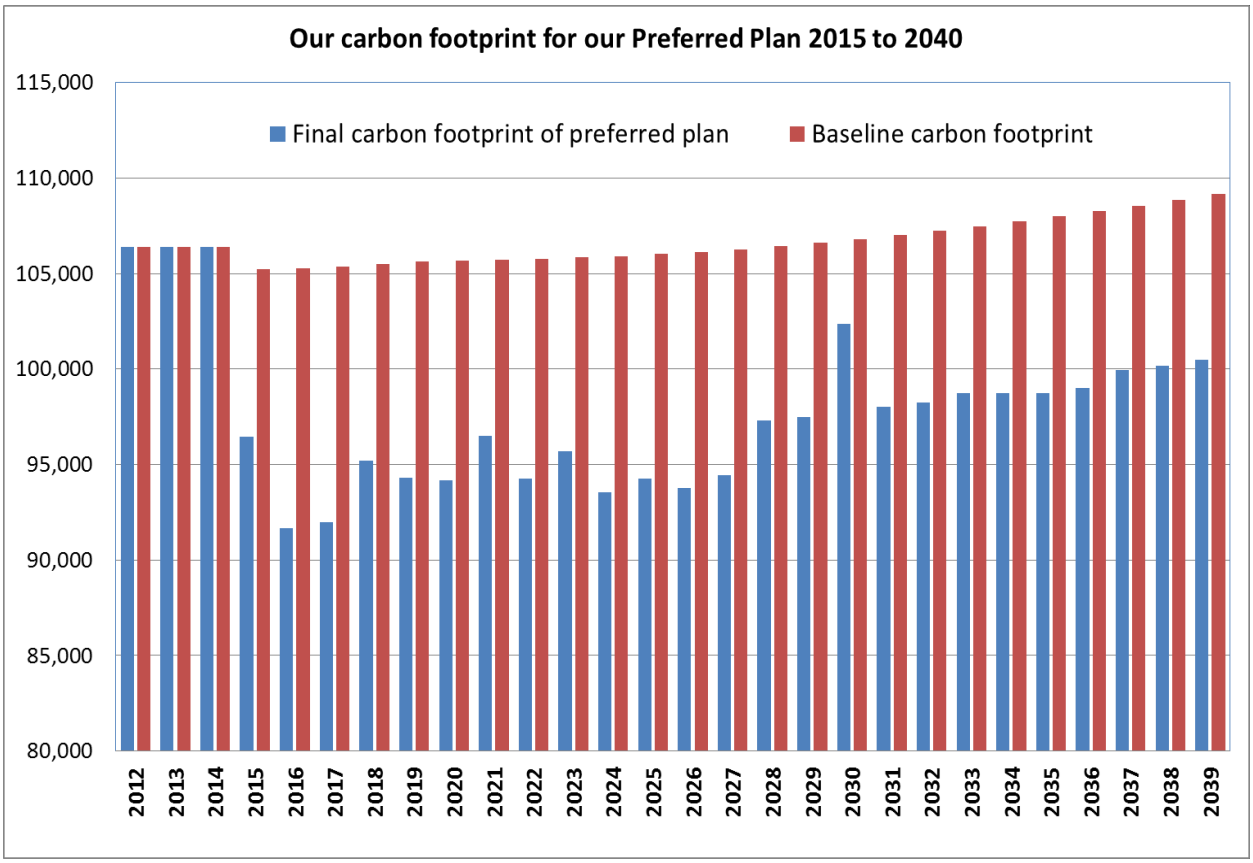

Figure 34: Preferred Plan carbon footprint

The effects of demand management can be seen in the early years, but the trend in carbon increases in later years reflects the underlying population growth. Overall, however, our Preferred Plan maintains carbon below the original baseline starting position.

10.6 Impact on customer bills

10.6.1 Summary

Our customers have some of the lowest water bills in England, whilst having one of the highest per capita consumption figures. We understand that customers will not welcome increased bills, and have considered this as we have developed our Preferred Plan.

In 2011/12, the average customer water bill was £169.00. In 2015, we forecast that the average bill will be £155.96 as a result of Ofwat's determination on our Price Review in 2009.

Based on the costs associated with the Preferred Plan, and, for illustration purposes, assuming no change to the average bill at the start of the planning period, customer bills would change as indicated in Figure 35.

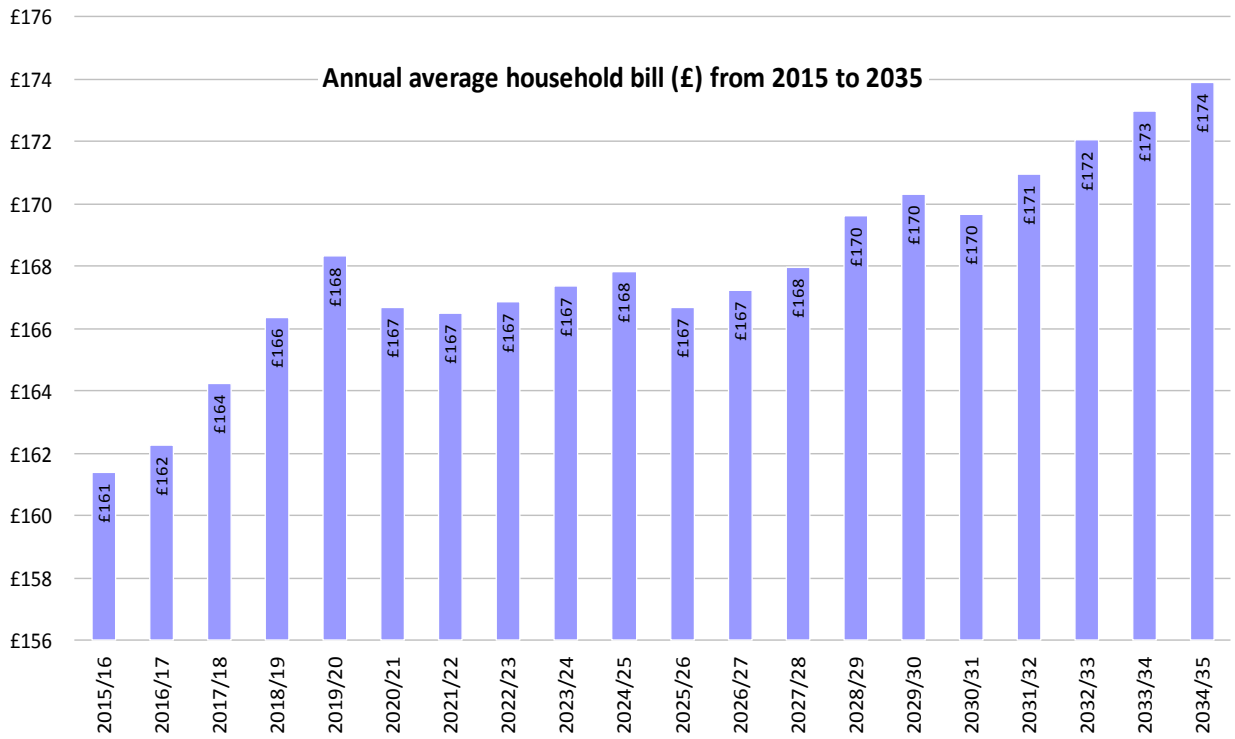

Figure 35: Change to customer bills as a result of the Preferred Plan

Our analysis indicates that managing the supply / demand deficit with our Preferred Plan will add an average of £18 to customer bills by 2035; this is an increase of around 5%.

It is our intention, however, to minimise the impact on customer bills.

As we continue to develop our Business Plan for Ofwat's periodic Price Review 2014, we will integrate our draft WRMP Preferred Plan with the investment programmes for managing all of our assets in order to be able to determine the overall least-cost plan to provide service in accordance with our customers' expectations over the next five years, as set out in our Strategic Direction Statement.

We will seek to identify efficiencies in how we will deliver our investment programmes, whether for the Water Resources Management Plan or the ongoing maintenance of our assets so that we can maintain flexibility and continue to offer best value solutions for our customers. We will continue to work with and support our customers to reduce their daily demand in order to preserve supplies for the next generation.

We will review our progress against the Preferred Plan annually and we will report our successes and lessons learned in a Company Statement published on our website.

We will continue to seek customer feedback about our performance and will seek to address any concerns.

10.6.2 Capital & operational expenditure

Customer bills are affected differently by capital and operational expenditure. We show in Table 32 and Table 33 the capital and operational costs of our Preferred Plan in the five-year period in which it is incurred.

Capital Expenditure, £ millions	AMP6 2015-20	AMP7 2020-25	AMP8 2025-30	AMP9 2030-35	AMP10 2035-40
Leakage	9.19	7.13	0.21	0.00	0.00
Metering	81.64	13.47	0.00	0.00	0.00
Water efficiency	0.00	0.00	0.00	0.00	0.00
Demand Management	**90.83**	**20.60**	**0.21**	**0.00**	**0.00**
Supply (ground & surface water)	2.00	4.64	5.93	1.17	10.55
Bulk transfers	1.87	0.00	1.19	7.32	0.63
Estimate of downstream costs	10.60	2.00	0.30	0.60	0.2
Total per AMP for Supply and Demand	**105.31**	**27.24**	**7.63**	**9.09**	**11.37**
Drought resilience	15.00	0.00	0.00	0.00	0.00
Total per AMP	**120.31**	**27.24**	**7.63**	**9.09**	**11.37**

Table 32: Capital expenditure of our Preferred Plan by quinquennium

Operational Expenditure, £ millions	AMP6 2015-20	AMP7 2020-25	AMP8 2025-30	AMP9 2030-35	AMP10 2035-40
Leakage	0.55	1.46	2.29	2.37	2.37
Metering	12.69	7.15	5.88	5.88	5.88
Water efficiency	5.12	0.81	0.00	0.02	2.58
Demand Management	**18.36**	**9.42**	**8.17**	**8.28**	**10.83**
Supply (ground & surface water)	0.11	0.26	1.00	1.99	2.83
Bulk transfers	27.21	18.63	19.32	21.74	24.80
Estimate of downstream costs					
Total per AMP for Supply and Demand	**45.68**	**28.31**	**28.49**	**32.01**	**38.46**
Drought resilience	0.44	0.65	0.65	0.65	0.65
Total per AMP	**46.12**	**28.96**	**29.14**	**32.65**	**39.11**

Table 33: Operational expenditure of our Preferred Plan by quinquennium

11 Next steps

11.1 Introduction

We expect to publish our Plan in May 2013. Our programme from that point will include:

- Informing our customers and stakeholders about our consultation programme and how they can influence our plans;
- Firming up prices on potential bulk transfers from neighbouring water companies;
- Considering ways to increase efficiency in the delivery of our Preferred Plan;
- Considering feedback from our customers and stakeholders to take account of their views in formulating our final WRMP, which we expect to publish in early 2014;
- Integrating our Preferred Plan with Ofwat's Price Review 2014 programme and our Business Plan modelling.

We have agreed 'certain' and 'likely' sustainability reductions with the Environment Agency for 2015 to 2025 but there are a number of areas where the requirements for further reductions remains uncertain. We anticipate we will have to reduce abstraction further in future so we have placed greater emphasis on demand management measures in the short term. If we are more successful in reducing demand than our plan assumption which would be more in line with what we have experienced in our Southeast region then we will be well paced to be able to further reduce abstraction and improve the conditions in more local water catchments.

We will continue to work in partnership with the EA to improve the detailed requirements for changing our assets to allow for sustainability reductions and to evaluate the cost benefit of these requirements. We will use this information to consult customers on whether they support the environmental improvements and we will adapt our plan in light of the outcome of that consultation.

11.2 Our approach to leakage reduction

In the next planning period, we will have a supply deficit and will therefore commit more resource to reduce leakage levels. Our programme of leakage reduction is challenging and will fulfil the following objectives:

- A continuous reduction in leakage over the 10 year period from 2015 to 2025;
- Control of leakage year on year below a predetermined leakage target;
- A cost beneficial approach to target setting and reaching levels of leakage wanted by our customers;
- Continual improvement towards increasing efficiency in managing and controlling leakage;
- Open and continuing dialogue with our customers on potential changes to service levels or the impact of leakage operations in the pursuit of lower leakage levels.

It is important that we have a balanced investment programme to manage the supply / demand deficit. Relying solely on very large levels of leakage reduction presents significant risks to our customers if these cannot be achieved in a sustainable and cost beneficial manner.

We will ensure a continually reducing leakage level through the careful monitoring and response to leakage outbreaks and the natural rate of rise of leakage encountered together with controlled implementation of leakage reduction measures from one leakage level to another.

We recognise that in order to achieve an upper bound level of leakage for all conditions we will need to operate at lower levels during benign weather periods. This level does not reflect a new economic level of leakage and may need to rise to nearer the target in more extreme weather event years as witnessed during the winters of 2008/09, 2009/10 and 2010/11.

Our plan will remain flexible. As we continue to reduce leakage the reliability of costs to reduce leakage further will also improve. We will review the cost-effectiveness of leakage reduction on a progressive basis and will reduce leakage further should this prove to be more cost-effective than alternative measures to balance supply and demand.

11.3 Our approach to metering

11.3.1 Introduction

We have concluded that metering of households in the East and Southeast regions for AMP6 will be optional only as Southeast is already at 93% household meter penetration and East does not have a supply / demand deficit.

In view of a significant challenge to reduce the effect our operations have on the water environment, to meet rising demand from population growth and the recent evidence from our metering programme that metering may reduce consumption by 16% or more, we consider metering is cost beneficial in our Central region.

We propose the following metering strategy:

- To achieve 90% household meter penetration in our Central region by 2023;
- Wherever practicable, existing unmeasured customers will have meters equipped with walk-by AMR installed on a focused, street-by-street basis in Central zones; WRZ1, WRZ3, WRZ4, WRZ5 and WRZ6 by 2020 (448,645 meters installed) and WRZ2 by 2023;
- Optant metering will continue in all of our regions (23,550 household meters in AMP6);
- All newly connected properties in all Affinity Water areas will be metered (forecast around 48,450 household meters in AMP6);
- Meters will be fitted externally at the property boundary wherever possible;
- AMR meter installations will be considered for metering of joint supply and difficult to fit properties on a case by case basis;
- Where newly installed meters show continuous use, the cause will be investigated and where necessary external supply pipes will be repaired under our supply pipe repair policy.
- Water efficiency advice will be offered to all households following installation of a water meter, including water audits;
- Meters and their respective AMR units will be replaced every 15 years;
- In the Central region properties wishing to use sprinklers or install larger swimming pools will continue to be required to be metered.

Our plans incorporate ambitious goals for reducing consumption to achieve a decrease in per capita consumption (PCC), despite a rise in population growth of at least 14% over the 25 year planning period.

From the experience gained in our Southeast region, the planned compulsory metering programme will include water audits and water efficiency advice for small and medium enterprises and domestic customers.

New metered properties and optant meter households will be transferred directly to a standard measured tariff.

As part of the consultation process for our draft WRMP we will seek customer views on their willingness to pay for metering. Our consultation phase takes place after publication of the draft Plan and will run for 12 weeks to late August 2013. We will use a range of methods to engage with our customers, including quantitative online panel surveys, specific willingness to pay studies and qualitative focus groups. During this phase we will define the issues in more detail and provide greater and better information in order to obtain majority support for all aspects of our metering plans.

We will utilise the process of consultation to gain an understanding of the impact of compulsory metering upon our customers and this will enable us to develop options to manage the transition to metered tariffs for anyone affected by the change over. Topics for consultation will include consideration of a possible transitional tariff for severely affected groups. Following the impact assessment a mitigation plan will be put in place.

Shared supplies can present significant difficulties for meter installation. We are aware, from customer feedback, that customers in multi-dwelling buildings such as blocks of flats, have been disappointed when unable to have meters installed. In AMP6, through the use of remote read AMR units, we anticipate a significant proportion of these types of properties will now be able to be metered successfully.

> “Why can’t I have a water meter in my flat?”

11.3.2 Justification for Metering Strategy

We have carried out modelling of water resource requirements both in conjunction with the Water Resources in the South East group (WRSE) as well as independently using an in-house model that looks at the economic balance of supply and demand known as the EBSD model. In almost all of the scenarios modelled, metering was selected for the Central region very early in the planning period as an optimal solution for balancing supply and demand.

Our proposed metering programme is supported by the outputs of our various models including:

– Our Strategic Environmental Assessment;

– The Economic Balance of Supply and Demand modelling supports metering in five of the six zones of Affinity Water Central region demonstrating that it represents the least cost planning solution to maintain the supply / demand balance;

– Through the use of the UKWIR Smart Metering Model we find that metering including AMR over 5 years offers the optimal metering solution.

Our analyses take on board the requirements of the Environment Agency's guidelines that we determine the best value solution taking account of climate change, sustainability and resilience.

11.3.3 Meter projections

In the five years of AMP6, from 2015 to 2020, our Preferred Plan will achieve over **36Ml/d** reductions in demand from compulsory metering by AMR in five of our six water resource zones in the Central region. Table 34 and Table 35 show the levels of meter penetration by year in AMP6, including Change of Hands (CoH) metering and new properties. We plan to continue metering in the sixth Central regions in AMP7 and expect to reach 90% metering in Central by 2023.

	AMP6					
	2015/16	2016/17	2017/18	2018/19	2019/20	TOTAL
Optants	6,863	5,147	4,289	3,431	1,716	21,446
Selective (street)	77,205	89,214	95,219	95,219	91,788	448,645
Selective (CoH)	0	0	0	0	0	0
New builds	9,134	9,018	8,760	8,618	8,320	43,850
% penetration	**53.9%**	**63.0%**	**70.5%**	**77.8%**	**85.8%**	

Table 34: Projection of metered households in AMP6 for Central

	AMP6					
	2015/16	2016/17	2017/18	2018/19	2019/20	TOTAL
Optants	700	600	400	300	100	2100
Selective (street)	0	0	0	0	0	0
Selective (CoH)	0	0	0	0	0	0
New builds	315	315	315	315	315	1575
% penetration	**81.2%**	**83.5%**	**86.3%**	**88.4%**	**90.0%**	

Table 35: Projection of metered households in AMP6 for East

No table is supplied for Southeast (WRZ7) as there is no pro-active metering programme in that region due to the high levels of penetration (93%), and our forecast is that the remaining customers who can opt to have a meter will be minimal.

11.3.4 Where metering is infeasible

Experience has shown that there are a number of situations where metering of individually occupied premises is not possible. This may be due to complex plumbing or difficulties in achieving access for surveys and meter installations.

For those customers who cannot be metered because of the plumbing arrangements at their property we will examine whether further work at a sensible economic cost to the company could make metering possible. If the cost is prohibitive the customer will be asked if they wish to pay for the work to be carried out in order to have the benefit of a meter installed.

In the event that it is not possible to physically install a meter, that property will be transferred onto an assessed charge.

11.3.5 Metering installation

We propose to install an AMR unit on all future meter installations in all three regions.

We have proved that the technology works and we are going to be able to provide more information to customers on their water use in the future, both as part of their bills or through our website. There is a considerable body of evidence to suggest that regular feedback has a positive effect on reducing consumption.

AMR technology has the potential to be adapted to allow customers to monitor their own water usage in near real time.

11.4 Our approach to water efficiency

11.4.1 Introduction

Our proposed future water efficiency programme has three main stands of activity:

- Community targeted projects that are cost effective to balance supply and demand over the next 25 years.
- Support of our metering programme to help maximise consumption savings
- Baseline water efficiency and education programme working with customers and partner organisations to promote a continuous reduction in consumption

As a result of our proposals for a coherent demand management programme that will include metering, education, community programmes, leakage reduction and pressure management, we forecast that our metering and water efficiency strategy will reduce consumption by 49Ml/d by 2020 and 33Ml/d net savings, taking account of population growth. This means we expect a reduction in average consumption of 20l/p/d by 2040.

Details of our approach to water efficiency are included in our Technical Report 3.4: *Water Efficiency*.

We recognise that a strong commitment to reducing PCC was a key feature of our customer consultation process so we are setting ourselves a target for:

A long term reduction in PCC through a mix of demand management methods, to achieve a 20 litre reduction in average company PCC over the next 25 years.

Achieved through a mix of the three strands listed above, we intend that our bold target will set a new benchmark in level of water efficiency activity being achieved by a UK water company and will demonstrate a proposed direction of travel for encouraging consumption towards the ultimate target of below UK average PCC for the whole Affinity Water area by 2050.

We consider that increased meter penetration, pressure management and customer wastage reduction will together contribute to reducing PCC so whilst our plans are ambitious we believe they are achievable in partnership with the local communities we serve.

11.4.2 Strand 1: Supporting our communities

The first strand of activity will promote a number of community targeted projects that are cost effective to balance supply and demand. These projects have been derived based on the most successful activities undertaken to date and will be carried out across our regions at different points over the 25 year planning horizon where they are cost effective and selected as part of our Preferred Plan.

- **Community focused water efficiency scheme.** Two communities (of approx. 16000 properties) would be selected. Domestic, commercial, local authority and educational properties would all be targeted with a concerted installation and educational engagement programme. Water saving devices would be delivered and fitted through an assisted audit, ensuring devices are appropriate for the properties and that occupants had received water saving messages and guidance on the products installed. The scheme would be expected to yield approximately 2 million litres of water per day for each community engaged.
- **Dual flush WC retrofit**. Target households will be small metered properties with high occupancy, who are unlikely to be able to afford to replace their existing WC. Free installation of a low volume dual flush WC will be offered and it is estimated that 60,000 WC's will be installed. The scheme would be expected to yield approximately 1 million litres of water a day over the life of the project.
- **Non process commercial water audits.** Commercial water audits will be offered to advise businesses how to be more water efficient in non-industry specific activities such as toilet flushing and hand washing. Advice and free water saving products will be provided to cover tap use, WC flushing, urinal flushing and behaviour change. Staff would be engaged to promote water saving devices and behaviours at home. The scheme would be expected to yield approximately 1 million litres of water a day over the life of the project.
- **Commercial process water audits.** Commercial water audits are undertaken to advise businesses how to use water more efficiently in processes that are industry specific but common across an industry sector. The scheme will be delivered in partnership with a 3rd party industry specialist in process use. The saving of water through commercial processes will not reduce PCC directly but contributes to our duty to promote water efficiency to all

customer groups and will raise the presence of water saving activity to the staff of commercial premises, thereby indirectly influencing PCC. The scheme would be expected to yield approximately 1 million litres of water a day over the life of the project.

– **Major customer water efficiency retrofit.** Water audits and installation of water saving measures will be targeted at major customers in our operating area such as the three major airports within the Affinity Water area, with devices and guidance offered to airport terminal buildings and neighbouring companies, hotels and industry. Support and guidance will also be offered to help alter water using behaviours of both staff at these premises and the customers using the facilities. This may indirectly influence PCC if key messages are taken away with people and used in their homes. The scheme would be expected to yield approximately 0.2 million litres of water a day over the life of the project.

11.4.3 Strand 2 : Support of our metering programme

We propose to align water efficiency activity with our metering programme, ensuring that customers receiving a meter are automatically entitled to a free home water audit, and property retrofit of water saving devices to maximise water consumption savings due to the meter being installed.

In addition, the role of water efficiency will be used to support the future metering programme through awareness schemes highlighting the benefits of meter installation. This will be implemented through contact with customers prior to metering roll out in their communities via direct customer contact, engagement with schools, higher education establishments and in the local community, through partnerships with local interest groups. We will also align our approach with key partners in each community being engaged to enhance the relevance of the message being delivered, relating our activities back to local environmental benefits where possible. It is therefore expected that our metering programme is likely to begin where water availability is at its most acute.

We envisage that the compulsory installation of water meters, twinned with a water efficiency support programme, to include free home water audits and retrofitting, which will yield an overall PCC reduction of approximately 20 litres per person per day achieved over the full duration of the metering roll out, when approximately 500,000 meters will be installed.

11.4.4 Strand 3: Base water efficiency and education programme

We expect that the proposed projects and support of our metering programme will need to be complemented by an additional baseline level of water efficiency to ensure we achieve our future PCC reduction aspirations. This programme of activity will need to be bold and innovative, ensuring that we work with key stakeholders and partners. This programme will need to be a step up from the work delivered through AMP5 and will be based around community scale projects that relate water efficiency awareness back to the local community thereby increasing its relevance to the audience. We propose in the remainder of AMP5 to undertake a number of different community engagement trial programmes to understand the most successful methods of messaging and building relationships with customers in readiness for our proposed activities beyond 2015.

The future baseline water efficiency programme will need to develop a number of new approaches to take us beyond our current level of understanding. The proposed strategy to

reduce consumption is being engineered around key themes that are informed by consultation with customers. The likely features of our future water efficiency baseline programme will be:

Our new **Community Delivery Model** to determine the optimum water efficiency strategy for each of our communities. The community delivery model defines our company areas into 8 differentiated communities based on the local water sources, as described in Figure 8.

The water efficiency activities chosen will be tailored towards the particular needs of each catchment area, and may be phased to align with other activities like metering roll out. The proposed activities will also take into account the domestic / commercial split and the effect of sustainability reductions as a vehicle for promoting water efficiency to communities. The different needs of each of the eight regions will be taken into consideration, so it is likely that in aligning our water efficiency programme to the needs of our East and Southeast regions their water efficiency activity will be different to that undertaken in the Central region. This is likely to be achieved through baseline activity alone, without the need for additional targeted projects.

– **Partnership with outside organisations**. We plan to strengthen our relationships with local community groups (such as wildlife trusts, river groups and business in the community) to enhance the credibility of our activities and to help demonstrate the real world benefits to customers of carrying out our programme. We will also align our activities with other partners in industry (energy saving groups, and retailers promoting efficiency messages), and where possible neighbouring water providers to give a clear coherent regional message with regard to water savings. Activities are likely to be on the ground in an outreach format, which will require us and partners to get out into the communities to maximise face to face engagement with our messages, as opposed to advertising campaigns using traditional hard copy media.

– **Our Environment and Education Service.** Our service will be significantly enhanced to deliver water saving advice and guidance. This will be strongly outreach focused engaging people within their own communities. The activities undertaken will be tailored to the particular needs of each of the 8 communities we serve, and will cover other related aspects such as mains renewal programmes and information about future meter roll out in the local area. We are also investigating better monitoring systems (such as automated meter reads) that can be used to highlight the benefits of our activities direct to consumers, who can use the evidence presented to better inform their opinions.

– **Innovation.** Water efficiency activities that we deliver will build on the successes made in real world water saving projects. Innovative new approaches will be trialled and implemented where practicable. We plan to embrace new technologies and innovations in both communications and water saving technologies, to help drive our efficiency programmes. We recognise that in order to achieve a 1 litre reduction in PCC annually through water efficiency and other demand management activities that our work may be at the frontier of new water efficiency understanding. We therefore intend to share best practice with other practitioners and relevant stakeholders to further the wider understanding of water efficiency in England and Wales.

Appendices

Appendix A: List of Technical Reports

Component	ID	Title
1. Supply	**1.1**	**Deployable Output Assessment**
	1.1.1	Surface Water Deployable Output Assessment
	1.2	**Level of Service Hindcasting – Assessment of the Frequency of Drought Restrictions**
	1.2.1	Drought Planning for Third Dry Winter Scenario
	1.3	**Assessment of Climate Change Impacts on Deployable Output**
	1.3.1	Anglian Reservoir Briefing note for Affinity Water
	1.3.2	The Impacts of Climate Change on DO
	1.4	**Sustainability Reductions**
	1.4.1	AMP5 NEP Progress and Summary of PR14 Schemes
	1.5	**Outage**
	1.5.1	Summary Report for Outage (Central and Southeast Regions)
	1.6	**Water Resource Zone Integrity**
	1.6.1	Water Resource Zone Integrity Assessment for Affinity Water (Central region)
2. Demand	**2.1**	**Micro-component Analysis**
	2.1.1	Customer Analysis and Micro-component Demand Forecasting
	2.2	**Domestic Housing and Population Forecast**
	2.2.1	Population, Household and Dwelling Forecasts for WRMP14: Phase 1 Draft Final Report
	2.3	**Non-household Demand Forecast**
	2.4	**Headroom**
	2.4.1	Summary Report for Headroom (Central and Southeast)
3. Investment Appraisal	**3.1**	**Options Appraisal**
	3.1.1	Unconstrained Options Study
	3.1.2	Option Screening and Constrained Options Methodology
	3.1.3	Constrained Options Dossiers
	3.2	**Leakage Strategy Report**
	3.2.1	Update of the Sustainable Economic Level of Leakage (SELL) for PR14
	3.3	**Metering Strategy & Cost Benefit Analysis**
	3.3.1	Affinity Southeast - Effects of Metering
	3.3.2	Metering Trials - 2nd interim report
	3.4	**Water Efficiency**
	3.5	**Water Company & Third Party Bulk Transfers**
	3.6	**Water Resources in the South East Modelling**
	3.7	**Economics of Balancing Supply and Demand Model Development, Commissioning & Use**
	3.8	**Engaging Customers in Future Planning**
	3.8.1	Investing in Your Community consultation summary
	3.9	**Environment Report**
	3.9.1	SEA Scoping Report

Appendix B: List of Stakeholders & Consultees

In accordance with Government's regulations, we are required to state who we will consult with on our plans.

Listed here are the stakeholders and consultees with whom we consulted during our pre-consultation and we will engage with this same group about our draft Water Resources Management Plan.

Key to acronyms to Stakeholders & Consultees table:

Customer code key	Group	Includes
A	All customers all types	Universal - all.
B	Domestic	Metered, unmeasured, all bill types
C	Commercial	Monthly billed
D	Commercial	Quarterly / 6 monthly billed
E	Commercial	Small to medium enterprise customers - actively managed by Commercial team by 11 sector profiles
F	regulators	National (FN), Regional (FR) and Local (FL) regulatory bodies.
G	MPs and MEPs	MPs (GM) and MEPs (GE)
H	Local and regional authorities	Councils (HC), Chief Executive Officers (HX) and GLA (HG)
I	Health protection agencies	EHOs and CCDCs
J	Parish councils	Parish council Clerks
K	NGOs	RSPB, CPRE, National Trust, Waterwise, WWF, Blueprint for Water etc…
L	Trade & professional associations	NFU, CLA, Housebuilders Federation, CIWEM, Horticultural Trade Assoc, Sport UK, English Cricket Boards, Football Association, Chambers of Commerce, Enterprise Groups, Energy Saving Trust, Housing Associations.
M	Local environmental groups	Chiltern Chalk Streams Society, Friends of Mimram, Beane Restoration Society, Ver Society, Hertfordshire & Middlesex Wildlife, Groundwork Hertfordshire & Thames Valley, Hertfordshire Environmental Forum.
N	Community support groups	Age UK, CAB, St Albans Civic Society
O	Customer Challenge Group	As defined by Stakeholder Engagement Manager
P	Water companies	Thames, Anglian, Cambridge, Essex, South East, Southern, Sutton & East Surrey
Q	Potential third party suppliers	Vauxhall, McMullens.
R	Libraries	All
S	Staff	All
T	Contractors	
U	Suppliers	

List of Stakeholders & Consultees

(Names of individuals have been omitted)

Position	Organisation Name	code	sector	area
	A D Bly Construction	E	Construction & Engineering	
Clerk	Abbess, Beauchamp and Berners Roding Parish Council	J		Central
Clerk	Abbots Langley Parish Council	J		Central
Chairman	Abington Pigotts Parish Council	J		Central
	Active Luton	E	Sports & Leisure	
	Age UK	N		
Clerk	Albury Parish Council	J		Central
Clerk	Aldbury Parish Council	J		Central
Clerk	Aldenham Parish Council	J		Central
Clerk	Alkham Parish Council	J		Southeast
Clerk	Alresford Parish Council	J		East
Chief librarian	Amersham Library	R		Central
Clerk	Amersham Town Council	J		Central
Managing Director	Anglian Water Group	P		
Clerk	Anstey Parish Council	J		Central
Clerk	Ardeley Parish Council	J		Central
Clerk	Ardleigh Parish Council	J		East
Clerk	Arkesden Parish Council	J		Central
Chairman	Artington Parish Council	J		Central
Clerk	Ash Parish Council	J		Southeast
Clerk	Ash Parish Council	J		Central
Clerk	Ashdon Parish Council	J		Central
Head of Environmental Health	Ashford Borough Council	I		
Clerk	Ashley Green Parish Council	J		Central
Clerk	Ashwell Parish Council	J		Central
Clerk	Aspenden Parish Council	J		Central
Clerk	Aston Parish Council	J		Central
Head of Environment Services	Aylesbury Vale District Council	I		
Clerk	Aylesham Parish Council	J		Southeast
Manager	Aylett nurseries	E	Agricultural & Environmental services	
Clerk	Ayot St Peter Parish Meeting	J		Central
Clerk	Aythorpe Roding Parish Council	J		Central
Clerk	Bar Hill Parish Council	J		Central
Clerk	Barkway Parish Council	J		Central
Clerk	Barley Parish Council	J		Central
Manager	Barnet Health Care Trust	E	Pharmaceutical, medical & health service	
Clerk	Barnston Parish Council	J		Central
Clerk	Barrington Parish Council	J		Central
Clerk	Bartlow Parish Council	J		Central
Clerk	Barton le Clay Parish Council	J		Central
Clerk	Barton Parish Council	J		Central
Clerk	Bayford Parish Council	J		Central
Clerk	Beaumont Parish Council	J		East
CCDC	Bedfordshire & Hertfordshire Health Protection Team	I		
Head of Public Protection	Bedfordshire Council	I		
Senior Conservation Officer	Bedfordshire Wildlife Trust	M		
	Beds Wildlife Trust	M		
Clerk	Bengeo Rural Parish Council	J		Central
Clerk	Benington Parish Council	J		Central
Clerk	Berden Parish Council	J		Central
Clerk to the Council	Berkhamsted Town Council	J		Central

Position	Organisation Name	code	sector	area
	Berystede Hotel	E	Hotels, Catering and Laundry Services	
Clerk	Billington Parish Council	J		Central
Clerk	Binfield Parish Council	J		Central
Clerk	Birchanger Parish Council	J		Central
Clerk	Bisham Parish Council	J		Central
Town Clerk	Bishops Stortford Town Council	J		Central
Clerk	Bisley Parish Council	J		Central
Clerk	Blackmore, Hook End and Wyatts Green Parish Council	J		Central
Clerk	Bledlow Cum Saunderton Parish Council	J		Central
	Boultbee	E	Business and Consulting	
Clerk	Bovingdon Parish Council	J		Central
Manager	Bowmans Farms	E	Food, Drink, Tobaco and retail services	
Senior Environmental Health Officer	Bracknell Forest Borough Council	I		
Director of Environment	Bracknell Forest Council	HC		
Chief Executive	Bracknell Forest Council	HX		
Clerk	Bracknell Town Council	J		Central
Clerk	Bradfield Parish Council	J		East
Clerk	Bramfield Parish Council	J		Central
Clerk	Braughing Parish Council	J		Central
Clerk	Bray Parish Council	J		Central
Facilities Resource	BRE Building Research Establishment	E	Construction & Engineering	
Director of Environment & Culture	Brent Borough Council	HC		
Chief Executive	Brent Borough Council	HX		
Clerk	Brent Pelham and Meesden Parish Council	J		Central
Head of Planning and Regulation	Brentwood Borough Council	HC		
Chief Executive	Brentwood Borough Council	HX		
Environmental Health & Enforcement Manager	Brentwood Borough Council	I		
Clerk	Brenzett Parish Council	J		Southeast
Clerk	Brickendon Liberty Parish Council	J		Central
Clerk	Brightlingsea Parish Council	J		East
Chairman	British Disabled Waterski Association	M		
	British Trust for Ornithology	M		
	British Water Ways	M		
Clerk	Britwell Parish Council	J		Central
Clerk	Brookland Parish Council	J		Southeast
Clerk	Broxted Parish Council	J		Central
Clerk	Buckhurst Hill Parish Council	J		Central
CCDC	Buckinghamshire & Milton Keynes Health Protection Team	I		
Chief Executive	Buckinghamshire County Council	HX		
Clerk	Buckland and Chipping Parish Council	J		Central
Clerk	Buntingford Town Council	J		Central
Clerk	Burmarsh Parish Council	J		Southeast
Branch Secretary	Butterfly Conservation Association	M		
	Butterfly Conservation Association	M		
Clerk	Bygrave Parish Council	J		Central
Clerk	Caddington Parish Council	J		Central
Clerk	Caldecote Parish Council	J		Central
Clerk	Cambourne Parish Council	J		Central
Managing Director	Cambridge Water Ltd	P		

Position	Organisation Name	code	sector	area
	Campaign to Protect Rural England	K		
Environmental Health Manager	Canterbury City Council	I		
Clerk	Capel-le-Ferne Parish Council	J		Southeast
	Car Wash Association	L		
Clerk	Carlton cum Willingham Parish Council	J		Central
	Carmelite	E	Business and Consulting	
Clerk	Castle Camps Parish Council	J		Central
Director of Sustainable Communities	Central Bedfordshire Council	HC		
Chief Executive	Central Bedfordshire Council	HX		
Clerk	Chalfont St Giles Parish Council	J		Central
Chief librarian	Chalfont St Peter Library	R		Central
Clerk	Chalfont St Peter Parish Council	J		Central
Clerk	Chalgrave Parish Council	J		Central
Clerk	Chalton Parish Council	J		Central
Managing Director	Charis Grants	O		
	Chartered Institution of Water and Environmental Management	L		
Clerk	Chartridge Parish Council	J		Central
Clerk	Chenies Parish Council	J		Central
Clerk	Chepping Wycombe Parish Council	J		Central
Chief librarian	Chertsey Library	R		Central
Clerk	Chesham Bois Parish Council	J		Central
Clerk	Chesham Town Council	J		Central
Chairman	Chickney Parish Council	J		Central
Clerk	Chigwell Parish Council	J		Central
Project Manager	Chiltern Chalk Streams, Chiltern Conservation Board	M		
Head of Health & Housing	Chiltern District Council	HC		
Interim Head of Health and Housing	Chiltern District Council	HC		
Chief Executive	Chiltern District Council	HX		
Environmental Health Officer	Chiltern District Council	I		
	Chiltern Society	M		
Clerk	Chipperfield Parish Council	J		Central
Chief librarian	Chipping Barnet Library	R		Central
Clerk	Chobham Parish Council	J		Central
Clerk	Chorleywood Parish Council	J		Central
Clerk	Chrishall Parish Council	J		Central
	Citizens Advice	N		
Clerk	Clavering Parish Council	J		Central
Clerk	Claygate Parish Council	J		Central
Chairman	Clothall Parish Meeting	J		Central
Clerk	Codicote Parish Council	J		Central
Clerk	Coleshill Parish Council	J		Central
Clerk	Colnbrook & Poyle Parish Council	J		Central
	Colne Valley Angling Society	M		
Clerk	Colney Heath Parish Council	J		Central
Clerk	Comberton Parish Council	J		Central
Clerk	Compton Parish Council	J		Central
Policy Manager	Consumer Council for Water	FN		
Local ConsumerAdvocate (LCA) London and the SE	Consumer Council for Water	O		
	Consumer Council for Water London & South East	I		
Clerk	Cookham Parish Council	J		Central
Clerk	Coton Parish Council	J		Central
Clerk	Cottenham Parish Council	J		Central
President	Country Land and Business Association	L		
Director	Countryside Management Service	M		

Position	Organisation Name	code	sector	area
Clerk	Cox Green Parish Council	J		Central
Clerk	Crowthorne Parish Council	J		Central
Clerk	Croxley Green Parish Council	J		Central
Clerk	Croydon Parish Council	J		Central
Corporate Director Housing and Regeneration	Dacorum Borough Council	HC		
Chief Executive	Dacorum Borough Council	HX		
Maintenance Team Leader	Dacorum District Council	O		
Environment & Sustainability Officer	Dacorum Environmental Forum	M		
	Dacorum Environmental Forum Water Group	M		
Environmental Health Officer	Darcum Borough Council	I		
Clerk	Datchet Parish Council	J		Central
Clerk	Datchworth Parish Council	J		Central
	Day Aggregates	E	Construction & Engineering	
Clerk	Debden Parish Council	J		Central
Clerk	Dedham Parish Council	J		East
	DEFRA	FN		
Clerk	Denton-with-Wooton Parish Council	J		Southeast
Site Manager	Do & Co Event & Airline Catering	E	Manufacturing	
Deputy Head Teacher	Doddinghurst Infant School	E	Education	
Clerk	Doddinghurst Parish Council	J		Central
Chief Executive	Dover District Council	HC		
Chief Executive	Dover District Council	HX		
Team Leader for Environmental Protection	Dover District Council	I		
Clerk	Dover Town Council	J		Southeast
Clerk	Downley Parish Council	J		Central
	Drinking Water Inspectorate	O		
Clerk	Dry Drayton Parish Council	J		Central
Clerk	Duxford Parish Council	J		Central
	DWI	FN		
Clerk	Dymchurch Parish Council	J		Southeast
Executive Director of Customer Services	Ealing Borough Council	HC		
Chief Executive	Ealing Borough Council	HX		
Chief librarian	Ealing Road Library	R		Central
Chief librarian	East Barnet Library	R		Central
	East Berkshire	I		
Clerk	East Clandon Parish Council	J		Central
Head of Environmental Services	East Hertfordshire District Council	HC		
Chief Executive & Director of Customer & Community Services	East Hertfordshire District Council	HX		
Environmental Health Manager (Commercial)	East Hertfordshire District Council	I		
Clerk	East Horsley Parish Council	J		Central
Head of Housing Management	East Kent Housing	O		
	East of England Regional Assembly	M		
Clerk	Eastry Parish	J		Southeast
Clerk	Eastwick and Gilston Parish Council	J		Central
Clerk	Eaton Bray Parish Council	J		Central
Facilities Manager	Efco & Kite Glass	E	Manufacturing	
Clerk	Effingham Parish Council	J		Central
Chairman	Eggington Parish Council	J		Central
Clerk	Elham Parish Council	J		Southeast
Clerk	Ellesborough Parish Council	J		Central
Strategic Director - Services	Elmbridge Borough Council	HC		

Position	Organisation Name	code	sector	area
Chief Executive	Elmbridge Borough Council	HX		
Senior Environmental Health Officer	Elmbridge Borough Council	I		
Clerk	Elmdon Parish Council	J		Central
Clerk	Elmstead Parish Council	J		East
Clerk	Elmsted Parish Council	J		Southeast
Clerk	Elsenham Parish Council	J		Central
Clerk	Elstree and Borehamwood Town Council	J		Central
Clerk	Elsworth Parish Council	J		Central
	Energy Saving Trust	L		
Director of Environment	Enfield Borough Council	HC		
	English Heritage - East of England Region	M		
	English Heritage - London Region	M		
	English Heritage - South East Region	M		
	Environment Agency	FL		
	Environment Agency	FL		
	Environment Agency	FL		
	Environment Agency	FL		
	Environment Agency	FL		
	Environment Agency	FL		
	Environment Agency	FN		
	Environment Agency	FR		
	Environment Agency	FR		
Water Planning Manager	Environment Agency - South East	O		
Head of Environmental Services	Epping Forest District Council	HC		
Chief Executive	Epping Forest District Council	HX		
Engineering, Drainage and Quality Team Manager	Epping Forest District Council	I		
Chief librarian	Epping Library	R		Central
Clerk	Epping Town Council	J		Central
Clerk	Epping Upland Parish Council	J		Central
Clerk	Essendon Parish Council	J		Central
	Essex and Suffolk Water	P		
Chief Executive	Essex County Council	HC		
Executive Director for Environment	Essex County Council	HC		
Chief Executive	Essex County Council	HX		
CCDC	Essex Health Protection Unit	I		
Clerk	Eton Town Parish Council	J		Central
Member of the European Parliament	European Parliament	GE		
Member of the European Parliament	European Parliament	GE		
Member of the European Parliament	European Parliament	GE		
Member of the European Parliament	European Parliament	GE		
Member of the European Parliament	European Parliament	GE		
Member of the European Parliament	European Parliament	GE		
Member of the European Parliament	European Parliament	GE		
Member of the European Parliament	European Parliament	GE		
Member of the European Parliament	European Parliament	GE		
Member of the European	European Parliament	GE		

Position	Organisation Name	code	sector	area
Parliament				
Member of the European Parliament	European Parliament	GE		
Member of the European Parliament	European Parliament	GE		
Member of the European Parliament	European Parliament	GE		
Member of the European Parliament	European Parliament	GE		
Member of the European Parliament	European Parliament	GE		
Member of the European Parliament	European Parliament	GE		
Member of the European Parliament	European Parliament	GE		
Chairman	Eversdens Parish Council	J		Central
Manager	Expeditors International UK Ltd	E	Transport & Motor vehicles	
Clerk	Eythorne Parish Council	J		Southeast
Clerk	Farnham Parish Council	J		Central
Secretary of the Parish Meeting	Fawley Parish Meeting	J		Central
	Federation for Window Cleaners	L		
PAA	Federation House	K		
Clerk	Felsted Parish Council	J		Central
Clerk	Fen Ditton Parish Council	J		Central
Clerk	Fen Drayton Parish Council	J		Central
Clerk	Flamstead Parish Council	J		Central
Clerk	Flaunden Parish Council	J		Central
Clerk	Folkestone Town Council	J		Southeast
Clerk	Fowlmere Parish Council	J		Central
Clerk	Foxton Parish Council	J		Central
Clerk	Frating Parish Council	J		East
	Friends of Stockers Lake	M		
	Friends of the Mimram	M		
Chief librarian	Friern Barnet Library	R		Central
Clerk	Frinton & Walton Parish Council	J		East
Clerk	Fulbourn Parish Council	J		Central
Clerk	Furneux Pelham Parish Council	J		Central
Clerk	Fyfield Parish Council	J		Central
Clerk	Gamlingay Parish Council	J		Central
	Garden Centre Association	L		
Clerk	Girton Parish Council	J		Central
UK Environment Manager	GlaxoSmithKline	O		
Clerk	Goodnestone Parish Council	J		Southeast
Clerk	Grantchester Parish Council	J		Central
Clerk	Graveley Parish Council	J		Central
Clerk	Great Abington Parish Council	J		Central
Clerk	Great Amwell Parish Council	J		Central
Clerk	Great and Little Chishill Parish Council	J		Central
Clerk	Great and Little Hampden Parish Council	J		Central
Clerk	Great Bentley Parish	J		East
Clerk	Great Bromley Parish	J		East
Clerk	Great Canfield Parish Council	J		Central
Clerk	Great Chesterford Parish Council	J		Central
Clerk	Great Dunmow Parish Council	J		Central
Clerk	Great Easton & Tilty Parish Council	J		Central
Clerk	Great Gaddesden Parish Council	J		Central
Clerk	Great Hallingbury Parish Council	J		Central
Clerk	Great Marlow Parish Council	J		Central

Position	Organisation Name	code	sector	area
Clerk	Great Missenden Parish Council	J		Central
Clerk	Great Oakley Parish Council	J		East
Clerk	Great Sampford Parish Council	J		Central
Clerk	Great Shelford Parish Council	J		Central
Clerk	Great Wilbraham Parish Council	J		Central
	Greater London Authority	HG		
	Greater London Authority	HG		
	Greater London Authority	HG		
	Greater London Authority	HG		
	Greater London Authority	HG		
	Greater London Authority	HG		
	Greater London Authority	HG		
	Greater London Authority	HG		
	Greater London Authority	HG		
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	Greater London Authority	HG		
	Greater London Authority	HG		
	Greater London Authority	HG		
	Greater London Authority	HG		
	Greater London Authority	HG		
	Greater London Authority	HG		
	Greater London Authority	HG		
	Greater London Authority	HG		
	Greater London Authority	HG		
Owner	Greenacres Equestrian	E	Agricultural & Environmental services	
Executive Director	Groundwork Herts	M		
Executive Director	Groundwork Thames Valley	M		
Energy and Sustainability Manager	GSK WARE R&D	E	Pharmaceutical, medical & health service	
Strategic Director	Guildford Borough Council	HC		
Chief Executive	Guildford Borough Council	HX		
Environmental Control Officer	Guildford Borough Council	I		
Chief librarian	Guildford Library	R		Central
Clerk	Guston Parish Council	J		Southeast
Clerk	Hadstock Parish Council	J		Central
Director of Urban Environment	Haringey Council	HC		
Chief Executive	Haringey Council	HX		
Chief librarian	Harlesden Library	R		Central
Environmental Health Manager	Harlow Council	I		
Strategic Director	Harlow District Council	HC		
Head of Environmental Health	Harlow District Council	HC		
Chief Executive	Harlow District Council	HX		
Chief librarian	Harlow Library	R		Central
Clerk	Harlton Parish Council	J		Central
Clerk	Harpenden Rural Parish Council	J		Central
Clerk	Harpenden Town Council	J		Central
Corporate Director of Community and Environmental Services	Harrow Council	HC		
Head of Community Safety	Harrow Council	HC		
Corporate Director of Place Shaping	Harrow Council	HC		
Chief Executive	Harrow Council	HX		

Position	Organisation Name	code	sector	area
Clerk	Harston Parish Council	J		Central
Clerk	Harwich Parish Council	J		East
Clerk	Haslingfield Parish Council	J		Central
Clerk	Hatfield Broad Oak Parish Council	J		Central
Clerk	Hatfield Heath Parish Council	J		Central
Clerk	Hatfield Town Council	J		Central
Clerk	Hatley Parish Council	J		Central
Clerk	Hauxton Parish Council	J		Central
Head Teacher	Havelock School	E	Education	
Clerk	Hawkinge Parish Council	J		Southeast
Chief librarian	Hayes Libary	R		Central
Clerk	Hazlemere Parish Council	J		Central
Energy Manager	Health Protection Agency	E	Pharmaceutical, medical & health service	
Clerk	Heath Reach Parish Council	J		Central
Water and Environment Manager	Heathrow Airport Limited	O		
Clerk	Hedsor Parish Council	J		Central
Clerk	Hempstead Parish Council	J		Central
Chief librarian	Hendon Library	R		Central
Clerk	Henham Parish Council	J		Central
Clerk	Herongate and Ingrave Parish Council	J		Central
Clerk	Hertford Heath Parish Council	J		Central
Clerk	Hertford Town Council	J		Central
Director of Environment and Commercial Services	Hertfordshire County Council	HC		
Chief Executive & Director of Environment	Hertfordshire County Council	HX		
Sustainability Team Leader	Hertfordshire County Council	M		
Clerk	Hertingfordbury Parish Council	J		Central
	Herts & Middlesex Bat Group	M		
Chief Executive	Herts & Middlesex Wildlife Trust	M		
Conservation Manager	Herts & Middlesex Wildlife Trust	M		
	Herts Chamber of Commerce	L		
Director of Environment	Hertsmere Borough Council	HC		
Chief Executive	Hertsmere Borough Council	HX		
Asst. Chief Environmental Health Officer	Hertsmere Borough Council	I		
Clerk	Hexton Parish Meeting	J		Central
Clerk	Heydon Parish Council	J		Central
Clerk	High Easter Parish Council	J		Central
Clerk	High Ongar Parish Council	J		Central
Clerk	High Roding Parish Council	J		Central
Clerk	High Wych Parish Council	J		Central
Clerk	High Wycombe Charter Trustees	J		Central
Clerk	Hildersham Parish Council	J		Central
Director of Environmental & Consumer Protection	Hillingdon Borough Council	HC		
Clerk	Hinxton Parish Council	J		Central
Clerk	Histon Parish Council	J		Central
Clerk	Hockliffe Parish Council	J		Central
Clerk	Holwell Parish Council	J		Central
	Home Builders Federation	L		
Clerk	Hormead Parish Council	J		Central
Clerk	Horningsea Parish Council	J		Central
	Horticultural Trades Association	L		
Clerk	Horton Parish Council	J		Central
Clerk	Hougham Without Parish Council	J		Southeast
Clerk	Houghton Regis Parish Council	J		Central
	Huco Engineering Indust. Ltd.	E	Construction &	

Position	Organisation Name	code	sector	area
			Engineering	
Clerk	Hughenden Parish Council	J		Central
Clerk	Hunsdon Parish Council	J		Central
Clerk	Hurley Parish Council	J		Central
Clerk	Hyde Parish Council	J		Central
Clerk	Hythe Town Council	J		Southeast
Clerk	Ibstone Parish Council	J		Central
Clerk	Ickleford Parish Council	J		Central
Clerk	Ickleton Parish Council	J		Central
Clerk	Ingatestone and Fryerning Parish Council	J		Central
	Inland Waterways	M		
Chief librarian	Iver Heath Library	R		Central
Clerk	Ivychurch Parish Council	J		Southeast
Purchasing Coordinator	Kelly Communications	E	Utilities	
Clerk	Kelshall Parish Meeting	J		Central
Clerk	Kelvedon Hatch Parish Council	J		Central
	Kempton Investment LTD	E	Business and Consulting	
Chief librarian	Kensal Rise Library	R		Central
Clerk	Kensworth Parish Council	J		Central
Council Leader	Kent County Council	HC		Southeast
Corporate Director	Kent County Council	HC		Southeast
CCDC	Kent Health Protection Unit	I		
Clerk	Kimpton Parish Council	J		Central
Clerk	Kings Langley Parish Council	J		Central
Clerk	Kings Walden Parish Council	J		Central
	Kingsbury Secondary Assessment Centre	E	Education	
Clerk	Kingston Parish Council	J		Central
Clerk	Knapwell Parish Meeting	J		Central
Clerk	Knebworth Parish Council	J		Central
Manager	Kwik Fit/Stapletons	E	Food, Drink, Tobaco and retail services	
Manager	Kwik Fit/Stapletons	E	Food, Drink, Tobaco and retail services	
Manager	Kwik Fit/Stapletons	E	Food, Drink, Tobaco and retail services	
Manager	Kwik Fit/Stapletons	E	Food, Drink, Tobaco and retail services	
Manager	Kwik Fit/Stapletons	E	Food, Drink, Tobaco and retail services	
Clerk	Lambourne Parish Council	J		Central
Clerk	Landbeach Parish Council	J		Central
Clerk	Lane End Parish Council	J		Central
Clerk	Langdon Parish Council	J		Southeast
Clerk	Langley Parish Council	J		Central
Clerk	Latimer Parish Council	J		Central
Clerk	Lawford Parish Council	J		East
Clerk	Leaden Roding Parish Council	J		Central
Clerk	Leighton Linslade Town Council	J		Central
Clerk	Letchworth Garden City Council	J		Central
Clerk	Lilley Parish Council	J		Central
Clerk	Linton Parish Council	J		Central
Clerk	Litlington Parish Council	J		Central
Clerk	Little Abington Parish Council	J		Central
Clerk	Little Bardfield Parish Council	J		Central
Clerk	Little Bentley Parish Council	J		East
Clerk	Little Berkhamsted Parish Council	J		Central
Clerk	Little Bromley Parish	J		East
Clerk	Little Canfield Parish Council	J		Central

Position	Organisation Name	code	sector	area
Clerk	Little Chesterford Parish Council	J		Central
Clerk	Little Clacton Parish	J		East
Clerk	Little Dunmow Parish Council	J		Central
Clerk	Little Gaddesden Parish Council	J		Central
Clerk	Little Gransden Parish Council	J		Central
Clerk	Little Hadham Parish Council	J		Central
Clerk	Little Marlow Parish Council	J		Central
Clerk	Little Missenden Parish Council	J		Central
Clerk	Little Oakley Parish Council	J		East
Clerk	Little Sampford Parish Council	J		Central
Clerk	Little Shelford Parish Council	J		Central
Clerk	Little Wilbraham & Six Mile Bottom Parish Council	J		Central
Clerk	Lolworth Parish Meeting	J		Central
Director Environment and Operations	London Borough Barnet	HC		
Deputy Chief Executive & Executive Director of Environment & Regeneration	London Borough Barnet	HC		
Chief Executive	London Borough Barnet	HX		
Group Manager (Food, Health & Safety)	London Borough of Barnet	I		
Regulatory Service Manager	London Borough of Brent	I		
Senior Environmental Health Officer	London Borough of Ealing	I		
Chief Executive	London Borough of Enfield	HX		
Team Leader for Environmental Health	London Borough of Enfield	I		
Lead Officer for Food and Safety	London Borough of Haringey	I		
Team Manager, Environmental Protection and Animal Services	London Borough of Harrow	I		
Chief Executive	London Borough of Hillingdon	HX		
Team Manager Food Health and Safety Team	London Borough of Hillingdon	I		
Food Safety Manager	London Borough of Houndslow	I		
Director of Environment	London Borough of Hounslow	HC		
Chief Executive	London Borough of Hounslow	HX		
Clerk	London Colney Parish Council	J		Central
	London Colney Village Concern	M		
	London Underground	L		
	London Wildlife Trust	M		
Clerk	Longstanton Parish Council	J		Central
Clerk	Longstowe Parish Council	J		Central
Clerk	Loughton Town Council	J		Central
Corporate Director	Luton Borough Council	HC		
Chief Executive	Luton Borough Council	HX		
Environmental Health Service Manager	Luton Borough Council	I		
Chief librarian	Luton Central Library	R		Central
Chairman	Luton rugby FC	E	Sports & Leisure	
Clerk	Lydd Town Council	J		Southeast
Clerk	Lydden Parish Council	J		Southeast
Clerk	Lympne Parish Council	J		Southeast
Clerk	Manuden Parish Council	J		Central
Clerk	Margaret Roding Parish Council	J		Central
Clerk	Markyate Parish Council	J		Central
Clerk	Marlow Bottom Parish Council	J		Central
Clerk	Marlow Town Parish Council	J		Central
Clerk	Matching Parish Council	J		Central
Estates And Facilites Manager	McNicholas Construction	E	Construction &	

Position	Organisation Name	code	sector	area
			Engineering	
Clerk	Medmenham Parish Council	J		Central
Clerk	Melbourn Parish Council	J		Central
Clerk	Meldreth Parish Council	J		Central
Chief librarian	Mill Hill Library	R		Central
Clerk	Milton Parish Council	J		Central
Clerk	Mistley Parish Council	J		East
Clerk	Moreton, Bobbingworth & The Lavers Parish Council	J		Central
Clerk	Mountnessing Parish Council	J		Central
Clerk	Nash Mills Parish Council	J		Central
Chief Executive	National Association for AONB	M		
Director	National Farmers Union	M		
Lead Adviser	Natural England	FN		
Central Processing Team	Natural England	FN		
Clerk	Navestock Parish Council	J		Central
Clerk	Nazeing Parish Council	J		Central
Clerk	Nettleden with Potten End Parish Council	J		Central
Clerk	New Romney Town Council	J		Southeast
Clerk	Newchurch Parish Council	J		Southeast
Chairman	Newham and Caldecote Parish Council	J		Central
Clerk	Newington Parish Council	J		Southeast
Clerk	Newport Parish Council	J		Central
Clerk	Newton Parish Council	J		Central
	Nexus Community	E	Sports & Leisure	
	Nexus Community	E	Sports & Leisure	
	NFT Distribution Limited	E	Transport & Motor vehicles	
	NHP (UK) Limited	E	Agricultural & Environmental services	
Clerk	Nonington Parish Council	J		Southeast
	Norbert Dentressangle	E	Transport & Motor vehicles	
Clerk	Normandy Parish Council	J		Central
CCDC	North East and North Central London Health Protection Unit	I		
Head of Leisure & Environmental Services	North Hertfordshire District Council	HC		
Acting Environmental Protection Manager	North Hertfordshire District Council	I		
	North Herts College	E	Education	
Clerk	North Mymms Parish Council	J		Central
Clerk	North Weald Bassett Parish Council	J		Central
Director	North West London Health Protection Unit	I		
Clerk	Northaw & Cuffley Parish Council	J		Central
Clerk	Northbourne Parish Council	J		Southeast
Clerk	Northchurch Parish Council	J		Central
Manager	Notcutts	E	Agricultural & Environmental services	
Clerk	Nuthampstead Parish Meeting	J		Central
Clerk	Oakington & Westwick Parish Council	J		Central
	Oaklands College	E	Education	
Clerk	Ockham Parish Council	J		Central
	Odyssey Knebworth LTD	E	Sports & Leisure	
Clerk	Offley Parish Council	J		Central
	OFWAT	FN		
	Old Fold Manor Golf Club	E	Sports & Leisure	
Chief librarian	Old Harlow Library	R		Central

Position	Organisation Name	code	sector	area
Clerk	Old Windsor Parish Council	J		Central
Clerk	Ongar Parish Council	J		Central
Clerk	Orwell Parish Council	J		Central
Clerk	Over Parish Council	J		Central
	Padfield (Hayleys) Ltd	E	Agricultural & Environmental services	
Clerk	Pampisford Parish Council	J		Central
Clerk	Papworth Everard Parish Council	J		Central
Chairman	Papworth St Agnes Parish Meeting	J		Central
Clerk	Penn Parish Council	J		Central
Clerk	Piddington and Wheeler End Parish Council	J		Central
Clerk	Pirbright Parish Council	J		Central
Clerk	Pirton Parish Council	J		Central
Clerk	Postling Parish Council	J		Southeast
Clerk	Preston Parish Council	J		Southeast
Clerk	Preston Parish Council	J		Central
Clerk	Princes Risborough Town Council	J		Central
Clerk	Puttenham Parish Council	J		Central
Clerk	Quendon & Rickling Parish Council	J		Central
Clerk	Radnage Parish Council	J		Central
Clerk	Radwell Parish Meeting	J		Central
Clerk	Radwinter Parish Council	J		Central
	Ramblers Association	K		
Chair	Rampton Parish Council	J		Central
Clerk	Ramsey & Parkeston Parish Council	J		East
Clerk	Redbourn Parish Council	J		Central
Clerk	Reed Parish Council	J		Central
	Rickmansworth Waterways Trust	M		
Clerk	Ridge Parish Council	J		Central
Clerk	Ringwould with Kingsdown Parish Council	J		Southeast
Clerk	Ripley Parish Council	J		Central
Clerk	Ripple Parish Council	J		Southeast
	River Chess Association	M		
	River Chess Group	M		
Clerk	River Parish Council	J		Southeast
Commercial Services Team Leader	Royal Borough of Windsor and Maidenhead	I		
	Royal Horticultural Society	M		
Clerk	Roydon Parish Council	J		Central
Clerk	Royston Town Council	J		Central
Water Policy Officer	RSPB	M		
	RSPB	M		
Development Officer	RSPB Central England Office	M		
Estates	Ruby Food Products	E	Manufacturing	
Head of Environmental Protection	Runnymede Borough Council	HC		
Chief Executive	Runnymede Borough Council	HX		
Environmental Health and Licensing Manager	Runnymede Borough Council	I		
Clerk	Rushden and Wallington Parish Council	J		Central
	Safestore	E	Manufacturing	
Chief librarian	Saffron Walden Library	R		Central
Clerk	Saffron Walden Parish Council	J		Central
Clerk	Saltwood Parish Council	J		Southeast
Clerk	Sandgate Parish Council	J		Southeast
Executive Officer	Sandhurst Town Council	J		Central
Clerk	Sandon Parish Council	J		Central
Clerk	Sandridge Parish Council	J		Central

Position	Organisation Name	code	sector	area
Clerk	Sarratt Parish Council	J		Central
Clerk	Sawbridgeworth Town Council	J		Central
Clerk	Sawston Parish Council	J		Central
Clerk	Seale & Sands Parish Council	J		Central
Clerk	Seer Green Parish Council	J		Central
Clerk	Sellindge Parish Council	J		Southeast
Clerk	Send Parish Council	J		Central
Clerk	Shackleford Parish Council	J		Central
Clerk	Shalford Parish Council	J		Central
Clerk	Sheering Parish Council	J		Central
Clerk	Shenley Parish Council	J		Central
Clerk	Shepherdswell-with-Coldred Parish Council	J		Southeast
Clerk	Shepreth Parish Council	J		Central
Chief Executive	Shepway District Council	HC		
Chief Executive	Shepway District Council	HX		
Environmental Health Officer	Shepway District Council	I		
Clerk	Shere Parish Council	J		Central
Clerk	Sholden Parish Council	J		Southeast
Chairman of the Parish Meeting	Shottesbrooke Parish Council	J		Central
Clerk	Shudy Camps Parish Council	J		Central
Clerk	Slip End Parish Council	J		Central
Strategic Director	Slough Borough Council	HC		
Chief Executive	Slough Borough Council	HX		
Food & Safety Manager	Slough Borough Council	I		
Head of Sustainable Development	South Bucks District Council	HC		
Head of Environment	South Bucks District Council	HC		
Director of Services	South Bucks District Council	HC		
Chief Executive	South Bucks District Council	HX		
Environmental Health Manager	South Bucks District Council	I		
Executive Director	South Cambridgeshire District Council	HC		
Corporate Manager	South Cambridgeshire District Council	HC		
Chief Executive	South Cambridgeshire District Council	HX		
Managing Director	South East Water Ltd	P		
Deputy Chief Executive	Spelthorne Borough Council	HC		
Head of Environmental Services	Spelthorne Borough Council	HC		
Chief Executive	Spelthorne Borough Council	HX		
Environmental Health Manager	Spelthorne Borough Council	I		
Facilities Manager	St Edmunds College	E	Education	
Clerk	St Ippolyts Parish Council	J		Central
Clerk	St James Parish Council	J		East
Clerk	St Margarets-At-Cliffe Parish Council	J		Southeast
Clerk	St Martha Parish Council	J		Central
Clerk	St Mary in the Marsh Parish Council	J		Southeast
Clerk	St Michael Parish Council	J		Central
Clerk	St Osyth Parish Council	J		East
Clerk	St Paul's Walden Parish Council	J		Central
Clerk	St Stephen Parish Council	J		Central
Regulatory Services Manager	St. Albans City and District Council	I		
Head of Environmental & Regulatory Services	St. Albans City Council	HC		
Chief Executive	St. Albans City Council	HX		
Chief librarian	Staines Library	R		Central
Clerk	Stanbridge Parish Council	J		Central
Clerk	Stanford Parish Council	J		Southeast
Clerk	Stanford Rivers Parish Council	J		Central
Clerk	Stanstead Abbotts Parish Council	J		Central
Clerk	Stanstead St Margarets Parish Council	J		Central
Clerk	Stansted Mountfitchet Parish Council	J		Central

Position	Organisation Name	code	sector	area
Clerk	Staple Parish Council	J		Southeast
Clerk	Stapleford Abbotts Parish Council	J		Central
Clerk	Stapleford Parish Council	J		Central
Clerk	Stapleford Tawney Parish Council	J		Central
Manager	Station Hotel Newcastle	E	Hotels, Catering and Laundry Services	
Clerk	Stelling Minnis Parish Council	J		Southeast
Strategic Director of Environmental Services	Stevenage Borough Council	HC		
Strategic Director	Stevenage Borough Council	HC		
Principal Community Development Manager	Stevenage Borough Council	HC		
Green Spaces Policy and Development Manager	Stevenage Borough Council	HC		
Chief Executive & Head of Paid Service	Stevenage Borough Council	HX		
Environmental Health Manager (Commercial Services)	Stevenage Borough Council	I		
Clerk	Stocking Pelham Parish Council	J		Central
Clerk	Stokenchurch Parish Council	J		Central
Clerk	Stourmouth Parish Council	J		Southeast
Clerk	Stow-cum-Quy Parish Council	J		Central
Clerk	Streatley-Parish-Council	J		Central
Clerk	Strethall Parish Council	J		Central
Clerk	Studham-Parish-Council	J		Central
Clerk	Sundon-Parish-Council	J		Central
Clerk	Sunningdale Parish Council	J		Central
Clerk	Sunninghill & Ascot Parish Council	J		Central
CCDC	Surrey and Sussex Health Protection Unit	I		
Strategic Director for Environment and Infrastructure	Surrey County Council	HC		
Chief Executive	Surrey County Council	HX		
Head of Built Environment	Surrey Heath Borough Council	HC		
Chief Executive	Surrey Heath Borough Council	HX		
Senior Environmental Health Officer	Surrey Heath Borough Council	I		
Clerk	Sutton-By-Dover Parish Council	J		Southeast
Clerk	Swavesey Parish Council	J		Central
Chairman	Tadlow (Parish Meeting) Parish Council	J		Central
Clerk	Takeley Parish Council	J		Central
Chief Executive	Tendring District Council	HC		
Chief Executive	Tendring District Council	HX		
	Tendring District Council	O		
Clerk	Tendring Parish Council	J		East
Clerk	Teversham Parish Council	J		Central
Secretary	Tewin Flyfishing Club	M		Central
Clerk	Tewin Parish Council	J		Central
Manager	TGF Pizza	E	Food, Drink, Tobaco and retail services	
CEO	Thames Water Utilities Ltd	P		
Clerk	Thaxted Parish Council	J		Central
	The Association of Professional Landscapers	L		
Secretary	The Audley Fly Fishing Club	M		Central
	The British Association of Leisure Parks, Piers and Attractions Ltd.	L		
	The British Veterinary Association	L		
Business Manager	The Chauncy School	E	Education	
	The England and Wales Cricket Board	L		

Position	Organisation Name	code	sector	area
	The Football Association	L		
	The Independents hotel Association	L		
Clerk	The Lee Parish Council	J		Central
	The National Society of Allotment and Leisure Gardeners Ltd.	L		
	The National Trust	K		
Strategic Director of Environmental Services and Deputy Chief Executive	The Royal Borough of Windsor and Maidenhead	HC		
Chief Executive	The Royal Borough of Windsor and Maidenhead	HX		
	The Swimming Pool and Allied Trades Association	L		
	The Upham Pub Company	E	Hotels, Catering and Laundry Services	
Accounts	The Weybridge Club	E	Sports & Leisure	
Clerk	Therfield Parish Council	J		Central
Clerk	Theydon Bois Parish Council	J		Central
Clerk	Theydon Garnon Parish Council	J		Central
Clerk	Thorley Parish Council	J		Central
Clerk	Thorpe-le-Soken Parish Council	J		East
Clerk	Thorrington Parish Council	J		East
Director of Community & Environmental Services	Three Rivers District Council	HC		
Chief Executive	Three Rivers District Council	HX		
Residential Standards Manager	Three Rivers District Council	I		
Clerk	Thriplow Parish Council	J		Central
Clerk	Tilmanstone Parish Council	J		Southeast
Clerk	Tilsworth Parish Council	J		Central
Clerk	Toddington Parish Council	J		Central
Clerk	Toft Parish Council	J		Central
Clerk	Tongham Parish Council	J		Central
Accounts manager	Total UK Ltd	E	Manufacturing	
Clerk	Totternhoe Parish Council	J		Central
Clerk	Tring Rural Parish Council	J		Central
Clerk	Tring Town Council	J		Central
	Turfgrass Growers Association	L		
Clerk	Turville Parish Council	J		Central
Clerk	Ugley Parish Council	J		Central
Member of the European Parliament	UK Government	GE		
Member of the European Parliament	UK Government	GE		
Member of the European Parliament	UK Government	GE		
Member of the European Parliament	UK Government	GE		
Member of the European Parliament	UK Government	GE		
Member of the European Parliament	UK Government	GE		
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Member of the European Parliament	UK Government	GE		
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Member of Parliament	UK Government	GM		

Position	Organisation Name	code	sector	area
Member of Parliament	UK Government	GM		
Member of Parliament	UK Government	GM		
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Member of Parliament	UK Government	GM		
Member of Parliament	UK Government	GM		
Member of Parliament	UK Government	GM		
Member of Parliament	UK Government	GM		
	UK Sport	L		
Director of Operations	Uttlesford District Council	HC		
Chief Executive	Uttlesford District Council	HX		
Head of Environmental Health	Uttlesford District Council	I		
Secretary	Ver Valley Society	M		
	Ver Valley Society	M		
	Ver Valley Society	M		
Clerk	Walkern Parish Council	J		Central
Clerk	Waltham Abbey Town Council	J		Central
Clerk	Waltham St Lawrence Parish Council	J		Central
Clerk	Wanborough Parish Council	J		Central
Clerk	Ware Town Council	J		Central
Clerk	Wareside Town Council	J		Central
Clerk	Warfield Parish Council	J		Central

Position	Organisation Name	code	sector	area
Clerk	Waterbeach Parish Council	J		Central
Head of Environmental Services	Watford Borough Council	HC		
Executive Director (Services)	Watford Borough Council	HC		
Managing Director	Watford Borough Council	HX		
Environmental Health Manager	Watford Borough Council	I		
Clerk	Watford Rural Parish Council	J		Central
	Watling Chase Community Forest	M		
Clerk	Watton-At-Stone Parish Council	J		Central
Clerk	Weeley Parish Council	J		East
Director Strategy and Development	Welwyn Hatfield Borough Council	HC		
Chief Executive	Welwyn Hatfield Borough Council	HX		
Environmental Health Team Leader	Welwyn Hatfield Council	I		
Clerk	Welwyn Parish Council	J		Central
Procurement Manager	Wembley Arena	E	Sports & Leisure	
Clerk	Wendens Ambo Parish Council	J		Central
Clerk	Wendens Lofts Parish Council	J		Central
	West Berkshire	I		
Clerk	West Clandon Parish Council	J		Central
Clerk	West End Parish Council	J		Central
Clerk	West Horndon Parish Council	J		Central
Clerk	West Horsley Parish Council	J		Central
Clerk	West Wickham Parish Council	J		Central
Clerk	West Wycombe Parish Council	J		Central
Chairman	Westmill Parish Council	J		Central
Clerk	Weston Colville Parish Council	J		Central
Clerk	Weston Parish Council	J		Central
Clerk	Wexham Court Parish Council	J		Central
Chief librarian	Weybridge Library	R		Central
Clerk	Whaddon Parish Council	J		Central
Clerk	Wheathampstead Parish Council	J		Central
Clerk	Whipsnade Parish Council	J		Central
Chiltern Society	White Hill Centre	M		
Clerk	White Roding Parish Council	J		Central
Clerk	White Waltham Parish Council	J		Central
Clerk	Whitfield Parish Council	J		Southeast
Clerk	Whittlesford Parish Council	J		Central
Clerk	Wicken Bonhunt Parish Council	J		Central
Chairman	Widdington Parish Council	J		Central
Clerk	Widford Parish Council	J		Central
Clerk	Wigginton Parish Council	J		Central
Chief librarian	Willesden Green Library Centre	R		Central
Clerk	Willingham Parish Council	J		Central
Clerk	Wimbish Parish Council	J		Central
Clerk	Wimpole Parish Council	J		Central
Clerk	Windlesham Parish Council	J		Central
Clerk	Wingham Parish Council	J		Southeast
Clerk	Winkfield Parish Council	J		Central
Clerk	Wivenhoe Parish Council	J		East
Clerk	Wix Parish Council	J		East
Neighbourhood Services Manager	Woking Borough Council	HC		
Strategic Director	Woking Borough Council	HC		
Chief Executive	Woking Borough Council	HX		
Neighbourhood Services Manager	Woking Borough Council	I		
	Woking Football Club	E	Sports & Leisure	
Chief librarian	Woking Library	R		Central
Assistant Clerk	Wooburn & Bourne End Parish Council	J		Central

Position	Organisation Name	code	sector	area
Clerk	Woolmer Green Parish Council	J		Central
	World Wildlife Fund	K		
Policy and Programme Officer	World Wildlife Fund	M		
Clerk	Worplesdon Parish Council	J		Central
Clerk	Worth Parish Council	J		Southeast
Clerk	Wrabness Parish Council	J		East
Clerk	Wraysbury Parish Council	J		Central
	WWF	O		
Head of Environment	Wycombe District Council	HC		
Corporate Director	Wycombe District Council	HC		
Chief Executive	Wycombe District Council	HX		
Divisional Environmental Health Officer	Wycombe District Council	I		
Chairman	Wyddial Parish Meeting	J		Central
Clerk	Wymondley Parish Council	J		Central
CCG Chair		O		
County Councillor	Hertfordshire County Council (St Albans South Division)	HC		Central
	Ver Valley Society	M		Central
Vice Chair	St Albans Civic Society	N		