Water Resources Management Plan 2014

Main Report

South Staffs Water

FINAL WATER RESOURCES MANAGEMENT PLAN 2014

PART 1
MAIN REPORT

Contents

1 EXECUTIVE SUMMARY 9
1.1 Progress since the 2009 Water Resources Management Plan 10
1.2 Changes to the 2014 Water Resources Management Plan between Draft and Final versions 12
1.3 Overview of the Demand Forecast 12
1.4 Overview of the Water Supply Forecast 16
1.5 Overview of Headroom Uncertainty 17
1.6 Sensitivity 17
2 BACKGROUND 21
2.1 Description of South Staffordshire Water 21
2.2 Context 22
2.2.1 Water White Paper 22
2.2.2 Statement of Obligations 23
2.2.3 Ofwat Framework for Setting Price Controls for 2015-20 23
2.2.4 Water Framework Directive and the Catchment-Based Approach 24
2.2.5 Water Stress 24
2.2.6 Water Resources Planning Guideline Guiding Principles 25
2.2.7 Consistency with the Regulatory Environment 27
2.3 Links to Other Plans 27
2.3.1 PR14 Business Plan 27
2.3.2 Drought Plan 28
2.3.3 Strategic Environmental Assessment Directive (SEA) 28
2.4 Company Policies 29
2.4.1 The Environment 29
2.4.2 Optimisation of Existing Operations 31
2.4.3 Levels of Service 31
2.4.4 Metering 33
2.4.5 Water Efficiency 35
2.4.6 Leakage 38
2.5 National Security and Commercial Confidentiality 47
2.6 Document Structure 47

3 PLAN CONTENT AND DEVELOPMENT 48
3.1 Planning Period 48
3.2 Water Resource Zone Integrity Definition 48
3.3 Planning Scenarios 49
3.4 Climate Change 51
3.5 Sensitivity Analysis 51
3.5.1 Data Uncertainty 51
3.5.2 Sensitivity of Plan to Changes in Supply-Demand Balance 52
3.6 Other Licensed Water Undertakers in South Staffs Water's Area of Supply 52
3.7 Severn Trent Water 52
3.7.1 HL Abstraction Licence Entitlement 52
3.7.2 River Severn Modelling 53
3.7.3 Bulk Supplies 53
3.8 Water Trading 53
3.9 Internal Governance 54
4 CUSTOMER ENGAGEMENT 56
4.1 Overview 56
4.2 Pre-Consultation 56
4.2.1 Statutory Pre-Consultation 57
4.2.2 Environment Agency Liaison 59
4.2.3 Approach to Research on Customer Priorities and Initial Willingness to Pay 59
4.2.4 Summary of Focus Group Workshop Methodology 60
4.2.5 Summary of Customer Challenge Group Engagement 62
4.3 Further Customer Engagement since the dWRMP 63
4.3.1 Public Consultation on the dWRMP 64
4.3.2 Willingness to Pay Research 65
4.3.3 Consultation on Business Plan Initial Proposals 66
4.3.4 Acceptability Testing 67
4.4 Research Outcomes 68
4.4.1 Priorities 68
4.4.2 Metering 71
4.4.3 Water Efficiency 72
4.4.4 Leakage 72
4.4.5 Level of Service 73
4.4.6 The Environment 74
4.4.7 Willingness to Pay 75
4.4.8 Acceptability 77
4.4.9 Summary 78

5 DEMAND FOR WATER 79
5.1 Summary of the Demand Forecast 80
5.2 Changes in Demand Since the 2009 fWRMP 82
5.3 Changes to Demand Position Since Publication of the 2013 dWRMP 82
5.4 Methodology 83
5.5 Base Year 85
5.5.1 Review of 2011/12 86
5.5.2 The Relationship Between Demand and Climate 87
5.6 Population Projections 90
5.6.1 Population Data Availability 90
5.6.2 Population Forecast Methodology 92
5.7 Property Projections 93
5.7.1 New Household Property Projections 93
5.7.2 Metered Property Projections 94
5.7.3 Non-Household Properties 98
5.7.4 Void Properties and Demolitions 98
5.8 Household Occupancy Rates 99
5.8.1 Base Year Occupancy Rates and Overall Occupancy Projections 99
5.8.2 Unmeasured Household Occupancy 99
5.8.3 Measured Household Occupancy 99
5.8.4 Meter Optant Household Occupancy 99
5.8.5 New Supply Household Occupancy 100
5.8.6 Change of Occupier Household Occupancy 100
5.8.7 Overview of Household Occupancy 100
5.9 Household Demand (Final Planning Forecast) 100
5.9.1 Per Capita Consumption (PCC) and Micro-component Forecasts 101
5.10 Non-Household Demand 104
5.11 Leakage Forecast 109
5.12 Minor Components of Water Use 111
5.13 Climate Change Impacts on Demand 111
5.14 Water Efficiency in the Demand Forecasts 112
5.15 Dry Year Demand 113
5.16 Critical Period (peak week) Demand 115
5.17 Weighted Annual Average Demand 116
6 WATER SUPPLY 118
6.1 Overview 118
6.2 Deployable Output Assessment 119
6.2.1 Background 119
6.2.2 Description of the Supply System 119

6.2.3 Planning Scenario 120
6.2.4 Methodology 121
6.2.5 Description of model 122
6.2.6 Assessment of Average and Peak Deployable Output 125
6.2.7 Baseline Levels of Service and Deployable Output Assessment Results 126
6.3 The Impact of Climate Change on Deployable Output 131
6.3.1 Background 131
6.3.2 Vulnerability Assessment 131
6.3.3 Choice of assessment approach 133
6.3.4 Application of assessment approach and calculation of river flows 134
6.3.5 Calculation of deployable output in the 2030's 137
6.3.6 Scaling of impacts over planning period 138
6.3.7 Changes in Deployable Output due to Company investment plans 140
6.4 Outage 142
6.4.1 Methodology 142
6.4.2 Outage Data 142
6.4.3 Company Level of Risk 143
6.4.4 Outage Results 145
6.5 Sustainability Reductions 147
7 HEADROOM 150
7.1 Overview 150
7.2 Methodology 150
7.3 Company Level of Risk 151
7.4 Headroom Results 152
7.5 Headroom and Levels of Service 153
8 BASELINE SUPPLY DEMAND BALANCE 154
9 FINAL SUPPLY DEMAND BALANCE 157
10 SENSITIVITY TESTING 160
11 CARBON EMISSIONS 167
12 FUTURE UPDATES OF THE FINAL WATER RESOURCES MANAGEMENT PLAN 169

PART 2
WRP TABLES AND COMMENTARIES

LIST OF APPENDICES

Appendix	Title
A	Headroom Components and Model Results
B	Calculation of Deployable Output
C	Customer Service Priorities and Initial Willingness to Pay Report by MVA
D	South Staffs Water WRMP Customer Engagement Report by Community Research
E	CCG Briefing Notes
F	Household Occupancy and Micro-Component Methodology
G	Peak Demand Forecast Report by Atkins
H	Outage Assessment
I	Compliance with Water Resources Management Plan Directions
J	Statement of Response

FOREWORD FROM THE MANAGING DIRECTOR

The Water Resources Management Plan sets out our water resources and demand projections for the Company's South Staffs region of supply, for the next 25 years. The Company does not forecast a supply demand deficit within the 25 year planning horizon, therefore major resource development or demand management measures are not required to meet a supply shortfall.

Ensuring that all of our customers have a plentiful supply of high quality drinking water is at the heart of our business. We are proud of our record of not having a hosepipe ban since the drought of 1976 and this plan demonstrates that we will continue to maintain the highest levels of security of supply to our customers.

However, we recognise the pressures that taking water from the environment for public water supply can have on flora and fauna and therefore will continue to promote increased metering so that customers can better understand how much water they use and can make most benefit from our water efficiency activities. Research with our customers has shown that most agree that meters are the fairest way to pay for water and support further metering.

Alongside the metering programme, we will refocus and reinforce our activities in the area of water efficiency to provide our customers with the information they need to make informed decisions about using water wisely. We will also continue to work hard to maintain leakage at the economic level. Our proposed leakage targets from 2015 are significantly lower than current targets set by Ofwat for the AMP5 period.

We have consulted customers and keys stakeholders during the preparation of this plan and the views we obtained have helped shape our proposals. More customer engagement has been undertaken than ever before.

It now gives me great pleasure to present to you the Company's final Water Resources Management Plan for the period 2015 to 2040.

Phil Newland
Managing Director

1 EXECUTIVE SUMMARY

Overview of the Final Water Resources Management Plan

Customer Views
The Company has consulted with customers and key stakeholders during the preparation of the fWRMP and has gained views on key strategy areas. For issues relevant to the fWRMP customers place high importance on metering, leakage levels, the environment and water efficiency activity. The Company believes it has taken customer views on board in the development of its proposals in these areas.

Levels of service
The Company's planned level of service for customer restrictions is 1 in 40 years on average. Customers have not indicated they wish this to change.

Metering
The Company is forecasting a significant increase in domestic meter penetration through the following metering policies; metering of new households, free meter options, compulsory metering for customers with swimming pools or ponds greater than 10,000 litres capacity and of domestic customers wishing to use unattended garden watering devices and subject to funding in the next price review, change of occupier metering (introduced in 2010). The combined impact of these policies is to increase domestic meter penetration from around 30% to 73% by the end of the period.
Customers have indicated they support increased metering.

Leakage
The sustainable economic level of leakage (SELL) appraisal has been updated in accordance with best practice and latest available data. The resulting normal year SELL has been assessed as 70.54Ml/d which compares to a current leakage target of 74Ml/d. A forecast increase in the cost of carbon from 2020 could have the impact of reducing the SELL even further during AMP7 into the early part of AMP8. This could reduce the steady state SELL by circa 4 Ml/d between 2020 and 2030.
Customers have indicated they want leakage levels to reduce but are not willing to pay for it to be reduced beyond what is economic.

Water Efficiency
The Company will continue to promote water efficiency through a number of policies throughout the plan period.
Customers have indicated that water efficiency is important.
The Company will seek to integrate metering and water efficiency policies with the affordability issue so that metered customers who struggle to pay their bill are informed of how they can reduce their bill by using less water.

Overview of the Final Water Resources Management Plan Continued

The Environment
The Company has included sustainability reductions as confirmed in the phase 4 NEP release in the fWRMP and has taken into consideration uncertainty around the Water Framework Directive.

Climate Change
The Company has used the latest UKWIR guidance to assess the impact of climate change on both the future demand for water and the future availability of water supply.

The Supply Demand Balance
The Company has sufficient resources to meet forecast demand plus target headroom for both dry year annual average and peak week conditions throughout the plan period. The Company projects a surplus in the supply demand balance of the order of 22Ml/d at the end of the plan.

Water Trading
The Company is actively discussing the potential for South Staffs Water to provide Severn Trent Water with water to address its supply demand deficit. However, they do not require additional water until the middle of the plan period.

The Company is pleased to present this fWRMP for the South Staffs region. Customers in this region currently receive an average water bill that is over 20% cheaper than the national average, and the service they receive is already high. The Company is delighted that this plan allows it to continue to offer customers good value, keeping bills low and providing a high service. The plan is not radically different to previous plans, there is still a healthy supply surplus. But the Company is nevertheless proposing a 5% reduction in the leakage target over the medium term; it is in agreement with the Environment Agency over phase 3 of the National Environment Programme; and its metering policies are such that change of occupier metering will continue even though there is no deficit to address. This is because customers recognise the wider benefits of metering. The improvements proposed for metering, leakage and the environment all recognise that water is a precious resource.

1.1 Progress since the 2009 Water Resources Management Plan

The Company has undertaken a comprehensive review of both supply and demand for this fWRMP. The main changes are summarised as follows:

- The water resources modelling software platform has been changed and the model parameters comprehensively reviewed and updated.
- All groundwater deployable outputs have been reviewed to reflect performance in the 2011 drought.
- Surface water flow models have been reviewed and a conjunctive use deployable output assessed under a number of different level of service scenarios.
- The impact of climate change on water supply has been assessed using the latest UKWIR methodology using the more comprehensive UKCP09 data sets.
- The data record for outage events has been extended and the outage allowance reassessed.
- Headroom uncertainty has been reassessed using latest figures.
- The SELL appraisal has been updated using latest data and is based on the latest industry methodology.
- The dry year factor has been reviewed.
- The peak week volume has been reassessed using an extended data record to produce more robust regression models.
- The Company's econometric model for forecasting non-household demand has been updated with latest explanatory factors and data in order to reflect the economic downturn which had started to become evident as the 2009 Water Resources Management Plan was being compiled.
- Latest Local Authority Development Plans have been used to forecast housing growth. These replace the Regional Spatial Strategies used in the last plan.
- Current and forecast population has been updated for latest 2011 census outputs. The Company has undertaken two household occupancy and water use surveys in 2010 and 2012 to define the base year micro-components and household occupancies of different customer categories.
- A new micro-component model, Micro-F, has been designed by consultant RPS for the Company to use for per capita consumption forecasting.

In addition to revisions to the supply and demand components the Company has undertaken more customer engagement than ever before during all stages of the development of the fWRMP and as part of the wider customer engagement for the PR14 Business Plan.

1.2 Changes to the 2014 Water Resources Management Plan between Draft and Final versions

Following the formal public consultation on the dWRMP the Company published a Statement of Response (SoR) detailing any changes to the plan arising from the representations received. The SoR is included in this plan as Appendix J.

The dWRMP also highlighted that the Company expected to update the fWRMP in areas where more up to date information would become available. This included the incorporation of further releases of data from the 2011 Census into the demand forecast; the latest release of the National Environment Programme (Stage 3); and further information arising from customer research and the PR14 business plan process.

The following areas of the fWRMP have been updated:

- Leakage
- Customer Engagement
- Population, properties and demand
- National Environment Programme (NEP)
- Water Efficiency
- Water trading
- Catchment management
- Biodiversity

None of the updates have resulted in a material change in our plans to manage the supply demand balance over the 25 year planning period.

1.3 Overview of the Demand Forecast

Overview of Water Demand Forecast

Household Demand

There are a number of factors influencing the forecast of household demand:

- Increasing population
- Increasing households
- Decreasing household occupancy levels
- Improved efficiency of water using appliances
- Metering policies
- Promotion of water efficiency

Overview of Water Demand Forecast Continued

Non - Household Demand
An econometric model developed for the Company by Deloitte's has been updated to forecast non-household demand by sector. A significant drop in demand has been seen over recent years due to the economic downturn. This included the closure of the Company's third largest user. A further small decline in demand is forecast for the remaining years of AMP5 before it stabilises and grows slowly over the remainder of the plan period.

Metering Strategy
The Company proposes to continue with the following existing metering policies subject to funding at the next price review:

- Free meter policy
- New supply policy.
- Compulsory metering policy for customers with swimming pools or ponds greater than 10,000 litres capacity and of domestic customers wishing to use unattended garden watering devices
- Compulsory metering of all non-household properties where it is possible to install a meter at reasonable cost. Already 95% of non-households are metered.
- Change of occupier metering policy

Domestic meter penetration will rise from the current level of around 30% to 40% at the end of 2019/20 and to 73% by the end of the plan period. If the discretionary change of occupier metering policy is not funded at the next price review meter penetration would reach only 64% by the end of the period.

Water Efficiency
The Company has assumed the continuation of water efficiency targets for AMP6 and AMP7 and that it will achieve these.

Leakage
The SELL appraisal has been updated in accordance with best practice and latest available data. The resulting normal year SELL has been assessed as 70.54Ml/d which compares to the current target of 74Ml/d. A forecast increase in the cost of carbon from 2020 could have the impact of reducing the SELL even further during AMP7 into the early part of AMP8. This could reduce the steady state normal year SELL by circa 4 Ml/d between 2020 and 2030.

The Company does not have a supply demand deficit and therefore there are no demand options presented in this fWRMP. The Company has presented a baseline demand forecast excluding the effects of change of occupier metering, since this activity is discretionary. Whilst this is a baseline metering policy for the Company the guidance in the Environment Agency Water

Resources Planning Guideline has been followed and this metering policy has been included only in the final planning demand forecast from 2015/16.

The fWRMP tables present only the dry year annual average and peak week scenarios. Both of these are built up from the normal year demand forecast.

Over the 25 year planning period distribution input in the baseline dry year scenario is forecast to increase by 9Ml/d. Household water demand is forecast to rise by 13Ml/d and non-household consumption by almost 2Ml/d. This increase in customer water use is largely off-set by a forecast reduction in distribution losses.

Total household population is forecast to rise by approximately 188,000 people over the 25 years and it is forecast there will be an additional 118,000 homes by the end of the period. Under the Company's proposed metering strategies an additional 302,000 meters would be installed with 59,000 of these being installed on change of occupancy. Domestic meter penetration would rise from around 30% at the beginning of the period to around 73% by the end. If change of occupier metering is not funded at the next price review meter penetration will reach only 64%.

The household demand forecasts include assumed savings due to water efficiency activity. Currently water efficiency targets are calculated on 1 litre/property/day where average pcc is above 130 l/h/d. When pcc falls below this level the target is based on 0.5 litre/property/day. The Company's demand forecasts estimate that average pcc under normal year conditions will fall below this threshold in 2018/19. Under the dry year scenario it reduces to less than 130l/h/d after 2031/32. Therefore, if water efficiency targets continue to be set on this same basis the Company's target would fall to 0.26Ml/d during AMP6.

However, the Company has taken a prudent approach and has included the achievement of the full current Ofwat water efficiency targets in the demand forecasts for the period 2015/16 to 2019/20, equivalent to 2.65Ml/d by 2020. For the period 2020/21 to 2024/25 the Company has assumed a 'half target'. Thereafter, savings from water efficiency are assumed to be inherent within the micro-component forecasts and non-household forecasts. For the AMP6 period it is assumed that 0.27Ml/d of the 0.53Ml/d target will be derived from hard measures and 0.16Ml/d from soft measures applied to household demand and the residual from non-household demand. For AMP7 these savings are assumed to be halved.

An econometric model has been used to forecast non-household demand by sector. A significant drop in demand has been seen over recent years due to the economic downturn. A further small decline in demand is forecast for the remaining years of AMP5 before it stabilises and grows slowly over the remainder of the plan.

The SELL appraisal has been updated in accordance with best practice and latest available data and is described in section 2.4.6 of the fWRMP. The

Company's AMP6 leakage management strategy is to maintain leakage at the SELL unless customers are willing to pay for reductions below the economic level.

The resulting normal year SELL has been assessed as 70.54Ml/d for 2015/16, compared to the current target of 74Ml/d. A forecast increase in the cost of carbon from 2020 could have the impact of reducing the SELL during AMP7 into the early part of AMP8. This could reduce the steady state SELL by circa 4 Ml/d between 2020 and 2030.This potential reduction is based on a steady state SELL, and transitional costs need to be assessed periodically and at appropriate timescales, to ensure it is economic to move to and maintain the lower level of leakage.

Normal year demand has been converted to dry year demand by the application of a dry year factor of 4.1% to household demand. This factor was derived from a review of climatic factors and per household consumption. The adjustment has been applied to both the measured and unmeasured household demand in a normal year.

The Company commissioned Atkins Ltd to reassess household consumption in the critical period (peak week) by applying the 2006 UKWIR Peak Water Demand Forecasting Methodology 06/WR/01/7. This work produced peak week household demand (PWHH) rather than a peak volume (difference between average and peak week distribution input) which was the approach taken for the 2009 fWRMP.

To derive total peak week demand in the base year, normal year household demand is deducted from normal year distribution input and the calculated forecast household peak demand is substituted. It is assumed that the proportion of PWHH demand to normal household demand in the base year remains constant over the planning period. Therefore as normal year household demand increases over the planning period so does PWHH demand.

In accordance with the Environment Agency Water Resources Planning Guideline the impact of climate change on demand is not included in the overall supply demand balance. The Company has accounted for the uncertainty associated with the impact of climate change on demand in headroom.

1.4 Overview of the Water Supply Forecast

Overview of Water Supply Forecast

Deployable output assessment

The Company has undertaken a comprehensive review of its deployable output assessment for the 2014 fWRMP and has moved to a new Aquator software platform (previously this was based on WRAPSIM). Water lost during the treatment process is now included in the deployable output model and is not shown separately. A comprehensive review of losses was undertaken in 2010/11 for inclusion in the new model.

Deployable output for dry year annual average for the 2014 fWRMP has been estimated as 370Ml/d. This compares to 363Ml/d for the 2009 WRMP (a change of less than 2% from the last assessment). As part of the overall review of deployable output the seasonal changes in water use have been revised. As a result the deployable output for peak week is now assessed as 458.1Ml/d which is an increase of 7% compared to the 2009 WRMP figure.

Levels of service

The Company's planned level of service for customer restrictions is 1 in 40 years on average. Customers have not indicated they wish this to change.

Impacts of climate change on deployable output

The Company updated its assessment of the impacts of climate change on water supply for the dWRMP. The dry year annual average supply demand balance includes a reduction in deployable output of 5.55Ml/d by 2039/40 and 6.88Ml/d for peak week. The uncertainty around climate change impacts on supply has been included in headroom.

Outage

The Company has followed UKWIR best practice for assessing outage allowance. The dry year annual average outage allowance has been modelled at 9.81Ml/d and 10.26Ml/d for peak week. These figures are similar to those used in the 2009 WRMP.

Sustainability reductions

The Company has included all schemes included in the phase 3 NEP release resulting in a total sustainability reduction of 10Ml/d.

1.5 Overview of Headroom Uncertainty

Overview of Headroom

The Company has continued to adopt the UKWIR best practice approach to headroom. Each element of headroom has been reviewed, and updated where appropriate for the fWRMP. Minor changes have been made to the supply components following a review of constraints affecting deployable output. A similar review has been made of demand components to reflect latest information or studies during AMP5 and water efficiency activities. An additional headroom component for new sourceworks has been assessed following progress on borehole maintenance work in AMP5. The influence of climate change on supply has been reassessed using UKCP09 climate change data.

The Company has retained the same level of risk regarding the target headroom estimate as was previously used for the 2009 fWRMP. This is 10% until 2025 and then progressively increases to reach 20% in 2039/40. This is considered to be a prudent level of risk reflecting the fact that the Company will work to reduce future uncertainties over time.

Headroom is between 2.5% and 3.5% of dry year demand, and between 2.1% and 2.8% of peak week demand.

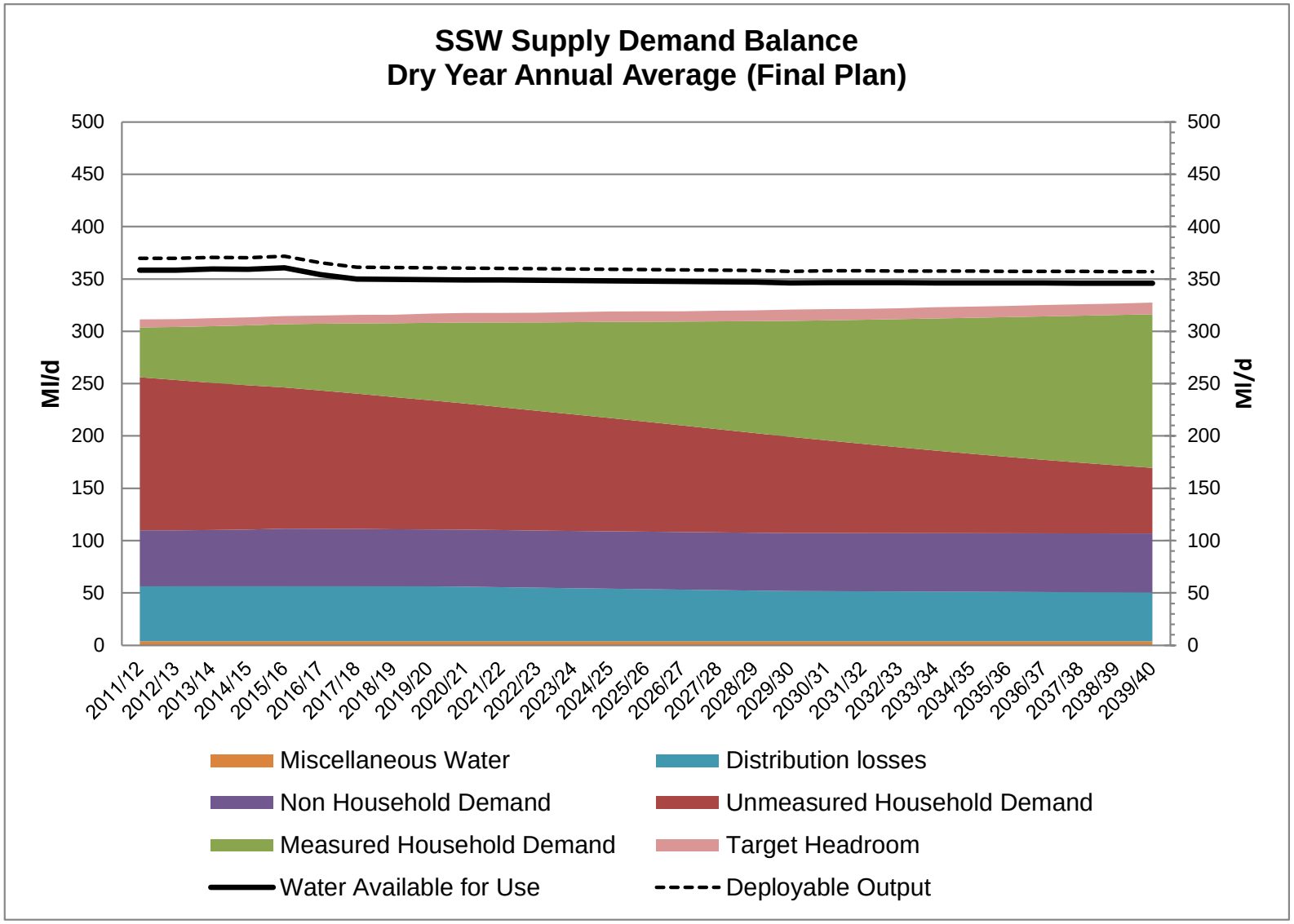
1.6 Sensitivity

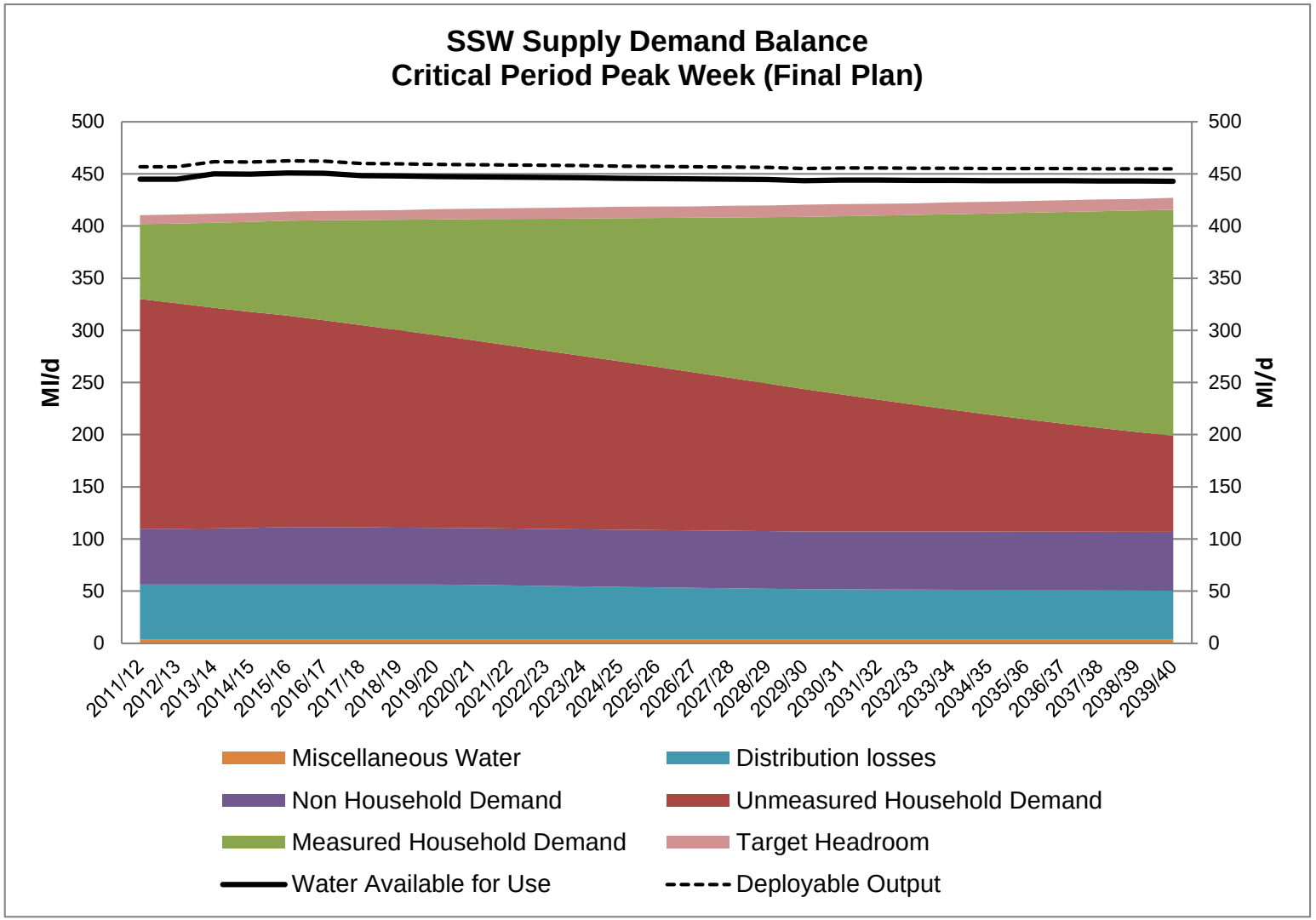
The Company has tested the sensitivity of the fWRMP to ensure that it is resilient to minor changes. The Company has considered the main factors which might impact on the supply demand balance and produced one overall alternative supply demand balance scenario for both peak week and dry year annual average.

The range of factors which could influence either supply or demand has been considered. The factors considered to present the most likely additional impact on the supply demand balance are water trading (+10Ml/d on demand), changes to costs and benefits which mean the potential leakage reduction is not economic (+4Ml/d on demand) and a potential additional reduction in deployable output due to Article 4 of the Water Framework Directive (-3Ml/d).

For the dry year annual average scenario these figures are less than the forecast surplus at the end of the planning period and therefore there is no requirement to change the Company's plan or present a set of options which might be required. For the peak week scenario there is a 1Ml/d deficit in the supply demand balance in the final year of the plan.

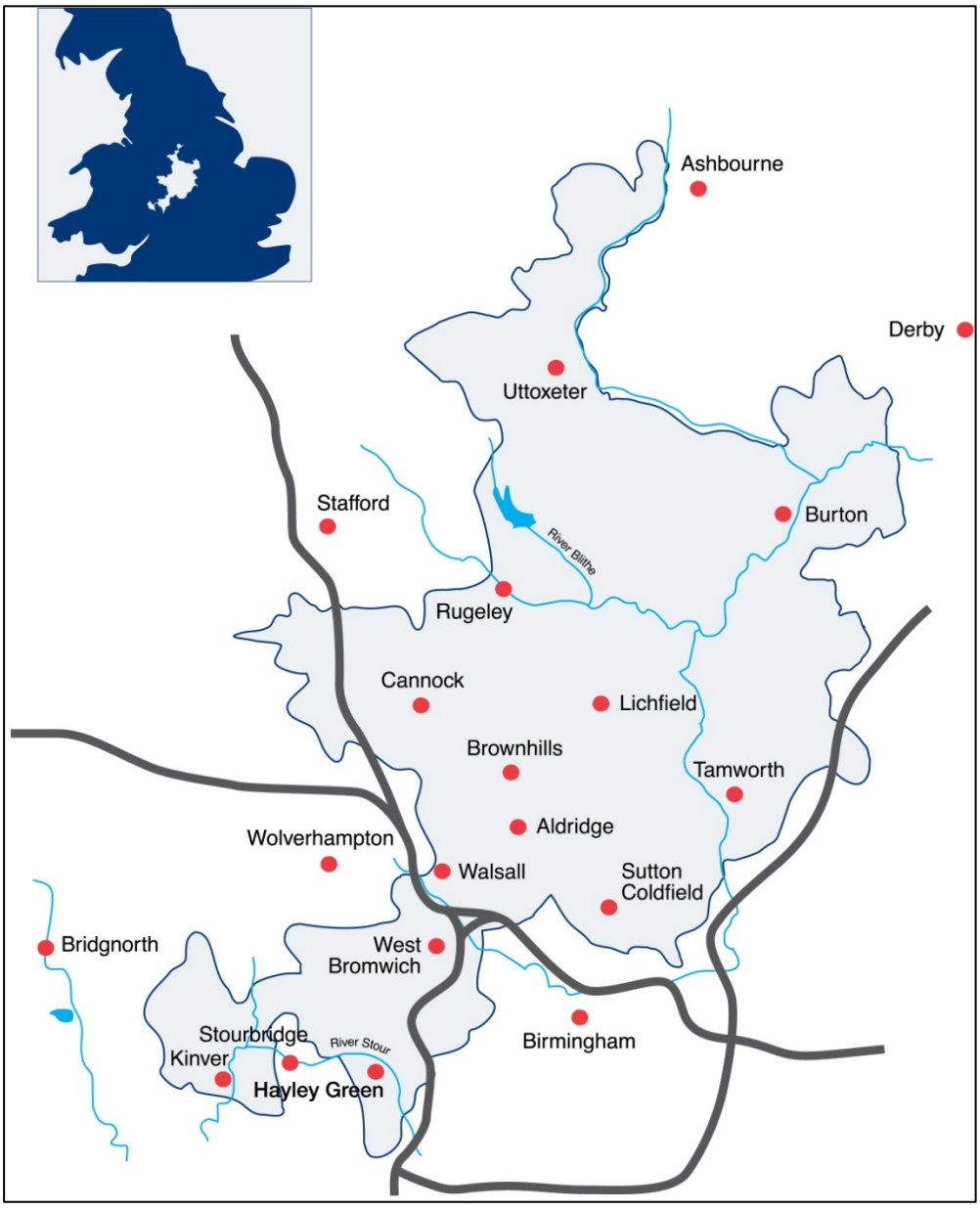
Given the uncertainty around these changes, the very small scale of the deficit and the fact that it is in the final year of the plan for only the peak week scenario the Company does not propose to change its plan or identify options to reduce the deficit. The most likely option would be to reduce the volume of water available for water trading. Within the next five years the Company will have more certainty over all these potential factors included in the sensitivity scenario and will if a supply demand deficit is confirmed include options within the next WRMP in 2019.


SSW Supply Demand Balance
Dry Year Annual Average (Final Plan)
Ml/d
Ml/d
500
450
400
350
300
250
200
150
100
50
0
2011/12
2012/13
2013/14
2014/15
2015/16
2016/17
2017/18
2018/19
2019/20
2020/21
2021/22
2022/23
2023/24
2024/25
2025/26
2026/27
2027/28
2028/29
2029/30
2030/31
2031/32
2032/33
2033/34
2034/35
2035/36
2036/37
2037/38
2038/39
2039/40
Miscellaneous Water
Distribution losses
Non Household Demand
Unmeasured Household Demand
Measured Household Demand
Target Headroom
Water Available for Use
Deployable Output


SSW Supply Demand Balance
Critical Period Peak Week (Final Plan)
Ml/d
500
450
400
350
300
250
200
150
100
50
0
2011/12
2012/13
2013/14
2014/15
2015/16
2016/17
2017/18
2018/19
2019/20
2020/21
2021/22
2022/23
2023/24
2024/25
2025/26
2026/27
2027/28
2028/29
2029/30
2030/31
2031/32
2032/33
2033/34
2034/35
2035/36
2036/37
2037/38
2038/39
2039/40
Miscellaneous Water
Distribution losses
Non Household Demand
Unmeasured Household Demand
Measured Household Demand
Target Headroom
Water Available for Use
Deployable Output

2 BACKGROUND

2.1 Description of South Staffordshire Water



South Staffordshire Water now incorporates the supply area of Cambridge Water. The Ofwat licence of appointment was unified on 1 April 2013. However, as the two areas are non-contiguous and there is a very different resources position, the Company has provided an undertaking that separate Water Resource Management Plans will be produced. Therefore this fWRMP is only for the original South Staffs region and a separate plan is being submitted to Defra and consulted upon in the Cambridge region.

South Staffordshire Water is responsible for public water supply across part of the West Midlands serving some 1.25 million people. The area

of supply stretches from the edge of Ashbourne in the north, to Halesowen in the south, and from Burton on Trent in the east to Kinver in the west.

Surface water sources provide approximately 50% of the Company's water resources in the dry year.

The Company also supplies water from 26 groundwater sources, abstracting from the Sherwood Sandstone aquifer.

The Company has a number of small bulk imports and exports with Severn Trent Water, some of which are used daily and others which are for emergency use only. The Company has a jointly funded treatment works with Severn Trent Water and they are entitled to take around a third of the output from this source. The Company is currently working with Severn Trent Water on a strategic mains connection to provide them with an emergency supply of water to improve the resilience of their network.

2.2 Context

2.2.1 Water White Paper

The Natural Environment White Paper, The Natural Choice, was published in June 2011. This paper set out the Government's commitment to taking an 'ecosystems approach' to environmental management and highlighted the economic and social benefits that can result from managing environmental activities at the larger scale. This paper recognised the relevance of this approach to management of the water environment across a whole catchment.

The Water White Paper, Water for Life, was published in December 2011. This paper set out the Government's vision for future water management to meet the challenges of adapting to climate change and increased pressure on water availability and quality.

The need for abstraction reform was identified as a priority within this document. Ofwat has committed to incentivise water trading and dis-incentivise damaging abstraction through the introduction of the Abstraction Incentive Mechanism (AIM) in the next price review cycle.

The Government announced its intention to legislate for structural reforms to the water and sewerage market to promote competition in the Water White Paper and the draft Water Bill to enact this was published for consultation in July 2012.

2.2.2 Statement of Obligations

In October 2012 Defra published its Statement of Obligations for water and sewerage undertakers for the price review period 2015-2020. The document is a summary of statutory obligations that already apply to water companies and sets out the Government's understanding of the main environmental statutory obligations relating to the water environment, drinking water, water treatment and supply.

The main areas of focus in the Statement of Obligations relevant to water resources management plans include maintaining and enhancing conservation and biodiversity, sustainable abstraction, metering and demand management options.

The issues of sustainable abstraction and conservation and biodiversity are largely addressed through the delivery of the National Environment Programme (NEP) discussed in section 6.x of the fWRMP and are further supported by the Company's policy on the environment described in section 2.4. The Company's approach to metering and demand management (leakage management and water efficiency) is also discussed in section 2.4 of the fWRMP.

2.2.3 Ofwat Framework for Setting Price Controls for 2015-20

In July 2013 Ofwat published its document 'Setting Price Controls for 2015-20 – Final Methodology and Expectations for Companies' Business Plans'. Ofwat's methodology framework is intended to support the Water White Paper and Draft Water Bill in the ambition to ensure that the water and sewerage sectors are resilient, efficient and customer focused. The key elements of the methodology are:

- Separate retail and wholesale price limits
- A total expenditure approach (totex)
- A focus on long-term outcomes that customers value
- Financial incentives for new water trading
- Reputational disincentives for environmentally damaging abstractions

The formation of a Customer Challenge Group (CCG) for each water company and their role in the price setting process was also set out. The Company established its CCG in April 2012 and the group has been involved in customer engagement throughout the development of the fWRMP and the PR14 Business Plan. See section 4 for full details.

Outside of the formal price control methodology Ofwat has made it clear that affordability of proposed price increases will be a key consideration when setting price limits for 2015-20.

The Company has embraced the need to engage customers and understand their priorities and reconcile these with investment needs. The Company's approach to customer engagement for the fWRMP and the PR14 Business Plan -is set out in section 4 of the fWRMP.

2.2.4 Water Framework Directive and the Catchment-Based Approach

The river basin management planning approach has been established for a number of years now in order to deliver the Water Framework Directive (WFD) objectives. In March 2011 the Government announced a new catchment-based approach to managing the water environment building on the river basin management planning approach. The key elements of the approach are bringing all interested parties together to build consensus about the best way to achieve outcomes.

Water companies have a key role in delivering WFD objectives and therefore should give due regard to catchment-based solutions when identifying options.

For South Staffs Water there is no deficit in the supply demand balance throughout the plan period and therefore it is not necessary to consider options. However, the Company is currently involved in a pilot catchment management project on a tributary of the River Severn and has been monitoring water quality in the River Severn catchment to better understand potential sources of metaldehyde pollution. As part of the Company's AMP6 NEP the Company is proposing catchment management schemes to address diffuse pollution issues in the River Severn and River Blithe catchments. These schemes are water quality schemes and as such do not impact on the fWRMP. During the implementation of these schemes opportunities will be identified for partnership working and wherever possible multiple benefits will be sought to bring even greater benefits to the environment.

2.2.5 Water Stress

In November 2012 the Environment Agency published a consultation on a revised methodology for determining water stress status for water companies. The consultation document contained a revised classification for the South Staffs Water area which stated that the Company's status would change from 'moderate' water stress to 'serious' water stress.

The Company made representation to the Environment Agency regarding the application of the new methodology as the Company believed it had been applied incorrectly to South Staffs Water.

The Environment Agency published the final classification of water stress in July 2013 and this confirmed that the Company would remain classified as 'moderate'.

2.2.6 Water Resources Planning Guideline Guiding Principles

In June 2012 the Environment Agency published the Water Resources Planning Guideline. The Guideline comprises two documents: one detailing the technical methods and instructions to be complied with and the other setting out the guiding principles for developing a water resources management plan. The guiding principles are closely aligned with the Water White Paper and with what Ofwat has published regarding regulation of the water sector.

The guiding principles document reinforces and complements the incentives for efficient and sustainable water resources use proposed by Ofwat (AIM, network interconnections, water trading). It also emphasises the need to engage with customers – especially to confirm preferred levels of service for customer restrictions. The role of the CCG in the formal consultation process for WRMPs is also described.

Within the guiding principles document key policy priorities are identified as:

- Taking a long term perspective beyond 25 years
- Water trading, cross boundary solutions and third party solutions
- Reducing demand for water
- Reducing water scarcity and environmental damage

There is an expectation that demand side solutions will be selected over supply options where there is a reasonable prospect that benefits will outweigh costs and that the downward trend for leakage will continue.

Taking a Long Term Perspective Beyond 25 years

The fWRMP provides details of the forecast supply demand balance over the next 25 years to 2039/40. The Company is not forecasting a deficit in the supply demand balance throughout this period. The projected surplus at the beginning of the period is 48Ml/d and this reduces to 22Ml/d by the end of the period. Due to the scale of the surplus at the end of the planning period the impact of events just beyond the 25 years are unlikely to significantly change the overall supply demand balance before 2050.

Water Trading, Cross Boundary Solutions and Third Party Solutions

Since the dWRMP was published the Company has continued to discuss the potential for the provision of surplus water to Severn Trent

to assist with a projected deficit in their supply demand balance in AMP7.

It has been agreed which of the options should be developed further, and the ambition is that sufficient detail can be defined to enable the options to be named as feasible options with outline costs and benefits in the Severn Trent Water fWRMP.

The Company has confirmed that a supply / demand surplus could be provided to supply the Severn Trent Water Strategic Grid zone. Severn Trent Water has confirmed that the most feasible option is to use existing assets to link into the Elan Valley Aqueduct to provide 10-20Ml/d of treated water supply. The Company has agreed to provide an indicative price for providing this supply, and in the final WRMP Severn Trent Water will compare it with the costs / benefits of the other new supply options available for that zone.

As there is currently no firm agreement over a trade the Company has not included it within the final supply demand balance but has included it in an updated sensitivity scenario in section 10 of the fWRMP.

If a water trade agreement is reached post publication of the fWRMP the planning framework allows for the adaption of 'better' solutions without triggering a formal review of plans, subject to materiality.

The Company does not have a supply demand deficit and therefore has no requirement to identify options from third parties.

Reducing demand for water

The Company is committed to promoting the efficient use of water to customers and helping them to manage the volume of water they use. The demand forecasts include expected reductions in demand due to water efficiency activities. Details of the Company's approach to water efficiency are included in sections 2.4.5 and 5.13.

The Company has forecast a potential reduction in leakage levels over the planning period. A potential further reduction in the estimated normal year SELL of 4Ml/d is forecast over the period 2020/21 to 2029/30. Details of the Company's approach to leakage management are included in sections 2.4.6 and 5.10

The Company's demand forecasts show that overall normal year pcc is already lower than the national average of 147litres per head per day at 132l/h/d and that this reduces further over the period to 120l/h/d.

Reducing Water Scarcity and Environmental Damage

The context for the Company is that its water stress status is classified as 'moderate' and it has a healthy surplus in its supply demand balance. It is committed to delivering sustainability reductions as defined in the National Environment Programme and is forecasting reducing per capita consumption and leakage reductions.

South Staffs Water takes the impact of its operations on the environment seriously. The Company's approach to managing the impact of its operations is described in section 2.4.1.

Customer Views

South Staffs Water is committed to engaging with all of the stakeholders who have an interest in this plan and has consulted with these stakeholders and the general public. The Company has undertaken a process of customer and stakeholder engagement during all stages of development of the dWRMP and the PR14 Business Plan. This is described in detail in section 4 of the fWRMP. The views obtained have helped shape our proposals. More customer engagement has been undertaken than ever before.

2.2.7 Consistency with the Regulatory Environment

The Company is mindful of the emerging changes in approach to regulating the water industry and price limits. The new emphasis is on ensuring future plans take a long-term perspective, are built on customer values and promote the sustainable use of water. The Company believes that this fWRMP is firmly based on these principles.

The Company has followed the Environment Agency Water Resources Planning Guideline in the preparation of this fWRMP and has engaged with Environment Agency staff wherever appropriate to do so.

2.3 Links to Other Plans

2.3.1 PR14 Business Plan

Ofwat will next review price limits for water companies in 2014. This process is called the Periodic Review 2014 (PR14). All water companies submit to Ofwat Strategic Business Plans detailing their view of what investment is required to provide services and meet objectives for the period 2015/16 to 2019/20. This will include investment associated with the supply demand balance. This is the sixth asset management plan (AMP6) which water companies have produced.

Ofwat will use the fWRMP as the basis of its assessment of the supply demand balance element of the strategic business plan as part of the process of reviewing water company price limits.

A company's water resources management plan and business plan are explicitly linked by the company's forecasts of demand and utilisation (where supply options are included in the final planning scenario). Ofwat will use the weighted annual average demand forecast as the basis of the Company's revenue forecast when it sets price limits.

PR14 Business Plans are to be submitted to Ofwat on 2nd December 2013. Whilst the timetable for the publication of the Final Water Resources Management Plan (fWRMP) is uncertain it is clear that this will not be published before the submission of business plans to Ofwat. Therefore, Ofwat will be basing its assessments on published dWRMPs and SoRs detailing changes for the fWRMP.

2.3.2 Drought Plan

The Company last reviewed and updated its Drought Plan in 2012/13. Following a process of public consultation, the revised plan was published on the Company's website in February 2013.

The Drought Plan details the actions the Company would take in the event of prolonged dry weather. The imposition of temporary use restrictions is one of the possible actions which the Company would take. The average frequency of customer restrictions defines the level of service.

The implementation of such restrictions is triggered by control curves based on the level in the Company's Blithfield Reservoir. These control curves are used in the Company's water resources model to calculate the amount of water the Company can reliably supply at the level of service customers expect.

The assumptions on levels of service for frequency of customer restrictions in the fWRMP are consistent with the Company's 2013 Drought Plan.

2.3.3 Strategic Environmental Assessment Directive (SEA)

According to the UK Regulations which transpose the SEA Directive, it is the responsibility of the 'authority' (in this case each water company) producing a plan to decide whether SEA is required. The requirement for SEA is dependent upon whether the provisions of the water resources management plan could cause 'significant environmental effects'.

SEA can be used to inform the selection of water resources management plan schemes. The short-listed measures / options,

including demand management, leakage reduction and resource development measures can be assessed against SEA criteria and the resulting water resource management plan programme selected on the basis of a reasonable balance between cost and environmental and social impact.

For South Staffs Water there is no deficit in the supply demand balance throughout the plan period and therefore a SEA is not necessary as options are not being selected.

2.4 Company Policies

There are a number of key policies that underpin the Company's fWRMP. Each of these is described in the following sections.

2.4.1 The Environment

The Company is committed to minimising the impact of its operations on the environment. Taking water from the environment for public water supply reduces the amount of water available for flora and fauna. The impact of this can be greater in some places depending on the environmental sensitivity of the specific location. The Company believes that by managing the amount of water abstracted through promotion of water efficiency, implementation of metering policies, leakage management and optimisation of operational plant this impact can be minimised.

Where the impact of the Company's operations is thought to be causing significant environmental damage the Company commits to the implementation of the NEP. This includes a programme of investigations to determine the scale of impact and appraises options for remedy. When the cause and effect is proven and the best option for remedy has been identified the Company commits to implement this solution.

Biodiversity

The Company has reviewed its current activities under biodiversity and has consulted with key stakeholder organisations regarding opportunities to work in partnership to deliver biodiversity outcomes. As a result of this review the Company has developed a new strategy to provide a focus for these activities and to raise awareness of the Company's contribution to biodiversity.

The strategy for biodiversity is to embed a culture of environmental awareness within the workforce, identify opportunities for enhancement and partnership working and to engage in sustainable projects. The focus is to maximise biodiversity opportunities arising from operational activities which might require a change in approach and to identify additional projects which provide benefit to the wider community.

The Company is a responsible land-owner and manages its important environmental sites to protect wildlife. The Company's Blithfield Reservoir estate includes a large area designated as a Site of Special Scientific Interest (SSSI) designated for its habitats for wading birds. The Company currently manages this estate sensitively with this in mind to balance operational and environmental needs. The Blithfield estate will continue to be a cornerstone of the Company's environmental strategy and a focus for biodiversity. The Company also has a nature reserve at its Chelmarsh Reservoir providing habitat for wading birds. Opportunities to manage and improve this locally important site are being developed.

The Company has joined the Birmingham and Black Country Nature Improvement Area (BBCNIA) partnership. NIAs were launched and are funded by Defra and are part of the Government's Biodiversity 2020 strategy. The Company owns land within the area identified for the BBCNIA and has met with a representative from Staffordshire Wildlife Trust to discuss opportunities for the Company to undertake projects in this area. This will not result in significant expenditure but will entail a review of current land-management activities and a potential change in approach. Funding for specific projects can be applied for through the BBCNIA if necessary.

The Company is reviewing its other land-holdings to identify other sites outside of the BBCNIA which might provide significant opportunities to protect and enhance biodiversity. Following the review a programme of implementation at priority sites will be developed and delivered during AMP6.

Catchment Management

The Company is proposing to engage in catchment management activities during AMP6. The aim is for catchment management to provide a sustainable alternative to end of pipe solutions using less chemicals and energy for treatment and providing opportunities for additional benefits to be identified.

Catchment scale management of the water environment is a focus in the Defra Statement of Obligations. There is a strong likelihood of success in surface water catchments as the link between application of agricultural chemicals and run-off into the watercourses is direct. In groundwater catchments it may be many years before any change in water quality is seen.

The Company is proposing to implement two surface water schemes focussing on reducing metaldehyde in these catchments. This will involve working closely with farmers in these catchments and engaging with the public. Investigations to determine the potential viability of

catchment management to reduce nitrates in two groundwater catchments will also be completed.

Activity during AMP6 in groundwater catchments will focus on determining the potential for significant water quality improvements with a view that nitrate treatment plants which are being replaced in AMP6 with an asset life of 25 years will not require a further replacement at the end of that period. These catchment management implementation schemes and investigations are included in the Water Quality NEP and appropriate funding has been included in the Business Plan submission.

Opportunities for environmental improvements associated with the improved water quality will be optimised as part of proposed catchment management projects so that multiple outcomes can be achieved.

2.4.2 Optimisation of Existing Operations

The Company has a mix of resources which it uses to meet the demand for water on a daily basis. Outside of drought conditions the Company generally operates the water supply system under cost optimisation principles where use of more expensive sources is minimised. The Company has a range of optimisation models which assist with this.

This approach is based on the cost of producing the water (energy including the cost of the Carbon Reduction Commitment tax and chemicals) and the ability to transfer it around the Company's area of supply. Operational changes triggered by drought conditions which switch the emphasis from cost optimisation are detailed in the Company's Drought Plan 2013.

Ofwat published its approach to setting price limits for PR14 in July 2013. Within this document Ofwat has stated that it plans to introduce the Abstraction Incentive Mechanism (AIM) in AMP6. The purpose of this mechanism is to incentivise companies to take water from sources which are less environmentally sensitive and to drive sustainable use of water resources. Ofwat has confirmed that the AIM incentive will not be financial but will be reputational for AMP6. The Company has agreed with the Environment Agency that there is only one site for which it holds an abstraction licence which is suitable for inclusion within the AIM. This site has been unused for a number of years and the Company has no plans to reintroduce abstraction from this source.

2.4.3 Levels of Service

South Staffs Water is proud of its record of not imposing a temporary use ban (previously known as a hosepipe ban) or any other form of restriction for many years. Despite the drought conditions experienced in 1995 and more recently in 2011/12, the Company has not imposed

customer restrictions since the record drought on the River Severn in 1976.

The Company's planned level of service for temporary use bans is determined by water resources modelling of the historic climate, with current supply availability and demand profile assumptions. The planned frequency of restrictions is determined by the modelled frequency that reservoir storage at Blithfield falls below the Implement Temporary Use Ban trigger curve at the reservoir. The Company's water resources modelling of deployable output and levels of service has been revised for the 2014 fWRMP (as described in section 6), however the planned level of service for temporary use bans remains unchanged at one in every 40 years (on average).

The South Staffordshire Water Drought Plan (2013) identifies that the Company would consider implementation of a ban on non-essential use if Blithfield Reservoir storage levels fell below the Implement Drought Permit trigger. A non-essential use ban can be used to restrict a wide range of water uses, including watering parks and public gardens, use of ornamental ponds, vehicle washing, and commercial cleaning activities. A ban on non-essential use would require an application for a drought order to the Secretary of State, and is likely to take 2 weeks to prepare and at least 4 weeks to determine. Examination of the simulated reservoir storage at Blithfield confirms that a non-essential use ban would only be required once in the model simulated period.

The Company does not believe that emergency drought orders (in particular the imposition of stand pipes) are an acceptable option for drought or water resources planning, and as such it has not defined a level of service for this type of order.

In practice the Company does not intend to impose customer use restrictions. The Company accepts that there is a small risk of these restrictions being implemented but will do all it can to avoid the need for the imposition of a temporary use ban or a non-essential use ban.

The Company's planned level of service of one temporary use ban in every 40 years is based on modelling using current assumptions on resource availability (deployable output). If deployable output was to change significantly in future then this could result in a different level of service, for example if major new schemes were commissioned or there were significant reductions in abstraction licences. However, the Company's forecast of deployable output remains approximately flat across the 25 year planning period (after the AMP6 sustainability reductions are implemented) and so predicted levels of service will remain unchanged at one temporary use ban in every 40 years.

The Company will maintain its security of supply index score of 100 throughout the plan period. The Company has the benefit of a range of

sources and a good mix of (regulated) river and borehole abstractions to call upon, so is well placed to deliver good levels of service to customers.

2.4.4 Metering

Meter Policies

The Company currently has a relatively low proportion of metered household customers (current meter penetration is approaching 30% of billed properties compared to an industry average of just above 40%).

The Company has a range of policies relating to metering. These include:

- Free meter policy – domestic customers can opt for a meter free of charge with a 12 month reversion period for domestic customers.
- New supply policy – all new household and non-household properties must be metered.
- Change of occupier metering policy – the Company commenced change of occupier metering in April 2010 where meters are installed in certain properties when they change occupier
- Compulsory metering policy for customers with swimming pools or ponds greater than 10,000 litres capacity
- Compulsory metering of domestic customers wishing to use unattended garden watering devices
- Compulsory metering of all non-household properties

The Company proposes to continue with the above metering polices subject to funding for all elements being confirmed in the 2014 price review. However, in accordance with the Environment Agency Water Resources Planning Guideline change of occupier metering is included only in the final planning scenario not the baseline scenario since this is a discretionary policy which the Company has adopted. The Company's CCG is fully supportive of the continuation of the discretionary policy of change of occupier metering, as they consider it to be a sensible way to achieve greater domestic meter penetration levels over the long term. Metering is supported by customers but they also want bill impacts to be minimised. Hence since the Company has a supply surplus, taking an approach that leads to moderate metering growth is seen as the right balance.

In the final planning scenario the collective metering policies will result in meter penetration rising from current levels up to 40% by the end of AMP6 and 73% by the end of the 25 year planning period. If the

change of occupier metering policy is removed then meter penetration reaches only 64% by the end of the planning period.

Meter Under-Registration and Meter Replacements

The Company makes an allowance in its demand forecasts for the inaccuracy of meters in recording total flows. Meters have an optimum point when they accurately record water flow. However at a point, usually at low flows, the accuracy is less certain. For example this often occurs at the end of a toilet flush or when a tap is left slightly running. To ensure that the forecasts take account of the under registration on the meters an allowance is made.

The Company increased the rate of meter replacements from 2010/11. A further increase in replacements is planned from 2015/16 subject to funding in the next price review. The proposed meter replacement programme is based on a review of costs and benefits of meter replacement to identify the optimal level of meter under-registration (MUR).

The Company worked with consultants, Tynemarch, to develop a model for PR09 which estimated household MUR based on meter test data, meter type and age details and planned meter replacements. This model has been updated by the Company for use in the 2014 fWRMP.

The updated model includes data from 718 independently tested meters from the last 5 years which is approximately double the amount of data used at PR09. Meters tested were selected from planned replacements and randomly sampled and included meters of different age and manufacturer. Meter accuracy was assessed by comparison with age and throughput. The correlation between performance and age is good, whilst there is limited correlation between performance and throughput. The updated model is also able to incorporate replacement cycles over a longer time period.

The Company has identified that there are potentially a number of stopped or nearly stopped meters within the current meter stock which will affect the average MUR. Further investigation of the scale of this potential issue is required before this can be fully determined. As more information regarding this matter becomes available the Company will review its MUR estimates. The model will also be updated with further meter test data as it is collected, however, it is likely that it will be some time before sufficient data to justify an update is available as this requires meters to be removed, tested and data analysed. Any change in MUR will not be material in terms of the supply demand balance.

The output from the 2013 model shows that the optimum MUR for household meters is 3.98%. The 2011/12 household MUR was 5.15%. The Company proposes to reduce this to the optimum over the AMP6

period and keep it at this level for the remainder of the plan period subject to sufficient funding in the price review for the required number of meter replacements.

MUR for non-households is made up of MUR for small meters (using the household MUR model) and data from meter testing of larger operational meters. This work has shown that the optimum MUR for non-households is 4.05%. The 2011/12 non-household MUR was 6.02%. The Company proposes to reduce this to the optimum over the AMP6 period and keep it at this level for the remainder of the plan period subject to sufficient funding in the price review.

This approach was reviewed and challenged by the CCG as part of the process of engagement for the PR14 business plan. The CCG commissioned a consultant to review key areas of the PR14 Business Plan including MUR and this review found that the approach to MUR proposed by the Company was robust.

Meter Location

The Company does not plan to change its policy on meter location: the preferred location for meter installations is external unless it is impractical or uneconomic to do so. External meter installation results in more efficient meter reading operations and helps identify supply pipe leakage. In circumstances where the meter cannot practically be installed externally it will be installed internally. The customer may be required to pay for plumbing pipework or other alterations that may be necessary to facilitate the internal meter fit. If a second meter is required to capture all consumption in the property (e.g. an extra meter to record consumption from a garden tap) the customer is required to pay for this additional meter. An assessed charge may be offered where it is not possible to fit a meter or the cost of installing a meter is unreasonably high.

The Company intends only to install meters externally under the change of occupier metering policy.

The Company installs boundary boxes at the time of mains renewals/ rehabilitation in preparation for metering growth.

2.4.5 Water Efficiency

In 2009/10 Ofwat introduced water efficiency targets for all water companies. For 2009/10 they were voluntary targets and from April 2010 they were mandatory for the period up to 2014/15. The Company's target is based on a saving of 1.0 l/property/day and is calculated in the same way for all companies with per capita consumption above 130l/h/d. The target is a 3 year rolling average, where deficits or surpluses are carried over in to subsequent years.

Ofwat has issued guidance on the savings that can be claimed by different types of activity on which this strategy is developed.

The target requires activities in the following areas:

- Households
- Non-households
- Furthering knowledge of water efficiency
- Education

The Company's performance to date has been as follows:

Year	Water Saving (Target 0.53Ml/d)	Comment
2009/10	0.07Ml/d	The target was voluntary and the Company was exploring the most appropriate strategy to follow.
2010/11	0.56Ml/d	0.03Ml/d surplus carried forward to 2011/12.
2011/12	0.99Ml/d	0.49Mld surplus carried forward to 2012/13.
2012/13	0.56Ml/d	0.52Mld surplus carried forward to 2013/14.

The Environment Agency Water Resources Planning Guideline states that companies must specify what their water efficiency strategy will be beyond 2015 and demonstrate that the estimated savings have been taken into account in the demand forecasts. If a water company has a supply demand balance deficit then water efficiency is one of the options to be considered for closing the gap.

The Company believes that promotion of water efficiency is important for a number of reasons; it is part of the Company's strategy for managing its impact on the environment, it is something that customers value, it can help with managing bills and affordability and it is part of providing good customer service. Water efficiency activity provides an opportunity for multiple benefits.

Traditionally the driver for investing in water efficiency has been based on the need to manage the supply demand balance and deliver obligations to promote water efficiency. South Staffs Water has a healthy surplus in its supply demand balance and on that basis requires only to continue with current levels of water efficiency activity. However, South Staffs Water has reflected on the strong messages received from customers during its various strands of engagement which indicate a clear desire for greater recognition of impacts on the environment and better communications specifically around water efficiency and proposes to revise its approach and move to focus on

behavioural change. This will be aimed at producing a sustained reduction on water usage over the longer term.

This will require a significant change in approach and the Company is currently working towards this through involvement in collaborative projects such as the Plug-in project. The Company's AMP6 Business Plan includes continued levels of expenditure on water efficiency activity but this will no longer be spent solely on the provision of water saving devices and will be refocused on a mixture of more sustainable water efficiency projects and initiatives working with key partners in the wider community.

The future water efficiency strategy will comprise a number of streams of activity likely to include:

- Provision of advice and information to large users through the B2B function
- Communication with all customers on availability of help and advice to save water
- Education of future customers through the Education Programme delivered through Blithfield Education Centre
- Outreach programme to provide help and advice to schools and groups of customers
- Participation in collaborative projects such as Plug-in
- A greywater recycling project in the Cambridge region
- Working with appropriate partners under the Green Deal

Innovation in water efficiency is continually evolving and the Company's strategy has changed each year since 2010/11 to reflect new ideas and approaches as they came to the fore. Therefore, the range of activities listed above should be considered as indicative only. The Company is committed to providing customers with water efficiency advice and devices and will continue to review its water efficiency programme on an annual basis to reflect the most effective means of doing this.

The Company's normal year demand forecast includes a continued reduction in per capita consumption as the use of water by customers becomes more efficient over time. Due to reductions in water use already seen, per capita consumption is forecast to fall below 130 l/head/d by 2018/19 in the Company's normal year demand forecasts.

2.4.6 Leakage

Overview

A key Company objective is to operate in line with the sustainable economic level of leakage (SELL) target. The Company also appreciates this is an important issue for customers and other stakeholders, as well as the wider environment and community. The Company is proud of the fact that it has achieved all regulatory leakage targets since they were introduced, and continues to operate leakage management policies to maintain this record. The Company's approach to leakage management is one of continuous development, incorporating innovative opportunities as appropriate, to improve operational efficiency and knowledge to enable lower leakage levels to be achieved over the longer term in a sustainable way.

AMP5 Leakage Performance

AMP5 to date has seen markedly different weather conditions that have impacted significantly on the level of leakage reported. The winter of 2010/11 was extreme, resulting in a significant rise in leakage during this period, however this was managed well, using the lessons learnt from the previous harsh winter of 2009/10. This meant the leakage target was still met despite the severity of the weather impact. The following two years in 2011/12 and 2012/13 were characterised by generally benign winter conditions. 2011/12 was dry, with drought conditions across some areas of the UK. In 2012/13, wet weather limited the leakage breakout during the summer, the subsequent winter was longer than normal but not as harsh as the 2010/11 event and although the annual average level remained low, the exit level was higher than seen in the previous two years.

The reported leakage in the first three years of AMP5 is shown in the following table relative to current regulatory targets.

	2010/11	2011/12	2012/13
Target	74.40 Ml/d	74.40 Ml/d	74.40 Ml/d
Actual	72.83 Ml/d	68.17 Ml/d	65.25 Ml/d

Table: AMP5 leakage targets and actual results

Current Leakage Management Policy

The Company's strategy is to manage leakage levels to achieve the SELL target. This is achieved through a number of activities, including:

- Active leakage control (ALC), covering operational leakage detection, location and repair, using DMAs to improve operational targeting
- Pressure management – new schemes as well as optimisation and maintenance of existing installations
- Asset management, including mains and service pipe renewals
- Customer supply pipe policies

The Company's district meter areas (DMAs) form the core tool for effective and efficient targeting of leakage management resources and investment. The Company has 523 DMAs and data is collected from 99.7% on a daily or more frequent basis. This data is used to target DMAs for active leakage control (ALC) intervention.

In general active leakage control is undertaken in each DMA at least once every 12 months. Data from DMAs is used to carry out more reactive interventions as and where required, and to maximise the efficiency and performance of available ALC resources.

Around a third of leak repairs are carried out on customer supply pipes, and active leakage control is undertaken to identify leakage on customer pipes as well as Company distribution mains. The Company has a free leak repair scheme (or subsidy towards replacement), as set out in the Code of Practice. Customer supply pipe leakage is also identified via customer reports and through meter installation.

Repair run times for both reported and detected leaks are monitored and managed to ensure delivery of the short run SELL.

The Company undertakes active leakage control surveys in areas to identify leakage upstream of DMAs. Trunk main network operational meters are used to assess areas of potential leakage, however it is recognised that there is currently a degree of uncertainty regarding the accuracy of leakage upstream of DMAs. Investment in AMP4 and AMP5 has been undertaken to improve metering to reduce this uncertainty. Further improvements in AMP6 and beyond are forecast to continue to provide a more effective and efficient approach to monitoring and targeting leakage upstream of DMAs.

A further programme of additional pressure management during AMP5 is nearing completion. This was justified to counteract a rise in the natural rate of rise (NRR) of leakage forecast over AMP5, and is considered to have been successful.

A programme of mains and service pipe renewal has continued during AMP5. Without this leakage would have increased. Whilst this renewal programme is driven primarily to maintain asset serviceability

in relation to burst mains, it is also a key policy in managing leakage and halting the "natural rate of rise" effect observed in ageing mains infrastructure.

The Company has also undertaken a series of trials in AMP5 to support the development of longer term business strategies in terms of leakage identification and management, metering and asset management. Most prominent of these are fixed radio network trials to gather data. These allow improved understanding of supply pipe leakage, household consumption and legitimate night use as well as providing measurements of different metering strategies for leakage management.

The Company will continue to review leakage management options and innovation to improve efficiency and knowledge to reduce the SELL over the longer term, but at this stage further leakage reductions are uneconomic.

Supply Pipe Leakage

The Company manages customer supply pipe leakage in line with the overall SELL principles. Leaks on the network, either Company or customer are identified as part of ALC operations.

The Company's current policy on customer supply pipe repairs remains unchanged and continues to be supported by the a Free phone leakline and provides free supply pipe repairs meeting the following criteria:

- First repair per property only
- External underground leaks only (internal or those under buildings or permanent structures are excluded)
- Private domestic customers only (excludes Local Authorities, Housing Associations etc.).

Customers can opt for a supply pipe replacement, and the Company will subsidise the cost of this to the value of the average cost of a supply pipe repair. The Company also promotes home insurance provision that covers supply pipes. The supply pipe repair policy is subject to periodic review.

The Company follows the UKWIR methodology[1] for assessing supply pipe leakage allowances developed in 2007/08. The proposed update to this methodology expected in 2012 has been delayed to enable further data collection across the industry. This has recently

[1] Towards Best Practice for the Assessment of Supply Pipe Leakage, UKWIR (2007), Report Ref. 05/WM/08/32

commenced and is expected to be completed over the remainder of AMP5.

Supply pipe leakage allowances per property are average estimates for all types and ages of property distinguished only by whether they are metered and the location of that meter. Supply pipe leakage allowances for unmeasured properties or internally metered properties are higher than externally metered properties due to the fact that leaks are identified more quickly on properties with external meters where the water leaking is registered through the meter and therefore repaired more quickly.

The forecasts for supply pipe leakage reflect the switching of unmeasured properties to metered through the free meter option scheme or the change of occupier metering policy. There is a reduction in supply pipe leakage allowance from 33.84l/prop/d to 24.95 l/prop/d for each property that becomes metered.

Each new property that is connected for water supply will be metered and has been assigned the lower metered supply pipe leakage allowance of 24.95l/prop/d reflecting the Company's policy to install meters externally.

The increase in properties forecast over the planning period driving supply pipe leakage upwards is largely off-set by the reduction in allowance per property as more properties become metered. Average supply pipe leakage allowances per measured or unmeasured property remain unchanged throughout the forecast period.

The current split between distribution and supply pipe leakage is maintained over the planning horizon.

Sustainable Economic Level of Leakage

The Company policy is to manage leakage at the economic level. The latest assessment of the Sustainable Economic Level of Leakage (SELL) has been updated for this FWRMP submission. This analysis has been undertaken in accordance with industry best practice as set out in Managing Leakage 2011[2] and further to the recommendations set out in the Review of The Calculation of Sustainable Economic Level of Leakage and its Integration with Water Resource Management Planning[3]. The analysis used the marginal cost of water production as forecast for 2015/16, and inflated the latest available leakage management cost and performance data to 2015/16. The analysis

[2] Managing Leakage 2011, UKWIR (2010), Report Ref. 10/WM/08/42

[3] Review of the calculation of sustainable economic level of leakage and its integration with water resource management planning, Defra/EA/Ofwat (2012)

takes into consideration external factors such as social, environmental impacts and the cost of carbon[4].

The Company undertook the updated economic leakage assessment using internal resources with external support from Beal Consultants. In previous assessments of the SELL, WRc's generic APLE model had been used. For the current revision in 2013, one of the most significant changes in methodology has been the development of a Company specific relationship between leakage management costs and the level of leakage used for the economic assessment. The Company has used Beal Consultants to provide general guidance and independent review of the Company assessment and data.

The Company has applied the same leakage reporting methodology as used at PR09, with the only changes relating to annual updates of consumption data. The Company hour-day factor (HDF) was re-assessed during AMP5, using more up to date pressure data following the updating of hydraulic network models. The HDF of 23.5 was calculated using the same approach as used since AMP4, and remains unchanged.

The resulting steady state SELL for a normal year is 70.54 Ml/d. The peak in operational leakage during an extreme winter and the associated recovery adds 2.71 Ml/d to the normal year SELL. Therefore a fixed leakage target for AMP6 to cover all expected weather impacts would be 73.25 Ml/d. The SELL assessed at PR09 was 74.40 Ml/d for comparison. The proposed "like for like" fixed (as opposed to a range) AMP6 target is therefore 1.15 Ml/d lower than for AMP5. The steady state normal year SELL of 70.54 represents the lowest total cost shown in the following chart.

[4] Updated short-term traded carbon values used for UK public policy appraisal, DECC (15 October 2012)

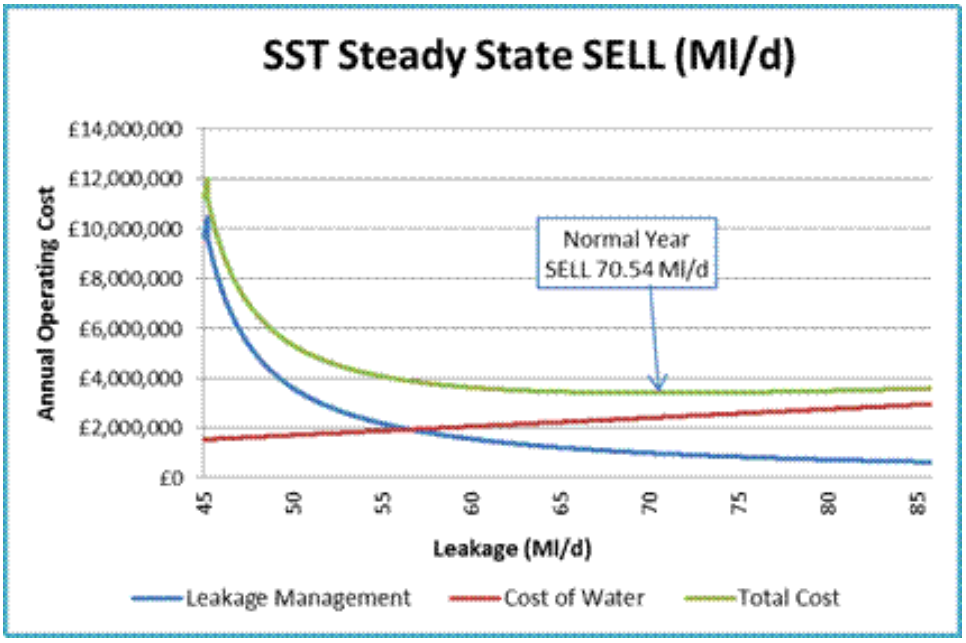


Chart: Steady State SELL (Ml/d)

As the Company has maintained a relatively consistent level of ALC resource over recent years, a small transition is considered to have already been delivered during 2011/12 and 2012/13, due to two successive benign winters and the need to manage leakage levels during a dry year. As a result the calculated SELL value of 73.25 Ml/d for an extreme winter is considered achievable going forward without the need for additional investment to make the transition from the AMP5 target of 74.40 Ml/d.

It is proposed that the SELL is set as a range for AMP6, rather than a fixed regulatory target as currently is the case in AMP5, to enable lower leakage targets for normal years, while also reflecting the need for the Company to operate in an efficient manner during periods of extreme weather impact. This will result in improved leakage performance and lower customer bills over the longer term. On this basis, the Company expects to achieve a leakage level of 70.54 Ml/d during a normal year. Using the impact of different weather scenarios on the level of leakage, the upper bound of this range would be 73.25 Ml/d and the lower bound 64.36 Ml/d. These scenarios have been developed using different operational profiles of leakage for summer and winter events, linked to weather impacts observed in recent years, and assessing the likelihood of these events occurring again in the future.

The winter event of 2010/11 forms the basis for an extreme winter scenario. Through analysis of over 100 years of weather data, the return period for a winter event of this magnitude is around 1 in 10 years, although the occurrence of these events is largely irregular.

The lower bound is based on a benign winter which reduces the leakage breakout through less freeze/thaw events. This scenario, in conjunction with a wet summer, is also likely to suppress leakage

levels further. In the context of setting the SELL as a range, the benign winter and wet summer could reduce the normal year SELL by up to 6.2 Ml/d (i.e. the difference between 70.54 Ml/d and 64.36 Ml/d). Recent winters have been relatively benign, particularly those in 2011/12 and 2012/13, resulting in periods of lower leakage levels.

A range of longer term factors such as network deterioration, population growth, increased customer metering penetration, cost of carbon, pressure management, operational metering improvements and the estimation of leakage upstream of DMAs, and mains renewal have all been considered to understand their long term impacts on managing leakage. The net forecast effect of these factors is presented in the chart below and represents a potential reduction in economic levels of leakage in the future, outside of the AMP6 period. In AMP6 there is no net overall change from the short run SELL values described above. However, a potential reduction in the economic level of leakage in AMP7 may be appropriate due to the impact of the current forecast cost of carbon during this period.

It is recognised that the short and long run SELL should be fully re-assessed at least every five years in line with Price Reviews, to ensure the latest cost and benefit information is used. However this latest analysis indicates the potential reduction in the longer term SELL, based on current information.

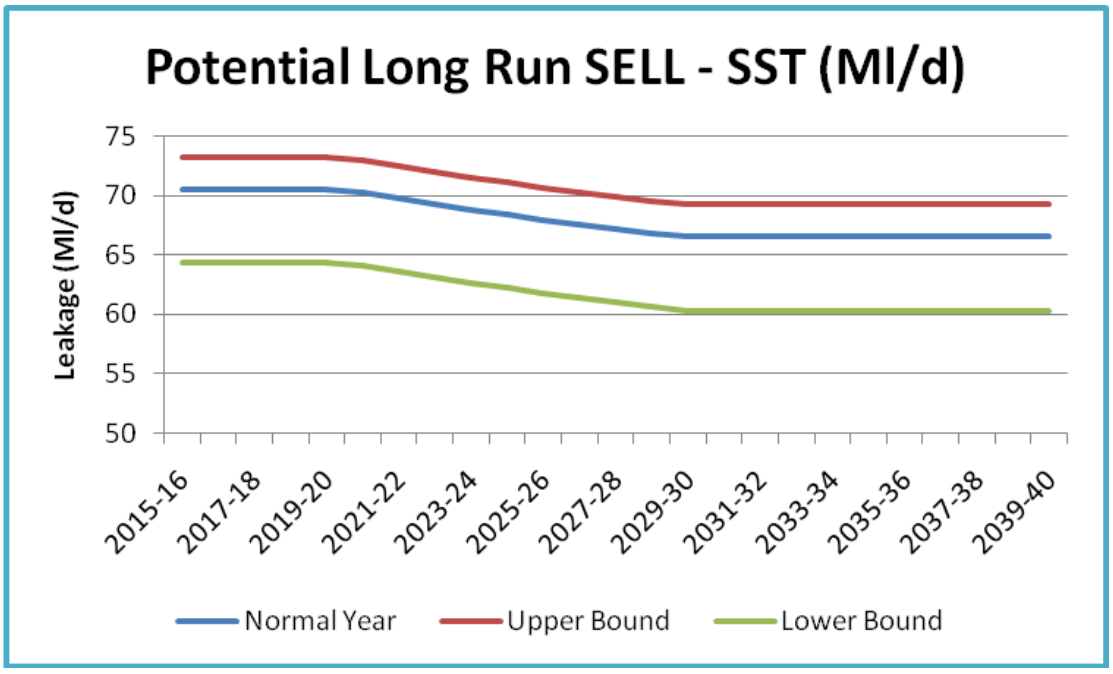


Chart: Potential long run SELL, including upper / lower bound and normal year

AMP6 Strategy

The overall strategy for the Company is to manage leakage at or below the SELL.

The Company would only support leakage being reduced lower than the SELL with strong customer support, demonstrated by a willingness to pay for this improved level of service through a bill increase. However, customer research carried out as part of the Company business planning process does not support a reduction of leakage below the SELL.

No water resource headroom deficit is forecast over the next 25 years starting from 2015/16, confirming no need for further leakage reductions below the short run SELL. However, long run options for leakage management have been explored to understand the costs and benefits associated with these, to confirm if customer support and willingness to pay would have made any of these options viable.

The approach of the Company in assessing the SELL is considered to be in line with the guidelines set out by Defra, the Environment Agency and Ofwat[3].

Proposed AMP6 Leakage Targets

The Company proposes that leakage targets for AMP6 are set as a range, to take account of the impact extreme weather conditions can have. This will enable lower leakage targets for normal years, while also reflecting the need for the Company to operate in an efficient manner during periods of extreme weather impact. This will result in improved leakage performance and lower customer bills over the longer term.

The following table sets out the proposed targets as a range of upper and lower bounds around the performance commitment for a normal year.

Scenario	2015/16	2016/17	2017/18	2018/19	2019/20
Upper Bound	73.25Ml/d	73.25Ml/d	73.25Ml/d	73.25Ml/d	73.25Ml/d
Normal Year Performance Commitment	70.54Ml/d	70.54Ml/d	70.54Ml/d	70.54Ml/d	70.54Ml/d
Lower Bound	64.36Ml/d	64.36Ml/d	64.36Ml/d	64.36Ml/d	64.36Ml/d

Table: Proposed AMP6 leakage targets for the SELL as a range

If a fixed regulatory target is to be used based on achieving all expected weather impacts, this economic target would be 73.25 Ml/d.

Future Leakage Management Policy

The Company's approach to leakage management during AMP6 would follow that used during AMP5 to ensure achievement of the SELL target.

In addition to the activities required to maintain the short run SELL, long run options for leakage management have been assessed for inclusion in the Company's Business Plan submission to Ofwat. The following leakage management options are proposed to continue to achieve the SELL, and provide increased knowledge to support further sustainable leakage reductions in future AMP periods, in line with customer expectations:

- Additional pressure management, where assessed as economic and practical to implement.
- Further enhancement to operational metering, to improve assessment and location of trunk main and service reservoir leakage.
- DMA improvements to increase the operational efficiency in a small number of problematic DMAs, while also incorporating more individual household monitoring in some areas to improve the assessment of night use, particularly in terms of providing seasonal data.
- Mains rehabilitation to maintain asset serviceability, and where appropriate synergies in leakage benefits will also be explored.
- On-going maintenance and replacement of DMA meters, PRVs and data loggers, to maintain current operational efficiency and effectiveness.
- Continuation of the current strategy of trialing emerging technology, as appropriate, to support improvements to future operational efficiency.
- Investment in one of the Company's larger supply zones through a more concentrated deployment of technology, with a key driver being to assess the longer term benefits of leakage management as a result of technology such as fixed radio networks, permanent noise logging or trunk main and surge monitoring, as part of an integrated smart network approach.

This approach should enable the Company to continue to achieve the SELL target during AMP6 and over the longer term.

2.5 National Security and Commercial Confidentiality

The Company does not consider that there are any parts of this plan that are commercially confidential, for the Company or for any third party. The Company has taken advice from its Certifier for Emergency Planning regarding exclusion of information that would be contrary to the interests of national security. As a consequence minor changes have been made to remove site specific references. The Company can confirm that the content complies with the Defra guidance on matters of national security. As a result of this the entire plan is presented in this document.

2.6 Document Structure

This submission has been prepared in line with the Environment Agency Water Resources Planning Guideline (August 2013). Commentary on the key components of the supply demand balance is set out in part 1, sections 3-10 and completed tables and line commentaries in part 2. Supporting technical documents can be found in the appendices.

3 PLAN CONTENT AND DEVELOPMENT

There are a number of issues relating to the underlying assumptions and development of the Company's fWRMP which are detailed in the following sections.

3.1 Planning Period

This plan covers the period 2011/12 to 2039/40. The year 2011/12 is the base year for the fWRMP. Actual data for the base year as reported in the 2012 Annual Review[5] has been revised to reflect updated population data and normalised to remove the impact of year on year climatic variation.

3.2 Water Resource Zone Integrity Definition

The Environment Agency Water Resources Planning Guideline includes a Water Resources Zone Assessment Method. The Company previously agreed with the Environment Agency (at PR09) that it is a single resource zone. For PR14 it has provided information to the Environment Agency as defined under stage 1, step 1 of the methodology to reconfirm this. The Environment Agency has confirmed that no further evidence is required.

The Company is a single resource zone with the risk of shortages of water being equal across the whole area of supply. The Company has two surface water treatment works and 26 groundwater sources, which are mainly situated in the southern and central areas. All these sources are linked by an integrated supply system.

The supply area has varying topography and the supply system has been developed over time to provide security of supply to all customers. This has been achieved by the linking of the Company's strategic service reservoir supply areas with large diameter mains, booster stations and remotely controllable valves to enable the transfer of water throughout the Company's supply area.

The Company has 20 supply zones with potable water storage provided by 35 service reservoirs and water towers. Water sources feed directly into some supply zones and zonal transfer boosters move water to zones with no direct resource input and between supply zones at times of peak demand or asset maintenance. Strategic control valves operate in a similar way to zonal transfer boosters but transfer water under gravity.

[5] Water companies must submit to the Environment Agency an annual review of their Water Resources Management Plans

As an example of zonal flexibility and integration, the Company has the ability to transfer water from the far south-west corner of its supply system to the northern and eastern supply zones. This is achieved by transferring water through the strategic reservoir system.

The Company operates a Control Room that is manned 24 hours a day. The primary purpose of this is to monitor and manage the supply system on a day to day basis. All zonal transfer boosters and control valves can be operated remotely from the Control Room.

In a resource shortage situation, the highly interconnected supply system allows the Company to transfer water between service reservoirs such that supplies can be maintained to all customers through balancing the fall in all water storage reservoirs. The Company's water resources model, (WRAPSIM at PR09 and Aquator for PR14), is set up to represent this ability to transfer water throughout the area of supply.

The Company operates a shared resource with Severn Trent Water. Severn Trent Water is entitled to up to one third of the original joint licence from the works. The entitlement is abstracted by South Staffs Water and transferred to Severn Trent Water to meet demand in Wolverhampton.

3.3 Planning Scenarios

The Environment Agency Water Resources Planning Guideline details the range of planning scenarios which a Company may need to consider. In accordance with this the Company uses the dry year annual average scenario for water resources planning purposes. A normal year demand forecast is developed initially and the key components of this demand which are influenced by dry weather are then adjusted to derive the dry year annual average demand forecast.

A new requirement for water resources plans for PR14 is the inclusion of weighted annual average demand forecasts. A weighted annual average demand forecast reflects the mix of demand under dry years and normal years and other weather scenarios. Weighted average demand represents the demand that is most likely to be experienced over the planning period on average. It is the weighted annual average demand which will be used by Ofwat to forecast the Company's revenue when it sets the PR14 price limits.

The Company developed supply and demand forecasts for the peak week scenario for PR04 and PR09. At PR04 the peak week scenario demonstrated a supply demand deficit which required option appraisal and implementation to address the deficit. At PR09 there was no peak week deficit. The Company has again produced a supply demand balance for the peak week scenario for PR14. There is no deficit

forecast under this scenario and this forecast is included in the fWRMP for the purposes of continuity and information only.

The base year data for 2011/12 has been normalised to reflect the low leakage levels due to the mild winter and this normalised data is then used as the starting point of the demand forecasts for all planning scenarios.

For South Staffs Water there is no deficit in the supply demand balance under any of the planning scenarios. Since the Company is not forecasting a deficit within the planning period there is no requirement for options and therefore there is no requirement for a utilisation forecast for supply side options.

The Company has presented a baseline forecast for each scenario and a final planning forecast for each scenario. The Company proposes to continue with change of occupier metering as a baseline metering policy subject to confirmation of funding at the PR14 price review but has complied with the Environment Agency planning guidance and has included this in the final planning forecast only post 2014/15.

The detail of the derivation of the demand forecasts is described in section 5 of the fWRMP. The planning scenarios presented in the fWRMP are summarised below.

Scenario	Included in SSW fWRMP	Comment
Normal year demand	Baseline and Final Planning	Not included but is the basis for dry year forecasts. Base year has been normalised for leakage only
Dry year demand	Baseline and Final Planning	None
Peak week demand	Baseline and Final Planning	Not required but included for continuity
Weighted average demand	Baseline and Final Planning	To be used for revenue forecasts in the Business Plan
Utilisation forecast (annual average)	No	Not required due to no deficit
Utilisation forecast (critical period)	No	Not required

The fWRMP does not include scenarios of very prolonged periods of high demand and reduced supply such as droughts. Droughts require additional measures and are planned for in the Company's Drought Plan.

In urban areas when many customers wish to take large volumes of water at around the same time usually for discretionary purposes such as garden watering pressures in the system can drop and customers can experience low pressure and occasionally no water. This is defined as supply stress and is not a water resources problem. However, some of the strategies designed to manage the overall supply demand balance, in particular metering, will also benefit those areas specifically suffering from supply stress.

It should be noted that the fWRMP is at the supply system overview level. Local transfer capacity difficulties as described above for example, may still require investment. These issues are not considered within the fWRMP, but where required investment may be included in the Final Business Plan.

3.4 Climate Change

The South Staffs Water fWRMP includes an assessment of the impact of climate change on the availability of water supply. The best estimate for this impact is included directly in the supply forecasts and the uncertainty associated with estimating the impact is included in the assessment of headroom uncertainty.

The uncertainty around the impact of climate change on demand has been included in the headroom assessment. The Company has made use of the techniques published in UKWIR report 13/CL/04/12 "Impact of Climate Change on Water Demand" in following the approach as set out in the Environment Agency Water Resources Planning Guideline.

The detail of the assessment of the impacts of climate change are described in sections 5.12 and 6.3.

3.5 Sensitivity Analysis

In the development of water resources plans water companies have to make assumptions, affecting almost every part of the plan. Therefore, it is important to demonstrate the sensitivity of the plan to these assumptions. The Company has looked at sensitivity in two areas:

- The sensitivity of the supply-demand balance to data uncertainty (headroom).
- The sensitivity of the proposed actions in the plan to assumptions or changes in the supply-demand balance (not in headroom).

3.5.1 Data Uncertainty

Uncertainty around assumptions in the baseline supply and demand forecasts are accounted for in headroom. Headroom is the planning

allowance calculated to provide a buffer for those uncertainties. The output from the headroom modelling is described in section 7 and the detail of the uncertainty assigned to each source of uncertainty included in headroom is described in Appendix A.

The Environment Agency planning guideline states that uncertainty associated with general sustainability reductions cannot be included within the estimation of target headroom. The Company has however, discussed the sensitivity of the supply demand balance to additional sustainability reductions within the sensitivity testing work in section 10.

3.5.2 Sensitivity of Plan to Changes in Supply-Demand Balance

The Company's baseline supply-demand balance indicates that there is no deficit throughout the planning period for either the dry year annual average or the critical period peak week scenario.

However, in addition to uncertainty around the central assumptions in the supply demand balance which are dealt with in headroom there are a number of other factors which could vary over the plan period. These include the potential for future water trading, future changes in leakage levels and future reductions in deployable output.

The Company has taken a prudent approach and included additional scenarios to demonstrate the sensitivity of the supply demand balance to these changes.

This sensitivity testing is described in section 10.

3.6 Other Licensed Water Undertakers in South Staffs Water's Area of Supply

At the time of preparing this plan there are no licensed water undertakers who supply water via the South Staffs Water supply system. There are no inset appointments in the South Staffs area of supply. Therefore, account of implications arising from other licensed water undertakers has not been necessary and is not considered further within this plan.

3.7 Severn Trent Water

Severn Trent Water borders South Staffs Water's area of supply on all sides and the two companies have a number of shared interests which require close liaison and a consistent planning approach within the respective fWRMPs for the two companies. The Company met with Severn Trent Water as part of the preparation of this fWRMP to discuss and agree a number of issues.

3.7.1 HL Abstraction Licence Entitlement

The Company's HL abstraction licence is a shared resource with Severn Trent Water which is entitled to one third of the original joint licence. This entitlement is reflected in the calculation of deployable output for each company.

3.7.2 River Severn Modelling

The Company's water resources model used for calculating deployable output does not include a hydrological model of the River Severn catchment. The River Severn inputs are taken from the Severn Trent model. The Company provides Severn Trent Water with relevant data and information regarding its own operations in order for the River Severn component to be accurate. Severn Trent provides data to the Company for deployable output estimation and for estimation of the impact of climate change on supply. South Staffs Water has used the latest updates from Severn Trent Water, based on rainfall-runoff modelling in the preparation of this fWRMP.

The detail regarding the modelling of the River Severn and the shared HL resource can be found in Appendix B describing the calculation of deployable output.

3.7.3 Bulk Supplies

The Company exports a number of small bulk supplies to Severn Trent and receives a number of very small bulk imports across the border. The Company also has a number of emergency bulk supply points in case of localised operational events close to its border. These regular and emergency bulks are in addition to the joint resource.

The Company has met with Severn Trent to agree planning assumptions on the scale of the imports and exports for the planning period.

3.8 Water Trading

During the pre-consultation stage of the development of the dWRMP the Company wrote to neighbouring water companies and water companies who utilise the same water resources as the Company to inform them of the Company's supply demand surplus which would be available for water trading arrangements. The Company had a series of meetings with Severn Trent Water to discuss the opportunities for the provision of surplus water from South Staffs Water to them.

Since the dWRMP was published the Company has continued to discuss the potential for the provision of surplus water to Severn Trent to assist with a projected deficit in their supply demand balance in AMP7.

It has been agreed which of the options should be developed further, and the ambition is that sufficient detail can be defined to enable the options to be named as feasible options with outline costs and benefits in the Severn Trent Water fWRMP.

The Company has confirmed that a supply / demand surplus could be provided to supply the Severn Trent Water Strategic Grid zone. Severn Trent Water has confirmed that the most feasible option is to use existing assets to link into the Elan Valley Aqueduct to provide 10-20Ml/d of treated water supply. The Company has agreed to provide an indicative price for providing this supply, and in the final WRMP Severn Trent Water will compare it with the costs / benefits of the other new supply options available for that zone.

As there is currently no firm agreement over a trade the Company has not included it within the final supply demand balance but has included it in an updated sensitivity scenario in section 10 of the fWRMP.

If a water trade agreement is reached post publication of the fWRMP the planning framework allows for the adaption of 'better' solutions without triggering a formal review of plans, subject to materiality.

The Company has also been contacted by a number of other water companies offering surplus water in the event of South Staffs Water having a supply demand deficit requiring some intervention. The Company has not pursued these options as there is no projected deficit throughout the planning period.

3.9 Internal Governance

The Company employed the services of consultants Monson to undertake an independent audit of the dWRMP. Staff attended the South Staffs Water offices to review the details of the demand and supply forecast assumptions and calculations. An audit report was produced following the audit.

The audit report identified a small number of areas where further explanation or amendments could be considered. These were generally of a minor nature and presented no material impact on the overall supply demand balance. The Company reviewed these areas and made amendments where it considered this to be appropriate. The audit report concluded that the dWRMP met the legal requirements, demonstrated a secure supply of water and complied with the Environment Agency Water Resources Planning Guideline. Monson was in agreement with the supply demand balance assumptions within the plan.

The Company also set up a steering group involving Directors who met monthly to discuss progress with the development of the dWRMP and approve relevant policy decisions. The detail of the dWRMP was

presented to the Board of Directors for approval at the February 2013 meeting.

The SoR to the public consultation on the dWRMP was approved by the Board of Directors prior to publication in November 2013.The SoR detailed the changes for the fWRMP. None of these changes are material.

4 CUSTOMER ENGAGEMENT

4.1 Overview

The Water Act 2003 made water resources management plans statutory documents which must be submitted to the Secretary of State (Defra). Once a dWRMP has been submitted the document must be made public and there must be a period of consultation where comments on the plan can be sent to the Secretary of State. Water companies must then consider the comments received and make any necessary changes to the plan before it is resubmitted to the Secretary of State.

In addition to the statutory requirement to consult specified stakeholders the Environment Agency Water Resources Planning Guideline makes it clear that customers have an important role to play in helping companies shape their plans. The Guideline specifies that customers should be involved through direct engagement and states that companies must decide how to make use of their CCG.

South Staffs Water is committed to engaging with all of the stakeholders who have an interest in this plan and has consulted with these stakeholders and the general public. The Company undertook a range of customer and stakeholder engagement activities during the preparation of the plan. This included the statutory pre-consultation, a focus group workshop with customers, focused discussions with the CCG, a public consultation on the published dWRMP and consultation associated with the broader PR14 Business Plan.

The WRMP is part of the business planning cycle for determining price limits for water companies. There is a range of customer engagement activity associated with the Business Plan which is also relevant to issues within the fWRMP.

For issues relevant to the fWRMP customers and stakeholders place high importance on metering, leakage levels, water efficiency activity and the environment. The Company believes it has taken customer and stakeholder views on board in the development of its proposals and is confident that the fWRMP reflects customer and stakeholder expectations in these areas.

All of this customer engagement is described in the following sections of this chapter.

4.2 Pre-Consultation

During the preparation of the dWRMP the Company undertook the following activities:

- In line with statutory requirements a range of stakeholders were contacted to invite views on what the dWRMP should consider
- The Company held regular meetings with Environment Agency staff during the development of the dWRMP
- Research to explore customer priorities and initial WtP (Willingness to Pay) was undertaken in autumn 2012 using consultants MVA. The report detailing this research is included as Appendix C, a summary of the research approach is included in section 4.2.3 and the outcomes are included in section 4.4.1
- The PR14 CCG was informed and views on key strategy areas sought
- The Company met with Consumer Council for Water (CCWater) to explain the detail of the Company's commitments under the NEP
- A focus group workshop was undertaken in January 2013 to gain feedback from a group of domestic customers using consultants Community Research to facilitate the process. The full report from this event is included as Appendix D, a summary of the methodology is included in section 4.2.4 and the outcomes are included in the sub sections of section 4.4.

4.2.1 Statutory Pre-Consultation

There is a statutory requirement to consult the following groups prior to the preparation of the draft plan; the Environment Agency, Ofwat, the Secretary of State and any licensed water supplier which supplies water to premises in the Company's area via its supply system.

Pre-consultation letters were sent to key stakeholders in August 2012 notifying them of the Company's work to develop a new dWRMP and asking them for initial views on issues to be considered. Letters were sent to the following:

- CCWater
- Ofwat
- Environment Agency
- Defra
- Natural England
- CC Wales
- Customer Challenge Group
- Severn Trent Water
- Anglian Water
- Bristol Water

There are no licensed water undertakers who supply water via our supply system.

Responses were received from Ofwat, the Environment Agency and CCWater. The main points raised in these responses were:

- The plan must comply with the Water Resources Planning Guideline
- The plan must comply with the WRMP Directions
- The plan must demonstrate how the Company will reduce demand over the plan period
- The plan must include confirmed and likely sustainability reductions as notified by the Environment Agency
- The plan must be risk based
- If there is a deficit at any point within the plan period appropriate options must be identified
- Water trading with neighbouring companies must be explored
- The plan must demonstrate how customer and third party involvement and consultation has helped shape it
- The plan must be consistent with the Company's Strategic Direction Statement.

All these comments are generic to any company and were generally as expected. These points were taken on board and addressed in the dWRMP and are reflected in the fWRMP.

4.2.2 Environment Agency Liaison

The Water Resources Planning Guideline specifies that water companies should consult with their local Environment Agency team regarding the proposed approach for the following:

- single resource zone justification,
- deployable output modeling,
- climate change vulnerability assessment for water supply,
- climate change assessment approach for water supply

The Company held regular meetings with Environment Agency staff during the development of the dWRMP. These meetings provided the Environment Agency with early sight of these particular areas of the plan and in addition the micro-component forecasts, customer engagement, the inclusion of the NEP and the SELL.

The Company took on board informal comments received from the Environment Agency during these discussions. In particular, the Company agreed to adopt a more complex modelling approach to assess climate change impacts on supply as a result of these discussions.

4.2.3 Approach to Research on Customer Priorities and Initial Willingness to Pay

In autumn 2012 consultant MVA was appointed by the Company to engage with customers to gain insights into aspects of service where customers may want to see changes and/or improvements. The research objectives were to:

- provide domestic and business customers' views on the company, and their levels of satisfaction, or dissatisfaction, with existing service provision;
- identify those aspects of service that are most important to domestic and business customers, and where improvements would be most valued;
- explore customers' expectations and aspirations regarding future service delivery; and
- (tentatively) identify customers' willingness to pay for defined service improvements and/or willingness to accept quality reductions in other service aspects.

To best meet these objectives, a quantitative survey of customers was deployed. The research obtained the views of domestic and business

customers, both unprompted by information about the Company's services (to represent the current views of customers) and prompted, so that the Company could understand customers' fully-informed choices and preferences.

A series of qualitative interviews were also undertaken with business customers to supplement the quantitative findings with deeper insight into the underlying reasons for the viewpoints expressed by the business community.

The CCG were involved in the development of the quantitative questionnaire for both domestic and business customers. The main fieldwork was undertaken throughout September 2012. The quantitative survey was conducted via online and face-to-face methods. 461 web-based interviews and 150 face-to-face personal interviews were undertaken with domestic customers. A combination of 108 web-based and telephone interviews were undertaken with business customers where 15 were extended in-depth interviews.

Obtaining customers' uninformed view (initially) is very important as it provides valuable insight into the views of most customers currently. However, it has been proven by previous market research that – for many customers – there is little appreciation of the complexities of water supply and therefore it can be difficult for customers to be able to provide steer on future services. In order for the customer to provide an informed view, customers were presented with information on their existing service provision and a range of possible improvements or reductions in service level.

This research was not limited to WRMP issues. It also covered other aspects of service like water quality and customer interactions with the Company on operational or billing matters. Specific research focussed on the WRMP was also undertaken. It was identified that the best way to do this was to undertake a customer focus group / workshop so that customer views could be explored fully rather than just review quantitative research findings. This important strand of customer engagement is discussed below.

4.2.4 Summary of Focus Group Workshop Methodology

The Company appointed independent facilitators to lead the workshop and to write the report that followed. Consultant Community Research was used. The purpose of the January 2013 workshop was to understand customers' informed and uninformed views about various aspects of the dWRMP. Since many of the elements to be included in the plan were not well-known or understood by most customers, there was a need to build an element of education and information provision into the customer engagement process. A qualitative and deliberative process, bringing together customers from different backgrounds and lifestyles to debate issues over an extended period, was developed.

This approach was chosen because it would allow participants time and space to understand the issues being faced by the Company in developing its plan. A full day's deliberative workshop was held on Saturday 26th January 2013 at South Staffs Water's offices in Walsall. Representatives from the Environment Agency and the CCG were present to observe proceedings.

The key elements of the dWRMP, upon which the Company wished to gain customer feedback, were broken down into different sessions during the course of the day. Various stimuli were developed in order to inform workshop participants about the issues and challenges being faced by the Company in developing the dWRMP. These took the form of written handouts, verbal presentations and an interactive quiz session. Handheld voting keypads were used in order to gather individual participants' responses to a number of key polling questions. Workshop participants discussed the issues in small groups, each facilitated by an independent researcher. Notes of these separate small group discussions were taken and these were analysed, alongside the polling results, to produce a report of the event and the findings.

The original target for the workshop was to recruit 40-45 customers. Participants were recruited to be broadly representative of the West Midlands as a whole, with reference to the following criteria; gender, age group, ethnic background and working status. A recruitment target was set to ensure that the mix of participants involved in the workshop would reflect the Company customer base in terms of water metering. Furthermore, recruitment sought to ensure that the vast majority of participants were responsible for the Company bill (although it was recognised that in order to include the right proportion of younger participants, some of those taking part might not be the bill-payer.)

The workshop was attended by 27 customers. Whilst 45 customers were originally recruited to attend; the workshop was subject to an unusually high degree of last minute cancellation, largely due to there being amber weather warnings for snow in the forecast on the evening before the event. Whilst this did mean that the overall number of participants was lower than had been hoped for, the make-up of the workshop reflected the make-up of the area very well in terms of key socio-demographic variables and a lively debate was evident.

Events of this nature and scale cannot claim to offer a robust or statistically reliable representation of the 1.2 million customers served by the Company. Neither are they intended to; the data produced is qualitative rather than quantitative in nature. However, the process does provide extremely useful insight into what a broad cross section of customers concluded, after they had had the opportunity to learn more about the issues facing the Company.

4.2.5 Summary of Customer Challenge Group Engagement

As part of the PR14 Business Plan process Ofwat specified that all water companies must establish a Customer Challenge Group (CCG) to ensure that the company's business plan reflects a sound understanding and reasonable balance of customers' views, and whether the phasing, scope and scale of work required to deliver outcomes – including legally prescribed standards and other regulators' requirements – is socially, economically and environmentally sustainable.

The role of the group also includes consideration of evidence of a company's direct customer engagement, discussing and challenging how the Company has responded in its business plan. The group is to advise Ofwat on how well this has been done.

As well as other regulators and the Company itself, the CCG comprises:

- Consumer representatives, such as CCWater and the Federation of Small Businesses, together with 2 of the Company's large users
- Regulatory and community stakeholders (including local authorities, the Environment Agency, the Drinking Water Inspectorate and Natural England)
- Those that represent particular segments of customers, such as representatives from local Citizens Advice Bureaus.
- An independent chair.

The Company established its CCG in April 2012.

The Company has recognised the benefit of engaging stakeholders in the development of the WRMP and invited the CCG to be involved. On 14th November 2012 a workshop for CCG members on key issues for the dWRMP was held at Green Lane, Walsall. The intention of the workshop was to provide background information to educate CCG members in preparation for the full committee meeting in December 2012 when the proposed strategies to be included in the dWRMP would be presented and discussed.

In preparation for the workshop a suite of briefing notes was produced covering an overview of water resources planning, metering and water efficiency, leakage, levels of service for customer supply restrictions, the NEP and water trading. At the workshop informal presentations covering the material in the briefing notes were given. Attendees were encouraged to raise questions throughout the sessions and there was considerable discussion around each subject.

The December 2012 CCG meeting focused on the key strategy areas for the dWRMP seeking views from the group on the Company's proposals. The CCG discussed a number of elements of the plan including:

- The pace of metering
- The need to deliver the NEP
- Maintaining leakage at the SELL

Following debate around these issues the CCG gave support to the Company's proposals in the areas of metering, leakage, water efficiency, level of service for customer restrictions and the environment. However, the CCG forum noted that it had not yet had the opportunity to look at the dWRMP proposals alongside all the other priorities coming from customers and proposals to be included in the Company's Business Plan submission to Ofwat. Therefore the CCG noted that it would be looking again at the proposals in this wider context before the Company submitted its Business Plan in late 2013. The CCG were invited to submit formal comments on the dWRMP as part of the public consultation exercise but did not submit a response.

The briefing notes developed for the CCG are included in Appendix E. The minutes from the CCG meetings can be viewed in the CCG section of the Company website at www.south-staffs-water.co.uk

4.3 Further Customer Engagement since the dWRMP

The customer research on priorities and initial willingness to pay carried out in Autumn 2012, the views of the CCG and the feedback obtained during the focus group event in January 2013 were used to refine the dWRMP.

Since the dWRMP was submitted to Defra in March 2013 the Company has continued with its strategy for customer engagement around proposals for the PR14 Business Plan and the CCG has continued to be heavily involved in this process. There have been four key pieces of research undertaken since then. These are:

- Public consultation on the dWRMP
- Willingness to Pay
- Consultation on Business Plan Initial Proposals
- Acceptability testing

The public consultation focussed on the detail of the dWRMP. The other additional research has been focussed around the specific investment proposals in the Company's PR14 Business Plan which includes combined proposals for the two operating regions of

Cambridge and South Staffs. The findings of these additional areas of research are generally supportive of the Company's proposals. The details of this additional research are available on the Company's website (www.south-staffs-water.co.uk).

A summary of the approach taken for the additional research is included in the following sub-sections of section 4.3. A summary of the research outcomes is included within section 4.4 on Research Outcomes.

4.3.1 Public Consultation on the dWRMP

The Water Act 2003 states that companies must publish their draft plan within 30 days of notification from Defra that Defra is not proposing to give any direction (under section 37B(10) of the Water Act 2003) to amend the plan on the grounds of national security.

This draft plan was published on the Company website (www.south-staffs-water.co.uk) on 24th May 2013. Letters were sent notifying key stakeholders (as specified in The Water Resources Management Plan Regulations 2007) of the consultation period, directing them to the website and advising that a paper copy of the plan was available if required. These stakeholders included:

- The Secretary of State
- The Environment Agency
- Ofwat
- Licensed water suppliers within the Company's area of supply
- Regional Development Agencies within the Company's area of supply
- Regional Assemblies within the Company's area of supply
- Local Authorities within the Company's area of supply
- Natural England
- The Historic Buildings and Monuments Commission (English Heritage)
- Canal and Rivers Trust
- Severn Trent Water
- The Consumer Council for Water

There followed a 12 week period for representations where any comments or questions on the draft plan could be sent to the Secretary of State for Environment, Food and Rural Affairs. The responses to the consultation were reviewed and a statement of response was published on the Company website on 22nd November 2013. The

Company informed everyone who made representations that this statement of response had been published.

The Company received a total of 8 responses from a variety of stakeholders. There were no comments which resulted in a substantial change to the fWRMP. A summary of the areas of the dWRMP which have been updated since the dWRMP is included in section 1.2.

The Statement of Response is included as Appendix J to the fWRMP.

4.3.2 Willingness to Pay Research

In May 2013 the Company commissioned a stated preference study (willingness to pay research) with customers to support decisions on investment to be included in its PR14 Business Plan.

The findings from customer qualitative research, a review of complaints data, lessons learnt from PR09 and recent UKWIR studies around customer valuation where used to identify the service attributes to be valued. The attributes identified covered a broader spectrum of service than the fWRMP but all are included here for completeness in the following table.

Service attribute	Unit of measure
Boil water notice	Number of properties affected in any one year
Discoloured tap water	Number of properties affected each year
Taste and smell of tap water	Number of properties affected each year
Hard water	Number of properties affected each year
Hosepipe ban	The chance that a hosepipe ban will be required in any one year
Non-essential use ban	The chances that a non-essential use ban will be required in any one year
Minor pollution incident	The chance in any one year that South Staffs Water causes one minor pollution incident
Low water levels and flow in rivers and streams	The percentage of rivers out of 339 miles experiencing low flow in the South Staffs region
Low water pressure	Number of properties affected each year
Unexpected supply interruption lasting 3 to 6 hrs	Number of properties affected each year

Internal water flooding	Number of properties affected each year
Leakage	The amount of water lost through leaks each year. Number of properties that could be supplied.

For each attribute, up to five levels of service were specified based on South Staffs Water's performance data: the current level of service (status quo), two improved levels of service (+1 and +2), and two deteriorated levels of service (-1 and -2). The balance of two improved and two deteriorated levels provides an appropriate range to non-linear effects to be examined.

The survey was piloted and then implemented with a total of 506 South Staffs Water domestic customers and 300 non-household customers.

4.3.3 Consultation on Business Plan Initial Proposals

South Staffs Water (SSW) published its combined draft Business Plan for both operating regions in September 2013 and launched a consultation of key stakeholders, including domestic and business customers, on the content of the plan. The consultation closed on 4th October 2013.

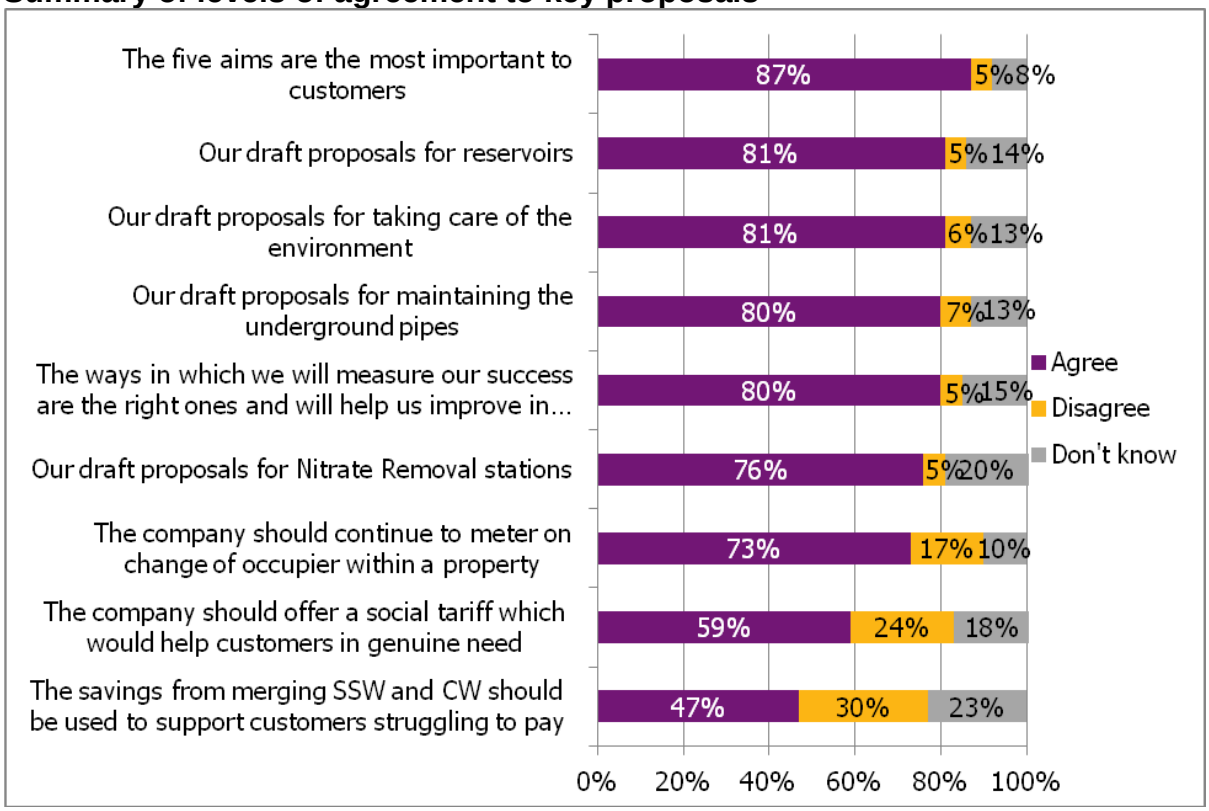
A summary version of the draft business plan, titled 'The future is your cH2Oice 2015-20' was published on the Company website, customers for whom email addresses were available were sent the document and a hard copy was sent to 500 key customer groups and stakeholders. 300 letters and posters signposting the consultation were sent to health centres, schools and children's centres, and a press release was issued. In addition, customers calling SSW heard a recorded message directing them to the website to respond to the consultation.

The over-arching objective of this consultation was to gain feedback on key elements of the Company's draft Business Plan. Consultees were also asked about the Company's proposals for five specific areas; metering, the environment, nitrate removal stations, storage reservoirs and underground pipes. The first three items are relevant to the fWRMP and the results from this part of the consultation are included in section 4.4 describing the key research findings.

In total, consultation responses were received from 983 individuals and organisations. The vast majority (969) of these were household customers, and 14 were businesses or other stakeholders. In total, 525 responses were received from Cambridge Water customers and 446 from South Staffs Water customers, with 12 respondents indicating that they did not know. This represents a relatively high response rate from domestic customers to an open consultation of this type.

There was a high level of agreement with the outcomes identified in the plan and how they will be measured. Respondents gave the most positive response to plans for investing in reservoirs, underground pipes and the environment.

Summary of levels of agreement to key proposals



Base: All respondents (983)

4.3.4 Acceptability Testing

A new Ofwat requirement for 2014 Periodic Review of Prices (PR14) is Customer Acceptability Testing of the proposed plan.

"Customers' views will feed into the price-setting process in one of three ways. Through direct local engagement between each company and its customers to understand customers' views, to inform development and test acceptability of the company's plan"
Involving Customers in Price Setting, Ofwat, 2012

In October 2013 841 household customers and 203 business customers were surveyed to test their views on the acceptability of the Company's investment proposals based on the proposed outcomes and measures.

4.4 Research Outcomes

The key findings of the customer research and engagement undertaken to date are described below.

4.4.1 Priorities

As part of the process of customer engagement for the dWRMP and the PR14 Business Plan customers have been asked to identify their priorities.

The results from the customer priorities research undertaken by MVA in autumn 2012 show that the top 5 improvements that domestic customers most prefer are:

- Leakage reduction
- Improved hardness
- Less disruption to roads
- More social discounts on bills to help more customers
- Improved risk of environmental pollution

For business customers the top 5 improvements most preferred are:

- Leakage reduction
- Less disruption to roads
- Improved water efficiency provision
- Improved risk of short interruption in supply
- Improved risk of environmental pollution

The following tables summarise the results of the customer priorities research.

Customers Priorities and Initial Willingness to Pay for Improvements

Service Description	Domestic Customers		Business Customers	
	Top 5 Improvements	Willingness To Pay	Top 5 Improvements	Willingness To Pay
Leakage reduction	38%	8%	44%	11%
Reduced water hardness	32%	9%	N/A	8%
Less disruption to	26%	6%	31%	N/A

Service Description	Domestic Customers		Business Customers	
	Top 5 Improvements	Willingness To Pay	Top 5 Improvements	Willingness To Pay
roads				
More discounts for low income families	18%	N/A	N/A	N/A
Reduced risk of environmental pollution	17%	6%	20%	6%
Reduced environmental impact on habitats	N/A	6%	N/A	N/A
Increased water efficiency activity	N/A	N/A	27%	6%
Reduced risk of short interruptions to supply	N/A	N/A	22%	6%
Reduced risk of long interruptions to supply	N/A	N/A	N/A	7%

Customers Most Accepted Quality Reductions and Initial Willingness to Accept

Service Description	Domestic Customers		Business Customers	
	Most Accepted Quality Reductions	Willingness to Accept	Most Accepted Quality Reductions	Willingness to Accept
Increased risk of hosepipe bans	16%	15%	9%	7%
Increased risk of short interruptions to supply	8%	6%	11%	N/A
Reduced water efficiency activity	8%	11%	N/A	5%
More disruption to roads	6%	N/A	7%	7%
Reduced means for customer contact	3%	5%	7%	N/A

Service Description	Domestic Customers		Business Customers	
	Most Accepted Quality Reductions	Willingness to Accept	Most Accepted Quality Reductions	Willingness to Accept
Increased energy usage	N/A	N/A	7%	N/A
Increased hardness of water	N/A	N/A	N/A	6%

At the outset of the focus group workshop held in January 2013 customers were asked to suggest what they considered to be the most important issues facing water companies currently. This was prior to the provision of any information or any other input regarding the kinds of issues that would be discussed during the course of the day.

A broad range of issues was suggested by customers as being important for water companies, including (in order of popularity):

- Leakage / wastage
- (Increased) prices / (increased) costs
- Metering / fairer pricing
- Water conservation (by the company or nonspecific)
- Hosepipe bans / drought/ shortages
- Flooding / ground water levels / drainage
- Environment /global warming
- Water quality/ safety / contamination
- Customer satisfaction / customer communications
- Maintaining supplies
- Infrastructure renewal / technology
- Water wastage / conservation by customers
- Profit
- Affordability / customer debt
- Competition
- Adding things to water e.g. fluoride

Early in the day customers were also asked to identify the three most important issues from a list of challenges that water companies may face. The results illustrate that leakage was seen as the most important

issue, closely followed by ensuring water quality and keeping bills affordable.

This same question was returned to towards the end of the workshop and the informed position of customers, following all of their discussions during the course of the day, was considerably different in terms of the priority levels they assigned to the various different challenges. Installing more water meters, in particular, gained a much greater level of importance for participants than had been true prior to the workshop discussions. Reducing leakage in the system was lower in the priority order, although it remained in the top four priorities. Encouraging people to use less water was assigned a significantly higher level of importance.

4.4.2 Metering

Customer views on metering changed significantly during the focus group workshop. At the beginning of the event increasing the level of metering was not seen as a particularly prominent issue. At the end of the day, however, metering was viewed by the majority of customers as being one of the top 3 issues for the Company and the most important challenge for some.

Customers at the workshop agreed that paying for water by metered charge is the fairest way to pay. Furthermore, they reported becoming a great deal more conscious of their water use and water wastage as a result of being on a meter. Some customers also recognised that meters could have wider benefits in terms of leakage being more easily detectable and in being more “environmentally friendly”.

The majority of customers at the focus group workshop gave support for the Company’s proposed metering strategy and the discretionary change of occupier metering policy and in fact some customers expressed a preference for a faster rate of growth in metering numbers.

The CCG is generally supportive of the Company’s proposed metering strategy with a rate of growth in domestic meter penetration of around 2% per year over the plan period.

The Company believes that a gradual growth in metering levels best addresses customer preferences for increasing meter penetration whilst balancing the impact on customer bills and concerns about affordability.

In response to the consultation on the Company’s Business Plan proposals a majority of respondents (73%) agreed that the Company should continue with the change of occupier metering policy. Customers who have a meter were substantially more likely to agree (88%) than those without a meter (51%).

Of those who disagreed with the Company's proposals for metering, a small proportion (13%) thought that we should be doing more metering. More than a third (37%) thought the Company should be doing less metering, and half (50%) thought something else should be done. Of the latter, around one-third indicated that they were not sure or did not know what should be done.

The most frequent reasons given for agreement were that metering is the fairest way to charge people for what they use, and that it encourages people to think about how much water they are using, promoting conservation. Half of those who disagreed with the Company's proposal for metering said that they believed customers should have a choice.

4.4.3 Water Efficiency

The results from the customer priorities research in autumn 2012 show that water efficiency is ranked by business customers as the third highest priority for improvement. In fact 41% of business customers would like a tailored service including water efficiency services. However, only a minority of customers (6%) were willing to pay for it. Domestic customers ranked water efficiency as the most accepted reduction in service.

At the focus group workshop customers quickly linked water efficiency with metering and identified the benefits of undertaking water efficiency to reduce their bill. All customers at this workshop supported the view that the Company needs to undertake water efficiency activity and would like the Company to do a lot more work in this area. Current communication around water efficiency was not seen to be effective. The Company will look to significantly improve this during the delivery of its water efficiency strategy for 2015 onwards.

There was a minority view expressed at the focus group workshop that it is not a core part of a water companies' role to undertake consumer education. Whilst this complete rejection of the idea that the Company should act on the issue of water efficiency was a minority view, many more participants did suggest that there should also be a strong role for Government, with regards to educating the public on the importance of water conservation. The Company agrees with this view and will continue to work with colleagues in the Environment Agency to identify better ways of communicating with customers about water efficiency.

4.4.4 Leakage

The CCG is supportive of the Company's proposal to operate at the SELL unless customers are willing to pay to go below this level.

The results from the customer priorities research in autumn 2012 show that leakage reduction is ranked by domestic and business customers as the top priority for improvement. However, only a minority of customers (8% domestic and 11% business) were willing to pay for it.

As with metering, customer views on leakage also changed significantly during the focus group workshop. Uninformed customers generally rated leakage as one of the top 3 issues for the Company. Once customers understood the SELL concept leakage fell lower in the list of priorities. However, some still felt the actual amount of leakage was too high and was only acceptable because of the Company's position of water resource surplus. Some customers suggested they might be willing to consider paying more to reduce leakage beyond the SELL.

Learning about leakage levels also consolidated customer thinking about meters. Having heard that 30% of leakage happens on customer supply pipes the importance of meters as a way of identifying the location of such leakage was further recognised.

Customers at the focus group workshop remained split about whether the Company should continue to operate with leakage levels at the SELL or go beyond this and reduce leakage further. Customers linked this issue with the current supply demand balance and the projected Company surplus and the fact there is no need to go below the SELL.

Since the Company is not forecasting a deficit in the supply demand balance throughout the plan period the impact of reducing leakage beyond the SELL for water resources planning purposes is not significant.

The willingness to pay research found that customers are not willing to pay enough to fund a reduction in leakage.

4.4.5 Level of Service

The results from the customer priorities research in autumn 2012 show that a reduction in level of service is ranked by domestic customers as the most accepted reduction and the second most acceptable reduction for business customers. It was not identified as an area for improvement by any group of customers.

At the focus group workshop the current level of service being achieved by South Staffs Water was widely seen as impressive and there was no appetite at all for it to be bettered. There was some feeling that a lower level of service would be acceptable, especially since quite a number of participants were relatively unconcerned about the impact that a hosepipe ban might have for them. Some however, did not like the idea of 'going backwards'. Some concern was expressed that this would lead to lower levels of customer satisfaction.

Rather than placing an emphasis on reducing bills, some of those participants who had said that they would be prepared to accept a lower service level preferred that the money saved be used to invest in leakage or improvements to the local environment.

There was no consensus in view of either an improvement or a reduction in service levels on customer restrictions. Therefore the Company proposes to maintain the current service level.

In response to the consultation on the Company's Business Plan proposals most respondents (76%) agreed with the Company's proposals for major spending on up to three nitrate removal stations to help achieve secure and reliable water supplies, now and in the future. Of those who disagreed with the proposals for nitrate removal stations, nearly half (46%) thought the company should be doing something different. One-fifth said that they did not know.

Those who agreed did so in the main because they believe drinking water quality and safety are important, with some mentioning the use of nitrates in agriculture. More than a third of those who disagreed with the proposals said that agricultural nitrate use should be reduced or that customers should not have to pay for nitrate removal.

4.4.6 The Environment

The results from the customer priorities research in autumn 2012 show that no customers identified a reduction in environmental impact as a priority. Six percent of domestic customers were willing to pay for an improvement.

At the focus group workshop customer views on the environment did not change significantly during the day. Very few gave looking after the natural environment priority in terms of importance as a challenge facing water companies at the beginning of the day. A minority of customers highlighted it in their top three challenges at this early stage. By the end of the day a few more placed looking after the natural environment in their top three challenges but this still remained the minority view.

Customers felt that water companies do have a special responsibility towards the environment and they expected them to behave in a responsible way in managing the local environment.

For some, the requirements set down by the Environment Agency in the NEP were seen as sufficient. Some customers felt that the Company should not go further unless there was some specific incentive or business benefit from doing so. However, it was considered to be important to ensure that local as well as national environmental concerns are reflected in the Company's plans.

There was no broad based support to pay more for environmental improvements beyond those specified by the Environment Agency. Some customers were not averse to this idea if the additional payments were small and the environmental projects would have value for local communities, however others were much less willing to pay for such activities.

Environmental Regulators at the CCG are of the view that the Company should go beyond the agreed NEP and make further environmental improvements. However, this is not the consensus view of the CCG.

Since the dWRMP was submitted to Defra the Company has continued to work with Natural England and the Environment Agency to explore further the benefits of doing more for the environment. As a result of this the Company has committed to developing and delivering a strategy to protect and enhance biodiversity on its land-holdings. This commitment is one aspect of the Company's proposals for environmental activity which was included in the draft Business Plan. The Company's policy on the environment is described in section 2.4.1 of the fWRMP.

In response to the consultation on the Company's Business Plan proposals the majority of respondents in all categories (81%) agreed with the Company's proposals for taking care of the environment. Those in agreement gave reasons such as corporate responsibility and the need to protect the environment generally. Some of the small proportion (6%) who disagreed, made comments about wanting care of the environment to be cost neutral to customers and that it should not be the Company's responsibility. Of those who did not know, some said the subject was too complicated or that they did not have enough knowledge or information. Of the 6% who disagreed with the proposal, almost half felt that the Company should be doing more and a third felt that they should be doing something different.

4.4.7 Willingness to Pay

The study results present a consistent view of customer preferences. For a large number of service attributes, the majority of domestic and non-domestic customers indicated that they were satisfied with the current level of service experienced. A notable exception is dissatisfaction with water hardness across both domestic and non-domestic customers.

Customer satisfaction with current services levels is also borne out by analysis of the choice experiment data, which shows a preference for both domestic and non-domestic customers for maintaining current levels of service. It should be noted however, that this does not imply that improvements in services are not valued by customers. The econometric modelling consistently identifies positive and statistically

significant WTP for improved levels of service. The interpretation instead is that in the choice tasks respondents were prepared to select improved service levels if they were judged to offer 'value for money' or if they thought that the service area would affect them directly. This is also supported by feedback provided by respondents.

The findings show that where the results are expressed in comparable units, such as per property, internal water flooding is a priority for both domestic and non-domestic customers. Non-domestics customers also have a relatively strong preference to avoid discolouration, interruptions to supply and taste and odour. When 'package effects' are taken into account domestic customers concentrate a majority of their value on drinking water quality service areas whilst non-domestic customers valuations are fairly evenly distributed across service areas. The domestic customer's results also indicate that removing hard water is a priority whilst the non-domestic customer's views appear to be mixed.

The study results have been applied to the customer base to form aggregate benefits estimates for the water services.

Aggregate WTP benefit estimates (£/year/unit)

Service attribute	WtP SSW	Unit
Boil water notice	1.92	Per property per year
Discoloured tap water	1.53	Per property per year
Taste and smell of tap water	1.58	Per property per year
Hard water level 1	0.0035	Remove very hard water
Hard water level 2	?	Remove moderately hard water
Hosepipe ban	6856	% change per year
Non-essential use ban	45503	% change per year
Minor pollution incident	30	% change per year
Low water levels and flow in rivers and streams	59.62	% change per year
Low water pressure	-	Per property per year
Unexpected supply interruption lasting 3 to 6 hrs	0.42	Per property per year
Internal water flooding	44.68	Per property per year
Leakage	372	Per property supplied

As expected significant package effects are observed when large improvements to multiple water services are valued. Customers have indicated that there is a maximum increase on domestic bills for all service improvements of £9.80, with a corresponding 5.13% for businesses.

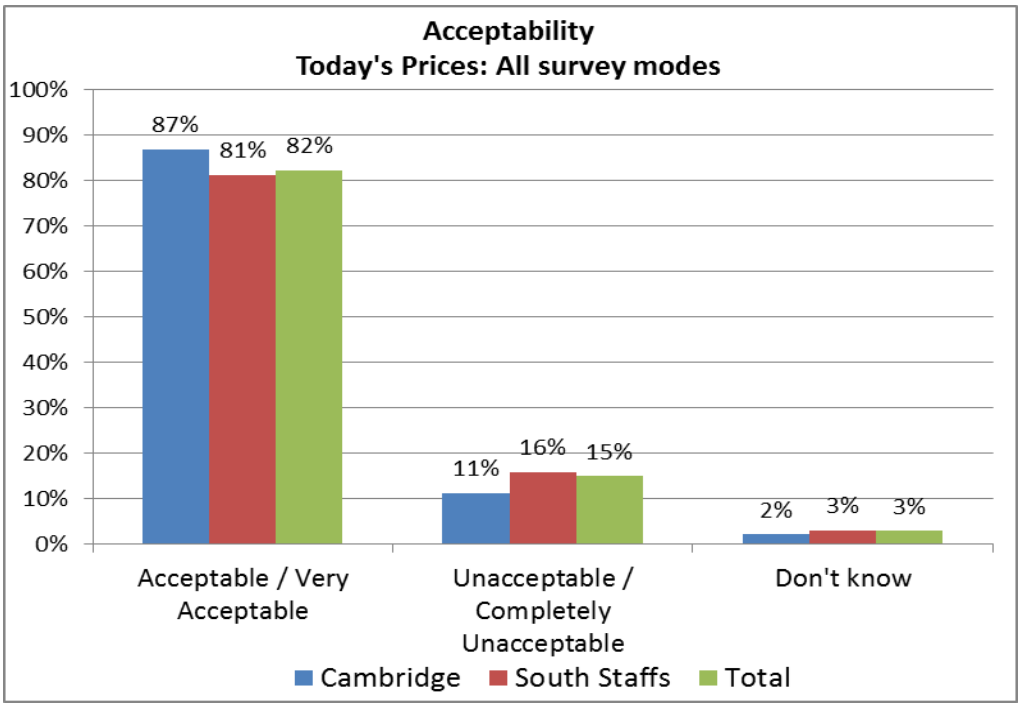
Whilst the non-domestic results appear to be consistent across service areas (choice experiment blocks) the domestic results are notably different. The domestic customers have indicated that they value the drinking water quality service areas the most.

These values cannot be used in isolation as it is a result of the cost of the improvement versus the value placed on it by customers which determines whether the investment is cost beneficial. The Company has used these values in its investment optimisation tool which has been used to determine the most cost beneficial PR14 investment programme.

When used in the investment optimisation tool the willingness to pay survey results demonstrate that customers are supportive and willing to pay for improvements to low flow rivers but are not willing to pay enough to reduce leakage beyond the SELL.

4.4.8 Acceptability

Overall the survey found the level of acceptability of the Company's Business Plan proposals is 82%.



4.4.9 Summary

For issues relevant to the fWRMP customers and stakeholders place high importance on metering, leakage levels, water efficiency activity and the environment. The Company believes it has taken customer and stakeholder views on board in the development of its proposals and is confident that the fWRMP reflects customer and stakeholder expectations in these areas.

5 DEMAND FOR WATER

Overview of Water Demand Forecast

Household Demand
There are a number of factors influencing the forecast of household demand:

- Increasing population
- Increasing households
- Decreasing household occupancy levels
- Improved efficiency of water using appliances
- Metering policies
- Promotion of water efficiency

Non - Household Demand
An econometric model has been used to forecast demand by non-household sector. A significant drop in demand has been seen over recent years due to the economic downturn but this has now stabilized. Demand is forecast to start to recover for the remaining years of AMP5 and to grow slowly over the remainder of the plan period.

Metering Strategy
The Company proposes to continue with the following existing metering policies subject to funding at the next price review:

- Free meter policy
- New supply policy.
- Compulsory metering policy for customers with swimming pools or ponds greater than 10,000 litres capacity and of domestic customers wishing to use unattended garden watering devices
- Compulsory metering of all non-household properties
- Change of occupier metering policy

Meter penetration will rise from the current level of around 30% to 40% at the end of 2019/20 and 73% by the end of the plan period. If the change of occupier metering policy is not funded at the next price review meter penetration would reach only 64% by the end of the period.

Water Efficiency
The Company has assumed the continuation of water efficiency targets for AMP6 and AMP7 and that it will achieve these.

Leakage
The SELL appraisal has been updated in accordance with best practice and latest available data. The resulting normal year SELL has been assessed as 70.54Ml/d. A forecast increase in the cost of carbon from 2020 could have the impact of reducing the SELL during AMP7 into the early part of AMP8. This could reduce the steady state SELL by circa 4 Ml/d between 2020 and 2030.

5.1 Summary of the Demand Forecast

The Company does not have a supply demand deficit and therefore there are no demand options presented in this fWRMP.

The Company has presented a baseline demand forecast excluding the effects of change of occupier metering. Whilst this is a baseline metering policy for the Company the guidance in the Environment Agency Water Resources Planning Guideline has been followed and this metering policy has been included only in the final planning demand forecast from 2015/16.

The fWRMP tables present only the dry year annual average and peak week scenarios. Both of these are built up from the normal year demand forecast.

Over the 25 year planning period distribution input in the baseline dry year scenario is forecast to increase by 9Ml/d. Household water demand is forecast to rise by 13Ml/d and non-household consumption by almost 2Ml/d. This increase in customer water use is largely off-set by a forecast reduction in distribution losses.

Total household population is forecast to rise by approximately 188,000 people over the 25 years and it is forecast there will be an additional 118,000 homes by the end of the period. Under the Company's proposed metering strategies an additional 302,000 meters would be installed with 59,000 of these being installed on change of occupancy. Domestic meter penetration would rise from around 30% at the beginning of the period to around 73% by the end. If change of occupier metering is not funded at the next price review meter penetration will reach only 64%.

The household demand forecasts include assumed savings due to water efficiency activity. Currently water efficiency targets are calculated on 1 litre/property/day where average pcc is above 130 l/h/d. When pcc falls below this level the target is based on 0.5 litre/property/day. The Company's demand forecasts estimate that average pcc under normal year conditions will fall below this threshold in 2018/19. Under the dry year scenario it reduces to less than 130l/h/d after 2031/32. Therefore, if water efficiency targets continue to be set on this same basis the Company's target would fall to 0.26Ml/d during AMP6.

However, the Company has taken a prudent approach and has included the achievement of the full current Ofwat water efficiency targets in the demand forecasts for all of the period 2015/16 to 2019/20. For the period 2020/21 to 2024/25 the Company has assumed a 'half target'. Thereafter, savings from water efficiency are assumed to be inherent within the micro-component forecasts and non-household forecasts. For the AMP6 period it is assumed that 0.27Ml/d

of the 0.53Ml/d target will be derived from hard measures and 0.16Ml/d from soft measures applied to household demand and 0.1Ml/d from non-household demand. For AMP7 these savings are assumed to be halved.

An econometric model developed for the Company by Deloitte's at PR09 has been used to forecast non-household demand sector. A significant drop in demand has been seen over recent years due to the economic downturn but this has now stabilized. Demand is forecast to start to recover for the remaining years of AMP5 and to grow slowly over the remainder of the plan period.

The SELL appraisal has been updated in accordance with best practice and latest available data and is described in section 2.4.6 of the fWRMP. The Company's AMP6 leakage management strategy is to maintain leakage at the SELL.

The resulting normal year SELL has been assessed as 70.54Ml/d for AMP6 between 2015 and 2020. A forecast increase in the cost of carbon from 2020 could have the impact of reducing the SELL during AMP7 into the early part of AMP8. This could reduce the steady state SELL by circa 4 Ml/d between 2020 and 2030. This potential reduction is based on a steady state SELL, and transitional costs need to be assessed periodically and at appropriate timescales, to ensure it is economic to move to and maintain the lower level of leakage.

Normal year demand has been converted to dry year demand by the application of a dry year factor of 4.1% to household demand. This factor was derived from a review of climatic factors and per household consumption. The adjustment has been applied to both the measured and unmeasured household demand in a normal year.

The Company commissioned Atkins Ltd to reassess household consumption in the critical period (peak week) by applying the 2006 UKWIR Peak Water Demand Forecasting Methodology 06/WR/01/7. This work produced peak week household demand (PWHH) rather than a peak volume (difference between average and peak week distribution input) which was the approach taken for the 2009 fWRMP.

To derive total peak week demand in the base year, normal year household demand is deducted from normal year distribution input and the calculated forecast household peak demand is substituted. It is assumed that the proportion of PWHH demand to normal household demand in the base year remains constant over the planning period. Therefore as normal year household demand increases over the planning period so does PWHH demand.

In accordance with the Environment Agency Water Resources Planning Guideline the impact of climate change on demand is not included in the overall supply demand balance. The Company has

accounted for the uncertainty associated with the impact of climate change on demand in headroom.

5.2 Changes in Demand Since the 2009 fWRMP

The Company has experienced a significant reduction in the demand for water over the period since 2005/6. A reduction in demand from both non-household and household customers has been seen. Household demand has fallen by approximately 15Ml/d despite an increasing number of connections and non-household demand has fallen by approximately 14Ml/d. In addition to this leakage has been reduced by approximately 5Ml/d. There are a number of factors thought to have influenced this including the economic downturn, increased domestic metering, a reduction in water useage by household appliances, general water efficiency, improvements to social housing stock and improvements in leakage detection and management approaches.

Whilst some reduction in demand was evident when the 2009 fWRMP was compiled the continuation of the economic downturn was not predicted. Demand has continued to decline and the Company's customer and demand base is now significantly different to that in 2005/6. This significant change has led the Company to review in detail all aspects of the demand forecasts for the 2014 fWRMP.

The Company has adopted latest published methodologies and latest available data in developing the demand forecasts.

5.3 Changes to Demand Position Since Publication of the 2013 dWRMP

In the dWRMP the Company identified that a revision to the population forecasts would be undertaken for the fWRMP if the Office for National Statistics released forecast data based on Census 2011 in time. This work has been completed and the revised figures for the fWRMP show an increased growth in population and housing towards the end of the plan period.

Continued volatility in the economic situation has led to a review of the Company's econometric model of measured non-household consumption. This forecast has been updated to incorporate actual consumption data from 2012 and 2013 and the latest published economic drivers. This has resulted in a small recovery being forecast for the remaining years of AMP5 and continued slow growth for the remainder of the plan period.

The Environment Agency in their response to the public consultation recommended that the Company include information on the number of households the Company plans to meter for reasons of high

discretionary use. Accordingly a small allowance of 10 meters per annum fitted at the behest of the Company to unmetered sprinkler users has been included in the fWRMP demand forecast.

5.4 Methodology

In producing the demand forecasts included in the fWRMP the Company has followed the guidance in the Environment Agency Water Resources Planning Guideline and the relevant published methodologies including:

- Method of Estimating Population and Household projections (EA update 2012)
- Customer Behaviour and water use - a good practice manual and roadmap for household consumption forecasting 12/CU/02/11
- Demand Forecasting Methodology and Forecasting Water Demand Components (NRA and UKWIR 1995)

The Company has developed demand forecasts for the following scenarios as directed in the Environment Agency Water Resources Planning Guideline.

Scenario	Included in SSW fWRMP	Comment
Normal year demand	Yes	Not included but is the basis for dry year forecasts. Base year has been normalised for leakage only
Dry year demand	Yes	None
Peak week demand	Yes	Not required but included for continuity
Weighted average demand	Yes	To be used for revenue forecasts in the Business Plan

The Company does not have a supply demand deficit and therefore there are no options presented in this fWRMP.

The Company has presented a baseline demand forecast excluding the effects of change of occupier metering. Whilst this is a baseline metering policy for the Company the guidance in the Environment Agency Water Resources Planning Guideline has been followed and this metering policy has been included only in the final planning demand forecast.

Actual data for the base year has been reviewed to determine whether any adjustment is required to produce demand in a normal base year. The analysis undertaken is described in section 5.5. The key components of demand which are dependent on the weather are

household demand and leakage. Household demand can be affected by hot, sunny, dry weather and leakage by freeze thaw episodes.

The analysis determines that per household consumption (PHC) in 2011/12 was normal and therefore an adjustment is not appropriate. The winter of 2011/12 was generally mild and therefore leakage was lower than normal. The revised SELL has been used in the base year to represent leakage levels in a normal year.

Whilst the actual data for household demand in the base year has been determined to represent normal demand the per capita consumption (pcc) has been updated using more up to date population and occupancy data which was not available at the time of submission of the 2011/12 Annual Review. The PHC has been converted to the base year pcc figures using the 2011 updated census population and the Company's 2012 household occupancy survey data. The Maximum Likelihood Estimation adjustment (MLE), as described in section 5.5, has been applied to the revised figures. The resulting base year pcc figures used for the normal year demand forecast are therefore not exactly the same as reported to the Environment Agency in the 2012 Annual Review.

Normal year demand forecasts across the planning period have been produced at the micro-component and sectoral level. The normal year demand forecast has been derived from Company specific data, industry best practice and research and is supported by the latest population projections, household micro-component and occupancy surveys and the housing projections from Local Authorities. The principles of the UKWIR/NRA (1995) Demand Forecasting Methodology have been followed to project the household and non-household demand for the planning period to 2039/40. The Company has confidence in the level of detail and knowledge of normal year demand at this level.

A dry year adjustment factor is applied to total household demand. This dry year adjustment volume is then apportioned to the categories of normal year household demand. The Company does not forecast dry year demand directly at the micro-component level.

Critical period demand has been derived from the normal year forecast by substitution of peak household demand for normal year household demand.

In accordance with the Environment Agency Water Resources Planning Guideline the uncertainty associated with the impact of climate change on demand is not included in the overall supply demand balance.

The uncertainty associated with the demand forecast has been accounted for in the headroom analysis in the plan. The demand

components of headroom are discussed fully within section 7 and Appendix A. This includes an assessment of the impact of climate change on demand.

The long-term demand reflects the impact of the Company's metering programme, water efficiency activity, leakage management and future house designs.

Each part of the demand forecast is summarised in the following sections. Further detail on the Company Household Occupancy and Micro-component Methodology can be found in appendix F.

5.5 Base Year

The Company has used 2011/12 as the base year for the demand forecasts in the fWRMP. Actual reported data for 2011/12 has been reviewed to determine whether this represents a normal weather and demand year.

Actual out-turn data for 2011/12 is derived using the following methods:

- Unmeasured household demand – Consumption monitor
- Measured household demand – Billing data
- Unmeasured non-household demand – Fixed rate
- Measured non-household demand – Billing data
- Leakage - Integrated flow and minimum night flow analysis
- Miscellaneous water – Company specific data

The base year actual data reported in the 2012 Annual Review is subject to the application of the maximum likelihood estimation reconciliation. This technique is used to reconcile the difference in water balance components resulting from the top-down, integrated flow approach and the bottom-up, minimum night flow approach. The Company introduced the current method for the MLE in 2009/10.

The method adjusts on distribution input, consumption, minor usage and total leakage. The adjustment quantity on total leakage is carried through to the distribution losses item and no adjustment is made to supply pipe leakage which is estimated independently. The Company has one resource zone therefore the initial estimate of the water balance has one MLE application.

The Company has applied an MLE adjustment since it was first introduced into the regulatory reporting framework. The application of these adjustments is consistent with approaches used by other water companies in the industry.

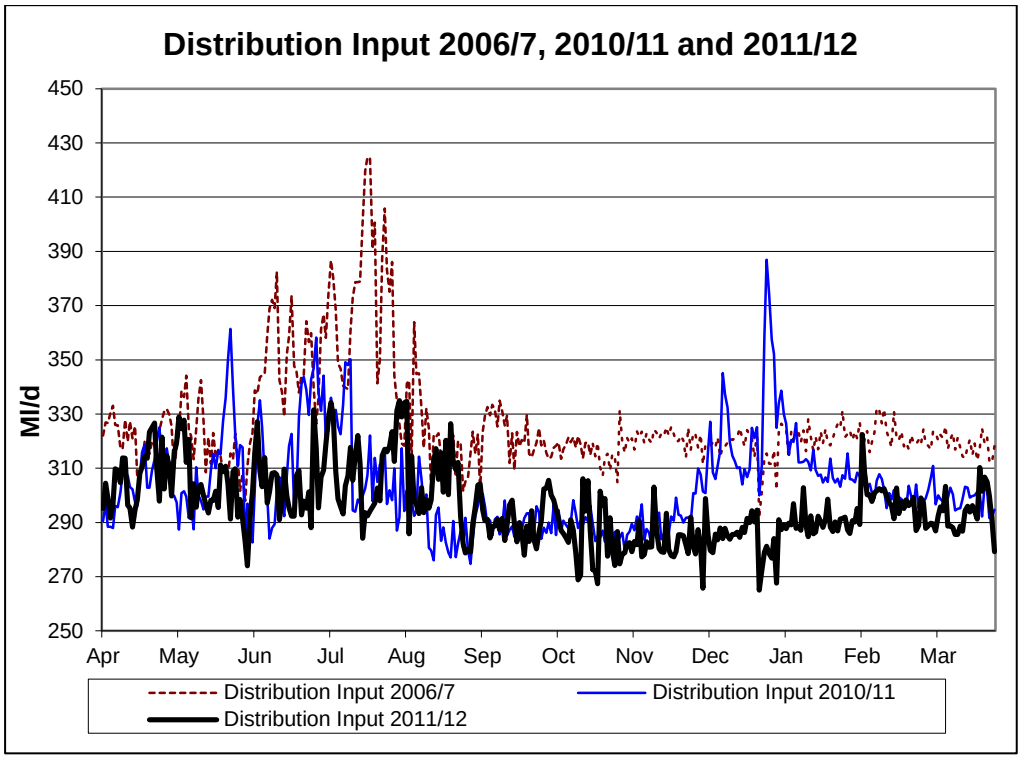
Following the revision of the pcc figures for the updated population and occupancy data for the base year the MLE adjustment has been reapplied. The actual reported data and the revised data is shown in the following table for comparison.

Water Balance Component	2011/12 Actual Reported Figures	2011/12 Adjusted Figures
uPCC	137.77 l/h/d	137.66 l/h/d
mPCC	129.60 l/h/d	118.86l//h/d
Total leakage	68.17 Ml/d	70.54 Ml/d
Distribution input	295.13 Ml/d	296.72 Ml/d

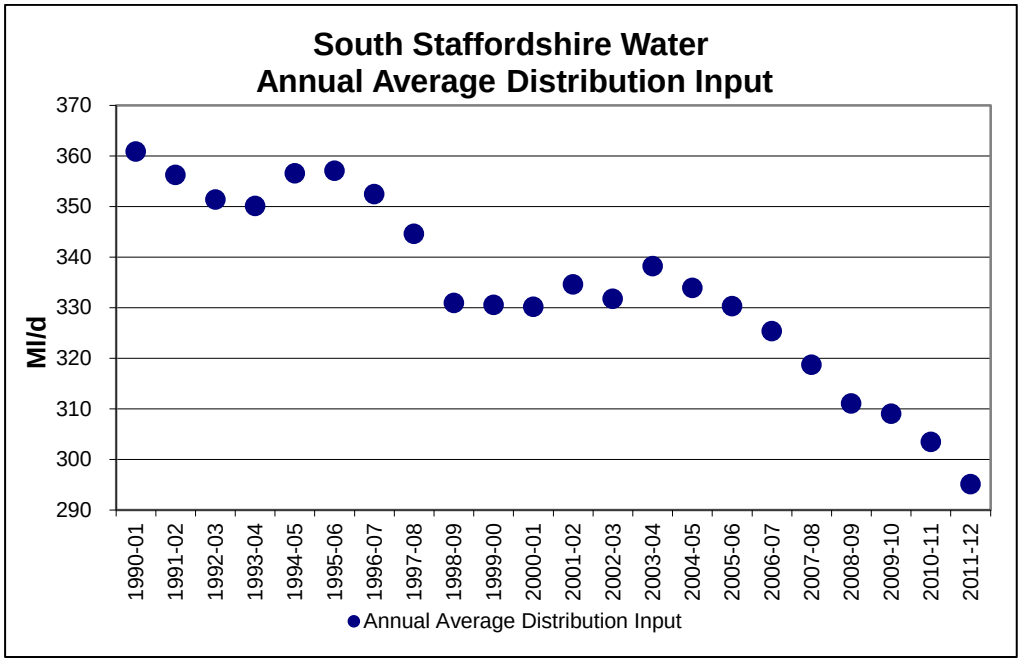
5.5.1 Review of 2011/12

The reported annual average distribution input for 2011/12 was 295.13Ml/d which was 8.5 Ml/d lower than 2010/11 and follows a steady downward trend over the period since 2003. Summer peak demand was 327.96Ml/d which was 15.05 Ml/d lower than in 2010/11 and no winter leakage events were experienced unlike in previous years.

The daily demand profile is shown in the chart below, along with the previous year and the last year with significant elevated summer demand (2006/07) for comparison. No winter peak was observed as the weather was generally mild and the mains burst rate lower than in previous years.



The trend in annual average distribution input between 1990 and 2012 is shown in the following chart.



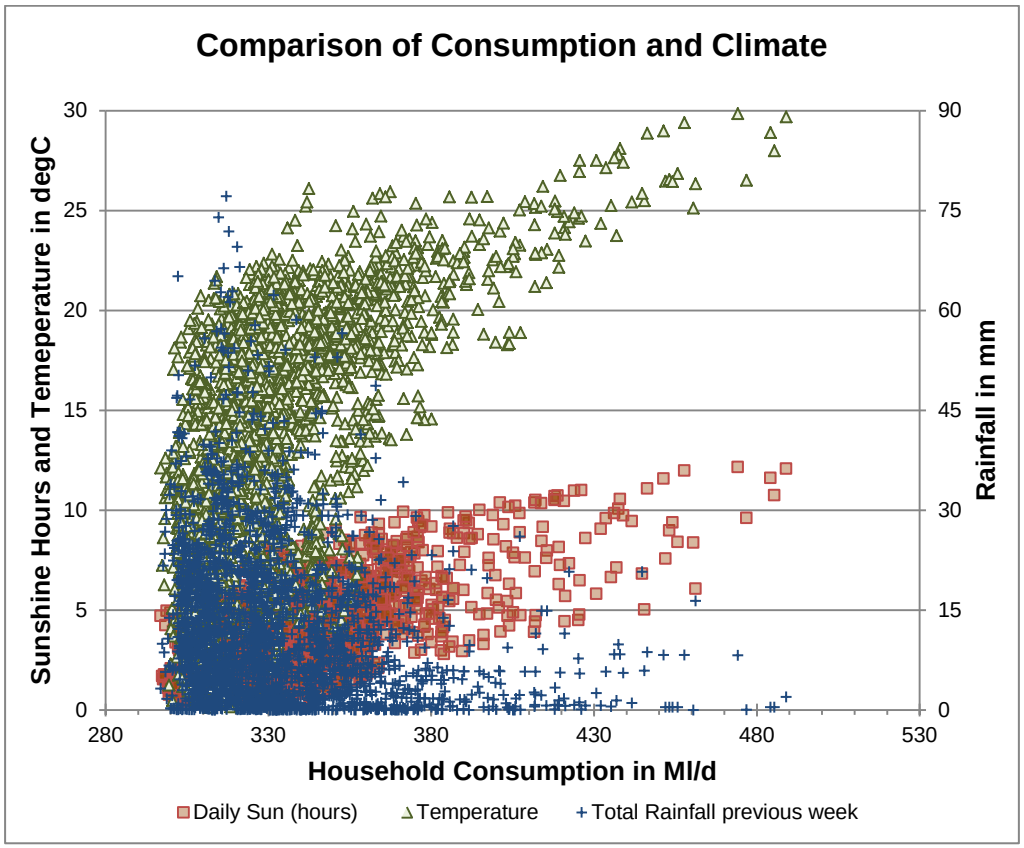
Total annual average rainfall figures (measured at Seedy Mill Water Treatment Works) for 2011/12 show that overall the reported year was significantly drier (70.9 %) than the 10-year annual average. Dry periods were marked in the spring and autumn 2011 and in late winter 2012, with exceptionally dry months in April 2011. In contrast December 2011 to mid-January 2012 was an exceptionally wet period.

Storage levels at Blithfield Reservoir were affected by the dry spring and early summer. Conservation measures were taken early to conserve reservoir resources including reductions in direct abstraction, recirculation of groundwater from Brindley Bank Pumping Station and surface water from the lower River Blithe and River Trent (when flow restrictions and the licence permitted) and use of the Company's high nitrate groundwater boreholes. Notwithstanding these, levels fell below the drought monitoring curve in July 2011 and continued to decline to a minimum of 56% in late October 2011. The Company exploited the healthier resource position in the Severn to pump potable water to Blithfield during November 2011. Conservation measures were progressively stood down following heavy rain and recharge in December and January.

5.5.2 The Relationship Between Demand and Climate

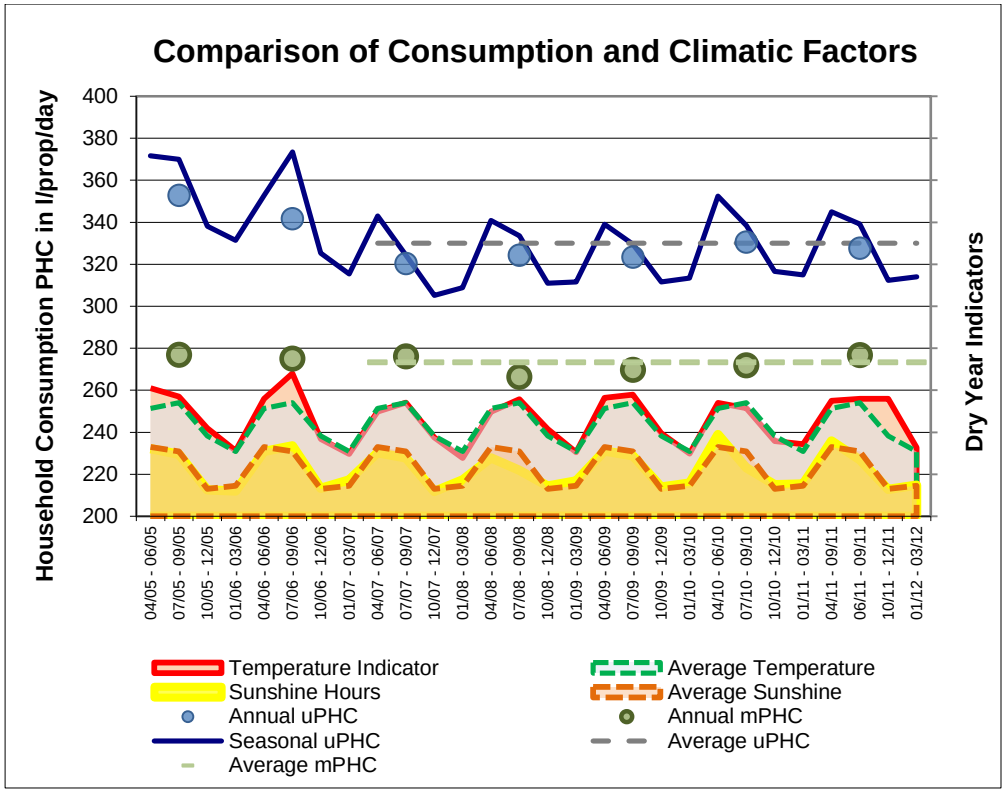
The following chart shows that there is a strong correlation between Company specific household consumption from the Company's unmeasured household consumption monitor and Company daily sunshine and temperature records. PHC is used for this comparison in order to remove any variances related to changes in household density and population assumptions.

The increase in household consumption is tempered by rainfall leading up to a period of dry, warm weather i.e. the need for summer garden watering and general outdoor water use begins to increase as more time passes since the last rainfall event. A further consideration is the timing of the non-rain events in the year and the prospect of our forecast for, the next wet or cooler period.



Further evidence of the relationship between PHC, temperature and sunshine hours can be seen below. Here the relationship between these factors in unmetered households is much stronger compared to measured households.

From the evidence presented below the Company has concluded that metered household consumption is not significantly affected by weather events in contrast to what is seen in unmetered households.



The analysis undertaken concludes that whilst overall 2011/12 was classified as a dry year the combination of the rainfall pattern, sunshine hours and temperature did not cause significantly above average household demand.

Annual Average Unmeasured Per Household Consumption (uPHC)

The average of the uPHC from the Company's domestic consumption monitor over the period April 2007 to March 2012 is 330.09 ltrs/prop/day. This compares to the 2011/12 figure of 327.6 ltrs/prop/day which is less than 1% below the average.

The Company has chosen the 2011/12 outturn consumption (341.07 ltrs/prop/day including allowances for supply pipe leakage and maximum likelihood estimation) to represent normal annual average uPHC in the base year. The outturn data is considered comparable with the average of the previous four years and therefore has not been 'adjusted' to produce a designed normal weather related year. The uPHC is then converted to the base year unmeasured per capita consumption (uPCC) using the 2011 census population updates and the 2012 household occupancy survey which were not available at the time of submission of the 2011/12 Annual Review.

Annual Average Measured Per Household Consumption (mPHC)

The average of the mPHC over the period April 2007 to March 2012 is 273.26 ltrs/prop/day. This compares to the 2011/12 outturn of 276.72 ltrs/prop/day which is just more than 1% above the average.

The Company has chosen the 2011/12 outturn consumption to represent normal annual average mPHC in the base year. The outturn data is considered comparable with the average of the previous four years and therefore has not been 'adjusted' to produce a designed normal weather related year. The mPHC is then converted to the base year measured per capita consumption (mPCC) using the 2011 census population updates and the 2012 household occupancy survey which were not available at the time of submission of the 2011/12 annual review.

5.6 Population Projections

5.6.1 Population Data Availability

Population data is collected every ten years through the National Census by the Office for National Statistics (ONS). ONS provides detailed census results at a number of spatial scales from local or unitary authority (LAUA) down to small scale 'output area' (OA) level where the mean population per OA is 300. ONS also provides annual updates of population and biannual 25-year forecasts of future population growth at the medium spatial scale i.e. lower super output area (LSOA) where the mean population per LSOA is 1500.

The ONS datasets also provide information on the number and type of households and the age distribution (demography) of the population. Data on the type of households is used to distinguish the population who live in non-household ("institutional and communal") properties and includes those living in medical, care, defence, prison service and education establishments, and those living on farms.

In parts of the UK concerns have been expressed over errors in population estimates arising from short term migrants and concealed population. Short term migrants are accounted for in the census results and forecasts whereas the concealed population arises from people who do not appear on the census. The Company currently believes these do not represent major areas of uncertainty with population projections for its supply area.

The Company has based its population forecasts in the fWRMP on the Department for Communities and Local Government (DCLG) household projections. This combines ONS population updates with local authority housing returns and projections to produce 25-year projections by age band, gender and relationship group.

Local authorities in the Company supply area produce annual data on housing and future delivery of new homes and demolitions. This includes data on housing type, tenures, delivery against 5-year housing supply targets and future development of employment land. Data is available on request for the location of major developments in the plan which is useful in identifying potential "hot spots" within the Company supply area. Housing projections by local authorities vary in planning horizon but are generally aligned to their development plans i.e. to 2026 with a few planning authorities consulting on plans up to 2030.

None of the local authorities within the Company's supply area produce independent population forecasts and so the Company has based its population forecasts in the fWRMP on the relevant DCLG and ONS projections.

The Company supplies all or part of the administrative areas of 12 local or unitary authorities. The Company has a single water resources zone that covers its supply area. This supply area cuts across the administrative boundaries of some of these local authorities and therefore there is a need to analyse population and household data at a more local scale to ensure statistical data is correct.

The Company has worked with Consultant CACI to ensure its approach meets the standards specified in the Environment Agency report ''Method of Estimating Population and Household Projections, 2012''.

The 2011 Census collected data from all households in England and Wales for 27 March 2011. The data was processed and analysed and the statistics on resident population released in four stages by ONS between July 2012 and July 2013. The first release included current population data at local authority (LAUA) level. CACI analysed this data for use in the Company's demand forecasts.

The release of updated ONS population projections in 2013 based on the 2011 Census showed an overall increased growth against the 2001 census mid-year estimates. This was primarily as a result of;

- More accurate counting of the population in the 2011 census
- In-migration found to be at a higher level than previously estimated.
- Base year upwards revision transmits as an equivalent change in all future projection years.
- Short-term projections of fertility rates increased to reflect recent data on birth rates.

This is supported by the following ONS statement:

"In the short-term, the UK fertility assumption is set to increase from current levels to a high of 2.02 in 2013 before decreasing to the long-term assumption of 1.84 by 2027. These short-term assumptions are very different to those used in the 2008-based projections which assumed a decreasing fertility rate and reached the long-term within five years. The 2010-based assumptions are higher and stay higher for longer reflecting the current relatively high trends in fertility." (National projections bulletin [(2) above] p13)

"While numbers of deaths and migration have increased slightly between the 2008-based and 2010-based national projections, numbers of births have increased more significantly in the short term. As a result of a national change, sub nationally births must, on average, increase to match."

As a result of the updates above the Company has increased the total household population in the fWRMP at the end of the plan period to 1,491,000 compared to 1,445,000 in the dWRMP; an increase of 46,000 people by the end of the plan period.

5.6.2 Population Forecast Methodology

Consultants CACI were commissioned to deliver population forecasts for the fWRMP. CACI was engaged to process population and household data from ONS to postcode level (mean population 50) and assign this using postcode data from the Company's RAPID customer database.

The 2011 census data (Output Area level) was used as the basis for the fWRMP forecast. The base year population estimate uses latest published (2013) ONS mid-year (OA level) data estimates in combination with ONS population projections, also published in 2013, based on the latest modelled rates of births, deaths and migration (as described above). CACI have extended this analysis to project population up to the end of the plan period.

Non- Household Population

Data on the type of households is used to distinguish the population who live in non-household ("institutional and communal") properties and includes those living in medical, care, defence, prison service and education establishments, and those living on farms. This is referred to as communal population in the Company's fWRMP. Communal population is deducted from total population to give household population.

Communal population projections are based on a fixed percentage from the base year. This results in a growth in communal population which is attributed to an increase in the number of establishments for the elderly, as has been seen in recent years.

The Company has also made an estimate for non-communal non-household population. The Company billing file shows just over 2000 non-household properties recorded as including living accommodation. There is no source of information to indicate the number of people resident at these properties. The type of living accommodation is likely to be small flats and therefore it is assumed that the average occupancy is between 0 and 2 people. Therefore the number of residents is estimated to be less than 2,500 over the planning period.

The allowance for uncertainty around the household population estimates included in headroom is +/- 1% in 2011/12 rising to +/- 3.6% in 2039/40. The uncertainty resulting from the non-communal non-household population is adequately covered by this allowance.

5.7 Property Projections

5.7.1 New Household Property Projections

Base year household property figures are taken from the Company's RAPID customer database and are consistent with those reported in the 2012 Annual Review.

Local authorities produce Annual Monitoring Reports (AMRs) and Development Plans (DPs) detailing housing projections and delivery against these targets. Generally published projections extend to 2026 or 2030. The Company has reviewed all available AM Rs and has met with those local authorities proposing significant housing growth.

Experience has shown that housing projections published by local authorities consistently over-estimate actual rates of house-building particularly in the short-term. This has been particularly evident in the most recent years during the economic downturn and the slump in the housing market.

Burton was previously a designated growth point under the previous Regional Spatial Strategy (RSS) for the area. Proposals for significant development in this area continue to be included in the East Staffordshire Development Plan. To date significant growth has not commenced but is progressing through the Development Plan and consultation stages

The Company has assumed the projected number of properties, as published in the Local Authority DPs, is achieved shortly after 2026 with an adjusted housing delivery profile of growth reflecting a slower rate of delivery in the period to 2019/20. Some small recovery to the housing market up to 2019/20 is assumed with more rapid recovery and growth rates up to 2026. Property projections post 2026 are based

on achieving the total number of properties forecast in the CACI projections which are based on DCLG figures.

Over the 25 year planning horizon there are approximately 118,000 new homes forecast to be built. This is an increase of 20% in connected household properties.

Uncertainty around the property projections is included in headroom and discussed in section 7 of the fWRMP.

5.7.2 Metered Property Projections

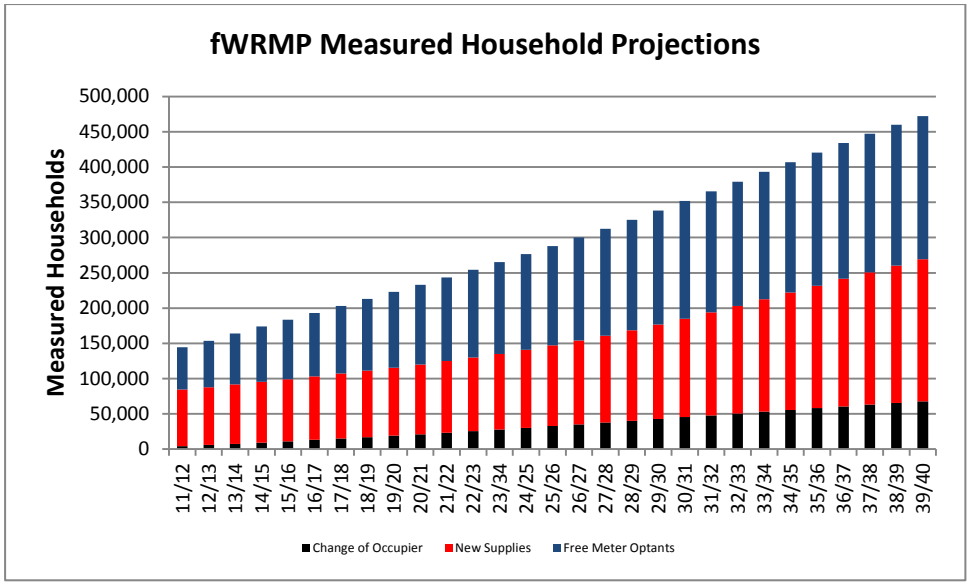
The Company's metering policies will result in a significant switch from unmetered households to metered households by the end of the planning period.

Measured households will increase from 186,000 in 2015/16 to 478,000 by the end of the plan. Unmeasured households fall from 345,000 in 2015/16 to 174,000 with total household properties being 652,000 by the year 2039/40.

The number of unmeasured households falls as change of occupier metering and optional metering increase. Those households that remain unmetered will be the residual that have not been selectively metered, are on a shared supply or have not opted by choice.

Enforcement of the mandatory and selective metering policies will result in meter penetration increasing from around 30% of billed properties in AMP5 to 73% by 2039/40 with a steady rate of growth in the early years of approximately 2% per year.

The following chart shows the growth in each category of metered property over the plan period.



Free Meter Optants

The Company has reviewed the actual number of meter optants experienced over the last eight years and the latest forecasts for the two remaining years of the AMP5 period to guide the likely number of optants going forwards. Whilst there has been variation in the number of optants installed year on year the averages for the five year periods 2005/06 to 2009/10 and 2010/11 to 2014/15 are relatively stable.

Year	Actual / Latest Forecast Number of Meter Optants
2005/06	5,224 (Actual)
2006/07	6,185 (Actual)
2007/08	4,344 (Actual)
2008/09	7,215 (Actual)
2009/10	6,322 (Actual)
2010/11	4,587 (Actual)
2011/12	5,992 (Actual)
2012/13	6,632 (Actual)
2013/14	6,400 (Forecast)
2014/15	5,900 (Forecast)
Average	5,880

Therefore the Company is forecasting that on average 5800 optional meters will be installed per year for the period 2015/16 to 2019/20. This reflects the current trend for customers to use metering as a way to control household bills. A decline in the uptake in the later part of the plan is forecast to reflect the smaller unmeasured base from which customers will opt.

The total number of meters forecast to be installed under the free meter option policy over the 25 year period of the plan is 125,000.

The Company will continue with its policy to meter sprinkler users. Experience to date shows that once customers become aware of this policy they commit to cease using a sprinkler or voluntarily opt for a meter. Therefore only a very small allowance (10 per annum) has been made in the forecast for meters installed at the 'behest' of the Company where users continue to use an unattended watering device and do not willingly opt for a meter through the Free Meter Option scheme.

Change of Occupier Metering

The Company introduced change of occupier metering in 2010/11. The actual number of properties metered under this policy has been significantly impacted by the decline in the housing market.

Year	Actual / Latest Forecast Number of Change of Occupier Meters
2010/11	2,144 (Actual)
2011/12	1,951 (Actual)
2012/13	1,506 (Actual)
2013/14	1,800 (Forecast)
2014/15	1,800 (Forecast)
Average	1,840

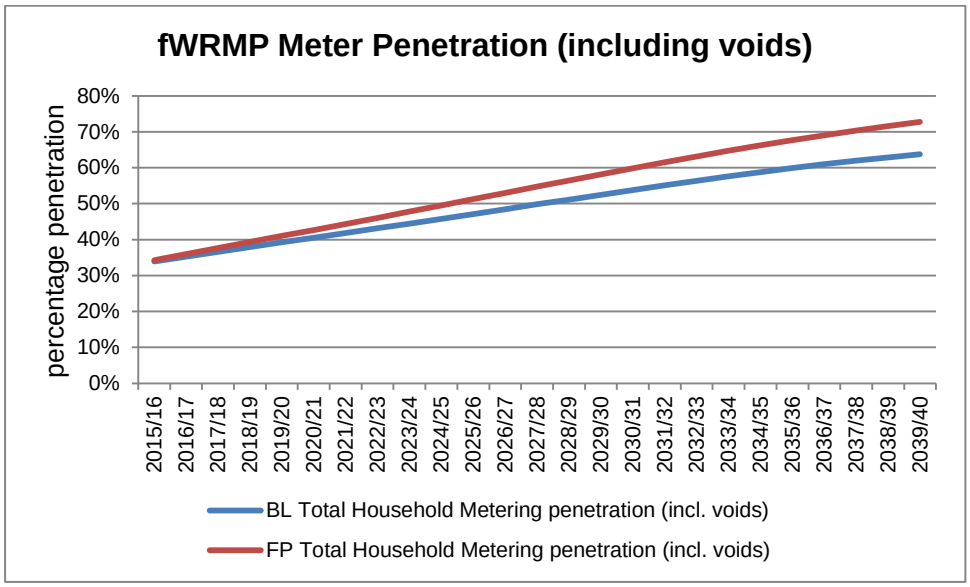
The Company proposes to continue with change of occupier metering as a baseline metering policy subject to funding being confirmed in the 2014 price review but has complied with the Environment Agency planning guidance and has included this in the final planning scenario only post 2014/15.

The number of properties forecast on average to be metered under this policy during the period 2015/16 to 2019/20 is 2000 per year. This reflects the Company's view that the downturn in the housing market will continue to impact the number of properties available to be metered under this policy. An increase in the number of change of occupier meters in the later part of the plan is forecast to reflect the recovery of the housing market.

The total number of meters forecast to be installed under the change of occupier policy over the 25 year period of the plan is almost 59,000.

Meter Penetration

The following chart shows the overall growth in meter penetration under the baseline scenario and the final planning scenario. Meter penetration is predicted to reach 73% by the end of the planning period. The continuation of the change of occupier metering policy contributes 10% to the growth in meter penetration over this period.



The Cost of Metering

The Company incorporated the latest actual costs for meter installations in its assessment of the costs of metering with its Business Plan Submission to Ofwat in December 2013.

The cost of the Company's proposed household metering programme is summarised in the following table:

	AMP6	AMP7	AMP8	AMP9	AMP10
New connections					
Total Number in period	10900	14500	23600	33200	35300
Operating costs (final year of period)	£30,800	£72,000	£139,000	£233,000	£332,500
Optants					
Total Number in period	29150	28250	26500	23300	18500
Installation costs (total in period)	£7,192,000	£6,970,000	£6,538,000	£5,748,600	£4,564,500
Operating costs (final year of period)	£82,500	£162,500	£237,500	£303,500	£356,000

Change of occupier meters					
Total Number in period	9800	11200	12500	12900	12200
Installation Costs (total in period)	£2,694,000	£3,079,000	£3,436,000	£3,546,000	£3,353,500
Operating costs (final year of period)	£28,000	£59,500	£95,000	£131,500	£166,000

The installation of meters for new connections is funded through the connection charge and therefore there is no direct cost to the Company. However, ongoing operating costs do accumulate.

Optional metering is part of the Company's existing metering strategy and is part of both the baseline and the final planning scenario.

Change of occupier metering is part of the Company's final planning scenario but it is not required in order to manage demand due to a supply demand deficit. Therefore, the costs of change of occupier metering have not been compared with other measures to manage demand for water.

5.7.3 Non-Household Properties

Growth in new non-household connections is assumed to be on average flat over the planning period based on the average growth experienced in recent years. This includes where unmetered non-household supplies are refurbished and supplies are split. Unmeasured non household properties will continue to reduce due to commercial meter optant switchers.

Uncertainty around the property projections is included in headroom and discussed in section 7 of the fWRMP.

5.7.4 Void Properties and Demolitions

Void properties are those that are unoccupied and therefore do not have an associated consumption. Supply pipe leakage allowances are applied to void properties. The forecast of the number of void properties over the planning period is based on a fixed percentage equivalent to the percentage of void properties in the base year.

Void properties are net of demolitions. The current rate of demolitions is forecast to continue across the planning period. Therefore, demolitions are not shown separately.

5.8 Household Occupancy Rates

5.8.1 Base Year Occupancy Rates and Overall Occupancy Projections

The base year household occupancies are derived from the 2012 Household Water Use and Occupancy Survey undertaken by RPS on behalf of the Company. The detail of this survey is included in Appendix F.

Whilst there is an underlying trend for population to grow over the planning period overall household occupancies are forecast to reduce. Overall occupancy falls from 2.47 people/property in 2015/16 to 2.31 people/property in 2039/40. This fall in occupancy is attributed to:

- The increasing number of household properties
- Changes to demographics and life expectancy
- Life style changes leading to smaller household units
- Government planning guidance

The household occupancies of different customer groups have independent profiles that reflect their characteristics. The trends in occupancy are described below.

5.8.2 Unmeasured Household Occupancy

The occupancy rate for unmeasured households is forecast to rise initially reflecting larger family units (growing families) who are unlikely to opt for metering and then reduce towards the end of the plan period reflecting the overall trend for lower occupancy.

5.8.3 Measured Household Occupancy

The average occupancy rate for all measured households reflects the mixture of lower occupancy optants and lower occupancy small newly built houses along with the average occupancy of properties metered on change of occupier.

The overall measured household occupancy rises mid-plan and reduces towards the end of the planning period from 2024/25.

5.8.4 Meter Optant Household Occupancy

New meter optant households have a lower occupancy than other customer groups. This is because optants are generally smaller households who use low volumes of water and therefore make a financial saving by opting for a meter and controlling their water bills through metering.

The average occupancy of a meter optant property is forecast to reduce slightly over the planning period.

5.8.5 New Supply Household Occupancy

The average occupancy of a new supply property is forecast to reduce slightly over the planning period.

5.8.6 Change of Occupier Household Occupancy

It is assumed that all properties have an equal likelihood of changing occupier. However, the Company's policy for change of occupier metering is that meters will only be installed externally upon change of occupier. Therefore, this will exclude households with a shared supply which have to be metered internally. The occupancy profile reflects the likelihood that older smaller properties are excluded due to their shared supply pipe.

The baseline demand forecast only includes change of occupier meters up until 2014/15. Change of occupier metering post 2014/15 is included only in the final planning scenario.

The average occupancy of a property metered on change of occupancy is forecast to fall over the planning period.

5.8.7 Overview of Household Occupancy

The following table shows the changes in occupancy rate for each of the different customer groups across the planning period.

Customer Group	2015/16 Occupancy	2039/40 Occupancy
All Households	2.47	2.31
Unmeasured Households	2.53	2.42
Measured Households	2.35	2.27
Meter Optant Households	2.24	2.13
New Supply Households	2.43	2.34
Change of Occupier Households	2.61	2.48

5.9 Household Demand (Final Planning Forecast)

The overall dry year household demand (water delivered) shows an increase of 14Ml/d by the end of the planning period.

Dry year unmeasured household demand falls over the planning period by -72Ml/d. This reflects the Company's metering policies, future changes to water using appliances, their associated water use and changing household densities in the micro-component forecasts.

In comparison dry year measured household demand rises over the planning period by 86Ml/d reflecting the increasing number of metered households.

5.9.1 Per Capita Consumption (PCC) and Micro-component Forecasts

PCC forecasts are estimated for the different household groups. Water usage information is gathered from household surveys, industry data or manufacturer's appliance specifications. Micro-component forecasts are based on individual elements of water usage and each component is forecast using appliance ownership rates, frequency of use and volume of water used per appliance. The main groups of identified use are highlighted below.

- Toilet use
- Personal washing
- Garden use and car washing
- Dish washing use
- Washing machine use
- Miscellaneous use

The Company employed the services of RPS Water and Environmental Consultants to carryout household occupancy and water use surveys in 2010 and 2012. The survey and the analysis of the results followed the same methodology in both years.

A new micro-component model, Micro-F, was developed by RPS Group using this data. The model enabled the Company to undertake detailed forecasting of demand for sub-categories of customers. The results of the survey were used to underpin the domestic micro-component demand forecast. The approach and the outputs are compliant with the Water Resource Planning Guideline and guidance published by UKWIR, in particular,

- It follows good forecasting practices above and beyond that which are appropriate for the Company's supply demand balance position as concluded in objective 1 in UKWIR 12/CU/02/11 – (Customer Behaviour and Water Use - A good practice manual and roadmap for household consumption forecasting).
- It follows the preferred micro-component analysis approach as established in 'Demand Forecasting Methodology and Forecasting Water Demand Components (NRA and UKWIR 1995)' and supported in the conclusion of objective 2 in the above UKWIR report (12/CU/02/11).
- It benefits from an improved survey mechanism and sample selection techniques.
- It benefits from a programme of regular frequent household water use and occupancy surveys implemented in AMP5.

The micro-component model and change in the household water using and occupancy survey approach represents an improvement in the Company's approach to micro-component and household consumption forecasts. The Company will further enhance these changes by maintaining the frequency of its household surveys in AMP6.

The outputs from the model are the estimates over the forecast period for each micro-component for unmeasured and measured households. The latter is a weighted average of the following metered categories:

- Metered optants;
- New supplies; and
- Change of occupancy metering.

The outputs also include a weighted average pcc for all households.

The key outputs from the Company's unmeasured and measured micro-component analysis are highlighted in the following tables. These are for the dry year scenario.

Full details of the household survey and the micro-component modeling are included in Appendix F.

Unmeasured Micro-component	Trend	2015/16 l/h/d	2039/40 l/h/d	Driving Assumption
Toilet use	Downward	38.1	33.5	Replacement with low flush cisterns
External Use	Downward	12.4	12.1	Less sprinkler use due to metering policy
Washing Machine use	Downward	12.0	10.7	Replacement with more efficient machines
Personal washing	Upward	48.8	49.2	More shower ownership, more frequent use, unrestricted behavior
Dishwasher use	Almost flat	15.4	15.2	Replacement with more efficient machines
Total uPCC	Downward	141	135	

Measured Micro-component	Trend	2015/16 l/h/d	2039/40 l/h/d	Driving Assumption
Toilet use	Downward	34.0	29.6	Replacement with low flush cisterns
External Use	Flat	10.7	13.5	Net effect of smaller gardens, water efficiency and sprinkler users in different metered categories
Washing Machine use	Downward	11.9	10.1	Replacement with more efficient machines
Personal washing	Upward	47.0	49.3	More shower ownership, more frequent use
Dishwasher use	Almost flat	11.9	11.8	Replacement with more efficient machines
Total mpcc	Downward	129	128	

PCC forecasts are based on a normal weather year. Dry year and critical period adjustments are added to the external household use micro-component to reflect greater use in dry periods associated with garden watering, outdoor play and general outdoor maintenance.

Table WRP6 does not include MUR as a separate input. It is important that MUR is included as not including this in the forecasts would under-estimate overall demand. Therefore the Company has added MUR to the micro-component forecasts. MUR is distributed across all components on a pro-rata basis. The evidence on which the Company has based its estimates of MUR is described in section 2.4.4.

The micro-component analysis and pcc forecasts result in an overall per capita consumption (average of all household customer's consumption in a normal year) falling from 132 ltrs/head/day in the base year to 123 ltrs/head/day by 2039/40 under normal year conditions. Overall pcc in a normal year falls below 130 ltrs/head/day in 2018/19.

5.10 Non-Household Demand

Since the submission of the 2009 WRMP the credit crunch and general economic downturn has had a significant impact on non-household demand. The Company has lost a number of large users over recent years and has not gained any new large users. Non-household demand has fallen by approximately 14Ml/d.

The non-household forecast consists of three elements: a model which analyses the influence of economic factors on customers in identifiable industrial sectors; analysis of consumption within mandatory commercial properties and growth rate in new connections, and; analysis of unmeasured non-household customers.

The Company engaged the consultant, Deloitte, to assist with the 2009 plan to produce a model for forecasting non-household demand. This econometric model has been updated with data post 2009 and has again been used as the basis for the non-household demand forecasts.

Continued volatility in the economic situation led to a further review, of the Company's econometric model after publication of the 2013 dWRMP, The model has been updated to incorporate actual consumption data from 2012 and 2013 and the latest published economic drivers. The review highlighted some weaknesses in the consumption datasets which led to:

- a reduction in the cohort used for modelling from 80 to 55 to reflect business closures
- re-basing of the forecast to the 2012/13 year
- some reallocation of large users within the industrial sectors to reflect latest business knowledge
- some re-weighting of analysis where recent consumption data suggested a change in demand trend

The econometric model forecasts demand by non-household sector using identified explanatory variables that influence demand of non-household customers. An 'expert panel' approach has also been applied to selected modelled sectors and has been incorporated into the modelled results.

A significant drop in demand has been seen over recent years due to the economic downturn but this has now stabilized. Demand is forecast to recover a little over the remaining years of AMP5, remain stable over AMP6 and to grow slowly over the remainder of the plan period, primarily as a result of a growth in new non-household connections.

The non-household demand forecasts include a proportion of the Ofwat water efficiency target. 0.1Ml/d of the 0.53Ml/d target is assigned to non-household demand reductions for the AMP6 period and 0.05Ml/d for the AMP7 period.

The model uses data from 55 of the top 80 industrial users to represent 12 industrial sectors based on the Company's own classifications from its billing records. This classification is similar to the Standard Industrial Classification (SIC) codes. Three sectors were found not to be represented by the sample of companies. These were places of worship, electricity generation and building supplies.

In addition to this all non-household properties metered since 1990 have been classified by the Company as "mandatory commercial". This category includes a wide range of water uses across the specific sectors and demand in this category has not been found to be sensitive to economic factors other than the number of new connections which are added to this category each year.

Forecasts for the specific explanatory variables used in the econometric model have been obtained from publicly available sources from the Office of National Statistics and the Bank of England. The explanatory variables relevant to industrial sectors are as follows:

- GDP (Agriculture and Mining, bricks and cement)
- Energy price (Chemical and allied industries and Mining, bricks and cement)
- Exchange rate (Metal manufacture and Mining, bricks and cement)
- Beer output (Breweries only)
- Industry output (Engineering only)

These are entered into the model and drive the forecasts.

Three scenarios have been modelled; a central estimate, a high and a low scenario. The different scenarios are primarily driven by variations in GDP and energy price forecast and result in only a small difference between the three scenarios. The Company has used the central estimate in its fWRMP.

The 55 companies used to build the model are taken as representative of the remaining companies within the 12 modelled sectors that in aggregate form the basis of the data. The modelled results for the sample companies are extrapolated and applied to the whole industrial sector. For these industrial sectors which were not covered by the sample of companies the same percentage changes have been applied to derive a forecast of demand for the total measured non-household customer base.

The output from the model has been combined with additional local knowledge derived from the Company's B2B Account Management service provided to customers using more than 100Ml/year. Additional information has been applied to four sectors. These adjustments are summarised below.

Breweries

The Company's largest breweries customer has installed a reverse osmosis plant which has had an effect on its consumption. Consumption over the next five years has been adjusted to remove any growth and is based on current levels of demand.

Agriculture

There is no additional capacity for our largest user in this sector to increase its production; therefore their consumption has been limited to current levels. Consumption over the previous four years has remained stable and supports this view.

General Engineering

A large user in this sector is no longer trading; therefore any consumption attributed to it has been removed. The Company that now occupies the site uses a dry process as opposed to water based for their operations.

Mining, Bricks and Cement

A quarry has been closed and its consumption has been removed

In general terms the results for the 12 industry groups show contrasting trends around a central story of stabilization and gentle recovery, as follows:

- Iron and Steel, Laundry and Sundry Supplies-Trade show a continued fairly static trend with little or no growth
- General Engineering and Agriculture show a rapid period of turnaround in AMP5 followed by strong growth and begin to stabilise by the end of AMP6.
- In contrast Chemical and Allied Industries show a continued decline. Similar though less pronounced decline is seen in water consumption for Metal Manufacture and Sport and Recreation
- Food and Drink, Mining, Bricks and Cement and the service sectors (Education, Public Services and Hospitals) stabilize in AMP5 and show a modest growth in AMP6
- Demand in the Breweries is forecast to remain stable over AMP5 and AMP6

The Company considers that the non-household demand forecast up to 2019/20 is based on reliable data sources and sophisticated statistical tests to ensure that the most appropriate econometric model is available, using relevant explanatory variables.

The model produces forecasts only for the period 2013/14 to 2019/20 due to limitations in availability of economic data beyond that point. There are few clear signals for increased non-household demand beyond 2020 and therefore a flat profile has generally been adopted for existing non-household demand.

The measured non-household demand forecast derived from the model output and local knowledge is further adjusted to take account of the following:

- Additional measured demand from commercial meter optants and reductions in demand from unmeasured non-household properties
- Additional measured demand from new commercial supplies
- Assumed savings from the water efficiency target in AMP6 and AMP7

Forecasts of measured non-household demand up to 2019/20 are based on the modelled output combined with expert knowledge, forecasts of growth from new supplies and meter optants and assumed savings from water efficiency as described above. Forecasts of measured non-household demand post 2019/20 are affected only by optants and new commercial supplies.

No allowance for a dry year has been applied to non-household demand as it is assumed dry year conditions do not significantly affect commercial water use. An allowance is included in the forecasts for meter under registration, and supply pipe leakage.

The following table summarises the non-household demand forecast by sector over the AMP6 period and at the end of the 25 year planning horizon.

Sector	Actual Demand in 2012/13 Ml/d	Forecast demand in 2015/16 Ml/d	Forecast Demand in 2019/20 Ml/d	Forecast Demand in 2039/40 Ml/d
Metal Manufacture	2.38	2.46	2.09	2.08
General Engineering	2.36	3.44	3.75	3.74
Iron and Steel Works	0.47	0.51	0.51	0.50
Breweries	2.87	2.86	2.84	2.83
Chemical and Allied Industries	2.08	1.44	0.63	0.63
Food and Drink	1.20	1.08	1.09	1.08
Mining, Bricks and Cement	0.59	0.90	0.93	0.93
Sundry Supplies - Trade	1.17	1.13	1.12	1.11
Educational	3.16	2.88	2.97	2.96
Agricultural	6.02	6.69	7.20	7.17
Commercial Public Services	1.57	1.45	1.49	1.49
Hospitals	1.63	1.68	1.74	1.73
Laundry	0.66	0.70	0.68	0.68
Sport and Recreation	1.30	1.00	0.99	0.98

Sector	Actual Demand in 2012/13 Ml/d	Forecast demand in 2015/16 Ml/d	Forecast Demand in 2019/20 Ml/d	Forecast Demand in 2039/40 Ml/d
Mandatory Commercial	19.70	20.29	20.13	20.04
Commercial New Supplies	(included above)	0.25	0.65	2.93
MUR	2.84	2.60	1.98	2.07
mSPL	0.71	0.68	0.70	0.84
Unmeasured Non-household (including uSPL)	3.02	3.06	2.96	2.49
Commercial Optants	(included above)	0.04	0.09	0.31
Total Non-Household Demand	53.73*	55.13	54.54	56.59
Cumulative ** Water Efficiency Savings	0.0	-0.10	-0.50	-0.75

Note: * June Return value for 2012/13
** Savings distributed proportionally through sectors. For info only

The threshold for non-households to be able to switch suppliers is to be removed once the Water Bill is in place. This presents both a risk to the Company in terms of losing further non-household customers and an opportunity to gain new non-household customers. The Company has no way of assessing the likely impact of this change. However, to date the Company has not lost large users due to switching and therefore it might be inferred that small users are also unlikely to switch.

Market reforms including retail marketing are planned to commence in 2017. It is assumed this is to facilitate competition for front-end customer service only (not changing water supplier). This could see switchers, especially national accounts, but this will not impact on demand.

Accordingly, the Company has not included anything explicit within the demand forecast to account for competition and market reforms. The uncertainty around this is dealt with within the headroom assessment.

5.11 Leakage Forecast

Based on the latest SELL appraisal, as described in section 2.4.6 of the fWRMP, the Company's AMP6 leakage management strategy is to maintain leakage at the SELL over the 25 year planning period unless customer's are willing to pay for reductions below the SELL.

The SELL for 2015/16 has been assessed as 70.54 Ml/d. This is the normal year SELL and therefore excludes the impact of extreme

weather. This is based on the short run SELL, and whilst the Company is not forecasting a water resource deficit, long run leakage management options have been evaluated solely in terms of costs and benefits.

In addition to the potential impact of long run schemes on the SELL, the cost of carbon[6] is forecast to increase relative to other costs from 2020. Assuming that this forecast rise materialises at above the general rate of inflation, this could have the impact of reducing the SELL during AMP7 into the early part of AMP8. This could reduce the steady state SELL by circa 4 Ml/d between 2020 and 2030, in line with recent guidelines[7].

This potential reduction is based on a steady state SELL, and transitional costs need to be assessed periodically and at appropriate timescales, to ensure it is economic to move to and maintain the lower level of leakage.

This potential longer term reduction in the SELL is driven by externalities, therefore is liable to impact on customer bills. This is notwithstanding any improvements in efficiency or technology during the interim period that could mitigate these increased costs that are currently forecast to be required in maintaining a lower steady state SELL.

The following chart presents the forecast potential change to the SELL over the planning period, based on data currently available. This position will be reviewed and revisited at least every 5 years during each Periodic Review, as this position could be subject to change over the longer term.

[6] Updated short-term traded carbon values used for UK public policy appraisal, DECC (15 October 2012)

[7] Managing Leakage 2011, UKWIR (2010), Report Ref. 10/WM/08/42

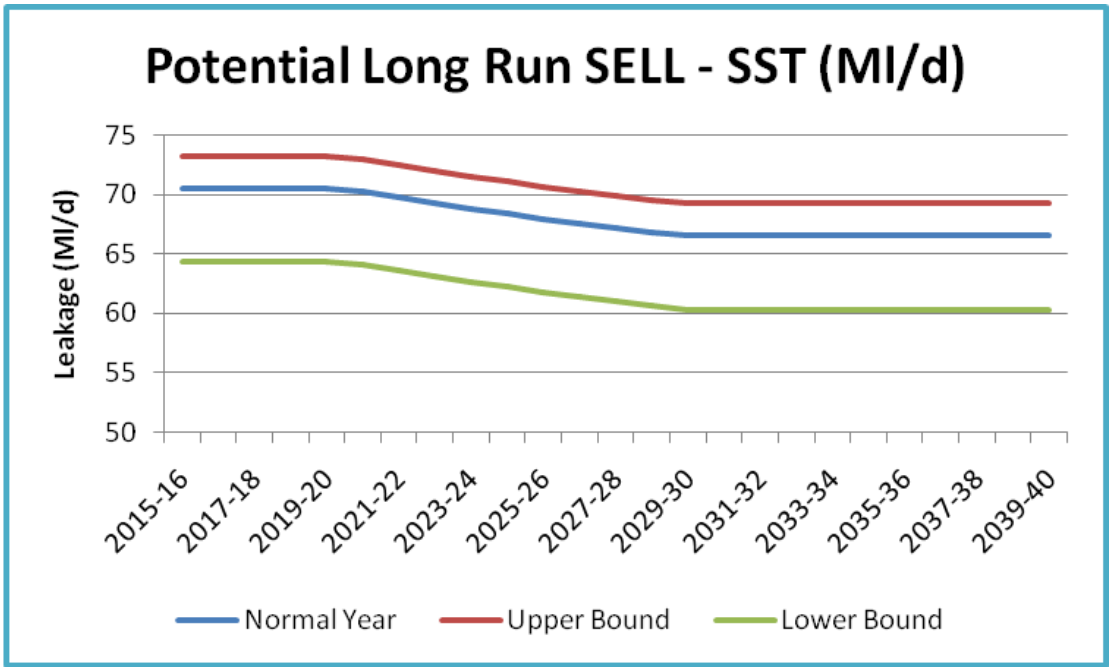


Chart: Potential long run SELL, including upper / lower bound and normal year

5.12 Minor Components of Water Use

Minor components of water use include:

- Distribution system operational use (e.g. mains flushing and water quality)
- Water taken legally but unbilled (e.g. fire stations and standpipe use)
- Water taken illegally (e.g. water theft and illegal connections).

The estimate of water use for these categories is based on Company specific data for the base year and is assumed to remain constant over the planning period and for all demand scenarios.

5.13 Climate Change Impacts on Demand

The Company agrees with the Environment Agency that investigations into the impact of climate change on consumption are uncertain at the present time (WRPG section 4.2.5.2 and WRPG – interim update August 2013).

Accordingly the Company has included a small estimate for the uncertain impacts of climate change in its headroom assessment (section 7) based on the draft outputs of 'Impact of Climate Change on Demand for Water' (UKWIR, 2013). In accordance with the WRMP Guidance (section 4.2.5.2) the Company has returned a zero value in rows 27 and 28 (WRP2 BL and WRP6 Demand) to reflect the

Company's view that it is not in a position to make an informed estimate of the impacts of climate change on the baseline.

The Company considers that the components of demand that will be affected by changing climate will be from household consumption, primarily for garden watering and outdoor use with a potential increase in the frequency or duration of showering. The Company retains its previous assessment for this based on the guidance in 'Climate Change and the Demand for Water' (Defra 2003) that its industrial and agricultural sectors are not sensitive to climate change."

5.14 Water Efficiency in the Demand Forecasts

As described in section 2.4.5 the Company is committed to promoting the efficient use of water and providing customers with information and opportunities to reduce the amount of water they use.

Currently water efficiency targets are calculated on 1 litre/property/day where outturn PCC is above 130 l/h/d. When PCC falls below this level the target is based on 0.5 litre/property/day. The Company's demand forecasts estimate that average pcc under normal year conditions will fall below this threshold in 2018/19. Therefore, if water efficiency targets continue to be set on this same basis the Company's target by the end of AMP6 would fall from 0.53 Ml/d to 0.26Ml/d.

However, the Company has taken a prudent approach and has included the achievement of the full current Ofwat water efficiency targets in the demand forecasts for the period 2015/16 to 2019/20. For the period 2020/21 to 2024/25 the Company has assumed a 'half target'. Thereafter, savings from water efficiency are assumed to be inherent within the micro-component forecasts and non-household forecasts. For the AMP6 period it is assumed that 0.27Ml/d of the 0.53Ml/d target will be derived from hard measures and 0.16Ml/d from soft measures applied to household demand and 0.1Ml/d from non-household demand. For AMP7 these savings are assumed to be halved. These savings have been applied to the micro-components of pcc.

The Company has not continued the water efficiency savings at the rate of the current Ofwat target beyond 2020/21 for a number of reasons:

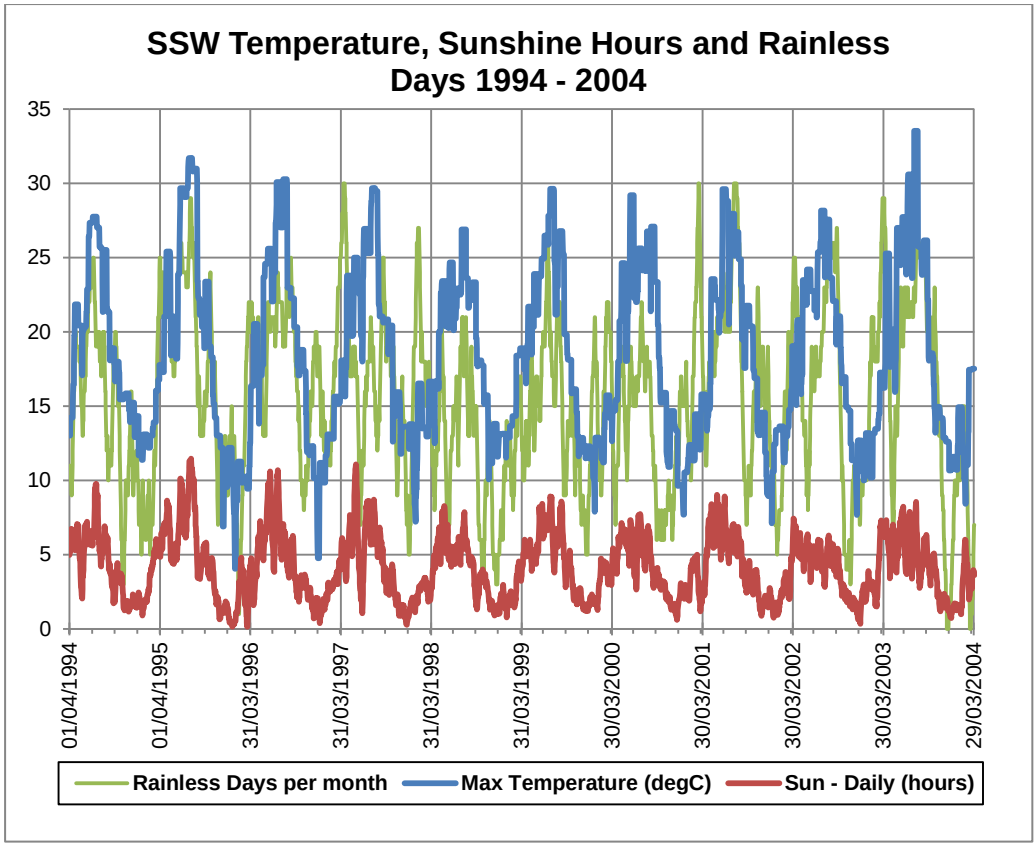
- There is a great deal of uncertainty regarding the actual volume of water saved as a result of water efficiency activity undertaken by a water company. The reported savings against the current Ofwat target do not necessarily indicate actual reductions in water use since the reported savings are calculated based on a number of standard assumptions.
- There is uncertainty regarding the sustainability of savings and whether there is any bounce back in demand from customers over time
- The PCC forecasts include a significant element of inherent water efficiency due to forecast replacement rates of appliances and lower volumes per use particularly relating to lower volume toilet cisterns
- If water efficiency savings at a rate of 0.53Ml/d are included each year over the 25 years the resulting pcc would be implausibly low
- There is a risk that the actual demand for water would be under estimated if assumptions over the continued delivery of savings at the rate of the current target were to be continued across the 25 year planning period.

The Company is committed to providing customers with water efficiency advice and devices and will continue to review its water efficiency programme on an annual basis to reflect the most effective means of doing this. The Company's proposed approach to water efficiency and the range of activities it is likely to include are described in section 2.4.5.

5.15 Dry Year Demand

Normal year demand is converted to dry year demand by the application of a dry year factor to household demand. This factor was derived from a review of climatic factors and Per Household Consumption (PHC). Studies consistently demonstrate that demand is directly related to sunshine hours and maximum temperature and the relationship with rainfall is significantly weaker.

The following chart shows how these data can be used to distinguish dry years from normal years for water resources planning purposes. The Company's reference dry year for PHC is based on the 1995. The climatic data shows the adjacent four year period from 1998/1999 to 2001/2002 best represents normal years, with reduced maximum temperatures and hours of sunshine.



The average overall PHC for the selected normal year period is 357.45ltrs/property/day compared to the reference year PHC of 372.11litres/property/day. The difference of 14.66ltrs/prop/day is equivalent to a 4.1% increase between the normal year period and the reference dry year.

The resulting dry year factor is applied to the normal year household consumption forecast uplifting it to the dry year scenario. The adjustment has been applied to both the measured and unmeasured household demand in a normal year.

The impact of the dry year adjustment on the final planning normal year demand is shown in the table below. The figures in the table exclude supply pipe leakage.

Scenario	2015/16	2039/40
Unmeasured Household Normal Year Consumption	118.38Ml/d	54.54Ml/d
Unmeasured Household Dry Year Consumption	123.23Ml/d	56.78Ml/d
Measured Household Normal Year Consumption	50.94Ml/d	124.01Ml/d
Measured Household Dry Year Consumption	53.03Ml/d	129.10Ml/d
Total Dry Year Adjustment	6.94Ml/d	7.33Ml/d

All other elements of demand are considered to be unaffected by the characteristics of a typical dry year.

5.16 Critical Period (peak week) Demand

The critical period for the Company is demand in a peak week scenario. The peak week scenario historically occurs in June or early July driven by household demand in conjunction with warm, sunny, dry periods. More frequent shorter periods of demand (peak hour and peak day) are effectively managed through network management and the Company's strategic storage supplies.

The Company commissioned Atkins Ltd to reassess household consumption in the critical period (peak week) by applying the 2006 UKWIR Peak Water Demand Forecasting Methodology 06/WR/01/7. This work produced peak week household demand (PWHH) rather than a peak volume (difference between average and peak week distribution input) which was the approach taken for the 2009 fWRMP. The change in approach to assessing peak week demand is supported by an improvement in climatic data, an increase in duration and quality of data sets since the 2009 submission and a more detailed statistical regression analysis.

Peak week household demand has been assessed through the creation of a multiple linear regression model of the variables affecting PWHH. This model uses climate data from 1971 to 2011 and has been applied to Company demand data over that period.

The UKWIR peak water demand framework has been applied as follows:

- Normalisation – correct average peak demand data for seasonal leakage and other factors to derive a representative peak week household consumption value. Collate and infill climate data to ensure a continuous dataset.
- Rebasing – consisting of the following.

  Regression analysis – to establish a relationship between historical peak demand events and climatic variables, and also including time-related trends affecting demand;

  Recalculation of historical peak demands – in this case using a regression model to estimate the peak volume or peaking factor which may have occurred if historic climatic conditions were to occur in the base year;
- Return period analysis – carried out on the rebased historical peak demands. The aim is to determine the base year value of peak volume or peaking factor for the company's chosen return period; and
- Forecasting – to establish the impact of such factors as climate change and customer behaviour on future peaking factors.

The output from the model suggests that the base year 1 in 40 year PWHH event is 272Ml/d.

To derive total peak week demand in the base year, normal year household demand is deducted from normal year distribution input and the calculated forecast household peak demand is substituted. It is assumed that the proportion of PWHH demand to normal household demand in the base year remains constant over the planning period. Therefore as normal year household demand increases over the planning period so does PWHH demand.

The full report produced by Atkins detailing the analysis of PWHH demand is presented in Appendix G.

5.17 Weighted Annual Average Demand

The weighted annual average demand forecast is intended to reflect the mix of demand in normal years, dry years and wet years. It reflects the Company's view of the demand in each type of year and the likely frequency of each type of year in the planning horizon.

The weighted average demand will be used by Ofwat to determine the Company's revenue forecast for setting price limits at the 2014 periodic review. The weighted average demand will not be used for any other purpose for the Company since it does not have a supply demand deficit.

The Company's weighted average demand forecast is based on the combination of normal year demand with dry year demand.

The Company assumes that household consumption is the only component of demand that is significantly affected by the weather and this is reflected in the derivation of the dry year demand forecasts. Other elements such as non-household consumption, leakage, distribution system operational use and water taken unbilled are assumed not to vary with the weather. The Company acknowledges that leakage also varies with the weather; however, since this component of demand is not related to income the Company has not included any variation of this between demand scenarios.

To determine the weighted annual average demand the Company has assumed that within a 10 year period there will be 2 dry years and 8 wet years.

6 WATER SUPPLY

6.1 Overview

Overview of Water Supply Forecast

Deployable output assessment

The Company has undertaken a comprehensive review of its deployable output assessment for the 2014 fWRMP and has moved to a new Aquator software platform (previously WRAPSIM). Water lost during the treatment process is now included in the deployable output model and is not shown separately. A comprehensive review of losses was undertaken in 2010/11 for inclusion in the new model.

Deployable output for dry year annual average for the fWRMP has been estimated as 370Ml/d. This compares to 363Ml/d for the 2009 WRMP (a change of less than 2% from the last assessment). As part of the overall review of deployable output the seasonal changes in water use have been revised. As a result the deployable output for peak week is now assessed as 458.1Ml/d which is an increase of 7% compared to the 2009 WRMP figure.

Levels of service

The Company's planned level of service for customer restrictions is 1 in 40 years on average. Customers have not indicated they wish this to change.

Impacts of climate change on deployable output

The Company has updated its assessment of the impacts of climate change on water supply for the fWRMP. The dry year annual average supply demand balance includes a reduction in deployable output of 5.55Ml/d by 2039/40 and 6.88Ml/d for peak week. The uncertainty around climate change impacts on supply has been included in headroom.

Outage

The Company has followed UKWIR best practice for assessing outage allowance. The dry year annual average outage allowance has been modeled at 9.81Ml/d and 10.26Ml/d for peak week. These figures are similar to those used in the 2009 WRMP.

Sustainability reductions

The Company has included all schemes included in the phase 3 NEP release resulting in a total sustainability reduction of 10Ml/d.

6.2 Deployable Output Assessment

6.2.1 Background

Deployable output (DO) is a building block in determining water supplies available for use by a company and is defined as:

"The output for specified conditions and demands of a commissioned source, group of sources or water resources system as constrained by;

- hydrological yield;
- licensed quantities;
- environment (represented through licence constraints);
- pumping plant and/or well/aquifer properties;
- raw water mains and/or aqueducts;
- transfer and/or output main;
- treatment;
- water quality;
- levels of service."

6.2.2 Description of the Supply System

Two surface water sources provide approximately 50% of the Company's water resources in the critical dry year.

There are 26 groundwater sources, which typically supply directly into the network. These sources provide approximately 50% of the Company's water resources in the critical dry year.

The two principal treatment works are linked by a strategic treated water spine main which passes through the key population areas of the Black Country (e.g. Dudley, West Bromwich and Walsall). There are additional branches to demand centres at Tamworth, Burton and Cannock. Other residential areas are supplied by connections off this strategic network and from groundwater sources.

The supply system can be classified as a conjunctive use system as surface water storage and groundwater are mixed and operated together to increase DO.

Severn Trent Water borders South Staffs Water's area of supply on all sides and the two companies have a number of shared interests.

The Company's HL abstraction licence is a shared resource with Severn Trent Water which is entitled to one third of the original joint licence. This entitlement is reflected in the Company's calculation of deployable output. Therefore the Company's calculated deployable output excludes the full Severn Trent entitlement of 40Ml/d at average and 48Ml/d at peak.

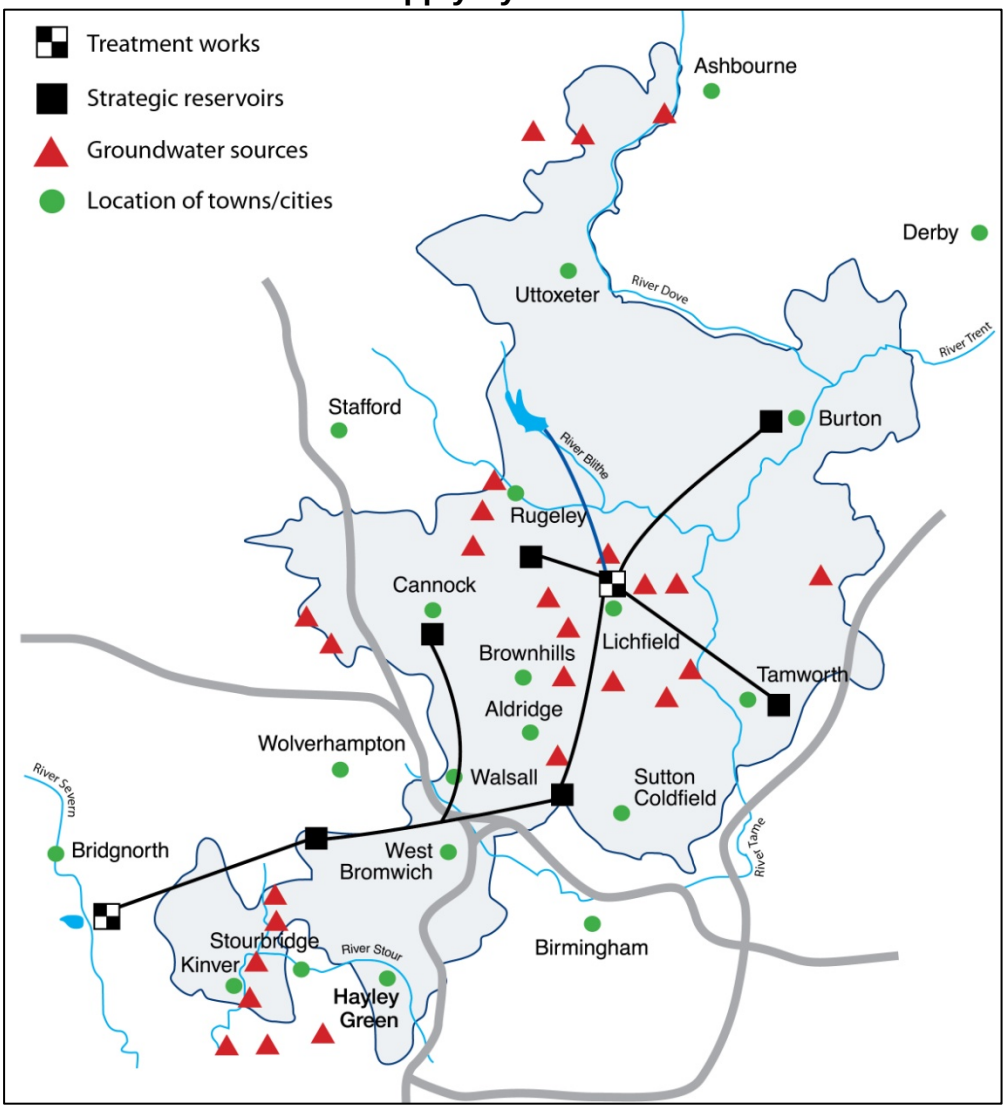
The Company also exports a number of small bulk supplies to Severn Trent and receives a number of very small bulk imports across the border. The Company also has a number of emergency bulk supply points in case of localised operational events close to its border. These regular and emergency bulks are in addition to the joint resource at HL. The total volume of these minor fixed bulk transfers to Severn Trent is 1.4Ml/d and none of them individually is greater than 1Ml/d. The volume of the minor bulk imports to the Company is less than 1Ml/d.

The detail regarding the modelling of the River Severn and the shared HL resource can be found in Appendix B describing the calculation of deployable output. More details of the Company's interactions with Severn Trent Water are included in section 3.7 of the fWRMP.

6.2.3 Planning Scenario

The Company has a single resource zone and reports both a dry year annual average and peak week deployable output using the water resources allocation model and employing behavioural analysis.

The South Staffs Water Supply System



6.2.4 Methodology

The methods used for calculating deployable output have been reviewed in a joint UKWIR and Environment Agency study (Water Resources Planning Tools 2012), otherwise referred to as WR27. The Company has used this review to establish the framework to determine the level of analysis required to assess deployable output which is proportionate to the nature of the supply system and the risk to both supplies and the environment.

A water resources zone (conjunctive use system) assessment framework has been selected for the following reasons:

- a conjunctive use model was previously used for the 2009 WRMP and therefore there is data and intelligence from previous model building and refinement studies available
- there is a medium to high degree of constraints on outputs
- there is a requirement to evaluate existing Company levels of service (LoS) and options for alternative levels of service.

A catchment/aquifer assessment framework is not currently required to assess ecological needs. Nevertheless the model has the capability to carry out this task if required in future.

6.2.5 Description of model

Conjunctive use has been simulated using an Aquator computer model for PR14. This is a mass balance water resources allocation model with a number of interconnected components which computes flows and volumes on a daily time step. The components include source nodes (including groundwater sources, reservoir and river intakes), transmission links (raw and treated water trunk mains, booster stations and service reservoirs) and demand centres. Individual parameters define the behaviour of each component and have been set using Company data and experience.

Environmental flows are represented by river nodes. The flows used by the model for the Upper and Lower River Blithe to determine behaviour of the Blithfield-Nethertown supply system have been determined for the Company using HYSIM rainfall runoff modelling by HydroLogic Ltd. Other inflow sequences have been determined by behavioural analysis using the Severn Trent Water strategic regional model and have been made available to South Staffs Water.

The conjunctive use model assesses the impacts of customer levels of service by applying restricted demand patterns triggered by control curves which conserve resources, allowing a higher deployable output to be obtained on average. These measures apply over the planning scenario (dry year average and peak). The frequency of any restriction is closely linked to DO and is determined by the highest average demand that can be sustained over the period of record (in the Company's case this is 89 years) before a further year with restrictions is required. For example, a 1 in 30 year level of service for a specified restriction would require that it occurs in no more than 3 years within this period.

The Company has undertaken a major review of its water resources modelling for PR14. This is described in Appendix B and summarised in the table below. The table includes an estimate of the impact of the model changes on annual average deployable output in terms of

whether it increased DO (+), decreased DO (-) or had negligible impact (neg).

Item	Description	Comments	Impact DYAA DO
Software	Platform change from WRAPSIM to Aquator	Previous model parameters, rules and datasets audited and documented and outputs verified	-
Model schematic and links	Demand zone review	Number of demand zones modelled increased from 7 to 15. Based on water supply zones with hydraulic mains models. Criteria for aggregation based on presence/absence of sources in WSZ and peak demand characteristics.	neg
	Transfer mains	The number of links increased in model to reflect trunk main network in hydraulic model.	neg
	STWL links	Additional links added to model schematic to facilitate modelling of water trading scenarios with STWL	neg
	Service reservoirs	Key treated water reservoirs added to model. Net capacity assumptions based on diurnal use pattern. Introduced to simulate peak week use of treated water storage under reference LoS and climate change scenarios.	+
Demand profile	Hydraulic modelling data	Demand split between demand zones changed based on a review of hydraulic models data. Peak/average ratios determined on zone-by-zone basis, whereas previously fixed ratio used.	-
	Dry year profile	Profile amended to reflect decline in average demand over time and reduction in leakage and non-household use. Fixed winter baseline demand set based on 2011 data. Summer profile based on excess consumption observed in 1995. **This resulted in increase in peak/average ratio from 1.18 to 1.24.**	- **(DYCP ++)**
Impact of customer restrictions	Demand savings assumptions	Demand savings for appeals for restraint, temporary use bans and non essential use bans reviewed against and aligned to UKWIR (2007) guidance. Seasonal profile retained. Applied uniformly to all demand zones (previously bias to Sedgely zone) and using control curves (previously savings fixed in 1976).	+
	Control curves	Principal control curves retained but secondary curves established to match changes to drought	-

Item	Description	Comments	Impact DYAA DO
		management triggers in Drought Plan in 2012. Separate curves established for Appeals for restraint, TUB's and non essential use bans.	
Blithfield-Nethertown-Seedy Mill supply system	River Trent HOF	Flow series changed from naturalised flows at Colwick with HOF of 2500 Ml/d to simulated flows at North Muskham with HOF of 2650 Ml/d	**neg**
	Nethertown operation rules	Rules amended to reflect operational practice in 2010/12 drought. Triggered by Level 1 curve (drought monitoring) whereas previously used secondary lower curves. Transfer capacity increased to 28 Ml/d subject to availability of water in lower Blithe.	**+**
	Peak capacity	Raw water capacity reviewed and amended to meet original design capacity (increase in raw capacity from 120 Ml/d to 125 Ml/d)	**+**
	HYSIM modelling	Rainfall and PE data collated for River Blithe catchment. Recalibration of HYSIM model for use to extend existing inflow series (2006 – 2010) and to act as baseline for CC scenarios (1921- 2010).	**-/+**
HL	Licence under river regulation	No changes to control rules. Put and take licence included in model increasing permitted abstraction by up to 11 Ml/d	**+**
	Chelmarsh Reservoir	Compensation release to River Severn (0.227 Ml/d) added	**neg**
	Peak capacity	Raw water capacity of 216 Ml/d not changed.	**n/a**
	West Bromwich Booster	Transfer capacity reviewed following operational performance in 2010/11 and new profile adopted.	**+**
Raw water storage	Overdraw facilities	Facility to draw down Blithfield and Chelmarsh Reservoir at maximum rates during peak week retained	**n/a**
	Emergency storage	Emergency storage assumptions retained	**n/a**
Groundwater sources	DO review 2012	Individual source deployable outputs reviewed and amended.	**+**
	Licence constraints and blending	Peak and aggregate licence volumes treated as constraints and explicitly modelled. Previously fixed volumes or profiles used. All blending arrangements are based on fixed volumes or included within site DO value, so no additional modelling requirement.	**neg**
	Peak DO	Change from fixed profile to behavioural modelling of groundwater DO values. Note seasonal changes in DO are driven	**+**

Item	Description	Comments	Impact DYAA DO
		by licence only, not changes in yield so full behavioural analysis not required.	
Treatment Losses	2012 update	Review of waste water losses carried out based on 2010/11 data.	**n/a**
	Modelling approach	Treatment losses modelled explicitly within model and included within DO assessment whereas previously reported in WRP tables. Fixed losses assumed at all groundwater sources and rate-dependant losses at surface water works.	**+**
Interface with STWL	Bulk transfers	Additional links added to model schematic to facilitate future modelling of water trading options with STWL. Review of existing transfer volumes but flat profile left unchanged for planning purposes.	**n/a**
	Wolverhampton	Demand profile reviewed but left unchanged as reflects STWL entitlement and 1995 consumptions.	**n/a**
	Use of regional model flows	In addition to simulated resource states of River Severn previously provided by STWL, new model uses River Trent flows at North Muskham. Models make use of current STWL outputs equivalent to purpose of prediction outputs (i.e. baseline DO, wet climate change scenario, dry climate change scenario, etc.)	**neg**
	Simulation of SSW system	Additional data provided to STWL concerning works capacities, DO and licence as well as control curves and demand savings assumptions. STWL have updated simplified schematic and used this to produce an improved simulation of river flows and resource states of Rivers Trent and Severn.	**n/a**

6.2.6 Assessment of Average and Peak Deployable Output

The source output assessment of groundwater sites in 2012 concluded that there was little evidence for seasonally variable groundwater DO values at site level. Nevertheless peak groundwater DO values are constrained by licence conditions both at group and sub-group level and this has been explicitly modelled.

The supply system has been modelled to investigate the benefits of conjunctive use of surface water and groundwater sources. At peak periods the model allows greater use of raw water storage in Blithfield reservoir and, to a lesser extent, raw water from Chelmarsh and treated water storage in service reservoirs. Outside peak demand

periods, storage is preserved and /or recovers with greater use of groundwater and pumped water transfers.

In critical drought years as Blithfield Reservoir storage levels fall, a sequence of customer demand restrictions are implemented. Supply measures are also implemented but these are limited to operation of the Brindley Bank raw groundwater source and Nethertown pump-back scheme within normal licence constraints and do not include operation of any drought permits.

Annual average deployable outputs are represented by the highest annual average demand that can be met before the levels of service criteria are not met, or that use of emergency storage is required. Peak deployable output is the demand met in peak week of the same model run.

Deployable output for dry year annual average for the fWRMP has been estimated as 370Ml/d. This compares to 363Ml/d for the 2009 WRMP (a change of less than 2% from the last assessment). As part of the overall review of deployable output the seasonal changes in water use have been revised. As a result the deployable output for peak week is now assessed as 458.1Ml/d which is an increase of 7% compared to the 2009 WRMP figure.

6.2.7 Baseline Levels of Service and Deployable Output Assessment Results

Three levels of service scenarios have been assessed as follows:

- Company level of service, which is for a temporary use ban every 40 years on average.
- Reference level of service, which is for a temporary use ban every 10 years on average, or a non-essential use ban every 40 years on average.
- Unrestricted level of service, which is for no temporary use ban to be required within the period of the model duration.

The following table lists the results of the deployable output assessment for three baseline scenarios.

Reported values of deployable output include the small scale bulk transfers to Severn Trent Water which have been assessed as a 1.4Ml/d net export under dry year conditions. It excludes the transfer of water to the Wolverhampton area to which Severn Trent Water are entitled through their joint ownership of the HL WTW and the Sedgley distribution system. The calculation of DO assumes the full entitlement (40 Ml/d at average and 48 Ml/d at peak) is taken by Severn Trent Water as this reflects the transfer capacity of this supply system.

Results of Baseline Deployable Output Scenarios

	Baseline Reference LoS DO	Baseline Company LoS DO	Baseline No Restrictions DO
DYAA DO Scaled	376.5	368.3	342.4
DYAA DO Scaled and Fixed Export	377.9	369.7	343.8
DYAA DO Scaled and Fixed incl STW	418.5	410.3	384.4
DYCP DO Scaled	466.9	456.7	424.6
DYCP DO Scaled and Fixed Export	468.3	458.1	426.0
DYCP DO Scaled and Fixed incl STW	516.3	506.1	474.0
Failure Mode	Includes 5 Level 4 events (1921, 1929, 1934, 1976, 1996) and two Level 5 events (1934 and 1976). Failure triggered by Blithfield Reservoir reaching emergency storage (1976).	Includes 2 Level 4 events (1934, 1976) and two Level 5 events (1934 and 1976). Failure triggered by third Level 4 event (1996).	Fails when Blithfield Reservoir reaches emergency storage (1976).

Notes:
DYAA DO Scaled is Dry Year Annual Average demand from Company demand centres met by supply.
DYAA DO Scaled and Fixed includes minor bulk transfers with fixed volumes. This is the Deployable Output value used in the Company water balance.
DYAA DO Scale Fixed incl. STW includes the Severn Trent Water entitlement of 40 Ml/d on average from HL. This volume is not the reported DO as HL is a shared resource with Severn Trent Water.
DYCP is Dry Year Critical Period (peak week). At peak the Severn Trent Water entitlement is 48 Ml/d.
Failure modes:
Level 4 restrictions are equivalent to Temporary Use Ban.
Level 5 restrictions are equivalent to non-essential use ban.

The reference levels of service scenario fails due to more than 2 non-essential use bans occurring in the period of record (1 in 40 years). The temporary use ban level of service for this return period is however greater at no more than 5 failures (around 1 in 20 years). However the increase in deployable output is not significant at less than 10 Ml/d.

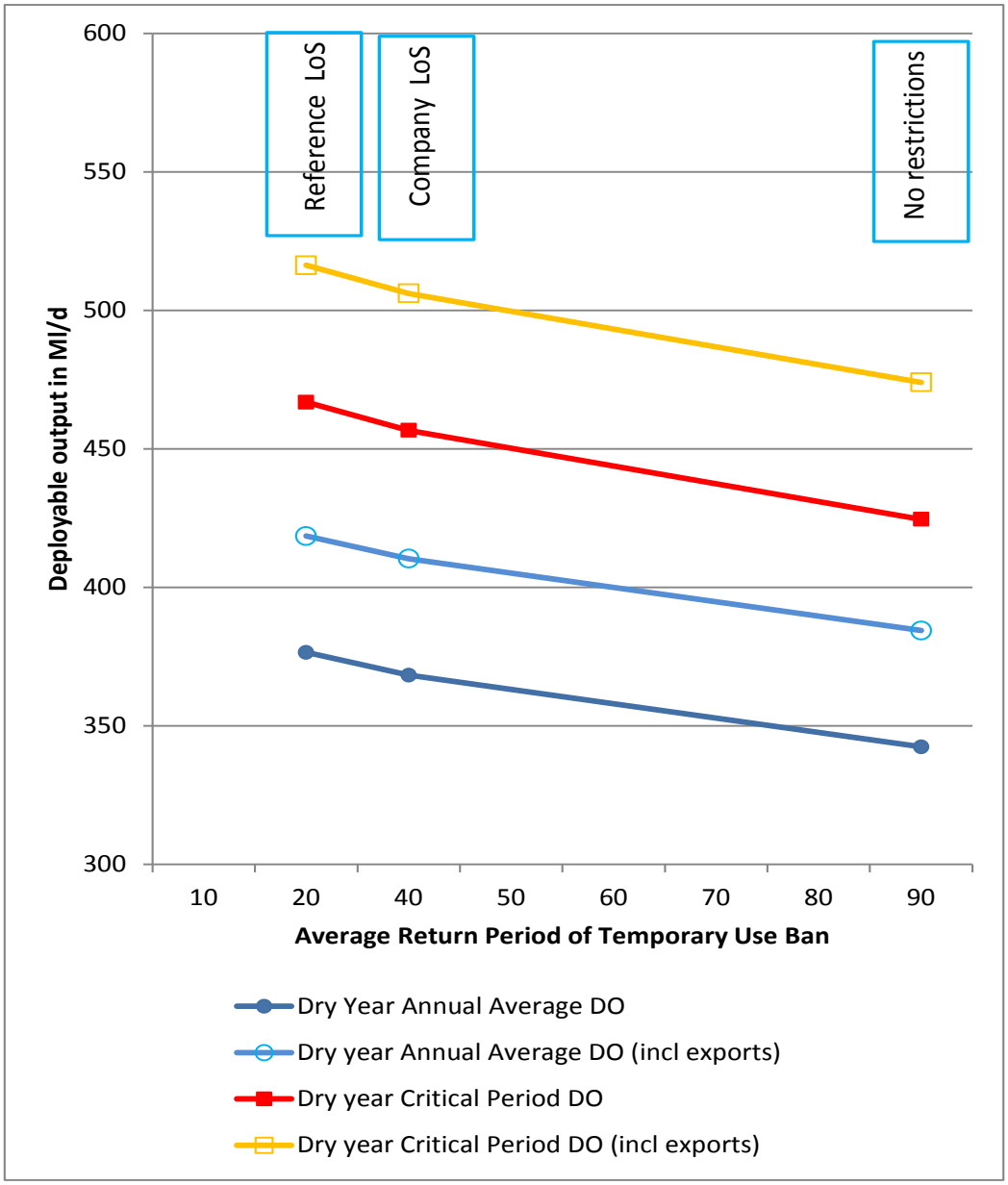
The No Restrictions Scenario implies a deployable output of more than 25 Ml/d lower than the Company level of service. The Company currently has a large surplus in the base year and is predicting that this will remain throughout the planning period. This surplus suggests that

the actual level of service customers are likely to experience under both the baseline and the final planning scenarios will exceed the planned level of service.

The Environment Agency planning guideline indicates that companies should state within their WRMPs the actual level of service customers are likely to experience. However, there is no guidance on how actual level of service should be determined. For the Company the actual level of service is likely to be between no restrictions and 1 in 60 years due to the surplus. However at such high return periods these values are difficult to estimate with a flow record of 89 years.

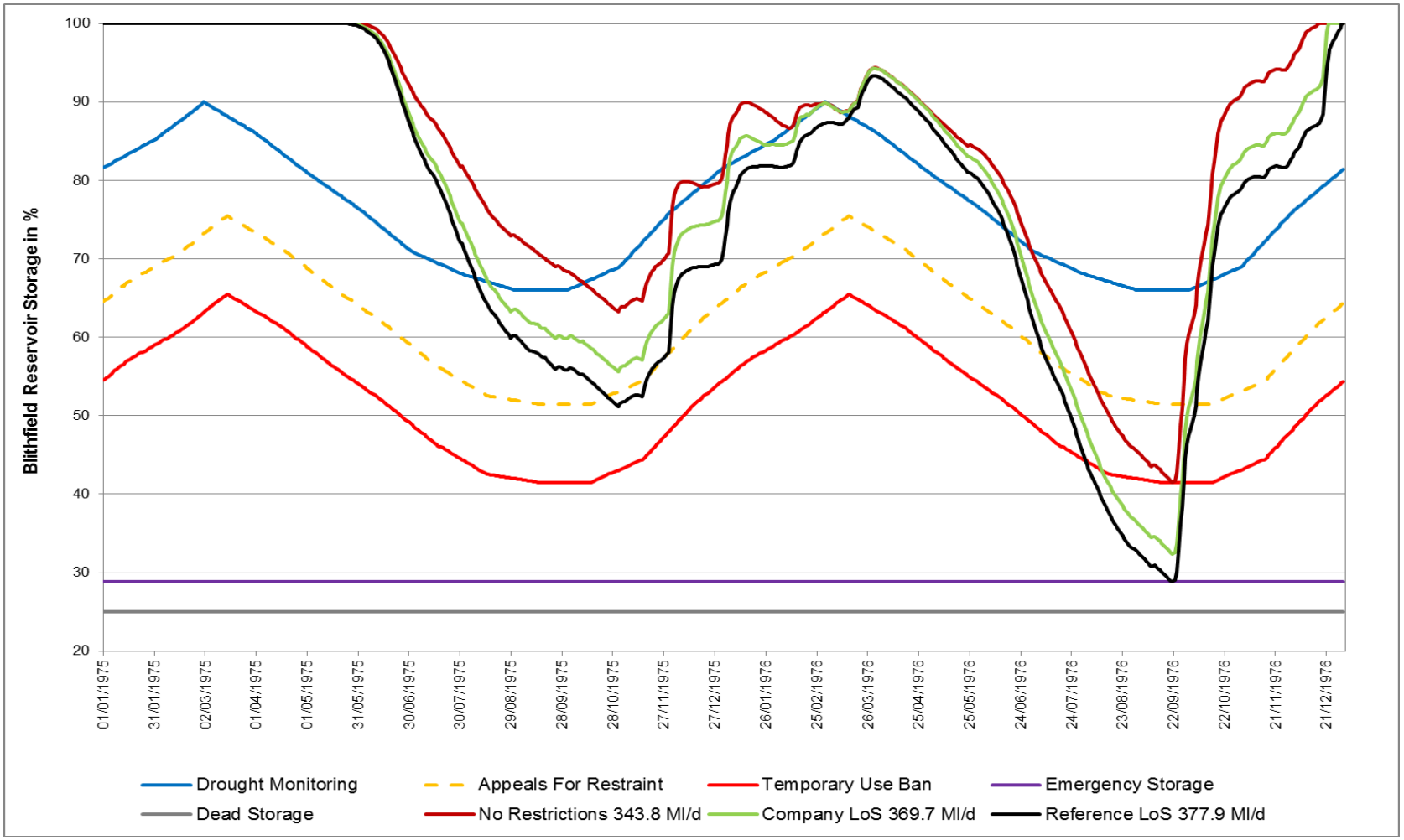
The Company has one of the best levels of service for customer restrictions in the UK water industry and customers have not indicated they wish to see a deterioration or an improvement. The Company does not propose to change the planned level of service.

The impact of levels of service on deployable output are illustrated on the following chart.



The impact of the deployable output scenarios on storage levels at Blithfield Reservoir in the 1975/76 drought period is shown in the following chart.

Comparison of predicted Blithfield reservoir storage levels under different levels of service



6.3 The Impact of Climate Change on Deployable Output

6.3.1 Background

The Company has updated its assessment of the impacts of climate change on water supply for the fWRMP. It has applied the methods in the Environment Agency guidance *Climate change approaches in water resources planning – Overview of new methods* (EA, 2012). This guidance explains how to make use of the latest climate change projections published by Defra in June 2009 (*Adapting to climate change – UK climate projections 2009*), otherwise known as UKCP09.

The climate change methodology consists of the following steps:

- A climate change vulnerability assessment
- Identification of appropriate assessment approach
- Calculation of river flows
- Calculation of deployable output in the 2030's
- Scaling of impacts of climate change and determination of headroom uncertainty

6.3.2 Vulnerability Assessment

The Company has carried out an initial vulnerability assessment in order to determine how vulnerable the Company water resource zone is to the effects of climate change. This is based on current knowledge of the zone complied during preparation of the Drought Plan in 2012 and makes use of the previous climate change analysis undertaken for PR09.

The PR09 analysis applied outputs from the UKCP06 climate change scenarios which are based on the projections from 6 global climate models (UKWIR, 2007). Statistical analysis of these results provided a series of monthly % change factors from which "Mid", "Wet" and "Dry" values were derived. The three sets of factors were then applied to the rainfall and potential evaporation data series used in the rainfall runoff models for the River Blithe and River Severn and used in the water resources model.

The resultant impact on deployable output for climate change scenarios to the 2020's was as follows:

	Dry Year(Ml/d)	% Reduction in DO	Range (Wet to Dry)
Base DO	419.7		
Wet	438.2	-4.41%	
Mid	419.1	0.14%	8.96%
Dry	400.6	4.55%	

These figures were applied to a magnitude versus sensitivity plot of deployable output due to climate change. The boundaries in the plot were based on results of 47 UK water resource zones. The sensitivity plot suggests the Company resource zone can be classified as 'medium' vulnerability.

Uncertainty range (% change wet to dry)	Mid Scenario (%reduction in deployable output)		
	<5%	>5%	>10%
<5%	Low	Medium	High
6 to 10%	**SSW**	Medium	High
11 to 15%	High	High	High
>15%	High	High	High

A high level review of various factors in the PR09 water resources plan, together with this classification concluded that the Company's vulnerability to climate change should be assessed as Low – Medium.

The following aspects of the assessment suggested that the Company's vulnerability to climate change assessment should be classified as MEDIUM:

- The range of impacts on deployable output between the Wet and Dry climate futures, leads to the Company's position on the combined magnitude/sensitivity plot falling into the medium vulnerability category
- The Company's area has been classified as being of moderate water stress.
- The Company's groundwater sources lie in groundwater units classified as 'Over-Abstracted'

The following aspects of the assessment suggest that the Company's vulnerability to climate change assessment should be classified as LOW:

- The Mid scenario impact of climate change on deployable output represents only -0.14% of existing deployable output
- The Wet and Dry scenarios used in the standard climate change analysis represent more extreme scenarios than do any of the six individual global climate models from which they are drawn.
- The significantly positive balances of available headroom and of supply -demand + target headroom (the supply-demand balance) in all years of the planning period to and beyond 2035
- The security of supply index of 100 in all years
- The highly integrated nature of all sources and demand centres in the Company's supply area
- The availability of surface and groundwater storage within the resource zone
- The mix of surface and groundwater sources in the supply area
- The low vulnerability to short (single season) drought events
- The main driver of resource availability is winter rainfall, the magnitude of which is expected to rise under most future climate projections
- The resilience of the Company's groundwater sources to drought, and the fact that they would remain so even if fluctuations in the Sherwood Sandstone aquifer (1~3m over the period of record) were to double
- The limited extent of resource constraints on the Company's sources, which are mostly licence limited and not hydrological resource limited
- The robustness of outputs from the Company's sources during drought periods
- The low peakiness of demand across the Company's area, which enables available supplies to be levelled out efficiently over time, and over the supply area as a whole
- The availability of supply-side and demand-side drought measures to secure resilience to drought events
- The potential available to escalate these measures over the medium term, to provide resilience during critical droughts
- The relatively low magnitude of potential future sustainability reductions compared to the available resource headroom
- Previous climate change assessments have indicated the potential for moderate variability about the present estimate of deployable output but within (+-20 Ml/d) the envelope of the supply demand surplus

6.3.3 Choice of assessment approach

Following pre-consultation with the Environment Agency discussions were made over the vulnerability status and options for assessment approaches. It

was agreed that a pragmatic approach was required as any deployable output modelling was highly dependent on outputs from the Severn Trent Water regional model. This makes it important that for each climate change scenario considered equivalent climatic conditions are modelled simultaneously on the River Trent and Severn as on the River Blithe. Accordingly it was decided to adopt a medium to high vulnerability approach as required by the vulnerability assessment of Severn Trent Water for its Strategic Grid Resource Zone. This involved application of Approach 2.2 (targeted sample of UKCP09 based on DI analysis).

6.3.4 Application of assessment approach and calculation of river flows

Approach 2.2 is a two staged analysis incorporating a detailed assessment of vulnerability to climate change. This involves undertaking a drought indicator analysis, in order to determine the sensitivity of the system to water availability in drought spells. This is applicable where deployable output is considered sensitive to drought frequency/severity as applies to the Severn Trent Water supply system. Where drought sensitivity is confirmed, the UKCP09 data set is sampled in two stages:

- First using Latin Hypercube Sampling (LHS) to develop a minimum of 100 climate change projections
- Secondly, by creating a sub-sample based on the drought indicator that deliberately focuses on getting sufficient samples at the dry end of the scale as well as a reasonable spread across the full sample.

This “smart sampling” avoids running a large number of “wet” scenarios unnecessarily but requires some post –processing of results. The perturbed climate data can be used in rainfall-runoff and/or groundwater modelling to develop a minimum of 20 flow sequences representing possible conditions. Water resource model output calculates deployable output values representative of future climate change conditions for the 2030’s.

The initial drought sensitivity analysis, preliminary LHS sampling and identification of a sub sample was carried out by HR Wallingford Ltd for Severn Trent Water based entirely on their supply system and rainfall runoff models for their regional model. Outputs from this work comprised the following reports and datasets supplied to South Staffs Water:

UKCP09 Analysis for the Severn Trent Region (HRWL, November 2012a). This report evaluated UKCP09 datasets for use in the assessment. It compared projections at a number of spatial scales to determine the optimum dataset for use in the analysis. Climate change projections were downloaded for the river basins of the Severn and the Humber, the administrative regions of the West Midlands and East Midlands, and 25 km^2 grid cells 1277 and 1425 which correspond with the far North East and South West of the STW supply area. Analysis of climatic data in the projections revealed little spatial variation in temperature with a little more variability in rainfall at the extremes of the 10^{th} and 90^{th} percentiles. Joint probability of temperature and rainfall

equally showed similar spatial consistency apart from at the extremes. The analysis demonstrated consistency in the projections across the supply region and recommended use of a single set of UKCP09 climate projections from the Severn river basin.

The report also carried the 100 LHS sampling of the 10,000 UKCP09 projections. Statistical techniques were used to select an optimal LHS set from 50 to ensure a consistent distribution of temperature and rainfall. The chosen dataset was further processed to calculate potential evaporation (PET) values from temperature using the Oudin formula.

Drought Indicator Analysis for the Severn-Trent Region (HRWL, November 2012b). This report analysed drought response during the 90-year period (1920-2010) of four reservoir storage systems in the Severn Trent supply region. It derived relationships between reservoir response to drought and the preceding climatic conditions for each reservoir system. It then used the resulting regression models to simulate reservoir response to the 100 LHS UKCP09 scenarios deriving drought minima from each 90-year sequence. These minima were then used to produce a drought ranking of projections, identify 10 driest projections and a further evenly distributed subsample of 10 projections from “dry” to “wet”. Weighting factors were also determined for the full sample.

A similar process was then applied to modelled monthly river flows using the five exemplar HYSIM catchment models (see below). These were modelled using the 100 LHS scenarios and compared with the historic 90-year record to generate three monthly flow parameters: mean annual flow change; mean April to September flow change, and; Mean June to August flow change. A similar 20 sample was generated for these flow indicators by ranking, picking a “dry split” and a further evenly distributed subsample.

All the indicators (drought and flow) were found to produce fairly similar results; however there was a larger variation in the drought indicator rankings and the use of flow indicators was preferred. The flow indicator of mean April to September flow change was chosen to define ranking, the makeup of the 20 subsample, and scenario weighting.

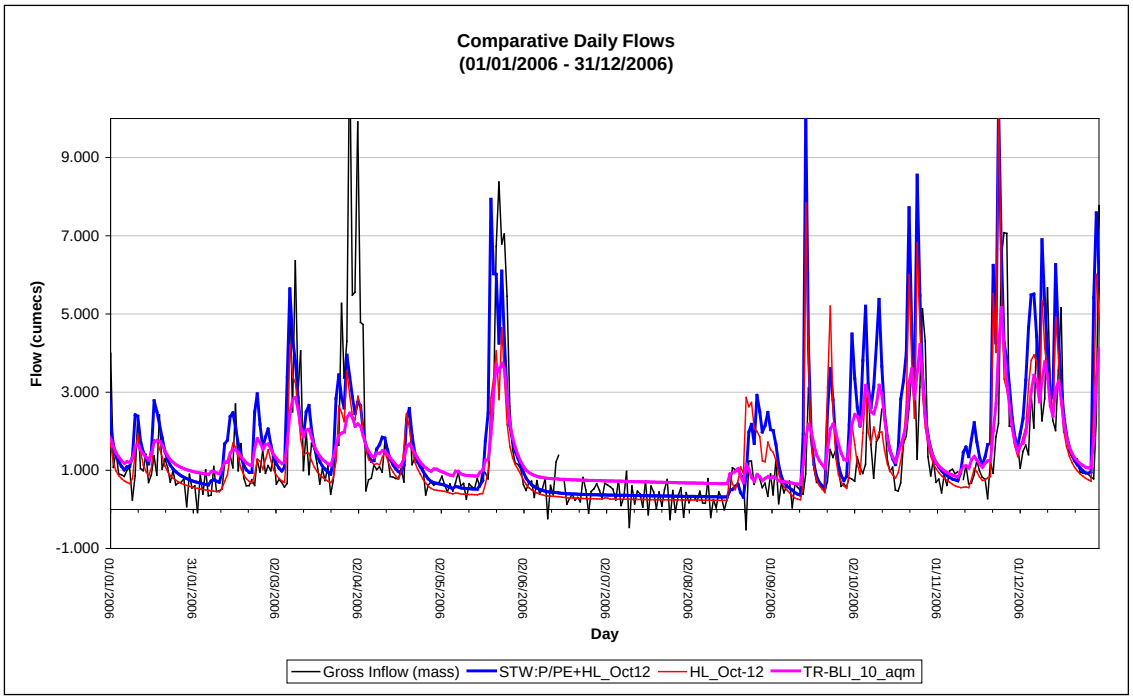
Hydrological Analysis for the Severn-Trent Region (HRWL, November 2012c). This report established and implemented a hydrologic modelling methodology for the assessment. It grouped the existing 78 HYSIM models into five groups according to their catchment area, rainfall and flow characteristics. From each of the five catchment groups a single exemplar hydrological model was selected and run with 100 UKCP09 climate projections for the medium emissions scenario and 2030s time period to provide a set of flow factors for each group. The set of 100 flow factors were then reduced to 20 using a river flow indicator from HRWL (2012b) above. The flow factors were applied to naturalised baseline flow series from each of the HYSIM catchments; artificial influences reinstated, and; further processing carried out to generate 20 climate perturbed datasets for use in the regional Aquator model.

Severn Trent Water Datasets. STW provided original and perturbed rainfall and PET datasets for the River Blithe catchment as well as original and perturbed flows using their exemplar catchment model approach. They also provided outputs from the 20 Aquator regional model scenario runs in the form of predicted River Trent flows and River Severn resource state time series for the 1920 – 2010 period.

An evaluation of the River Blithe datasets was made for the Company by Hydrologic Ltd. This compared existing Company modelled outputs with various options for ensuring that assumptions were compatible with the Severn Trent regional model outputs. These model options were as follows:

Flow series	Description	Rainfall	PET
Gross Inflow (mass)	"Observed" Blithfield Reservoir inflow series determined by mass balance calculations	n/a	n/a
HL_Oct-12	SSW HYSIM rainfall runoff model series adapted for climate change prediction scenarios	SSW	SSW
TR-BLI_10_aqm	STW HYSIM model used in regional model	STW	STW
STW P/PE+HL_Oct-12	SSW HYSIM model run with STW rainfall and PET data	STW	STW

The datasets were analysed by comparison of daily rainfall PET data, flow duration curves and annual hydrographs. The annual hydrograph for 2006 shows that the flows simulated by the Severn Trent Water HYSIM model (*TR-BLI_10_aqm*) consistently over predicts low flows and under-predicts peaks when compared to observed flows (*Gross Inflow (mass)*).



A much improved match is provided by the South Staffs Water HYSIM model which utilizes the Severn Trent Water rainfall and potential evaporation data (*STW P/PE+HL_Oct-12*) and this is comparable to that already established using South Staffs Water P/PE data (*HL_Oct-12*).

As the deployable output was found to be sensitive to the River Blithe inflow series during the development of the new Aquator model it was decided to base inflow modelling on the Company HYSIM model, whilst using the Severn Trent Water climatic data (i.e. STW P/PE+HL_Oct-12) to ensure compatibility with the regional model output. This model was then used to generate a revised baseline flow series as well as the 20 climate change scenario datasets for use in Aquator. All model scenarios were run between 1918 and 2010 and the 1921-2010 outputs used as inflow datasets.

6.3.5 Calculation of deployable output in the 2030's

The Company Aquator model was used by Hydrologic Ltd to investigate the UKCP09 climate change prediction scenarios. Models were run over the 1921-2010 period to evaluate the impact of climate on deployable output under existing Company levels of service (an average of one temporary use ban every 40 years).

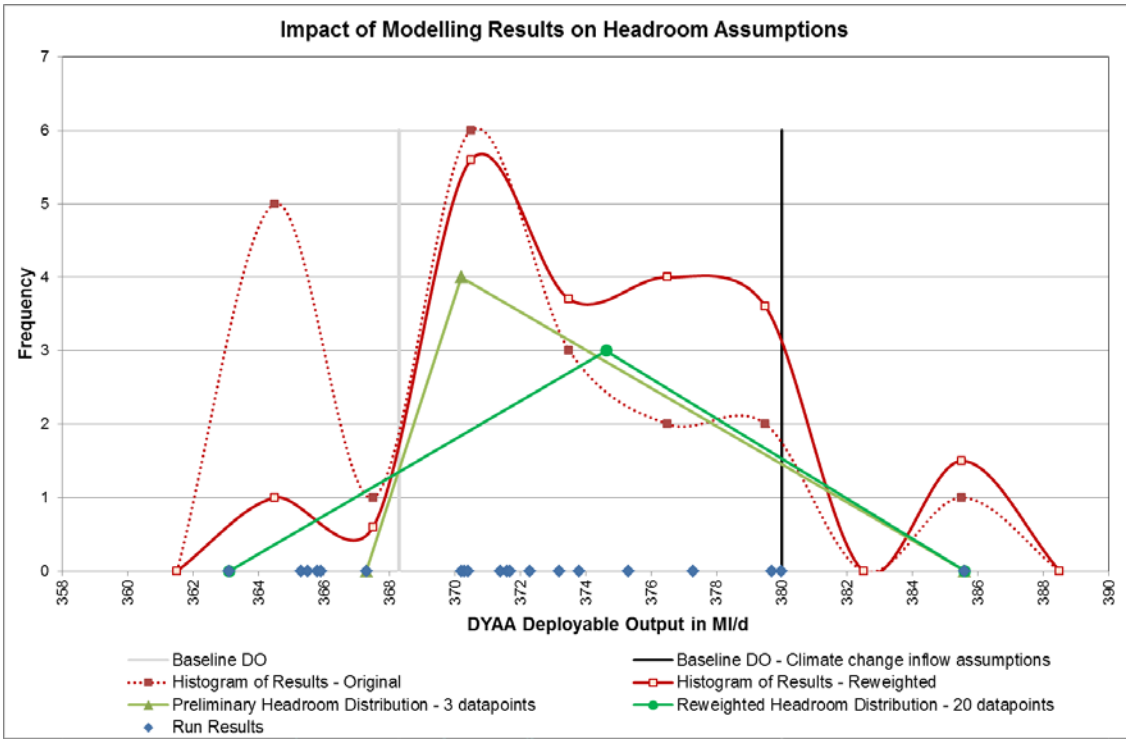
An initial revised baseline deployable output run was made to reference the climate change scenarios as a new rainfall and potential evaporation dataset was being used. The resultant deployable output values from these model runs are tabulated as follows:

Model Run *(UKCP09_rank_scenario)*	**Dry Year Annual Average DO - scaled (Ml/d)**	**Weight**
Baseline	**368.30**	n/a
Revised CC Baseline	380.00	n/a
UKCP09_01_8632 (V Dry)	363.10	0.01
UKCP09_03_3111	365.30	0.01
UKCP09_07_1345	365.50	0.01
UKCP09_02_9855	365.80	0.01
UKCP09_05_1090	365.90	0.01
UKCP09_10_684 (Dry)	367.30	0.03
UKCP09_50_3903 (Mid)	370.20	0.1
UKCP09_70_3306	370.30	0.1
UKCP09_15_2726	370.40	0.05
UKCP09_09_6461	371.40	0.01
UKCP09_06_2203	371.60	0.01
UKCP09_04_6108	371.70	0.01
UKCP09_08_8282	372.30	0.01
UKCP09_20_9701	373.20	0.075
UKCP09_30_3521	373.80	0.1
UKCP09_40_281	375.30	0.1
UKCP09_60_2745	377.30	0.1
UKCP09_80_9623	379.70	0.1
UKCP09_95_8764	380.00	0.08
UKCP09_90_1467 (Wet)	385.60	0.075

These results consistently show that in the majority of future scenarios there will be a reduction in deployable output by the 2030s but there is considerable variation in the volume of this reduction. The dataset has been used to determine the most likely reduction in baseline deployable output by 2030 and the probability distribution for headroom uncertainty (component S8).

6.3.6 Scaling of impacts over planning period

A histogram of these outputs illustrates the influence of the “dry split” in the original climate sample as a peak around 365 Ml/d. It also illustrates the upwards shift of the whole dataset from the baseline deployable output value based on the Company climatic dataset (368.3 Ml/d) to that based on the Severn Trent Water regional data grid (380 Ml/d). In considering the use of these results the Company has reweighted deployable output values based on the original weighting factor determined by HRWL (2012b) and this produces a more even distribution.



These values have also been re-scaled to reflect the higher baseline DO value used in the climate change modelling. The weighted mean of this distribution has been taken as the most likely 2030 DO value. A triangular distribution has been applied between the dry, weighted mean and wet values.

Predicted 2030 scenario	Change to DYAA DO	Change to DYCP DO
Unscaled reweighted		
Baseline DO	-5.36	-6.65
Dry (relative to baseline)	-11.54	-14.30
Wet (relative to baseline)	10.97	13.60
Scaled reweighted		
Baseline DO	-5.20	-6.45
Dry (relative to baseline)	-11.18	-13.86
Wet (relative to baseline)	10.63	13.18

The planning guidelines stipulated how 2030/31 values are to be applied across the planning period between 2011/12 and 2039/40. This is applied by means of a scale factor.

From 2030/31 onwards the scale factor equation is:

$$\text{Scale Factor} = \frac{\text{Year} - 1975}{2035 - 1975}$$

Between 2013/14 and 2029/30 the scale factor equation is:

$$\text{Scale Factor} = \frac{\text{Year - 2012}}{\text{2031 - 2012}}$$

The values used in the water resources planning tables are therefore (allowing for sign reversal for incorporation into headroom):

Annual Average	**2020**	**2025**	**2030**	**2035**	**2040**
Change in Baseline DO	-1.92	-3.28	-5.20	-5.11	-5.55
S8 Headroom					
Minimum Loss (gain in DO)	-3.9	-6.7	-10.6	-10.5	-12.9
Best Estimate	0.0	0.0	0.0	0.0	0.0
Maximum Loss (loss in DO)	4.1	7.1	11.2	11.0	13.5
Peak Week	**2020**	**2025**	**2030**	**2035**	**2040**
Change in Baseline DO	-2.38	-4.07	-6.45	-6.34	-6.88
S8 Headroom					
Minimum Loss (gain in DO)	-4.9	-8.3	-13.2	-13.0	-15.9
Best Estimate	0.0	0.0	0.0	0.0	0.0
Maximum Loss (loss in DO)	5.1	8.8	13.8	13.6	16.8

6.3.7 Changes in Deployable Output due to Company investment plans

The Company has embarked on an intensive programme of borehole maintenance in AMP5. This is planned to continue over the planning period with the objective of improving the condition and performance of the Company's groundwater boreholes, which currently have an average age of 80 years.

Capital works include:

- Abandonment and filling of unused boreholes; shallow relining of production boreholes, and; remediation of borehole headworks. These measures reduce the risk of bacteriological contamination and reduce the frequency of outage events.
- Relining and/or screening of open-hole sections of production boreholes; re-fitting of borehole pumps and/or changes to source operation. These measures reduce the risk of pumping turbid or sandy water and reduce the frequency of outage events but may reduce deployable output.
- Mechanical, chemical or other forms of remediation of existing casing, screen and open-hole sections of production boreholes. These measures increase the deployable output and/or reduce the frequency of outage events.
- Replacement of production boreholes. This measure increases the deployable output and/or reduces the frequency of outage events.

The present condition of groundwater boreholes is accurately reflected in the revised groundwater deployable output values used the Aquator model baseline runs and in the outage assessment.

During AMP5 six borehole schemes are scheduled with commissioning works due for completion early in AMP6. The predicted impact on deployable output and scheme availability is as follows:

Site	Description of Work	DYAA	DYCP	Year
Cookley	Refitting of borehole pumps	0.0	0.0	11/12
Seedy Mill	Refitting of borehole pumps	0.0	0.0	11/12
Maple Brook	Drilling new boreholes and refitting of pumps	+1.27	+3.8	13/14
Trent Valley	Relining of disused borehole and refitting of pumps	0.0	+1.5	13/14
Slitting Mill	Drilling new boreholes and refitting of pumps	+1.6	+1.6	15/16
Fradley	Drilling new borehole and refitting of pumps	0.0	+2.0	16/17

Note: DO increases at Cookley and Seedy Mill were included in the baseline DO assessment

The uncertainty of the yield of the new schemes has been assessed in headroom (supply component S9). An assumption has been made that in general the increases in deployable output and reductions in outage arising from future schemes will be offset by declines in other boreholes over the remainder of the planning period. However an additional headroom uncertainty has been made for the possibility that relining is required and this reduces deployable output at some sites. All increases in deployable output are within existing licenced volumes.

6.4 Outage

6.4.1 Methodology

Outage is the temporary loss of deployable output due to planned and unplanned events.

The Company has calculated outage by following the principles set out in the UKWIR report, Outage Allowances for Water Resources Planning (1995), and it has taken account of subsequent improvements to the methodology. The main elements of the methodology are briefly described below.

The outage methodology requires the identification of historical failures of supply, including the frequency, magnitude and duration of the events. This information has been collated by the Company and used to update the outage model developed for the last WRMP in 2009.

An assessment has been made of each event to determine whether it is a legitimate outage (it must contribute to a supply shortfall), and a probability distribution has been assigned to each event.

The outage model developed by Mott MacDonald on behalf of the Company in 2009 has been updated for the 2014 fWRMP. This work was carried out internally by the Company. Mott MacDonald carried out a functional audit of the revised model to ensure it was functioning correctly.

The model uses Monte Carlo analysis to derive an overall probability distribution of outage. This is achieved by randomly sampling the individual probability distributions using a statistical model (@RISK). Outage events are summed for each month, and the critical month is used to define outage

The appropriate level of uncertainty that the Company is prepared to plan for is then identified and this determines the outage figure.

The derived outage figure is included in the relevant water resources planning table (WRP1) and is subtracted from deployable output to derive Water Available for Use (WAFU).

6.4.2 Outage Data

The Company has built on the outage assessment that was undertaken for the 2009 Water Resources Management Plan. Its assessment is based on 11 years of actual data, for the period 2001–2012. The length of the data record and the level of detail of the logged events is considered to be sufficient to provide a robust assessment of outage.

This data was collated by the Company from the following sources:-

- Station log books
- Company records of lost production volumes from trips
- Records of planned outage events
- Knowledge of key personnel

Each outage event was assigned to one of the following categories:-

- Power Failure
- Plant Failure
- Pollution of Source
- Flooding
- Turbidity
- Algae
- Planned Work

The source specific outage data used in the analysis is listed in Appendix H (Outage Assessment), including the magnitude, duration and frequency of each event, and the probability distribution used. Outages with a duration of less than 24 hours were included within the assessment as a single event at the resource zone level, however this did not have any significant impact on the outage results.

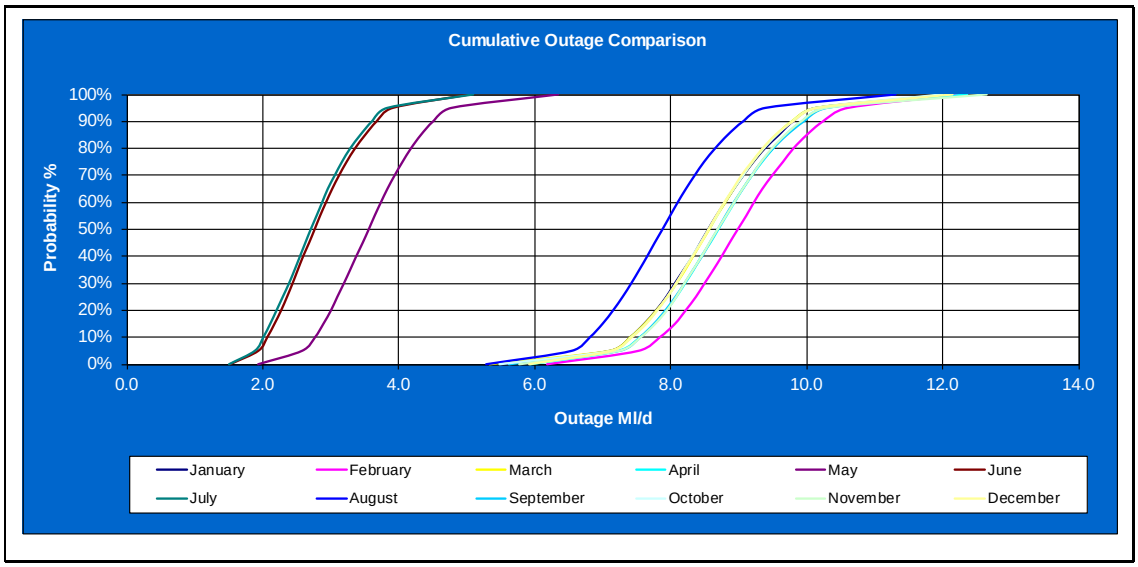
6.4.3 Company Level of Risk

The outage methodology produces a probability distribution of outage uncertainty. The outage results are presented by month as there are seasonal differences between outage events (particularly planned outage). The results are shown below (and included in Appendix H) as a graph of cumulative outage uncertainty by month.

In order to derive an estimate of outage the Company has chosen the 80% level of certainty as this represents a level of risk which is neither too low nor too high. Changing the level of certainty has a relatively small effect on outage, for example the dry year average outage varies between 8.99 Ml/d and 10.24 Ml/d for a range of certainty between 50% - 90%. The peak week outage varies between 8.76 Ml/d and 11.17 Ml/d for a range of certainty between 50% - 90%.

Dry Year Annual Average Outage Percentiles

Cumulative Outage Comparison



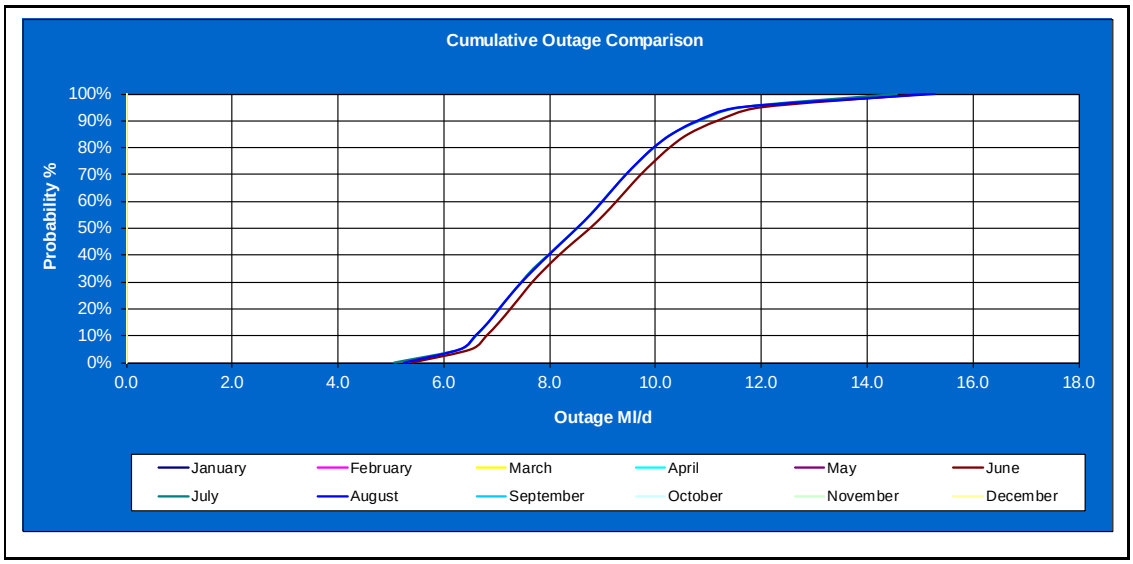
Critical percentile 80%

Allowable Outage and Planning Allowances (Ml/d)

Deciles	January	February	March	April	May	June	July	August	September	October	November	December
0%	5.523	6.182	5.333	5.934	1.932	1.520	1.504	5.286	5.621	5.481	5.772	5.919
5%	7.114	7.530	7.111	7.234	2.579	1.935	1.884	6.547	7.251	7.136	7.246	7.134
10%	7.405	7.840	7.404	7.547	2.769	2.066	2.008	6.811	7.548	7.418	7.556	7.427
15%	7.612	8.063	7.618	7.761	2.892	2.173	2.110	6.998	7.755	7.635	7.773	7.640
20%	7.786	8.221	7.791	7.936	3.004	2.270	2.202	7.153	7.923	7.803	7.944	7.803
25%	7.936	8.371	7.953	8.084	3.096	2.357	2.294	7.293	8.070	7.952	8.082	7.949
30%	8.062	8.498	8.086	8.211	3.193	2.438	2.386	7.420	8.204	8.082	8.202	8.078
35%	8.191	8.627	8.213	8.338	3.285	2.515	2.468	7.538	8.329	8.197	8.329	8.198
40%	8.322	8.750	8.328	8.450	3.374	2.593	2.547	7.654	8.461	8.316	8.454	8.323
45%	8.436	8.865	8.447	8.582	3.469	2.681	2.625	7.764	8.573	8.439	8.571	8.445
50%	8.552	8.986	8.566	8.699	3.558	2.763	2.705	7.879	8.692	8.558	8.690	8.556
55%	8.669	9.110	8.680	8.818	3.644	2.842	2.790	7.990	8.805	8.677	8.813	8.669
60%	8.799	9.224	8.803	8.939	3.737	2.930	2.873	8.103	8.927	8.793	8.933	8.789
65%	8.928	9.348	8.927	9.059	3.833	3.021	2.956	8.223	9.060	8.924	9.058	8.917
70%	9.068	9.493	9.062	9.196	3.939	3.122	3.058	8.353	9.192	9.063	9.193	9.040
75%	9.215	9.651	9.206	9.343	4.055	3.232	3.164	8.490	9.333	9.201	9.329	9.193
80%	9.384	9.805	9.365	9.506	4.179	3.357	3.286	8.653	9.506	9.364	9.489	9.351
85%	9.590	10.002	9.549	9.689	4.325	3.506	3.435	8.838	9.709	9.557	9.683	9.542
90%	9.798	10.239	9.781	9.929	4.505	3.673	3.604	9.064	9.957	9.791	9.919	9.797
95%	10.137	10.602	10.131	10.278	4.773	3.908	3.830	9.389	10.292	10.141	10.284	10.154
100%	12.205	12.273	12.087	12.360	6.344	5.040	5.094	11.307	12.080	11.992	12.647	12.145

Peak Week Outage Percentiles

Cumulative Outage Comparison



Critical percentile 80%

Allowable Outage and Planning Allowances (Ml/d)

Deciles	January	February	March	April	May	June	July	August	September	October	November	December
0%	0.000	0.000	0.000	0.000	0.000	5.397	5.063	5.253	0.000	0.000	0.000	0.000
5%	0.000	0.000	0.000	0.000	0.000	6.519	6.317	6.313	0.000	0.000	0.000	0.000
10%	0.000	0.000	0.000	0.000	0.000	6.805	6.605	6.594	0.000	0.000	0.000	0.000
15%	0.000	0.000	0.000	0.000	0.000	7.046	6.841	6.841	0.000	0.000	0.000	0.000
20%	0.000	0.000	0.000	0.000	0.000	7.259	7.039	7.047	0.000	0.000	0.000	0.000
25%	0.000	0.000	0.000	0.000	0.000	7.466	7.249	7.253	0.000	0.000	0.000	0.000
30%	0.000	0.000	0.000	0.000	0.000	7.673	7.464	7.476	0.000	0.000	0.000	0.000
35%	0.000	0.000	0.000	0.000	0.000	7.915	7.690	7.723	0.000	0.000	0.000	0.000
40%	0.000	0.000	0.000	0.000	0.000	8.176	7.970	7.980	0.000	0.000	0.000	0.000
45%	0.000	0.000	0.000	0.000	0.000	8.464	8.237	8.249	0.000	0.000	0.000	0.000
50%	0.000	0.000	0.000	0.000	0.000	8.763	8.518	8.512	0.000	0.000	0.000	0.000
55%	0.000	0.000	0.000	0.000	0.000	9.025	8.766	8.770	0.000	0.000	0.000	0.000
60%	0.000	0.000	0.000	0.000	0.000	9.262	8.991	8.999	0.000	0.000	0.000	0.000
65%	0.000	0.000	0.000	0.000	0.000	9.489	9.211	9.217	0.000	0.000	0.000	0.000
70%	0.000	0.000	0.000	0.000	0.000	9.722	9.443	9.441	0.000	0.000	0.000	0.000
75%	0.000	0.000	0.000	0.000	0.000	9.983	9.695	9.689	0.000	0.000	0.000	0.000
80%	0.000	0.000	0.000	0.000	0.000	10.265	9.969	9.960	0.000	0.000	0.000	0.000
85%	0.000	0.000	0.000	0.000	0.000	10.616	10.298	10.307	0.000	0.000	0.000	0.000
90%	0.000	0.000	0.000	0.000	0.000	11.168	10.831	10.790	0.000	0.000	0.000	0.000
95%	0.000	0.000	0.000	0.000	0.000	11.986	11.608	11.583	0.000	0.000	0.000	0.000
100%	0.000	0.000	0.000	0.000	0.000	15.101	14.564	15.269	0.000	0.000	0.000	0.000

6.4.4 Outage Results

The outage results for the dry year annual average scenario are summarised below:

Outage Summary - Dry Year Annual Average

Outage %	% Risk	Outage (Ml/d)
50	50	8.99
60	40	9.22
70	30	9.49
80	20	9.81
90	10	10.24
100	0	12.65

Using the 80% level of certainty produces a dry year average figure for outage of 9.81 Ml/d.

The outage results for the peak week scenarios are summarised in the following table:

Outage Summary – Peak Week

Outage %	% Risk	Outage (Ml/d)
50	50	8.76
60	40	9.26
70	30	9.72
80	20	10.26
90	10	11.17
100	0	15.27

Using the 80% level of certainty produces a peak week figure of 10.26 Ml/d. The peak week figures are lower than the annual average values as they do not include planned outages.

These outage figures have been fixed across the planning period. There is an assumption that there will be sufficient maintenance expenditure approved by Ofwat in the PR14 price review to maintain the serviceability of supply assets and to maintain outage levels at current levels. In particular, the Company will be seeking to sustain the level of expenditure on borehole maintenance started in AMP5. This will assist with the control of outage levels and sustaining deployable output going forward.

The modelling of the Company's data results in outage values which are on the low side, and they constitute a relatively small proportion of deployable output (2.7% of dry year annual average D.O., and 2.2% of peak week D.O.). The main reason why this is the case is that there are very few legitimate outages included for the Company's two largest sources. This is because a significant amount of investment has been put in place to minimise supply interruptions at these treatment works given that they contribute approximately 50% of the Company's supply. The HL abstraction from the River Severn is also supported by Chelmarsh bankside storage reservoir. This significantly reduces outages that may have occurred due to poor river water quality.

The outage data used in the assessment is therefore dominated by events at the Company's groundwater sources, which individually represent a much smaller proportion of deployable output. If the outage percentages are expressed as a proportion of groundwater deployable output then the percentages are higher (5.5% for dry year annual average and 5.7% for peak week).

6.5 Sustainability Reductions

South Staffs Water is committed to achieving a sustainable abstraction regime, which minimises the impact of its operations on the environment. The Company has a good track record in this area and continues to work with the Environment Agency to improve the ecological well-being of specific sites.

Actions undertaken to date include:-

- Reducing licensed abstraction in the Leamonsley Brook catchment, near Lichfield in AMP2.
- Reducing licensed abstraction in the Blakedown Brook catchment, in the Stour Valley in AMP3
- The construction and operation of an augmentation borehole in the Blakedown Brook catchment in AMP3.
- Investigations into the impact of abstraction on Checkhill Bogs SSSI in AMP4.
- Investigations into the impact of abstraction on the Rising Brook, Bourne Brook and the Blakedown Brook and ongoing investigations at Checkhill Bogs SSSI in AMP5.

Investigations being undertaken by the Company during AMP5 have provided information for the Environment Agency to identify obligations under the Water Framework Directive and the Wildlife and Countryside Act. The Company has worked collaboratively with the Environment Agency and other stakeholders to identify measures to improve good ecological status, good ecological potential (Heavily Modified Water Bodies) and condition of Sites of Special Scientific Interest where the Company's abstractions have been proven to play a significant part in the problem. The Environment Agency has to date provided the Company with Phase 1, Phase 2 and Phase 3 releases of the National Environment Programme detailing these requirements for inclusion in PR14 WRMPs and Business Plans.

The NEP releases include water resources schemes, fisheries schemes and water quality schemes. It is generally the water resources schemes which result in sustainability reductions with associated capital expenditure and operational expenditure costs. However, the impact of operational changes or engineering solutions for fisheries schemes also has the potential to impact on deployable output. Some water resources and fisheries schemes will require expenditure only with no impact on deployable output. Water quality schemes do not generally impact on deployable output and are therefore not considered within the fWRMP. However, they form the basis of the Company's proposed programme for catchment management in AMP6.

Some requirements remain less certain particularly around the Fisheries NEP and therefore the Business Plan submission allows for continued study with the objective of clarifying requirements and identifying measures for solutions should they still be required to be implemented early in AMP7 but still within the present River Basin Management Plan cycle. The Company is working closely with the Environment Agency to identify innovative and cost beneficial ways to meet the Eel Regulation requirements.

There are a number of schemes in the water resources NEP to address the impacts of abstractions and in total these will result in a 10Ml/d reduction in deployable output which is included in the baseline supply demand forecast. There are other schemes which will also be progressed throughout the AMP6 period to reduce the uncertainty around the fisheries schemes. All the schemes included in the phase 4 NEP release are included in the fWRMP and the PR14 Business Plan and these are shown on the following table.

Site	Deployable Output Reduction	Scheme Details	Comment
Checkhill Bogs SSSI	4Ml/d reduction in dry year deployable output	2 boreholes or one with 2 discharge points to provide flow augmentation and channel modifications	Evidence from SSW investigation studies supports this.
Puxton and Stour Vale SSSI	0 Ml/d	Rock ramp weir	Evidence from SSW investigation studies supports this.
Blakedown Brook (Hurcott and Podmore Pools SSSI)	2Ml/d reduction in dry year deployable output.	One augmentation borehole to dilute flow in the Brook.	Evidence from SSW investigation studies supports need to address water quality.
Bourne Brook	2Ml/d	Trial augmentation releases	Trials of augmentation releases to be made from an existing source
Rising Brook	2Ml/d	Trial augmentation releases	Trials of augmentation releases to be made from an existing source
Blithfield Reservoir	0 Ml/d	Fish passage.	Studies to investigate feasibility and impact of changing the compensation regime from Blithfield Reservoir and modification of Nethertown weir.

Site	Deployable Output Reduction	Scheme Details	Comment
Hampton Loade	0 Ml/d	Compliance with Eel Regulations. Screening of 3mm spacings	Investigations to identify requirements and options during AMP6 ready for early implementation in AMP7
Blithfield	0 Ml/d	Compliance with Eel Regulations. Screening of 6mm spacings	Investigations to identify requirements and options during AMP6 ready for early implementation in AMP7
Nethertown	0 Ml/d	Compliance with Eel Regulations. Screening of 6mm spacings	Investigations to identify requirements and options during AMP6 ready for early implementation in AMP7
Total	**10Ml/d**		

The Company has considered the impact of Article 4 of the Water Framework Directive ('no deterioration' in ecological status if abstractions increase from recent actual up to full licensed volumes) and has identified a number of sites which may be at risk. All these sites fall within existing NEP study areas and detailed investigation will be progressed through that route. It is not clear at this stage whether there could be an impact on deployable output arising from this. The Company has explored this potential within the sensitivity scenario described in section 10 of the fWRMP.

7 HEADROOM

7.1 Overview

Overview of Headroom

The Company has continued to adopt the UKWIR best practice approach to headroom. Each element of headroom has been reviewed, and updated where appropriate for the fWRMP. Minor changes have been made to the supply components following a review of constraints affecting deployable output. A similar review has been made of demand components to reflect experience from AMP5 studies and water efficiency activities. An additional headroom component for new sourceworks has been assessed following progress on borehole maintenance work in AMP5. The influence of climate change on supply has been reassessed using UKCP09 climate change data.

The Company has retained the same level of risk regarding the target headroom estimate as was previously used for the 2009 fWRMP. This is 10% until 2025 and then progressively increases to reach 20% in 2039/40. This is considered to be a prudent level of risk reflecting the fact that the Company will work to reduce future uncertainties over time.

Headroom is between 2.5% and 3.5% of dry year demand, and between 2.1% and 2.8% of peak week demand.

7.2 Methodology

Target headroom is the margin of safety used in water resources planning which accounts for the uncertainty around the supply and demand forecasts.

The Company has continued to use the improved methodology for assessing headroom (UKWIR, 2003), as defined in the Environment Agency's Water Resources Planning Guidelines (2012). The improved headroom methodology was developed by Mott MacDonald in 2002 and requires the identification of a probability distribution for each component of uncertainty. Monte Carlo analysis is then used to derive an overall probability distribution of headroom. This is achieved by randomly sampling the individual probability distributions using a statistical model (@RISK). The Company must then decide what level of uncertainty it is prepared to plan for and this determines the target headroom figure.

Available headroom is then compared to target headroom to provide an assessment of whether there is sufficient available headroom (this is identified as the 'simpler' approach within the updated 2003 methodology). The baseline dry year and peak week supply demand balances (including headroom) are illustrated in Section 8.

The uncertainty around each element of headroom has been assessed internally by the Company and used to populate and run the @RISK model. The Company employed consultant Mott MacDonald to carry out an audit to ensure that model updates had been implemented correctly.

Each element of headroom has been reviewed, and updated where appropriate for the fWRMP. Minor changes have been made to the supply components following a review of constraints affecting deployable output. A similar review has been made of demand components to reflect experience from AMP5 studies and water efficiency activities. An additional headroom component for new sourceworks has been assessed following progress on borehole maintenance work in AMP5. The influence of climate change on supply has been reassessed using UKCP09 climate change data. .

The input data are listed below, along with the chosen probability distribution.

	Dry Year Annual Average Headroom	Peak Week Headroom	Distribution used
***S1/1**	N/A	N/A	N/A
***S2/1**	N/A	N/A	N/A
***S3/1**	N/A	N/A	N/A
S5/1	Borehole deterioration	Borehole deterioration	Discrete
S5/2	Nitrate contamination	Nitrate contamination	Triangular
S5/3	Minewaters	Minewaters	Discrete
S6/1	Accuracy of groundwater supply data	Accuracy of groundwater supply data	(various)
S6/2	Accuracy of surface water supply data	Accuracy of surface water supply data	Triangular
S6/3	Accuracy of River Severn data	Accuracy of River Severn data	Triangular
S8	Climate change impact on deployable output	Climate change impact on deployable output	Triangular
S9	New sourceworks	New sourceworks	Triangular
D1/1	Data uncertainty	Distribution input meters	Triangular
D2/1	Demand forecasting uncertainty	Demand forecasting uncertainty	Triangular
D3/1	Climate change impact on demand	Climate change impact on demand	Triangular

*S1, S2 and S3 elements are not included in the headroom assessment. They have been considered in sensitivity testing in section 10 of the fWRMP.
(Note: S4 and S7 are not relevant to South Staffs)

The input data are detailed in Appendix A, which also includes details of the key changes from PR09, and the model results.

7.3 Company Level of Risk

The 2003 headroom methodology produces an assessment of headroom uncertainty which companies interpret in order to produce an estimate of target headroom.

The probability distribution derived from the Company's @RISK model generates headroom values for each year of the planning period at a range of different levels of certainty. In order to derive an estimate of target headroom the Company has determined the most appropriate level of risk that is acceptable for supply demand planning. In determining the level of risk to apply to headroom uncertainty the Company has followed the Environment Agency's Water Resources Planning Guidelines (2012, section 5.2).

The guidance states that 'it is neither practical or affordable to plan for 100 per cent certainty….however, water companies should not take unnecessary risks by applying too low a target headroom.' In addition the guidance confirms that 'we expect water companies to accept a higher level of risk in future years'.

The Company agreed the appropriate level of risk regarding the target headroom estimate following consultation with regulators in PR09 and this has been retained for the PR14. This is 10% at the beginning of the planning period until 2025 and then this progressively increases to reach 20% in 2039/40. This is considered to be a prudent level of risk reflecting the fact that the Company will work to reduce future uncertainties over time.

7.4 Headroom Results

In evaluating headroom uncertainty the Company has considered the range between positive (factors that will reduce water available for use or increase the demand for water) and negative (factors that will increase water available for use or reduce the demand for water) for each component of the water balance. The headroom model has determined the likely distribution of the combined impact of these components. At high levels of risk (generally greater than 50%) the combined headroom uncertainty is negative. The Company chosen level of risk is low (10 to 20%) and the resultant target headroom allowance is positive, i.e. it only reflects factors that will reduce water available for use or increase the demand for water.

The dry year annual average and peak week target headroom results are presented in detail in Appendix A and summarised in the tables below.

	2014/15	2019/20	2024/25	2029/30	2034/35	2039/40
Risk Profile	10%	10%	10%	14%	17%	20%
Dry Year (Ml/d)	7.6	8.8	9.9	10.8	10.7	11.2
Peak Week (Ml/d)	8.9	9.7	11.1	11.8	11.3	11.5

Target headroom starts off at relatively low values and rises steadily as more elements of uncertainty contribute to the analysis. However after 2025 the level of certainty adopted by the Company begins to decline down to 80%. This has the effect of counter balancing increasing elements of uncertainty so that target headroom remains relatively level to the end of the planning period.

The components which contribute most to dry year target headroom are:

- All demand components (38% in 2012 increasing to 55% in 2040)
- Accuracy of supply side data (57% in 2012 reducing to 25% in 2040)
- Impact of climate change on supply (increasing from 0% in 2012 to 15% by 2040)

The components which contribute most to peak week target headroom are:

- All demand components (54% in 2012 increasing slightly to 58% in 2040)
- Accuracy of supply side data (35% in 2012 reducing to 20% in 2040)
- Impact of climate change on supply (increasing from 0% in 2012 to 18% by 2040)

Target headroom is less than 3.5% of dry year and less than 3% of peak week demand throughout the planning period. These values are consistent with results from PR09.

It should be noted that whilst target headroom values have not increased for the 2014 fWRMP a significant element of climate change risk has been included in the baseline forecast (up to 5.6 Ml/d in a dry year and 7.0 Ml/d in a peak week by 2039/40). If this element of uncertainty were to have remained in headroom then target headroom would undoubtedly have increased.

7.5 Headroom and Levels of Service

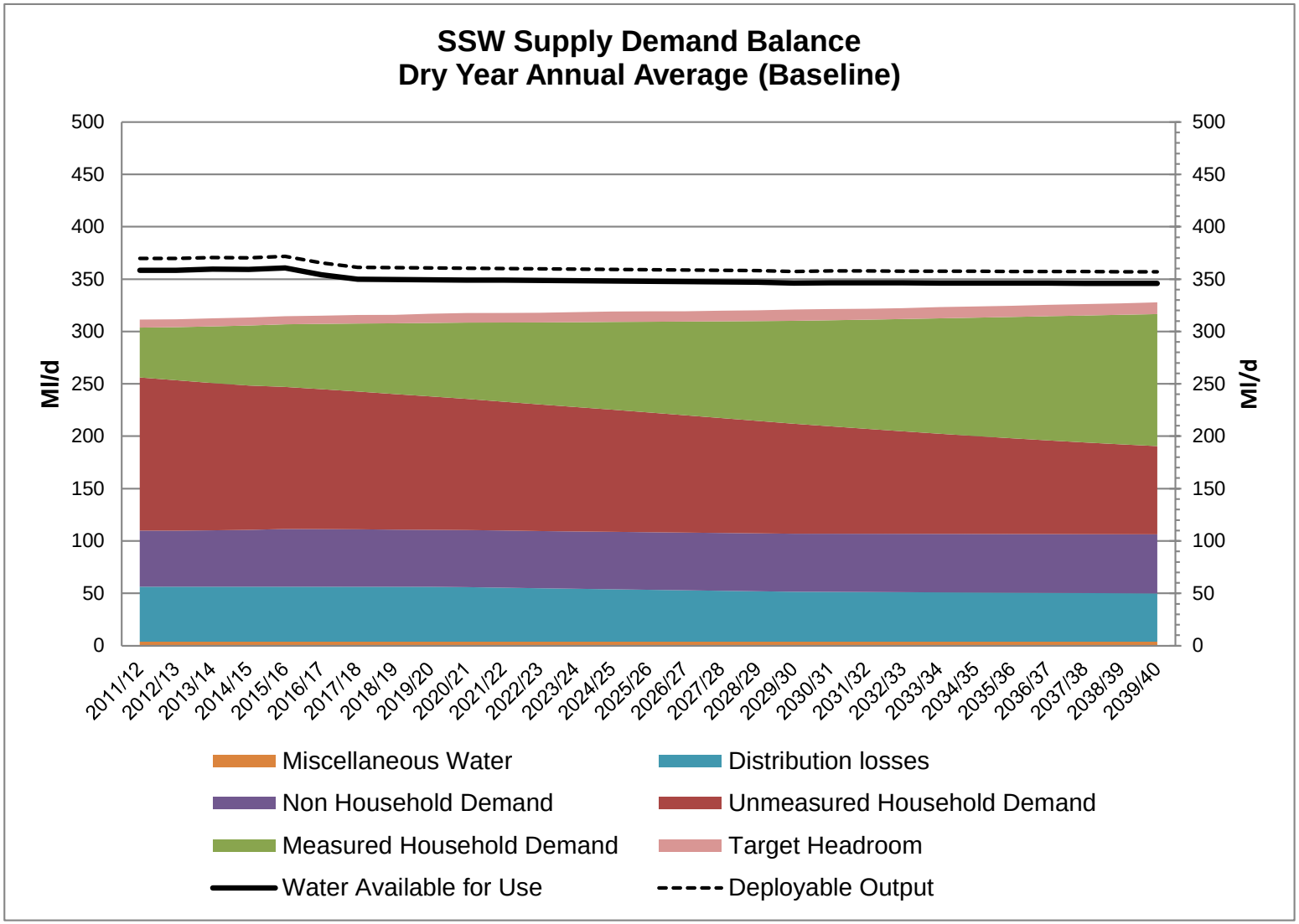
The baseline dry year and peak week supply demand balance presented in Section 8 includes the target headroom figures described above. Section 8 confirms that the Company has a modest surplus of available headroom for the entire planning period, and this equates to a security of supply index of 100%. The Company's planned level of service remains unchanged and is equivalent to on average one hosepipe ban in every 40 years. The Company's target headroom is therefore consistent with the Company's stated level of service.

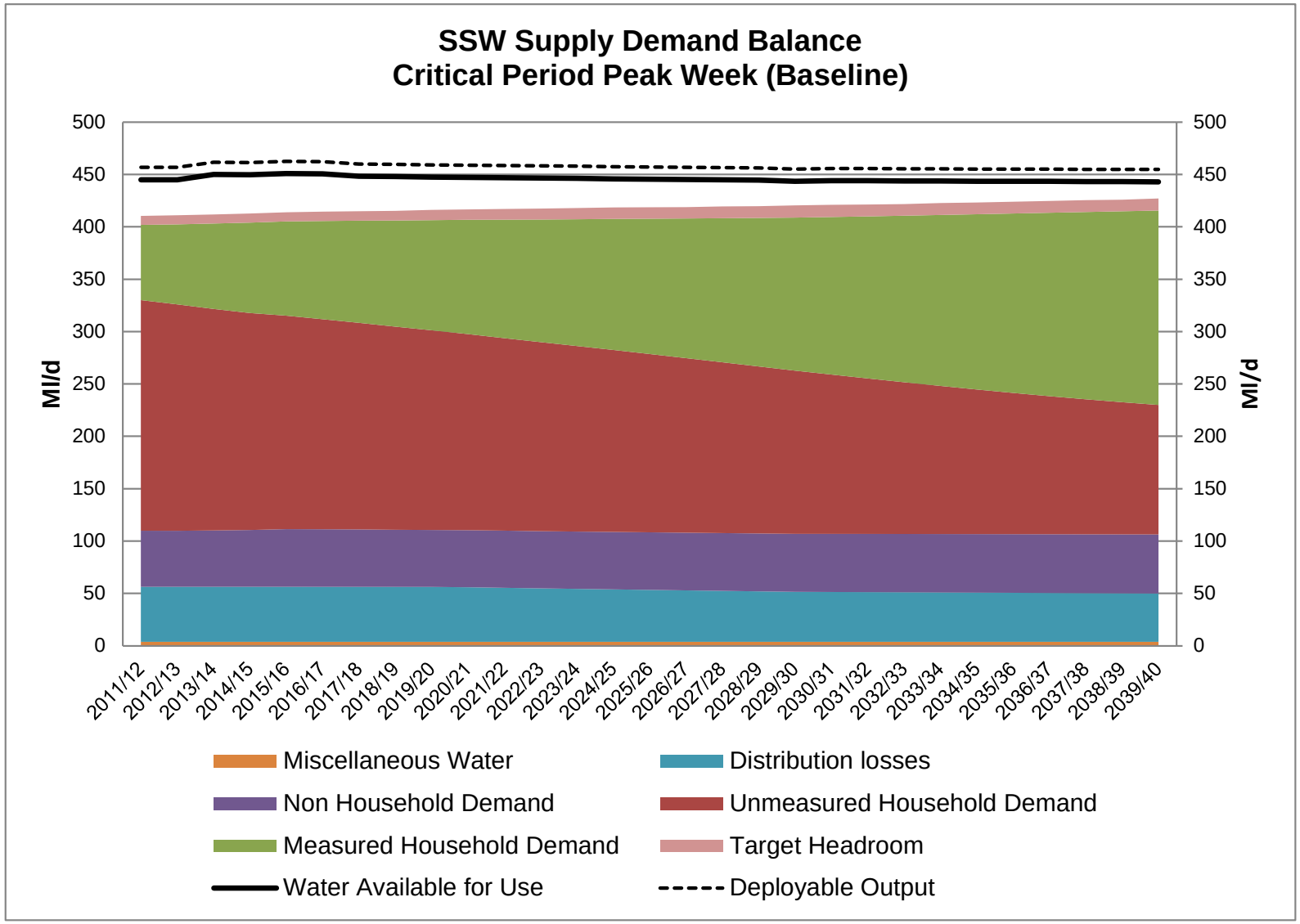
8 BASELINE SUPPLY DEMAND BALANCE

Using the baseline demand forecast and supply forecast the Company has sufficient resources to meet dry year annual average demand and critical period peak week demand throughout the plan period.

Under dry year conditions the amount of available headroom is forecast to exceed target headroom giving a surplus of 48Ml/d in 2015/16 falling to 22Ml/d in 2039/40. Under peak week conditions the amount of available headroom is forecast to exceed target headroom giving a surplus of 37Ml/d in 2015/16 falling to 16Ml/d in 2039/40.

The baseline supply demand balance is illustrated in the following graphs.


SSW Supply Demand Balance
Dry Year Annual Average (Baseline)
Ml/d
500
450
400
350
300
250
200
150
100
50
0
2011/12
2012/13
2013/14
2014/15
2015/16
2016/17
2017/18
2018/19
2019/20
2020/21
2021/22
2022/23
2023/24
2024/25
2025/26
2026/27
2027/28
2028/29
2029/30
2030/31
2031/32
2032/33
2033/34
2034/35
2035/36
2036/37
2037/38
2038/39
2039/40
Miscellaneous Water
Distribution losses
Non Household Demand
Unmeasured Household Demand
Measured Household Demand
Target Headroom
Water Available for Use
Deployable Output


SSW Supply Demand Balance
Critical Period Peak Week (Baseline)
Ml/d
Ml/d
500
450
400
350
300
250
200
150
100
50
0
2011/12
2012/13
2013/14
2014/15
2015/16
2016/17
2017/18
2018/19
2019/20
2020/21
2021/22
2022/23
2023/24
2024/25
2025/26
2026/27
2027/28
2028/29
2029/30
2030/31
2031/32
2032/33
2033/34
2034/35
2035/36
2036/37
2037/38
2038/39
2039/40
Miscellaneous Water
Distribution losses
Non Household Demand
Unmeasured Household Demand
Measured Household Demand
Target Headroom
Water Available for Use
Deployable Output

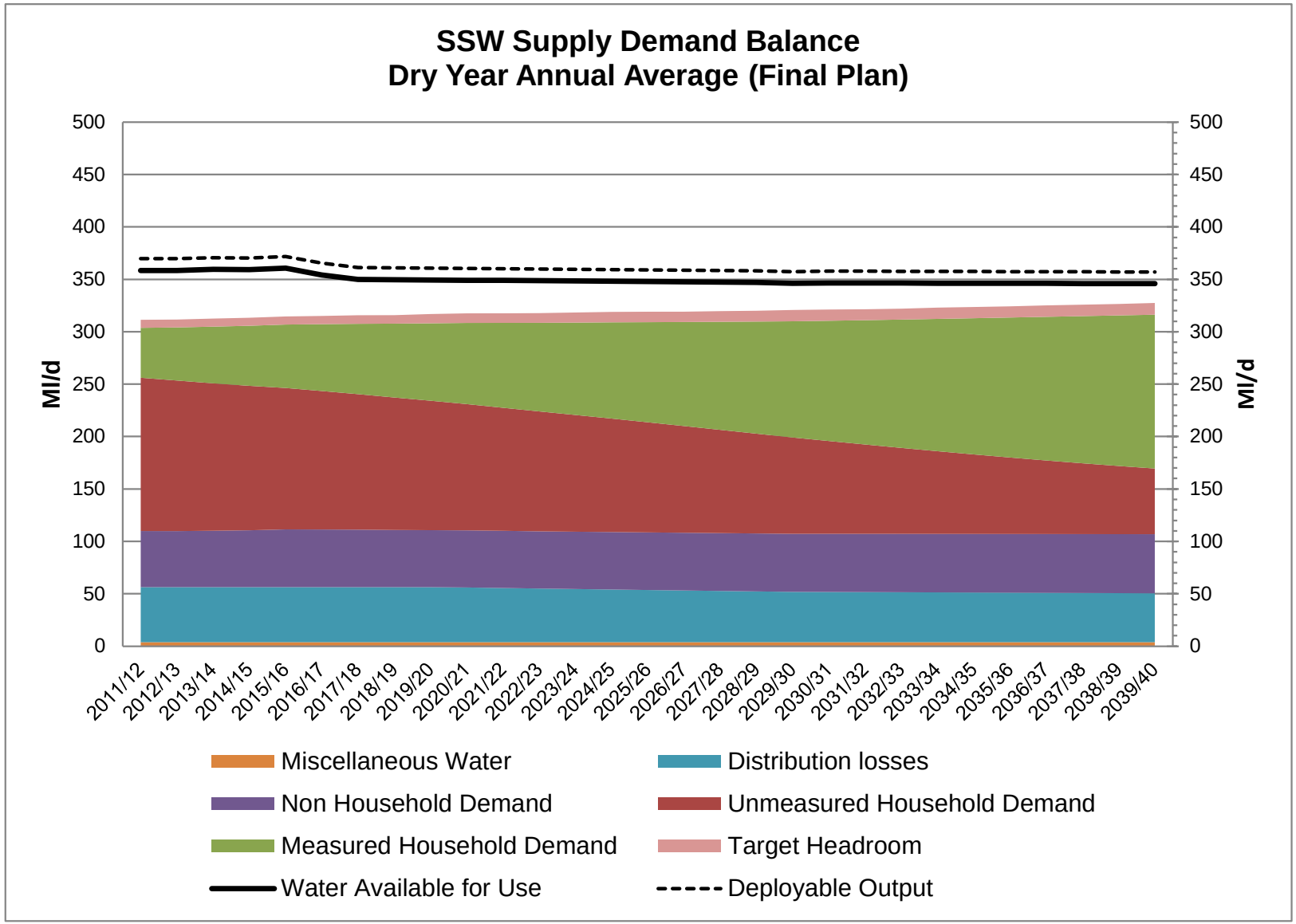
9 FINAL SUPPLY DEMAND BALANCE

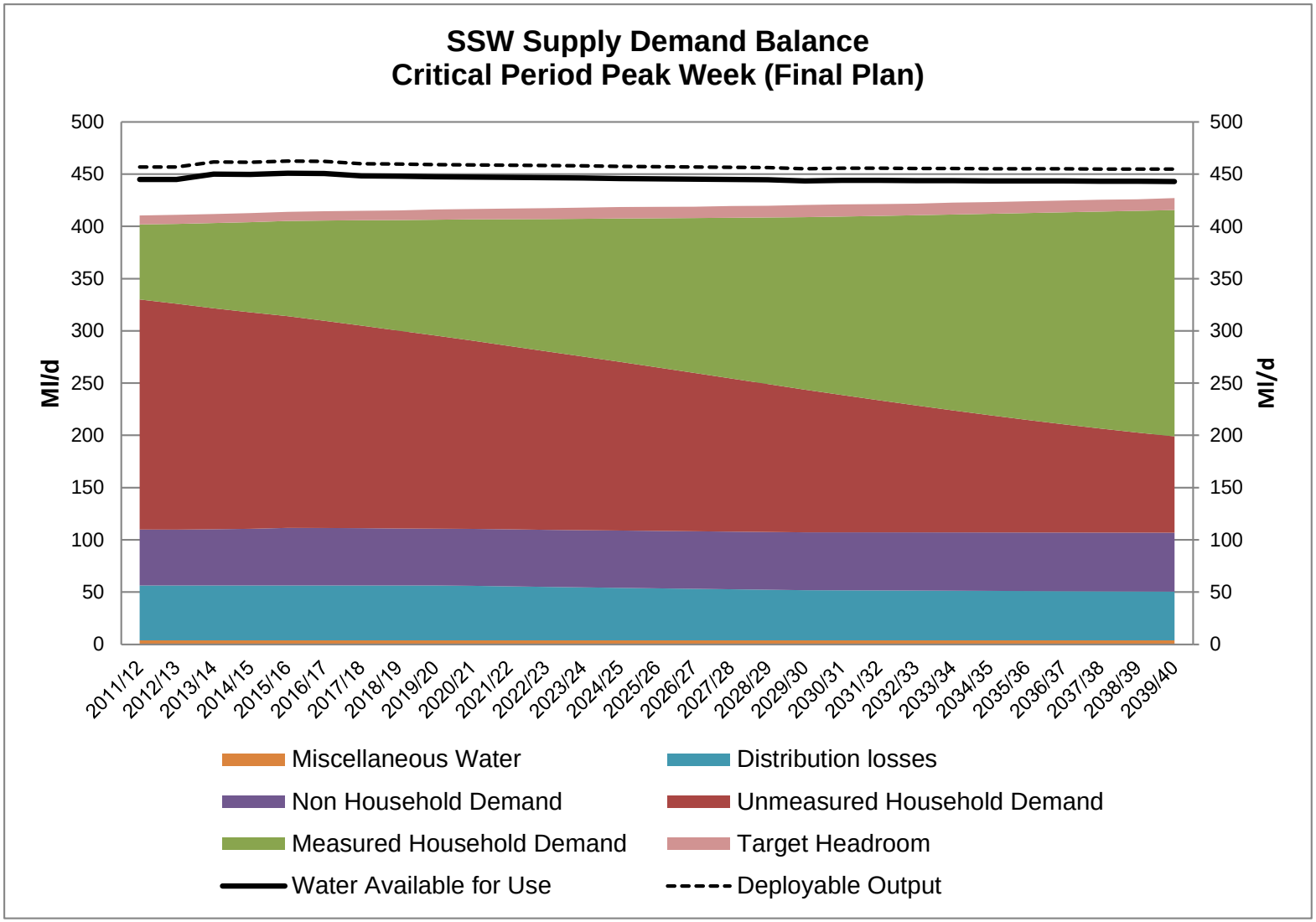
As section 8: Baseline Supply Demand Balance demonstrates, the Company has no deficit in its supply demand balance for either the dry year annual average or peak week critical period scenarios throughout the plan period. Therefore, no interventions are required to address a supply demand imbalance.

This healthy supply demand balance position does not mean that ongoing investment in the supply demand balance category is required to a lesser extent in future. Investment must be maintained to meet the increasing challenges of ongoing leakage control and delivery of the Company's metering strategies and water efficiency activities.

The only difference between the baseline and the final planning scenario is that change of occupier metering is not included in the baseline forecast, in line with Environment Agency planning guidelines despite the fact that this is a baseline policy for the Company. The impact of including the discretionary policy of change of occupier metering is to increase meter penetration at the end of the planning period from 64% in the baseline forecasts to 73% in the final scenario.

The final supply demand balance reflects the reduction in demand associated with this increased level of metering and continues to demonstrate that the Company has sufficient resources to meet dry year annual average demand and critical period peak week demand throughout the plan period as illustrated in the following graphs.


SSW Supply Demand Balance
Dry Year Annual Average (Final Plan)
Ml/d
500
450
400
350
300
250
200
150
100
50
0
2011/12
2012/13
2013/14
2014/15
2015/16
2016/17
2017/18
2018/19
2019/20
2020/21
2021/22
2022/23
2023/24
2024/25
2025/26
2026/27
2027/28
2028/29
2029/30
2030/31
2031/32
2032/33
2033/34
2034/35
2035/36
2036/37
2037/38
2038/39
2039/40
Miscellaneous Water
Distribution losses
Non Household Demand
Unmeasured Household Demand
Measured Household Demand
Target Headroom
Water Available for Use
Deployable Output


SSW Supply Demand Balance
Critical Period Peak Week (Final Plan)
Ml/d
Ml/d
500
450
400
350
300
250
200
150
100
50
0
2011/12
2012/13
2013/14
2014/15
2015/16
2016/17
2017/18
2018/19
2019/20
2020/21
2021/22
2022/23
2023/24
2024/25
2025/26
2026/27
2027/28
2028/29
2029/30
2030/31
2031/32
2032/33
2033/34
2034/35
2035/36
2036/37
2037/38
2038/39
2039/40
Miscellaneous Water
Distribution losses
Non Household Demand
Unmeasured Household Demand
Measured Household Demand
Target Headroom
Water Available for Use
Deployable Output

10 SENSITIVITY TESTING

Section 8 of the Environment Agency Water Resources Planning Guideline sets out requirements to undertake scenario testing to ensure that a WRMP is adaptive, flexible and resilient to minor changes. The guideline specifies that 5 scenarios should be undertaken, a maximum impact scenario, a least impact scenario and three intermediate scenarios. The main purpose of the scenario testing is to ensure that options proposed within a WRMP are proportionate to the risk to the supply demand balance and are not based on an extreme worst case forecast for supply and demand. Scenario testing is not to identify what would happen under extreme or unlikely scenarios.

Since South Staffs Water is not forecasting a deficit in the supply demand balance for either dry year annual average or peak week and has a healthy surplus throughout the planning period no options have been selected. The Company therefore, considers that it is unnecessary and inappropriate to undertake testing of 5 scenarios. The Company has considered the main factors which might impact on the supply demand balance and produced one overall alternative supply demand balance scenario for both peak week and dry year annual average.

The following table describes the factors considered and whether they are believed to present a possible or likely outcome that should be considered in sensitivity testing. Headroom components S1-S3 and S6/1 have been considered here.

Factor	Description of possible impact	Comment
S1 - Vulnerable surfacewater licences– Blithfield	Investigations into the requirement for and feasibility of a fish pass at Nethertown and changes to the compensation flow regime from Blithfield Reservoir are to be undertaken during the remainder of AMP5 and AMP6. An extreme outcome would be that there is a significant resultant impact on the deployable output of Blithfield Reservoir of upto 10Ml/d.	If there is an impact on the deployable output of Blithfield Reservoir then it is likely that the costs of the scheme would outweigh the benefits and the scheme would not be implemented. Therefore this is not included in an alternative scenario.
S2 – Vulnerable groundwater licences - NEP	All ‘certain’ and ‘likely’ sustainability reductions are included in fWRMP. There is a small risk that the actual volumes required may be more than has been included as option appraisal and testing is concluded.	This is considered to be unlikely and therefore is not included in an alternative scenario.

Factor	Description of possible impact	Comment
S2 – Vulnerable groundwater licences – general	Under the Water Framework Directive the water balance in water bodies should be in balance. Some groundwater water bodies from which the Company abstracts are grossly imbalanced indicating that significant reductions (circa 50Ml/d) in abstraction licences would be required to restore the balance. The Company has considered the impact of article 4 of the Water Framework Directive ('no deterioration' if licenced abstractions increase from recent actual up to full licence) and has identified a number of sites which may be at risk.	There are currently no ecological problems resulting from this imbalance which are not being addressed through the NEP. Therefore the cost of such large-scale reductions would outweigh any benefits and would not be implemented. Therefore this is not considered as a likely outcome and is not included in an alternative scenario. All the sites identified as potentially at risk under article 4 fall within existing NEP study areas and detailed investigation will be progressed through that route. It is not clear at this stage whether there could be an impact on deployable output arising from this but it is considered that 3Ml/d could be at risk on dry year deployable output. Therefore this volume is included in the alternative scenario for both the dry year and peak week scenario.
S3 – Time limited licences	Part of the HL licence for abstraction from the River Severn (No. 584) is time limited to 2017.	The Company is not aware of any concerns regarding the environmental impact of this licence. The source is regulated to protect the environment. It is considered unlikely that this licence would not be renewed in 2017.
S6/1 – Loss of groundwater deployable output due to climate change	The target headroom assessment includes the partial loss of output from the Moors Gorse source due to low water levels. It is possible that the output from the well would be lost completely as a result of the impact of climate change on water levels.	The sustainability reductions proposed as part of the Rising Brook NEP scheme will reduce the deployable output from Moors Gorse and it is unlikely that there would be any additional impact on deployable output arising from climate change at this source. Therefore this has not been included in an alternative scenario.
Loss of groundwater source due to point source	Point source pollution of a groundwater source would likely result in the permanent loss of the source or the need	Events such as this are rare and unpredictable. Therefore this is not considered as a likely outcome and is not included in

Factor	Description of possible impact	Comment
pollution	for the installation of expensive treatment processes.	an alternative scenario.
Water trading	Discussions are ongoing with Severn Trent Water regarding the provision of up to 10Ml/d from the middle of the plan period.	Additional 10Ml/d demand included in alternative scenario for dry year and peak week from the middle of the AMP7 period.
Economic recovery, market reform and competition.	A recovery of the economy could boost non-household water consumption or attract a new large user to the area. Additional non-household customers may also be gained through changes to the water market and competition.	Headroom includes uncertainty of +2.5% to account for this. However -5% for continued economic depression is also included for non-household demand forecasts. There is no evidence to suggest further uncertainty should be considered.
Leakage	The Company has forecast a potential further reduction of the SELL by 4Ml/d over AMP7 and AMP8. This is based on currently published figures for the cost of carbon. If this cost changes then the SELL reduction may not be economic.	SELL could remain at 70.54Ml/d. This has been included in an alternative scenario for both dry year and peak week.
Population	Uncertainty around the number of people in the Company's area of supply could influence the demand forecast up or down. Other than data uncertainty that is already accounted for in headroom other factors which could affect this include changes in Government policy relating to migrants, changes to birth rates and death rates and greater housing growth and economic recovery attracting people to the area.	Headroom includes +/-2.5% by 2030 and +/-3.6% by 2040 to account for uncertainty in the population forecast data. There is no evidence to suggest further uncertainty should be considered.
Housing growth	Economic recovery could result in greater housing growth especially in the early years of the demand forecast. There are also proposals for significant development in the green belt around Sutton Coldfield which are currently being consulted on.	Headroom includes +20% and -5% by 2039/40 to account for this. Any further inclusion would be an unlikely scenario.
Greater metering growth	The number of customers who opt for a meter each year is largely independent of actions	Headroom includes +5% and -2.5% by 2039/40 to account for this. Any further inclusion would

Factor	Description of possible impact	Comment
resulting from more meter optants	taken by the Company. Therefore, there is uncertainty around the numbers forecast.	be an unlikely scenario.
Innovation in water appliances	The Company's micro-component pcc model does not include any forecast reductions in volume use for water using appliances other than those which will result from replacement of appliances with those using water at the current known best efficiency.	Headroom includes +5% and -3% for unmeasured pcc and +5% and -2% for measured pcc by 2039/40 to account for uncertainty around pcc forecasts including this. Any further inclusion would result in a further reduction in pcc and the overall demand forecast and would further increase the surplus in the supply demand balance.
Water using behaviour change	Future changes in water using behaviour are difficult to forecast with certainty. Any national campaigns led by Government or the Environment Agency may have a lasting impact on behaviour.	Headroom includes +5% and -3% for unmeasured pcc and +5% and -2% for measured pcc by 2039/40 to account for uncertainty around pcc forecasts including this. Any further inclusion would result in a further reduction in pcc and the overall demand forecast and would further increase the surplus in the supply demand balance.

In summary, the factors considered to present the most likely additional impact on the supply demand balance are water trading (+10Ml/d on demand), further sustainability reductions due to article 4 of the Water Framework Directive (-3Ml/d on supply) and changes to costs and benefits which mean the potential leakage reduction is not economic (+4Ml/d on demand). The alternative supply demand balance scenarios tested are therefore as follows:

- Dry year annual average

+10Ml/d on demand for water trading from 2022/23
+4Ml/d on demand for SELL remaining at 70.54Ml/d from 2020/21
-3Ml/d on supply from 2020/21
Total impact on supply demand balance is 17Ml/d

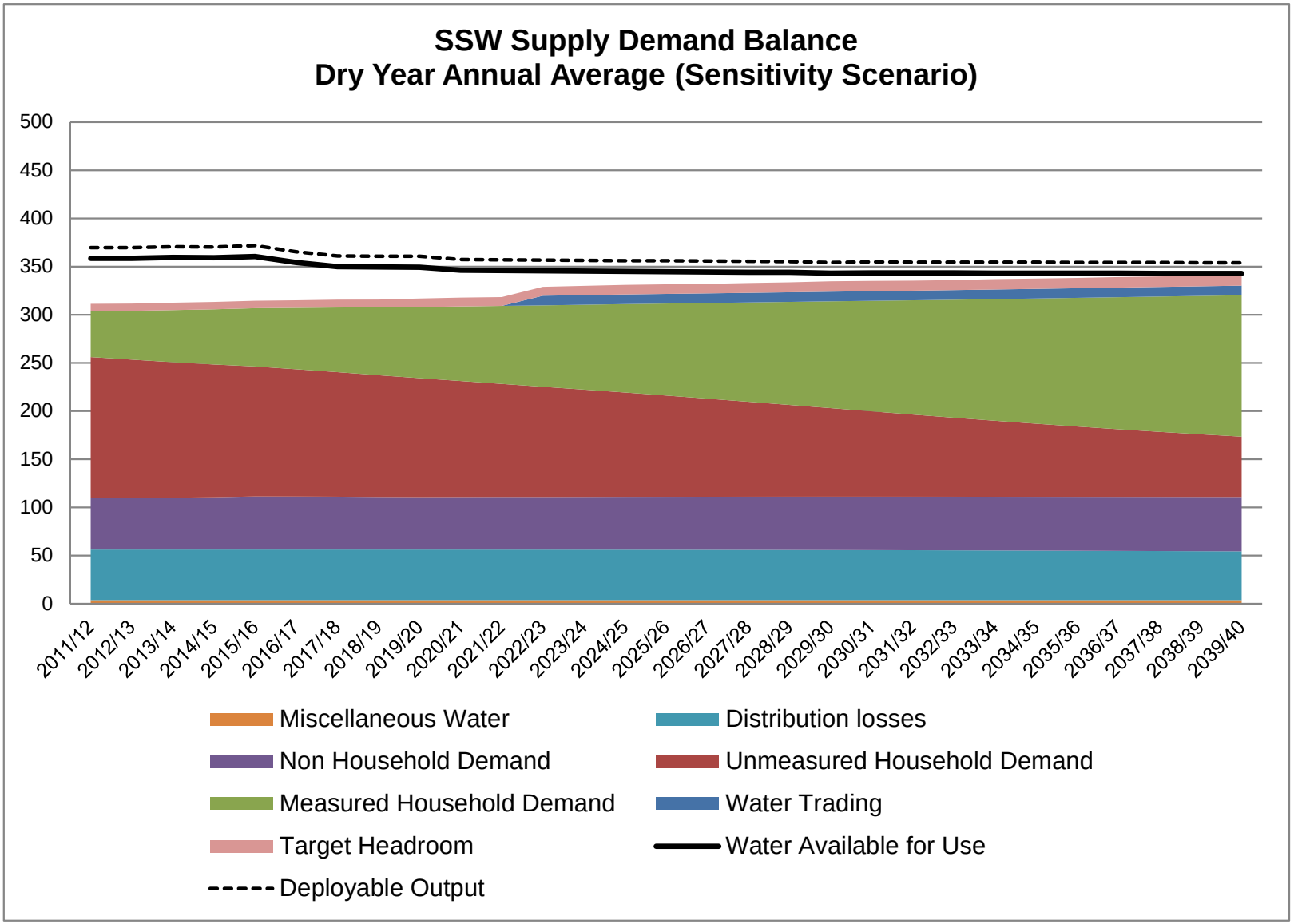
- Peak week critical period

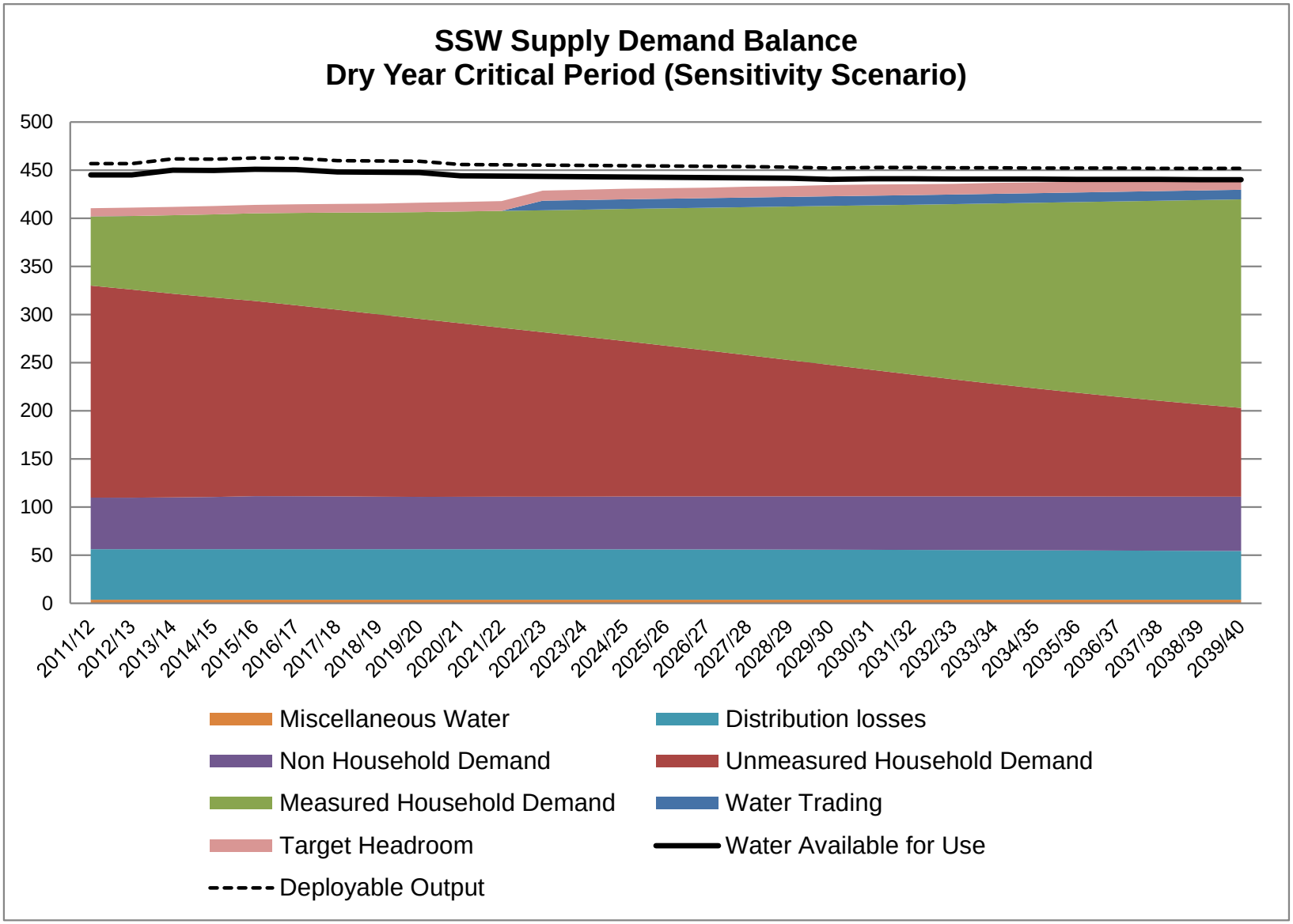
+10Ml/d on demand for water trading from 2022/23
+4Ml/d on demand for SELL remaining at 70.54Ml/d from 2020/21
-3Ml/d on supply from 2020/21
Total impact on supply demand balance is 17Ml/d

For the dry year annual average scenario these figures are less than the forecast surplus at the end of the planning period and therefore there is no requirement to change the Company's plan or present a set of options which might be required. For the peak week scenario there is a 1Ml/d deficit in the supply demand balance in the final year of the plan.

Given the uncertainty around these changes, the very small scale of the deficit and the fact that it is in the final year of the plan for only the peak week scenario the Company does not propose to change its plan or identify options to reduce the deficit. The most likely option would be to reduce the volume of water available for water trading. Within the next five years the Company will have more certainty over all these potential factors included in the sensitivity scenario and will if a supply demand deficit is confirmed include options within the next WRMP in 2019.

If some of the extreme or more unlikely factors were to materialise in the future to such an extent that there were a serious risk of a deficit in the supply demand balance then the Company would identify appropriate options to address the deficit. These options would include all the usual supply side (resource development, bulk imports, incoming water trades), demand side (metering, water efficiency, outbound water trading arrangements), production side (outage reduction, treatment works losses reduction), and distribution side (leakage reduction) options. Future potential impacts are of a scale and timing such that the Company will be able to respond in a timely fashion through future WRMP cycles.


SSW Supply Demand Balance
Dry Year Annual Average (Sensitivity Scenario)
500
450
400
350
300
250
200
150
100
50
0
2011/12
2012/13
2013/14
2014/15
2015/16
2016/17
2017/18
2018/19
2019/20
2020/21
2021/22
2022/23
2023/24
2024/25
2025/26
2026/27
2027/28
2028/29
2029/30
2030/31
2031/32
2032/33
2033/34
2034/35
2035/36
2036/37
2037/38
2038/39
2039/40
Miscellaneous Water
Distribution losses
Non Household Demand
Unmeasured Household Demand
Measured Household Demand
Water Trading
Target Headroom
Water Available for Use
Deployable Output


SSW Supply Demand Balance
Dry Year Critical Period (Sensitivity Scenario)
500
450
400
350
300
250
200
150
100
50
0
2011/12
2012/13
2013/14
2014/15
2015/16
2016/17
2017/18
2018/19
2019/20
2020/21
2021/22
2022/23
2023/24
2024/25
2025/26
2026/27
2027/28
2028/29
2029/30
2030/31
2031/32
2032/33
2033/34
2034/35
2035/36
2036/37
2037/38
2038/39
2039/40
Miscellaneous Water
Distribution losses
Non Household Demand
Unmeasured Household Demand
Measured Household Demand
Water Trading
Target Headroom
Water Available for Use
Deployable Output

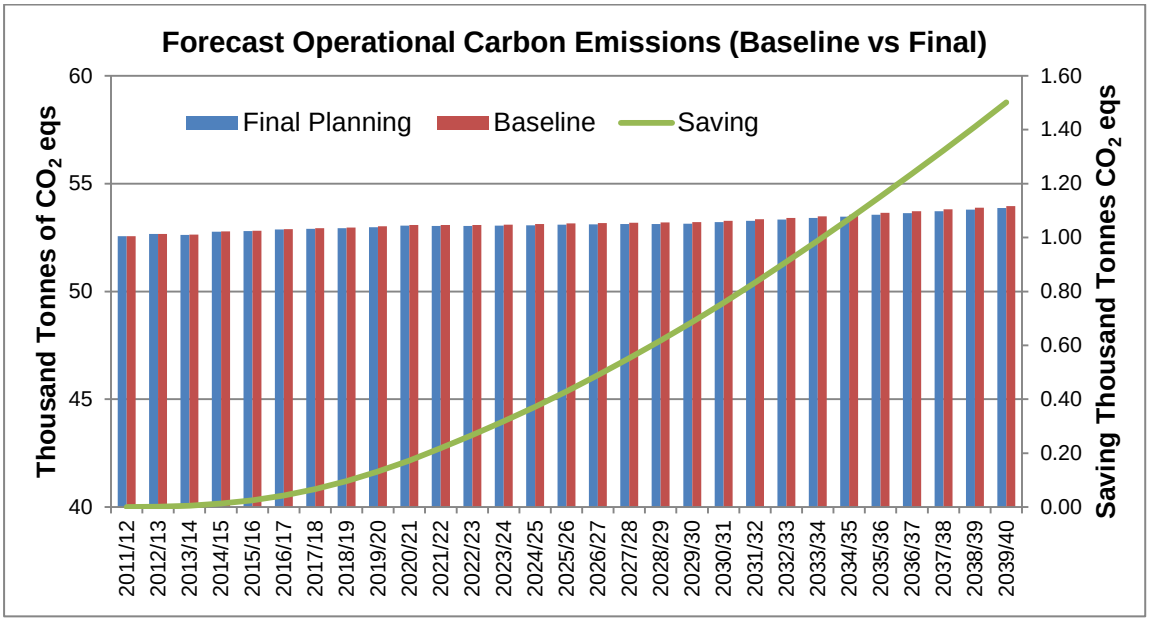
11 CARBON EMISSIONS

The Company's total operational carbon emissions have been calculated using the UKWIR carbon accounting methodology. This is based on the Defra total carbon emissions from pumping and treating water and all support and administrative activities. Data for the table below is the average of years 2007/8 to 2012/13.

Carbon Emissions		
Element	**Value**	**Unit**
Drinking water treatment and pumping emissions	**55,610**	tCO_2e
Total emissions including drinking water, sludge, administration and transport	**60,259**	tCO_2e
Volume of drinking water supplied	**124,435**	Ml
Emissions from drinking water and pumping per Ml of drinking water treated	**452.417**	$kgCO_2e/Ml$
Total emissions per Ml of drinking water treated including drinking water and pumping, sludge, administration and transport	**484.260**	$kgCO_2e/Ml$

Total emissions have been divided by the volume of water pumped to derive emissions per megalitre of drinking water. This base figure is then used to illustrate how carbon emissions will vary across the plan period in accordance with the forecast changes in demand (total emissions/Ml multiplied by forecast demand). Demand is based on the normal year annual average scenario, including bulk exports to Severn Trent Water, but excluding bulk imports. Embedded carbon has not been considered in this forecast.

The carbon emissions for the baseline and final water resources planning scenarios are shown below.



The baseline forecast is 55.04 thousand tonnes (CO_2 equivalent per year) at the end of the planning period, with a final planning forecast of 54.07 thousand tonnes in 2040.

The carbon emissions forecast assumes that capital maintenance spend will maintain stable serviceability and operational efficiency. As a result there is an assumption that operational emissions per megalitre of drinking water remain constant throughout the plan period. Therefore, the forecast of carbon emissions is a direct reflection of the volume of water forecast in the baseline and final demand scenarios.

12 FUTURE UPDATES OF THE FINAL WATER RESOURCES MANAGEMENT PLAN

Progress with implementation of the 2014 fWRMP will be reported in the Annual Review to be submitted to the Environment Agency each year. In particular progress with the following will be included:

- Implementation of NEP schemes
- Determination of the impact of article 4 of the Water Framework Directive on deployable output
- Impact on deployable output of sources which have been newly refurbished especially where replacement boreholes have been drilled as part of the Company's capital maintenance programme
- Water trading discussions with Severn Trent Water. If a water trade agreement is reached post publication of the fWRMP the planning framework allows for the adaption of 'better' solutions without triggering a formal review of plans, subject to materiality.

It is not anticipated that these will lead to material changes which would require a revised WRMP to be produced.

The next full review of the WRMP will be due in 5 years time and the pre-consultation process is likely to start in 2017.

PART 2
WRP TABLES AND COMMENTARIES

The Company has completed the following tables in version 2.0:

WRP Table
WRP1a
WRP1
WRP2
WRP2a
WRP2b
WRP4
WRP5
WRP6
WRP6a
WRP6b

The Company has not completed tables WRP3 or WRP3a since it does not have a supply demand deficit and has not appraised options.

The Environment Agency Water Resources Planning Guideline includes a data capture system consisting of a set of prescribed tables for water companies to complete and submit as part of their fWRMP. Version 2.0 of the data capture system was issued by the Environment Agency in August 2013 for completion of fWRMPs. These tables replace version 1.6 used for the dWRMP. Version 1.6 had a number of inconsistencies and errors within the format, formulas and line definitions of the tables which were identified by the water industry during the addition of the data to the tables for the dWRMP. Version 2.0 of the tables retain these inconsistencies. Therefore the 'work arounds' or amendments identified for the dWRMP remain for the fWRMP.

South Staffs Water has done all it can to ensure that the tables submitted as part of this fWRMP are consistent with the Water Resources Planning Guideline and represent the data used to compile its fWRMP . A number of minor formatting amendments have been made and a couple of specific 'work arounds' have been implemented. Where this has been done this is described in the line commentaries below.

Table WRP1: Baseline water supply

Row 1BL Raw water abstracted: The Company has calculated this value by correcting the distribution input for treatment and raw water losses, raw water and potable water transfers. It therefore represents the raw water abstraction required to meet distribution input.

Row 6BL Total potable water exported: The Company has included net export volumes for the small bulk transfers with Severn Trent. It has not included the Severn Trent Water entitlement from HL via the Sedgley system to Wolverhampton as the deficit is accounted for in DO (Row 7BL). Volumes assumed are 40 Ml/d DYAA and 48 Ml/d DYCP.

Row 7BL Deployable Output (baseline profile without reductions): The Company calculates this value with a conjunctive use model and the DO value generated includes treatment losses. This value has been entered directly as an input variable. The values in table WRP1a BL Licences are therefore for information only.

Row 8.3BL Total other changes to DO: The Company has used this row to enter forecasts changes to DO arising from AMP5 expenditure on borehole maintenance. Accordingly all values have a positive sign (increase in DO).

Row 9BL Treatment works losses and operational use: These are computed within the conjunctive use model and are not generated as model outputs. Values equivalent to the computed DO value have been calculated and are presented here for information.

Row 12BL water available for use: The Company has corrected this formula to exclude a deduction for treatment works losses as line 7BL already allows for this.

Table WRP1A BL Licences

The Company calculates DO values with a conjunctive use model and the DO value generated includes treatment losses. The values in this table have therefore been estimated based on model inputs and represent site DO values excluding losses.

Row 0.1 BL (individual licences): The Company has included 3 groundwater sites for which there are no aggregate licence conditions with other sites. The Company determined that DO at these sites is not limited by resource and that they are neither vulnerable to climate change nor is there a critical period limiting DO. The period of operational data used to assess DO is 1990 – 2012 although this has been extended back to 1976 by analogy to regional groundwater level data.

Row 0.1 BL (individual licences): the Company has included 7 groups of groundwater sites where there are aggregate licence conditions and 2 surface water sites where the DO is influenced by conjunctive use.

The Company determined that DO at most of these groundwater sites is not limited by resource and that they are neither vulnerable to climate change nor is there a critical period limiting DO. The period of operational data used to assess DO is 1990 – 2012 although this has been extended back to 1976 by analogy to regional groundwater level data. At Moors Gorse half of the site is resource limited and the DO was defined using 2011 operational data. The impact of climate change is uncertain and no value is quoted.

The DO for Brindley Bank is 0 Ml/d as it is a raw water source that supplies Blithfield. Zero DO values are also stated for Hulme Springs, Hagley and Sandhills as these sites are mothballed. As these sites are all incorporated

into group licences in active use they have not been listed under Row 0.3BL Unused Sources.

Treatment losses at all groundwater sites (where >0) are fixed and are not considered in this table.

The DO values for HL and Blithfield are calculated from the conjunctive model output. They represent the DO value for supply of Company customers only so the export to Wolverhampton is not included in the HL value presented. Treatment losses are calculated accordingly and a correction has been made to conjunctive model output to generate the values here, using known variable loss rates used within the model. All climate impacts on supply have been assigned pro rata to the two surface water sources.

Table WRP2a

Row 45BL and Table WRP6a Row 45FP

The Company forecasts the impact of void property movement between billed and void unmeasured households and between billed and void measured households. The Company has forecast the number of voids in any one year by using a fixed percentage from the base year applied to the total households connected. This results in reducing the number of void unmeasured households (as unmeasured households are reducing overall due to meter switchers) and increases the number of void measured households (as measured households are increasing due to switching and growth). The tables do not allow the Company to clearly show the movement in voids (which is important as it impacts on both allocation of population and income forecasts associated with billed properties only). The lines in their current format do not show growth in billed connections correctly.

The Company has worked around this by making an allowance in rows 45BL and 45FP equal to the measured household void movement. This reduces the overall measured household growth in the WRMP tables in order to ensure the total household connections, voids and billed properties are equal the Company's forecast for these categories.

The Company agreed this approach with Environment Agency officers at Head Office.

Rows 51.2BL to 51.6BL and Table WRP6a Rows 51.2FP to 51.6FP

To meet the requirement of the Water Resources Planning Guideline as far as possible and to ensure that the total measured household population meets the Company's population forecasts the Company has derived the cumulative measured household population for each type of metered household by deducting the previous year population for that customer group from the year in question. This does not reflect the line definition exactly *"Cumulative population of new meters installed as a result of change in occupancy" (WRMP Guidance page 33 Row 51.2 – 51.6BL and FP)*.

A further balance is included in row 51.6FP *'Other changes to existing measured population'* as a balancing adjustment to measured household population. This approach was identified by a number of water companies during the completion of the tables.

Also please note some of this field's formatting is not consistent.

Table WRP6

Rows 34FP – 39FP The Company has overridden the calculated cells in this block to correctly represent the Underground Supply Pipe leakage estimates from its demand forecast.