South Staffs Water

FINAL WATER RESOURCES MANAGEMENT PLAN

August 2009

PART 1
MAIN REPORT

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FOREWORD FROM THE MANAGING DIRECTOR

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 Water Resources Management Plan demonstrates that we will continue to maintain the highest levels of security of supply to our customers.

The plan sets out our water resources and demand projections for the Company's area 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.

We will continue to review this plan over subsequent years to ensure that we take account of new information. This is particularly important given the uncertainty in the future over climate change, over future potential reductions in licensed abstraction (to comply with the Water Framework Directive), and because of uncertainty over the pace of future housing and population growth.

Climate Change in particular presents a real challenge to South Staffordshire Water. The past few years have seen a series of extreme weather events across England and Wales. The 2005 and 2006 drought affected much of the south of England and the floods of summer 2007 and 2008 were unprecedented. These events provide supporting evidence of the very serious impacts of climate change. At South Staffs Water we aim to play our part in tackling climate change, and to reduce the Company's carbon footprint.

A key policy which will facilitate a reduction in the amount of water we pump is the introduction of change of occupier metering. Greater meter penetration will enable more effective development of tariffs in the future to demonstrate the value of water to customers through price signals. Research with our customers has shown that most agree that meters are the fairest way to pay for water but have concerns over affordability. We understand these concerns and will work hard with the regulators and customer groups to ensure that appropriate protection is provided for vulnerable customers.

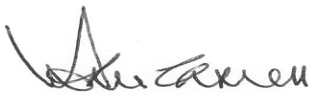
Alongside the new metering programme, we will refocus and reinforce our activities in the area of water efficiency to provide our customers with the information they need to make informed decisions about using water wisely. We will also continue to work hard to maintain leakage at the economic level.

In addition the Company will continue to focus on our successful energy management programme and maintain our pumps to the highest efficiency levels in the industry.

We consulted widely on our Draft Water Resources Management Plan when we asked you to tell us your views of our proposals. We then published a Statement of Response, which showed how we have taken all of your

comments on board, to produce our Final Water Resources Management Plan.

It now gives me great pleasure to present to you the Company's Final Water Resources Management Plan for the period 2010 to 2035.



Dr Jack Carnell
Managing Director

1 EXECUTIVE SUMMARY

Key Points for the Supply Demand Balance Strategy For the Period 2010 – 2035

Carbon

The Company remains committed to adopting carbon efficient strategies consistent with its 3 Cs core values and its Strategic Direction Statement. The Company's supply demand balance strategy is now underpinned by cost benefit analysis, and by customer views.

Levels of Service and Security of Supply

Existing levels of service will be maintained and have not changed between the DWRMP and the FWRMP. Research undertaken by the Company demonstrates that customers strongly support these levels of service.

- The return period for hosepipe bans is still once every 40 years on average and a return period for non-essential use bans has been defined as on average once in every 80 years.
- The security of supply index for the Company remains at the maximum score of 100 throughout the plan period.

Metering

The Company is forecasting a significant increase in domestic meter penetration through the following metering policies; metering on change of occupation, metering of unattended garden watering devices (sprinkler metering), metering of new households and non-household properties, and free meters for opting domestic and commercial customers. The impact of introducing change of occupier metering is to increase meter penetration at the end of the planning period from 60% in the baseline forecasts to 77% in the final scenario.

Leakage

The sustainable economic level of leakage (SELL) used in the FWRMP has been assessed as 74.4 Ml/d. This uses the latest leakage management performance and cost data, as well as external environmental and social costs and benefits.

Water Efficiency

The Company will continue to promote water efficiency through a number of policies throughout the plan period and has included the new OFWAT water efficiency target in the baseline demand forecast.

Climate Change Assessment and Environmental Obligations

Both of these issues have been assessed within the supply/demand forecasts, however there is no material impact on the FWRMP.

Supply Demand Balance

The Company has sufficient resources to meet forecast demand plus target headroom for annual average and peak week conditions throughout the plan period. There is no requirement for either supply or demand interventions.

1.1 Methodology

The Company has made significant methodological improvements to the way in which it assesses factors included in the supply demand balance forecasts. In addition, the level of sophistication has also improved significantly since PR04. Best practice has been followed wherever practicable and Company specific data used as much as possible. The main improvements made since the PR04 plan are listed below.

- The Company's water resources model WRAPSIM has been updated and improved, with the help of Entec.
- Treatment works losses have been comprehensively reviewed.
- The UKWIR methodology Outage Allowances for Water Resource Planning (1995) has been used to calculate the outage allowance. Company data for the last five years has been used in the model for the assessment. Consultant Mott Macdonald has been employed to undertake the modelling work.
- The UKWIR methodology An Improved Methodology for Assessing Headroom (2002) has again been used for calculating headroom. However, all the components input into the model have been reviewed and updated. Consultant Mott Macdonald has been employed to undertake the modelling work.
- More sophisticated methods for demand forecasting have been adopted. In particular the new UKWIR methodology Peak Demand Forecasting Methodology 2006 has been used. Atkins were employed to undertake the data analysis required for implementation of this approach.
- Consultant WRc prepared the Company's revised Sustainable Economic Level of Leakage (SELL) assessment. This follows best practice in line with the Tripartite Report and Ofwat's revised leakage methodology as reported in RD02/08 for the inclusion of environmental and social costs and benefits.
- WRc also prepared a Least Cost Plan in line with the UKWIR methodology the 'Economics of Balancing Supply and Demand Guidelines' (2002) in order to demonstrate the sensitivity of the demand forecasts and the supply forecasts. This included an improved assessment of the environmental and social costs of each of the options. The results were included in the Draft Water Resources Management Plan (DWRMP), and repeated as appendix J and K in the FWRMP.
- The Company has used cost benefit analysis (CBA) to appraise the costs and benefits of its proposed metering strategy.
- Consultant Deloitte, has constructed an econometric model to assist with non-household demand forecasting for the Final Business Plan (FBP) and the Final Water Resources Management Plan (FWRMP).

1.2 Progress Since the 2004 Water Resources Plan

The Environment Agency wrote to the Company after the Final Water Resources Plan 2004 was completed, detailing areas where further work was expected prior to the next water resources plan. The following table summarises the Environment Agency's requirements and the actions the Company has undertaken in response.

Issue	Environment Agency PR04 Comments	Company PR09 Position
1. Metering	Metering policy to be reconsidered and household metering to be promoted more proactively.	The Company's metering strategy has been reviewed. The phased implementation of change of occupier metering began in April 2008. Full details of the Company's metering policy can be found in section 3.4.
2. Leakage	Revised ELL to be prepared for 2006 and progress with leakage to be reported in annual reviews.	Progress with leakage management continues to be reported in the annual June Returns. The Company has submitted a SELL appraisal to Ofwat as part of the FBP. The SELL has been calculated as 74.4Ml/d and this is used in the demand forecast for the FWRMP. Details of the SELL appraisal can be found in appendix G.
3. Technical feasibility of resource schemes.	Further assessment of feasibility of resource options identified for AMP6 and AMP7 will be required for Periodic Review 2009.	The Company does not now forecast a supply demand balance deficit within the period of the FWRMP 2008 and therefore there are no resource schemes included within the plan. However, in the DWRMP the Company presented sensitivity testing to demonstrate the range of options which might be required if a deficit were to be forecast. The resource options used in the sensitivity testing were selected on the basis of a screening procedure including feasibility. The Environment

Issue	Environment Agency PR04 Comments	Company PR09 Position
		Agency were consulted on the list of resource options.
4. Deployable output modelling	Further work to improve deployable output modeling.	Significant improvements to the deployable output model, WRAPSIM, have been made including updates to inflow sequences. Full details can be found in section 5.
5. Climate change	Further modelling work to determine the impact of climate change.	The Company has undertaken new climate change modelling to determine the impact on deployable output in accordance with the latest Environment Agency guidance. Details of the Company's work on climate change can be found in section 7.
6. Consumption monitors	Review of Company consumption monitors and water delivered studies.	The company has developed a new unmeasured household consumption monitor. This has been used to report unmeasured per capita consumption in the annual June Return since 2006.
7. Headroom	Reconsider the inclusion of sustainability reductions in headroom as this is against the Environment Agency's guidance	The Company has reviewed the calculation of headroom and has complied with guidance to exclude sustainability reductions. However, the Company remains of the view that this is a significant area of uncertainty for the supply demand balance. The sensitivity of the inclusion of this in the headroom calculation is discussed in section 11.
8. Least cost plan	EA believe there was double counting of a small source in the least cost plan modelling for PR04.	The Company maintains there was no double counting within the least cost plan for PR04. The Company does not forecast a supply demand balance deficit within the FWRMP period and therefore least cost plan modelling is not required. However, the least cost plan was updated for the sensitivity testing in the DWRMP

Issue	Environment Agency PR04 Comments	Company PR09 Position
		and there was no double counting.
9. Environment Programme	Delivery of the environmental programme.	A compensation borehole at Hurcott and Podmore Pools SSSI is now operational. The Company has worked closely with the Environment Agency to clarify the requirements at Checkhill Bogs SSSI. The Company has continued to collect baseline monitoring data and has drilled a monitoring borehole adjacent to the site to provide further information about water levels below the site. The Company has included a reduction of 2Ml/d in groundwater abstraction in the FWRMP 2009 to address low flow problems at Checkhill Bogs SSSI. The Environment Agency has instructed the Company that a further reduction of 1Ml/d may be necessary from its source at Chilcote as a result of the review of consents adjacent to the River Mease under the Habitats Directive. The Company has not included this 1 Ml/d reduction in the plan. Details of the environment programme can be found in section 5.3.
10. Outage allowance	Data collection and adoption of UKWIR 1995 methodology.	The Company has adopted the UKWIR methodology for calculation of outage allowance. Actual data from the last five years has been utilised. Details of the estimation of the outage allowance can be found in section 5.4.

1.3 Changes Between the DWRMP and the FWRMP

The Company has undertaken further work to improve the FWRMP since the publication of the DWRMP in May 2008. Details of these changes were outlined in the Company's Statement of Response (SoR) to the comments

received on the DWRMP. The Company's SoR was published in February 2009, and is included as appendix N. Details of all changes are provided in the relevant sections of this plan.

The changes to the plan have taken into account the comments received from a range of stakeholders, as part of the public consultation process. In addition there have been other changes made to reflect the changing economic climate and to account for regulatory reporting updates.

The key changes since the DWRMP are summarised below:

- Change of occupier metering is not included in the baseline forecast, in line with EA planning guidelines. The impact of introducing change of occupier metering is to increase meter penetration at the end of the planning period from 60% in the baseline forecasts to 77% in the final scenario. Total meter penetration by 2035 has reduced slightly in the FWRMP from the level of 79% at the end of the period in the DWRMP.

- The Company has revised its metering projections to reflect the current economic downturn. This has resulted in a reduction in levels of change of occupier metering in the early period of the plan and an increase in meter optants when compared to the DWRMP. The number of new connections, which are all metered, has also been reduced over the early period of the plan.

- The latest leakage assessment used in the FWRMP has taken account of new developments and information available since the submission of the DWRMP. This includes a more robust approach to the assessment of environmental and social costs and benefits, in line with the latest best practice guidance. This latest assessment identified a SELL of 74.4 Ml/d based on a normalised base year, which has been used in the FWRMP supply demand balance analysis (final demand forecast).

- The new OFWAT targets for water efficiency have been included in the baseline demand forecast. Activity to achieve the target of 0.53 Ml/d has been included each year from 2009/10 until 2014/15.

- Consultants have updated population estimates for the Company to take account of the latest revised population growth and migration assumptions from the ONS (Office of National Statistics) and to improve the way population is apportioned along the Company's boundary. The effect of the above changes is to increase the household population forecast at the end of the planning period to 1,399,000 compared to 1,377,000 in the DWRMP. Further details are included in section 6.3.5.

- Non-household population has been reappraised and the changes included in the FWRMP.

- The Company has also reviewed its property forecasts including a reassessment of the latest information from the Regional Spatial Strategy (RSS) and has undertaken a detailed apportionment of these forecast

new properties to Councils within the Company's area of supply. The Company has based its forecasts on the highest scenario for the RSS. Treatment of demolitions and void properties has also been revised. The total number of billed households at the end of the planning period is 617,000 compared to 647,000 in the DWRMP. Further details are included in section 6.3.

- The Company has used 2007/8 as the base year for the demand forecasts in the FWRMP compared to 2006/7 in the DWRMP.

- The Company has revised the demand normalisation process and applied this to 2007/8 actual data. This has resulted in a lower starting point for the demand forecasts (per capita consumption and distribution input) and a lower demand profile throughout the plan period. The revised normal year baseline per capita figures are discussed in section 6.2.4

- Per capita consumptions (pcc) for measured and unmeasured customers have been revised to reflect the changes in; the normalised starting point for 2007/8, the revised population figures, the revised household numbers and the resulting household densities. Water efficiency savings due to distribution of cistern devices and self-audit information have been incorporated into the revised pcc forecasts. The downward trends in pcc remain unchanged and the overall impact has been to reduce the demand forecast. Per capita consumption is discussed in section 6.3.9.

- The revised figure for normal year average per capita consumption (pcc) at the end of the planning period is 126l/p/d (132l/p/d in the DWRMP). This compares to the DEFRA pcc aspiration of 130l/p/d by 2035 presented in Future Water (DEFRA, February 2008).

- The Company has engaged the consultant, Deloitte, to assist with forecasting non-household demand. There was a significant drop in actual non-household demand in 2007/8 and the April 2008 to end December 2008 data indicates that 2008/9 consumption will be even lower. This is attributed to the economic downturn. A model has been produced to forecast demand by non-household sector. Local knowledge of specific sectors is used together with the model output to produce the demand forecast for non-household customers. A further small decline is forecast for 2009/10 before a modest recovery is seen over the next five years. Non-household demand is discussed in section 6.4.

- The Company's deployable output calculation has been updated for the FBP. This follows a review of source capacities and incorporates Severn Trent Water's revised modelled River Severn flow and Clywedog Reservoir storage data. This has reduced the deployable output for dry year annual average by 18.5Ml/d to 379.9Ml/d and for peak week critical period by 13.4Ml/d to 448.9Ml/d. Deployable output is discussed in section 5.2 and in appendix D.

- The Company has also remodelled the headroom assessment as a result of the changes in the demand forecasts and comments from the

Environment Agency relating to the inclusion of additional factors of uncertainty. The Company has also reviewed the level of risk to accept for target headroom and has increased the level of risk from 5% to 10% for AMP5 and AMP6. Target headroom for dry year annual average for 2007/8 is 9.3Ml/d and for peak week critical period target headroom is 11.1Ml/d. Headroom is discussed in section 8 and in appendix C.

- The combined affect of all of the above is to reduce both the demand and supply figures in the supply demand balance but to maintain a healthy surplus for both dry year annual average and peak week critical period.

- The Company has undertaken cost benefit analysis of its metering strategy. This analysis has shown that there is a robust and credible justification for the Company's metering strategy, when all of the benefits are included. A summary of the costs and benefits is included in section 5.1 of the Statement of Response.

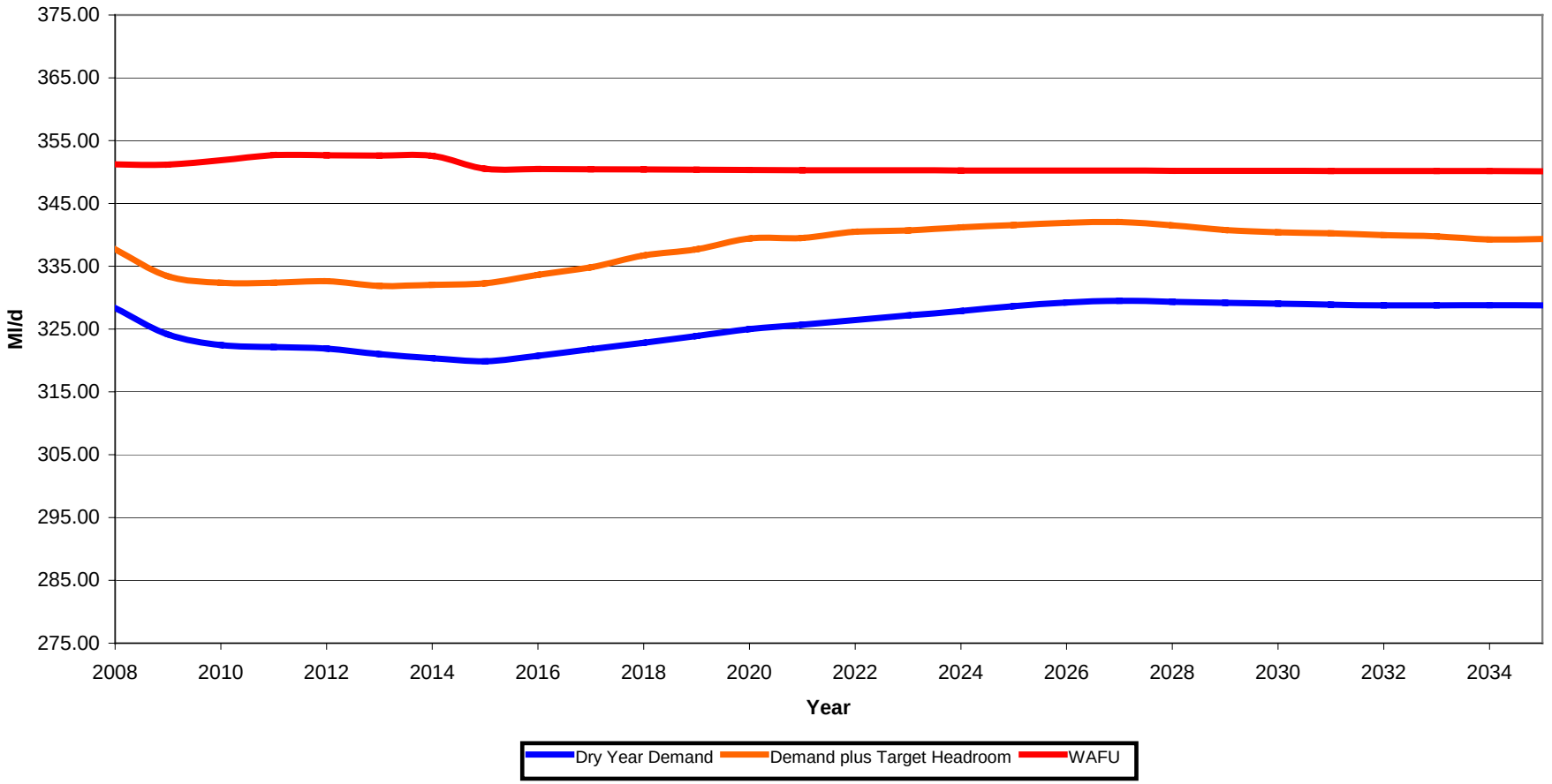
- The Company has updated its total carbon emissions forecast for the FWRMP. Carbon emissions are forecast to reduce marginally across the planning period. The revised baseline forecast is 56.4 thousand tonnes (CO2 equivalent per year) at the end of the planning period, with a final scenario forecast of 55.9 thousand tonnes in 2035. This is compared to 59.2 thousand tonnes in the DWRMP. This reduction for the FWRMP is a direct result of the lower demand now forecast in the FWRMP.

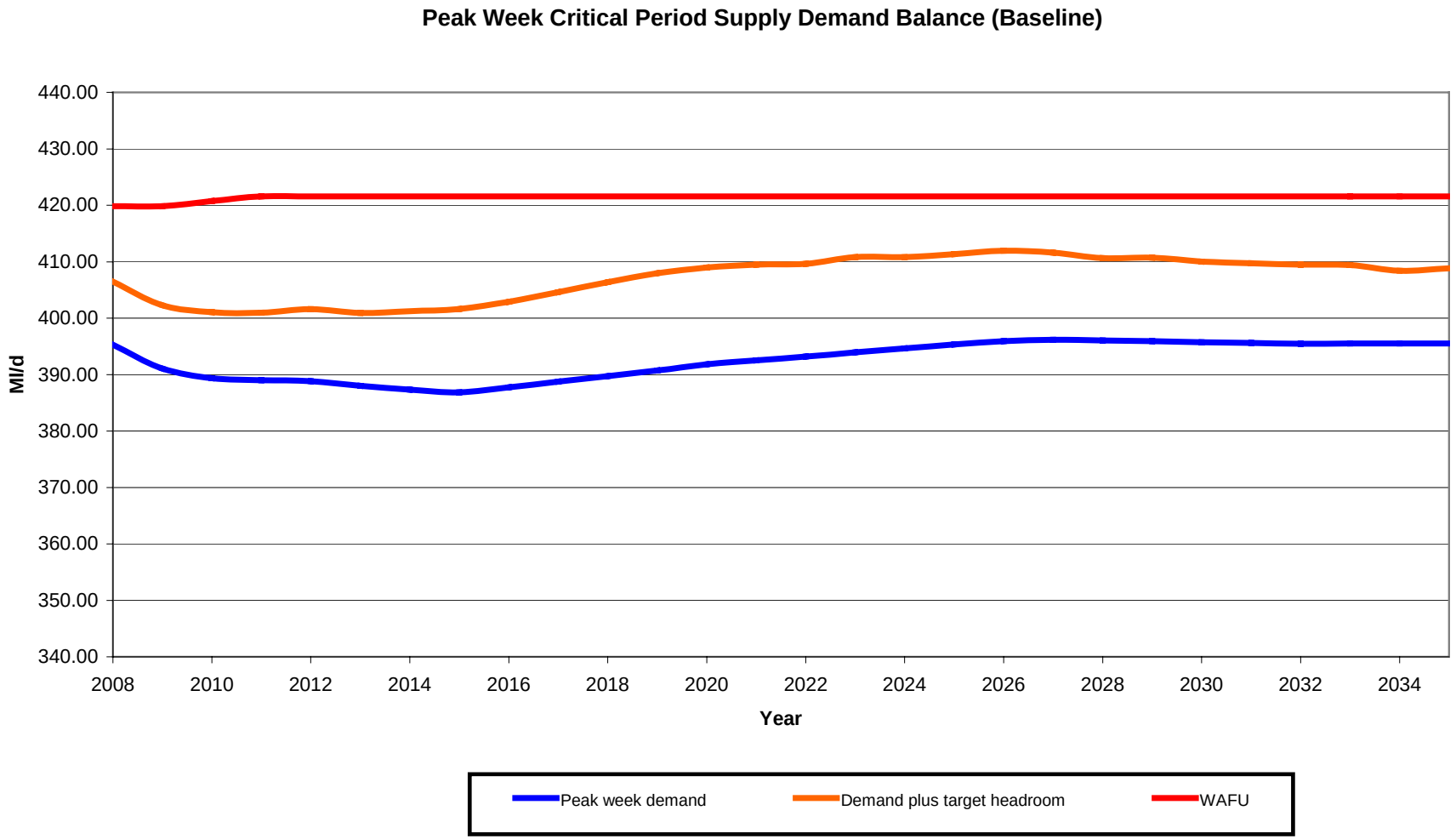
1.4 Details of the Supply and Demand Balance

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. However, investment is still required to deliver the Company's metering strategies and address localised supply stress issues.

The baseline supply demand balance is illustrated in the following graphs.

Dry Year Annual Average Supply Demand Balance (Baseline)




Peak Week Critical Period Supply Demand Balance (Baseline)
440.00
430.00
420.00
410.00
400.00
390.00
380.00
370.00
360.00
350.00
340.00
Ml/d
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
Year
Peak week demand
Demand plus target headroom
WAFU

1.4.1 Overview of the Demand Forecast

Key Drivers of the Demand Forecast

Upward Pressures

- An increased house building programme under the West Midlands Regional Spatial Strategy and urban regeneration
- Decreasing household occupancy levels
- Climate change

Downward Pressures

- Carbon reduction strategies
- Water efficiency through more water efficient household appliances
- Code for Sustainable Housing
- Change of occupier metering
- Sprinkler metering
- The economic downturn
- The continuing trend of a declining manufacturing sector and switch to service sector

Neutral Factors

- Leakage maintained at the Sustainable Economic Level of Leakage in the final demand forecast

The FWRMP includes a baseline demand forecast and a final demand forecast. The baseline forecast includes leakage at the current Ofwat target of 75Ml/d throughout the planning period and change of occupier metering is excluded. For the final forecast leakage is included at the currently assessed sustainable economic level of leakage (SELL) and change of occupier metering is included. The impact of introducing change of occupier metering is to increase meter penetration at the end of the planning period from 60% in the baseline forecasts to 77% in the final scenario. The DWRMP showed meter penetration rising from the current level of 20% to 79% at the end of the period in the final scenario.

The Company has revised its metering projections to reflect the current economic downturn. This has resulted in a reduction in levels of change of occupier metering in the early period of the plan and an increase in meter optants when compared to the DWRMP. The number of new connections, which are all metered, has also been reduced over the early period of the plan.

The revisions to the numbers of meter installations have not had a material impact on the Company's overall supply demand position or the level of meter penetration at the end of the plan period.

The Company's baseline demand forecast for the next 25 years for the dry year annual average scenario is essentially flat. The forecast includes impacts

due to climate change which are calculated in accordance with the best practice methodology commissioned by DEFRA, Climate Change and Demand for Water (2003) (CCDeW).

The overall trend of the demand forecast is influenced largely by the non-household demand forecasts. There was a significant drop in actual demand in 2007/8 and 2008/9. This is attributed to the current economic downturn. This fall in non-household demand equates to a significant drop in income for the Company. Non-household demand and income forecasts have therefore become one of the most important issues for the PR09 Final Business Plan.

The Company has engaged Consultant, Deloitte, to assist with forecasting non-household demand. A model has been produced to forecast demand by non-household sector. Local knowledge relevant to a few of the modelled sectors has been incorporated into the modelled results. A further small decline in demand is forecast for 2009/10 and then demand remains stable over the AMP5 period. The non-household demand forecasts include a proportion of the new OFWAT water efficiency target (0.38Ml/d of the 0.53Ml/d target is assigned to non-household demand reductions). Further detail of the modelling approach to the non-household demand forecasting is included in section 6.2.

The Company has reviewed its forecasts of new connections taking account of the latest information from the West Midlands Regional Spatial Strategy. These forecasts are based on the Nathaniel Lichfield high scenario. Growth will be focussed in the urban regeneration of the Black Country and in Burton-upon-Trent which has been designated as a growth point. However, the Company now believes that the combined effects of the worsening economic downturn and the delay in the publication of the Final Regional Spatial Strategy will mean a much slower start to implementation. Build rates at around 75% of the historic annual average are forecast for the first two years of AMP5 with a recovery to average rates in 2012/13 and an uplift in the last two years. Full implementation of the RSS is forecast in AMP6.

The demand forecasts include anticipated improvements in the efficiency of household water using appliances and therefore the consumption of water per person and per household includes integral efficiencies. This will be supported by the adoption of the Code for Sustainable Homes in all new housing developments.

The Company has also included a proportion of the new OFWAT water efficiency target in household demand (0.15Ml/d of the 0.53Ml/d target). As a result there will be a counterbalancing effect against the pressures of increasing numbers of households and increasing population and reducing household size. Household demand is forecast to decline marginally over the AMP5 period (-1.7%) and then rise by 1.1% over the AMP6 period. Over the 25yr planning period household demand falls by around 3%.

The Company commenced the phased implementation of change of occupier metering in June 2008. The final demand forecast includes assumed savings

due to metering effects for change of occupier metering. These savings have been based on industry research as detailed in the UKWIR report, 'The Impact of Household Metering on Consumption' (2004). The continuation of the Company's other existing metering policies and the introduction of the change of occupier metering programme will mean that meter penetration is forecast to reach around 35% by the end of AMP5 , 49% by 2019/20 and 77% by 2034/35.

The sustainable economic level of leakage (SELL) appraisal has been updated to take account of new developments and information since the submission of the DWRMP and DBP. This has been undertaken in accordance with industry best practice as set out in Tripartite Report[1], updated to take account of Ofwat's latest position as reported in RD16/08[2] and the application of environmental and social costs and benefits[3]. The analysis used the latest available leakage management cost and performance data, and the marginal cost of water production from 2007/08.

The Company's leakage reporting methodology has also been updated since the DWRMP and DBP to reflect the latest information regarding the hour-day factor used to convert night leakage into average leakage levels. This has resulted in an apparent increase in leakage levels; however this is the result of a data revision rather than a real increase in leakage. The overall water into supply remains unchanged, with the increase in reported leakage simply resulting in a reduction in previously assessed consumption levels. Overall there has been an increase in the robustness of the assessed level of leakage, as a result of the replacement of a previously used industry default figure for the hour-day factor by a Company specific value.

The resulting SELL has been assessed as being in line with current leakage levels, equal to 74.4 Ml/d, based on a normalised base year, to remove the undue influence of weather events. This result is below the AMP4 target of 75.0 Ml/d.

In addition to the normal year annual average demand forecasts the Company also forecasts demand for the dry year annual average and the peak week critical period demand scenario. The dry year forecast is calculated by applying a dry year factor to household demand. The peak week forecast is calculated by adding a derived peaking volume to normal year average demand. The peaking volume has been derived following the UKWIR best practice methodology, Peak Demand Forecasting (2006). The plan assumes that the effects of metering will also suppress peak demand. It is the dry year annual average demand forecast and the peak week critical period forecast which are used in assessing the overall supply demand balance.

[1] Best Practice Principles in the Economic Level of Leakage Calculation, March 2002; produced by WRc on behalf of Ofwat, EA and DEFRA (Tripartite Group)
[2] RD 16/08, Review of leakage target setting, August 2008; Ofwat
[3] Providing Best Practice Guidance on the Inclusion of Externalities in the ELL Calculation, November 2007; produced by RPS Water on behalf of Ofwat

1.4.2 Overview of Water Available for Use (Supply Forecast)

Key Drivers of Supply Forecast

Upward Pressures

- A small reduction in bulk exports to Severn Trent
- A small increase in deployable output from the Slade Heath borehole replacement scheme

Downward Pressures

- A small decrease due to sustainability reductions
- A small decrease due to climate change

Neutral Factors

- Maintenance of current levels of service
- Maintenance of outage levels
- Maintenance of treatment works losses throughout the plan period

The Company's deployable output calculation has been updated following a review of source capacities and operational constraints. The update has incorporated Severn Trent Water's revised modelled River Severn flow and Clywedog Reservoir storage data. The majority of the changes are due to the reassessment of the constraints on the groundwater deployable output figures. These revisions have ensured that the most up to date information has been used in the FWRMP.

The net effect of all the changes is a reduction in dry year annual average deployable output of –18.5 Ml/d (a decrease of 4.6% on the DWRMP figure).

The net effect of the model changes on peak week deployable output is a reduction in peak week deployable output of –13.4 Ml/d (a reduction of 2.9% on the DWRMP figure).

The forecast of water available for use remains relatively flat across the period of the plan. Between 2009 and 2011 there is a small increase (less than 2 Ml/d) due to a reduction in the volume of bulk exports to Severn Trent, and because a replacement borehole at Slade Heath will improve the yield of the source slightly.

The plan includes a small reduction in water available for use in AMP5, resulting from a need to address environmental issues at Checkhill Bogs, Site of Special Scientific Interest. The Environment Agency has advised the Company of the figures for reductions in abstraction which could be expected. The expected reduction of 2Ml/d is less than 1% of water available for use. The Environment Agency has also provided the Company with a list of sites for investigation during AMP5. These are Bourne Brook & Hopwas Hayes Site of Biological Interest, the Sherwood Sandstone aquifer of the Stour and

Smestow Valley, and the Rising Brook. Dependant upon the outcome of the investigations there may be abstraction licence reductions sought in future AMP periods.

The forecast of peak week water available for use also includes a similar increase in 2010/11 due to the reduction in bulk exports to Severn Trent. Sustainability reductions are not applied to peak deployable output.

The impacts of climate change on deployable output have been estimated. A small reduction (less than 1Ml/d) is forecast in the baseline water available for use. The uncertainty around this is included in headroom.

The Company has calculated deployable output using the water resources model WRAPSIM. The modelling is consistent with the Company's current levels of service and these are maintained throughout the plan period. Outage levels and volumes of treatment works losses also remain constant throughout the plan period.

1.4.3 Uncertainty

The key components of uncertainty within the demand and supply forecasts are included in the calculation of headroom. Headroom is an additional planning allowance to provide a buffer against inaccuracies in the forecast of demand and supply. The Company has reviewed all of the components of headroom for the FWRMP and updated several key areas.

For the demand side issues the Company has included uncertainty associated with the main components of demand, uncertainty over data accuracy and uncertainty over climate change impacts. For the FWRMP the demand components have been broken down and examined individually. The FWRMP now includes uncertainty around population, per capita consumption, leakage uncertainty, and the normal to dry year factor.

Uncertainty around housing growth projections have not been included as this would represent a double counting with the population uncertainty. Housing growth projections from the Nathaniel Lichfield scenarios for the West Midlands Regional Spatial Strategy have been used in the demand forecast in the FWRMP, and these represent the scenario with the highest levels of housing growth. It is recognised that the RSS is currently subject to public consultation, and these projections could change, however it is considered unlikely that the RSS housing numbers would increase above the current forecast.

For the supply side the key areas of uncertainty relate to groundwater quality deterioration, uncertainty within the deployable output calculation and climate change uncertainty.

Planning guidance from the Environment Agency is very clear on the uncertainties which can be included within the calculation of headroom. The

guidance explicitly excludes uncertainty for environmental problems which may arise from implementation of the Water Framework Directive, the EA's Catchment Abstraction Management Strategies (CAMS), time-limited licences and other non-statutory drivers. The Environment Agency position on this is that there are mechanisms in place which will ensure that the effects of reductions in licensed abstractions do not impact on a company's water available for use. South Staffordshire Water fundamentally disagrees with this assumption. A large proportion of the groundwater units from which the Company abstracts are classified by the Environment Agency as over-licensed and over-abstracted and are at risk of requiring reductions in abstraction. There is in fact a great deal of uncertainty over how these issues will be addressed in future and the Company believes that this uncertainty should be reflected within headroom.

Nonetheless, the Company has adhered to the Environment Agency guidelines for the calculation of headroom for inclusion in the baseline supply demand balance position.

1.4.4 Sensitivity

In the DWRMP the Company included sensitivity analysis to illustrate the potential range and sequence of options that might be required in the event of a supply demand shortfall. The uncertainty associated with future abstraction licence reductions was examined in headroom (components S1-S3). There was no supply demand deficit in the DWRMP and the sensitivity work was purely illustrative.

The baseline supply demand balance continues to show a surplus in the FWRMP therefore the Company has not revisited the sensitivity analysis or the least cost modelling of options. The options and analysis undertaken for the DWRMP are included as appendix I,J and K for reference.

The Company has revisited the uncertainty associated with future abstraction licence reductions, to ensure that the most up to date figures have been used. The uncertainty over catchment scale licence reductions (associated with the CAMS, WFD etc) has been reviewed and updated. This work is included as a sensitivity analysis in headroom (S1-S3), and the results are presented in section 11 to demonstrate the potential significant impacts of future licence reductions.

The Company has not undertaken sensitivity analysis on the two indicative sustainability schemes identified in the Environment Agency's National Environment Progarmme (The River Severn Estuary and the River Mease). The Environment Agency has confirmed that if these schemes are implemented in AMP5 the impact in the Company's abstraction licences would be negligible.

2 BACKGROUND

2.1 Context

DEFRA published the Government's water strategy for England, Future Water, in February 2008. The strategy sets out the Government's plans for water in the future and the practical steps that will be required to ensure that good clean water is available for people, businesses and nature. It looks ahead to 2030 and describes a vision of the water supply system and how this can be achieved. A number of stakeholders have key roles in the delivery of this vision including the water industry, OFWAT, the Environment Agency, the Consumer Council for Water and the Water Saving Group.

DEFRA also published a consultation in 2008 on draft statutory Social and Environmental Guidance to the Water Services Regulation Authority (OFWAT). This provides a steer on the key environmental and social policies the Government expects OFWAT to contribute to in carrying out its role as the independent economic regulator of the water industry. This guidance will be important for OFWAT in the forthcoming periodic review (PR09) which looks specifically at setting price limits for the five year period from 2010 to 2015.

In March 2009 the Environment Agency published a water resources strategy for England and Wales called 'Water For People and the Environment'. The strategy includes actions to improve resilience to climate change, to manage the environmental impacts of abstractions, to ensure the twin track approach of resource development and demand management is followed, and to further promote water efficiency across a range of sectors.

This Final Water Resources Management Plan (FWRMP) sets out the water company's proposals for balancing supply and demand to the year 2034/35. The FWRMP is also the basis for the Supply Demand Balance submission which was delivered to OFWAT as part of the PR09 Final Business Plan. The Company believes that the FWRMP is consistent with the Future Water vision, and the EA water resources strategy, on key areas of policy such as metering, water efficiency, climate change and carbon reduction and it aligns with the OFWAT business plan guidance.

The strategy set out in this plan is consistent with the Company's Strategic Direction Statement that sets out the direction of travel over the next 25 years for key issues. The Strategic Direction Statement was submitted to OFWAT on 14th December 2007 and is included as appendix A. Consultation with customers on the content of the draft Strategic Direction Statement was undertaken through a series of focus groups managed by consultants on behalf of the Company. A summary of customer views and stakeholder feedback is contained within the final Strategic Direction Statement and demonstrates customer support for the Company's proposals.

2.2 Description of South Staffordshire Water

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.

The two principal resources are Blithfield Reservoir (supplying Seedy Mill water treatment works) and the Hampton Loade river abstraction from the River Severn. The Hampton Loade abstraction feeds Chelmarsh Reservoir, which is a bankside storage reservoir, before supplying Hampton Loade water treatment works. These surface water sources provide approximately 50% of the Company's water resources in the critical dry year.

The Company also supplies water from 27 groundwater sources, abstracting from the Sherwood Sandstone aquifer.

The Company has a number of small bulk imports and exports with Severn Trent Water. Further details of the Company's relationship with Severn Trent can be found in section 4.7. Details, including a schematic of locations, of bulk imports and exports can be found in section 5.5.

The Environment Agency has classified the Company's area of supply as moderately water stressed. The classification of water stress is related to the amount of water available per person both now and in the future. The Environment Agency classification of the Company's area is based on data contained within the 2004 Final Water Resources Plan.

2.3 Consultation on the Draft Water Resources Management Plan

Following the Water Act 2003 water resources management plans are now statutory documents which are submitted to the Secretary of State (DEFRA).

The Draft Water Resources Plan (DWRMP) was published in May 2008 and this was followed by a period of consultation which ended on 25th August 2008. During this time representations on the draft plan were sent to the Secretary of State who then passed on these comments to the Company.

The Company made all of its customers aware of the preparation of the DWRMP and the consultation period via Waterline, the information leaflet sent to all customers with annual bills. The Company also presented the draft plan to a meeting of its Customer Consultative Committee (CCC) and to the Consumer Council for Water (CCWater) as these are the main bodies representing customer interests. The DWRMP was also presented by the Company and discussed at a PR09 Quadripartite meeting where OFWAT, Drinking Water Inspectorate (DWI), Environment Agency, Natural England and CCWater were in attendance.

In addition, copies of the draft plan were sent to all the statutory consultees, as specified by government legislation. These included, the Environment Agency, OFWAT, CCWater, Natural England, local authorities and other key stakeholders. The full DWRMP was published on the Company's website for all to access.

In total 8 responses were received during the consultation period, from the following organisations;

- The Environment Agency
- OFWAT
- English Nature
- The Consumer Council For Water
- WATERWISE
- The South Staffordshire Water Customer Consultative Committee
- The East Midlands Regional Assembly
- The Woodland Trust

The Company believes this relatively low number of responses reflects the fact that it has not imposed a hosepipe ban since 1976 and has a proven track record of managing its assets well. A significant proportion of all comments were made by the Environment Agency, Natural England and OFWAT.

The Company was pleased to see that there were a number of positive comments of support within the responses. Generally, these comments supported the Company's Strategic Direction Statement and the core values of the 3 Cs (customers, carbon and costs).

On February 2nd 2009 South Staffordshire Water published a response to the comments received, demonstrating how comments from the consultation have been taken into account and how the Company has amended the FWRMP as a result. This Statement of Response is presented as Appendix N.

The Company has also made a number of other amendments to the FWRMP since the publication of the draft. These amendments reflect the changing economic climate and regulatory reporting updates. The Statement of Response also includes a summary of those additional changes which are included in the FWRMP.

The Statement of Response was been reviewed by DEFRA who have subsequently given the Company approval to publish this FWRMP.

The Company has complied with all of the Directions issued by DEFRA regarding the content of the plan. These Directions are detailed in Appendix M, along with an description of how the plan has complied with their requirements.

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 can confirm that the content complies with the DEFRA guidance[4] on matters of national security. As a result of this the entire plan is presented in this document.

2.4 Strategic Environmental Assessment Directive

As a direct result of water resources management plans becoming statutory requirements it is now possible that such plans may require strategic environmental assessment (SEA) in accordance with the SEA Directive[5].

4 The Control of Sensitive Water Company Information. Advice Note 11 (DEFRA Nov 2006)

5 Directive 2001/42/EC of the European Parliament and of the Council of the European Union of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment.

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 dependant 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.

SEA must therefore be undertaken at the same time as the development of a water resources management plan and be integrated into the development of the plan.

For South Staffs Water there is no deficit in the supply demand balance throughout the plan period and therefore the Company does not believe that SEA is necessary as options are not being selected. However, at the time of preparing the DWRMP the Company decided to take a precautionary approach and undertake an SEA in case there were to be a supply demand deficit once the DWRMP was completed. The SEA was published on the Company's website and sent to the statutory stakeholders for comment.

The FWRMP continues to show a surplus of supply over demand, and as a result the Company has not revised the SEA, because options for the plan are not required. Nevertheless experience of the process for preparation of SEA has been gained and this will be valuable for future water resource management plans. A summary of the DWRMP SEA process and the results of the SEA are included in Appendix L.

2.5 Document Structure

This submission has been prepared in line with the Environment Agency Water Resources Planning Guideline (November 2008). Commentary on the key components of the supply demand balance is set out in part 1, sections 3-11 and completed tables and line commentaries in part 2. Supporting technical documents can be found in the appendices.

3 COMPANY POLICIES INCLUDING LEVELS OF SERVICE

There are a number of key policies that underpin the Company's Final Water Resources Management Plan. Each of these is described in the following sections.

3.1 Carbon Strategy

Climate change is recognised as the greatest environmental challenge facing the world today with carbon emissions identified as one of the key causes. South Staffs Water recognises the commitment of the UK government to tackle climate change and reduce carbon emissions by 26% from 1990 levels by the year 2020 and 60% by 2050. This is effectively a target reduction of 2% per year from 2008 until 2020.

In preparing for adaption to the future potential volatile weather patterns the Company has used the best available information to estimate the impacts on both demand and availability of water in the future. These best estimates are used in the supply-demand forecasts in accordance with reporting guidance. In addition to this, uncertainty around the best estimates is included in the calculation of headroom.

Following development of the Company's approach to cost benefit analysis for proposed investment for PR09 and consideration of feedback from OFWAT on the Company's carbon appraisal in the Draft Business Plan (DBP) and the DWRMP the Company has updated its approach to carbon appraisal. The Company remains committed to adopting carbon efficient strategies consistent with its 3 Cs core values and its Strategic Direction Statement. However, the Company recognises that carbon targets should not be the only drivers for investment. The Company's Final Business Plan (FBP) and FWRMP are underpinned by cost benefit analysis and by customer views. Carbon is a key component of the environmental and social aspects of cost benefit analysis and is therefore integrated throughout the plan and is not considered in isolation.

The Company's carbon reduction strategy includes three main areas:

- First, the Company will further extend its very successful energy management programme and undertake works to further improve overall pumping and energy efficiency.
- Secondly, the Company will undertake a business review of options to change it's principal infrastructure, possibly through the construction of trunk mains and a low level service reservoir. Investigation works will be undertaken in AMP5 and if the business case for such investment and the engineering logistics are both positive, implementation would begin as early as possible.

- Thirdly, the Company's proposed change of occupier metering programme and the continuation of the optional metering programme will reduce the volumes of water the Company treats and pumps on a daily basis.

Each of the above schemes has been assessed using cost benefit analysis as part of the FBP submission. All have been proven to be cost beneficial when all quantifiable costs and benefits have been included. The whole life benefits accruing from carbon reductions as a result of the pumping efficiency programme and the metering programme are amongst the highest of all proposed investment schemes included in the FBP for AMP5.

Consultation with customers on the Company's Strategic Direction Statement has shown that customers agree that tackling carbon is a priority and that they are willing to pay more to achieve this. The willingness to pay research, carried out on behalf of the Company, demonstrates that customers assign a value of £2.05 (out of a total of £3.60) on average on their current bill to improving the environment. This area was one of the highest priorities for customers. This WtP has been used within the cost benefit analysis undertaken to support the Company's FBP.

3.2 Water Framework Directive

The Water Framework Directive (WFD) is the most substantial piece of EC water legislation to date and is designed to improve and integrate the way water bodies are managed throughout Europe. In the UK, much of the implementation work will be undertaken by competent authorities. It came into force on 22 December 2000, and was put into UK law (transposed) in 2003. Member States must aim to reach good chemical and ecological status in inland and coastal waters by 2015.

The Directive is an all-encompassing piece of legislation with the specific aims to:

- enhance the status and prevent further deterioration of aquatic ecosystems and associated wetlands, which depend on the aquatic ecosystems
- promote the sustainable use of water
- reduce pollution of water, especially by 'priority' and 'priority hazardous' substances (see Daughter Directives)
- ensure progressive reduction of groundwater pollution

The WFD will be implemented through River Basin Management Plans (RBMP's), South Staffs Water being covered by two River Basin Districts (the Severn and the Humber). The first drafts of the River Basin Management

Plans were published in December 2008, and have been subject to a period of public consultation. The bulk of the programme of measures in the first round of river basin planning (2009-2015) is related to improving water quality and do not directly affect the Company, however the Company has included 3 investigation schemes in the PR09 FBP and FWRMP which have WFD drivers.

There is currently a great deal of activity by regulators, Government and businesses to fully understand the impacts likely to result from implementation of the Directive.

The Company is committed to keeping abreast of developments and the pace of implementation and will do all it can within the regulatory constraints to ensure that it complies with requirements.

At this point in time the Company has not planned for any abstraction licence reductions that may arise from the WFD in future. The Environment Agency has instructed water companies not to allow for potential future licence reductions from the WFD in their FWRMP's.

3.3 Levels of Service

South Staffordshire Water is proud of its record of not imposing a hosepipe ban or any other form of restriction for many years. Despite the drought conditions experienced in 1995, the Company has not imposed a hosepipe ban since the record drought on the River Severn in 1976.

The Company's planned level of service for hosepipe bans is determined by water resources modelling of the historic climate, with current supply availability and demand profile assumptions. The planned frequency of hosepipe ban restrictions is determined by the modelled frequency that reservoir storage at Blithfield falls below the Implement Hosepipe Ban trigger curve at the reservoir. The Company's water resources modelling of deployable output and levels of service has been updated for the FWRMP (as described in section 5.2), however the planned level of service for hosepipe bans remains unchanged at one in every 40 years (on average).

The South Staffordshire Water Drought Plan (2007) identifies that the Company would consider implementation of a ban on non-essential use if Blithfield Reservoir storage levels fell below the Implement Hosepipe Ban 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. Therefore the application for a drought order would be made 1-2 weeks before the hosepipe ban trigger was reached, and it would be implemented 2-3 weeks after a hosepipe ban. 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. For this reason a level of service of 1 in 80 years has been defined for a non-essential use ban.

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 a hosepipe ban or a non-essential use ban. The Company accepts that there is a small risk of these restrictions being implemented, but we believe that customers do not accept that they are a legitimate tool for managing demand. The Company will do all it can to avoid the need for the imposition of a hosepipe ban or a non-essential use ban.

The Company's planned level of service of one hosepipe 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 flat across the 25 year planning period and so predicted (or 'actual') levels of service will remain unchanged at one hosepipe ban in every 40 years.

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

3.4 Metering

The Company currently has a relatively low proportion of metered household customers (20% of billed properties compared to an industry average of 30%). In the 2004 WRMP the forecast for metering was also low as there were no drivers for additional metering. By the end of the plan period (2030) the Company forecast only around 35% penetration which would have been the lowest meter penetration of any water company in England and Wales compared to an average of between 70% and 80%.

The Company has had in place for a number of years a range of policies relating to metering. These include:

- Sprinkler metering policy – domestic customers wishing to use unattended garden watering devices must be metered.
- Free meter policy – domestic and commercial 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.

- Compulsory metering of all non-household properties.

The Company proposes to continue with the above metering polices. In addition, since AMP4 the Company has developed its position on metering based on the view that metering is the fairest method of charging. Greater meter penetration will enable more effective development and implementation of sophisticated tariffs, e.g. seasonal tariffs, and will enable the demonstration to customers of the value of water through price signals. This will also assist with the control and management of future peak demands and areas of supply stress. The Company also believes that there is a growing need to move away from the rateable value charging system for unmeasured households.

In order to address these requirements and at the same time maintain the impact on customer bills at manageable levels the Company believes that steps must be taken in AMP5 to proactively increase the rate of growth in meter penetration. The Company has identified that the introduction of change of occupier metering will assist with managing the growth in meter penetration. In the Company's experience the rates of optional metering can not be greatly influenced by the Company and therefore can not be relied on to deliver growth in meter penetration rates. Modest implementation of change of occupier metering in AMP5 will off-set a need for more rapid metering growth in subsequent periodic reviews.

The Company commenced the phased introduction of change of occupier metering in June 2008. This is an opportunistic metering policy under the powers of the 2003 Water Act. During 2008/9 and 2009/10 the Company aimed to compulsorily meter 500 domestic properties each year upon notification of change of occupier. Due to the effect the economic downturn has had on the housing market it is now forecast that around 250 properties will be metered upon change of occupier in 2008/9. The implementation area was extended Companywide in January 2009 with the intention of achieving the targeted 500 properties in 2009/10.

The phased introduction of the policy will enable all necessary system and process changes to be identified and addressed prior to full-scale implementation from 2010/11. The Company has taken advice from other water companies who currently operate a similar policy and has consulted with the Consumer Council for Water, OFWAT and the Environment Agency.

The target of 25,000 properties for the AMP5 period that was included in the DWRMP has been reduced to 15,500 for the FWRMP. This revised target reflects the impact of the continuing economic downturn and the practical difficulties of securing the higher number of properties to meter. The forecast number of billed change of occupier properties by 2034/35 is 106,136.

Cost benefit analysis of the proposed change of occupier metering programme has been undertaken for the FBP. The Company has considered the wider benefits of metering in its analysis as suggested by OFWAT in its feedback to the Company on its DBP submission. The results of the analysis

demonstrate that the proposed programme is cost beneficial and supports the Company's business case. The CBA includes the benefits from a reduction in demand which translates into a reduction in energy used and a reduction in carbon footprint, thus contributing to the Company's carbon reduction strategy.

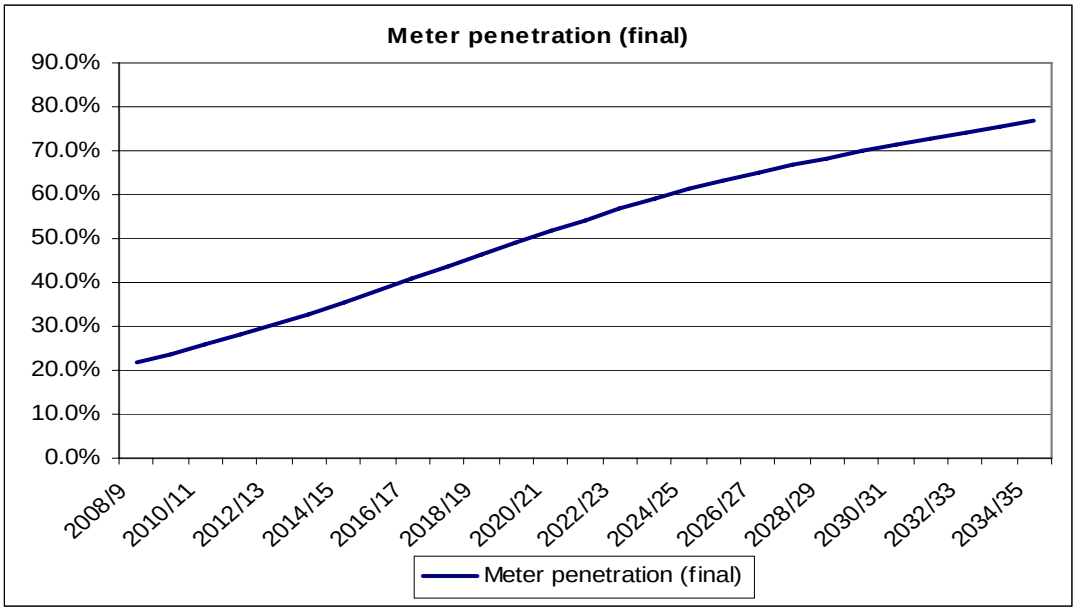
The introduction of the change of occupier metering policy was included in the Company's Charges Scheme for 2007/8 and OFWAT welcomed this policy in their letter to the Company dated December 2006. Approval of the charges scheme was given in February 2008. The Company's approach to metering in the future is also fully compatible with the Environment Agency position statement on household water metering. The Environment Agency calls for a number of actions on metering:

- water metering to form the basis of charging for water in future;
- the vigorous promotion of optional and change of occupier metering;
- the introduction of structured tariffs;
- the use of intelligent metering.

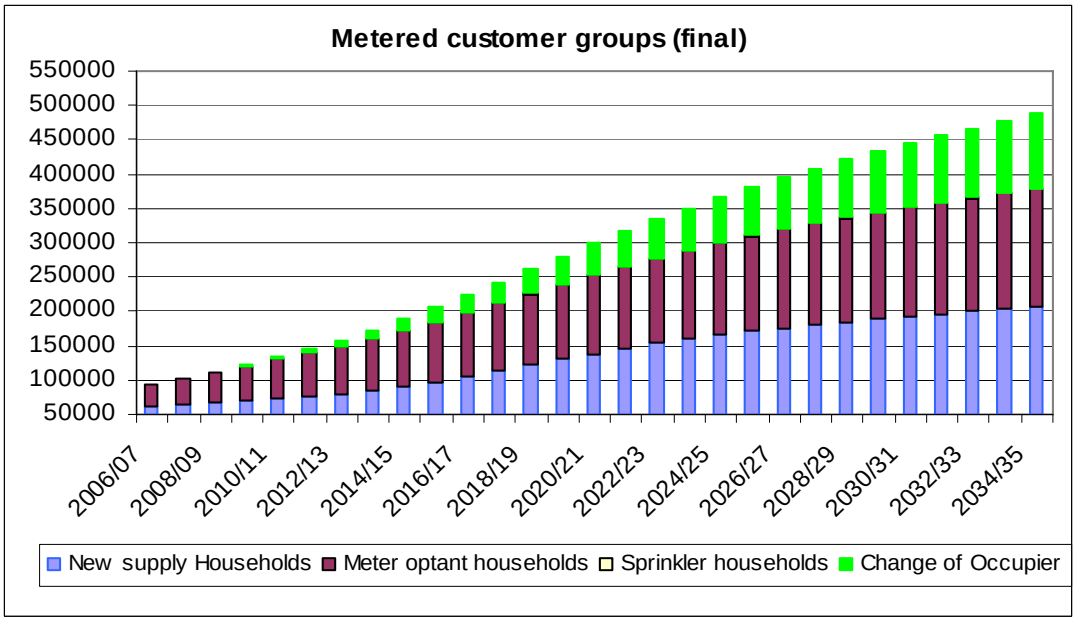
The Company's customer research has shown that paying by a meter is generally accepted as being the most equitable and the fairest method of charging because it has economic and environmental benefits. However, there is also some resistance to more widespread metering because of the possible financial implications for some customers e.g. vulnerable customers or low income, large families. Those customers against having a water meter installed did however recognise it is inevitable that one day they would need to pay by metered charges.

The Company is mindful of concerns for vulnerable customers relating to affordability issues as a result of increased metering. The Company will continue to engage in the debates on these issues and will work with Consumer Council for Water to ensure appropriate protection is provided through the right mechanisms.

The collective metering policies will result in meter penetration rising from 20% in the base year up to 35% by the end of AMP5. The increasing meter penetration is reflected in the total number of measured households at the end of the AMP5 period which rises from just over 100,000 in 2007/8 to approximately 184,000. The following graph shows the forecast growth in meter penetration up to 2034/35.



The following graph illustrates how meter penetration growth will be made up of the different categories of measured household property.



The Company plans to provide free water saving cistern displacement devices (e.g. hippo bags and /or save-a-flush bags) at the time of meter installation to all households metered under the change of occupier meter policy, sprinkler meter policy and free meter optant policy. Delivery of cistern displacement devices by the meter installer is the most cost effective means of distribution and provides the customer with an opportunity to save on water bills. These devices will not be provided to new connections as all new properties will have low flush cisterns installed during construction.

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 plans to increase the rate of meter replacements from 2010/11. The proposed meter replacement programme is based on a study undertaken by consultant Tynemarch on behalf of the Company. This programme will result in an improvement in meter under-registration levels. The Company has applied MUR of 6.02% for measured non-households in 2008/9 falling to 5.79% by the end of AMP5. MUR for measured households is 4.94% in 2008/9 falling to 3.82% by the end of AMP5.

The Company plans, subject to funding, to start to install intelligent meters in all new installations and all replacements from 2010/11. The new intelligent meter technology will facilitate the development and implementation of new tariff structures. Intelligent meters will also allow customers access to better information regarding their water use and can encourage households to use water more efficiently. Through a combination of better information and seasonal tariffs intelligent metering can help manage demand.

Any reduction in demand will also translate into a reduction in energy used and a reduction in carbon footprint. This will thus assist with the achievement of carbon reduction targets to be set by the Government.

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. In circumstances where the meter cannot practically be installed externally it will be installed internally if the customer is prepared to pay for any plumbing pipework alterations that may be necessary or for any additional meters that may be required to capture all consumption in the property (e.g. an extra meter may be required to record consumption from a garden tap). If the customer is unwilling to pay for these additional costs then they may be offered an assessed charge as an alternative. 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.

Consideration is being given to moving the location of meter installation from the footpath outside the boundary of the property to just within the boundary on the premises. This will not affect supply pipe leakage but may assist with offsetting future costs from the Traffic Management Act. The Company will continue to review the situation as more information becomes available.

Tariffs

The Company is currently looking at the introduction of new tariff structures. As a first stage, the Company is planning to develop a seasonal tariff for measured households for introduction in AMP5. This will be a simple tariff which customers can easily understand based on a volumetric charge which is 20% higher in summer than winter. The Company's reservation charge for large users already includes a seasonal element. The Company believes the benefits of a seasonal tariff are as follows:

- A higher charge in the summer months allows customers to recognise the value of water i.e. it is more expensive to supply water in the summer when more expensive sources are used. The higher cost of providing water is recovered from those who use it and it is therefore fairer.
- A higher summer charge is linked to supply stress problems and is designed to discourage customers from using excessive volumes of water for non-essential uses such as garden watering.

For a seasonal tariff to be effective the price differential between winter and summer charges may need to be relatively large. This may be resisted by OFWAT and customer groups. However, as already stated, the Company is mindful of concerns for vulnerable customers and will work with the relevant parties to ensure appropriate protection is provided. Overall with flat demand customer bills should not be any more expensive over the course of the year. Only customers with high discretionary use in summer should pay more.

If customers do not respond to the seasonal tariff then the Company may look to develop alternative tariffs such as rising block in future.

3.5 Water Efficiency

During the Company's customer consultation exercise water conservation and efficient use of water was seen by customers to be one of the most important areas to focus on. Customers thought that greater promotion, information and awareness is needed in this area.

The Government's Future Water strategy document placed significant importance on water efficiency and the wider benefits of its promotion in terms of contribution to carbon reduction. DEFRA guidance to OFWAT[6] focuses on the benefits of cistern displacement devices and water butts for domestic customers and the need to promote water efficiency within the industrial and commercial sectors. Hot water efficiency is also highlighted as a key area for focus where there can be wider benefits from the reduction in water used and the reduction in energy to both pump the water and heat it. Future Water also

[6] Consultation on draft statutory Social and Environmental Guidance to the Water Services Regulation Authority (OFWAT)

commits to greater integration on key messages to customers on the economic and environmental benefits of water efficiency.

The Company agrees that water conservation issues are of high importance and crossover with other areas such as protecting the environment and reducing its carbon footprint.

The Company currently undertakes a wide range of water efficiency activities consistent with its supply-demand position and in accordance with the OFWAT Good Practice Register. The current range of activities will be continued and includes:

- Provision of cistern devices on request to customers.
- Promotion of water butts.
- Provision of household self-audit information.
- Provision of non-household self-audit information.
- Provision of water efficiency advice during Water Regulations inspections.
- Water saving tips and information on the Company website.
- Promotion and enforcement of sprinkler metering policy.
- Water efficiency information advertised in appropriate press.

The Company proposes to seek opportunities to work with local authorities and housing associations to identify opportunities for mutual benefit. The Company will take every opportunity to work with the Consumer Council for Water, Waterwise and the Water Saving Group to develop and deliver effective messages for customers. The Company proposes to explore a number of opportunities through small scale trials in 2009/10 and will conclude the detail of its ongoing water efficiency strategy for implementation in 2010/11. Innovation in water efficiency is evolving and the Company's strategy is expected to change over time as new ideas come to the fore.

The Company has included the OFWAT water efficiency targets in the baseline demand forecasts for the period 2009/10 to 2014/15 (0.53Ml/d per year). Demand savings have been included in both the non-household demand forecasts (0.38Ml/d) and the household demand forecasts (0.15Ml/d). Household demand savings have been assumed to be achieved through the provision of free cistern devices to properties when metered on change of occupier and when optional meters are installed in addition to the activities listed above. For the household demand savings a profile has been used to reflect the asset life of the devices to be used to derive the savings. Therefore, activity has been included for six years but the resulting demand savings are profiled over a period of 15 years.

The impact of these new water efficiency changes is to include an additional component of demand reduction, compared to the DBP. This has no material impact on the overall supply demand balance, which remains in surplus throughout the period.

The Company's baseline demand forecasts also have an inbuilt element of water efficiency within them. The micro-component analysis for per capita consumption includes reducing volumes of water used by household appliances across the period. The Company believes technology will develop so that washing machines for example, will be designed to use smaller volumes of water without compromising performance. Customer attitudes will change such that water efficient appliances will be selected as the norm. The Company believes that its water efficiency activity will help to educate customers so they can make informed decisions when purchasing new appliances. The savings accruing from this activity are an integral part of the per capita forecasts and cannot be separated out.

The Company's normal year demand forecast includes reducing per capita consumption demonstrating that the use of water by customers is expected to become more efficient over time. DEFRA's aspiration for 130 l/head/d per capita consumption by 2030 is achieved in the Company's demand forecasts.

3.6 Leakage

3.6.1 Supply Pipe Leakage

The Company's policy on free supply pipe repairs remains unchanged and continues to be supported by the Company's freephone leakline and provides free supply repairs that meet the following criteria:

- Private domestic customers only (Local Authorities, Housing Associations and other tenanted properties are excluded).
- External underground leaks only (internal leaks or leaks under a building or other permanent structure are excluded).
- First repairs only.

Customers can opt for a supply pipe replacement and the Company will subsidise the cost of the replacement to the value of the average supply pipe repair.

The Company has adopted the new UKWIR methodology[7] for assessing supply pipe leakage allowances. The revised estimates were adopted in the annual June Return submission to OFWAT in 2008 and have therefore been used in the demand forecasts from 2007/8 for the FWRMP.

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

The Company was an original subscriber to the Supply Pipe Leakage Collaborative Research project which comprised 12 other companies who provided supply pipe leakage data to Tynemarch for analysis and for completion of the methodology document. The resulting supply pipe leakage estimates for 2007/8 were 30.80 l/prop/d for internally metered and unmeasured properties and 21.66 l/prop/d for externally metered properties. This compares to 45 l/prop/d and 26 l/prop/d respectively reported in previous June Returns and the 2004 WRMP.

These 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.

The forecasts for supply pipe leakage reflect the switching of unmeasured properties to metered i.e. a reduction in supply pipe leakage allowance from 30.80l/prop/d to 21.66 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 21.66l/prop/d reflecting the Company's policy to install meters externally.

Overall total supply pipe leakage is forecast to rise slightly across the plan period. This is because the growth in new connections and the additional supply pipe leakage which will result from these properties outweighs the reduction in supply pipe leakage due to metering of existing properties. Average supply pipe leakage allowances per measured or unmeasured property remain unchanged throughout the forecast period.

3.6.2 Economic Level of Leakage

The Company policy is to manage leakage at the economic level. The sustainable economic level of leakage (SELL) appraisal has been updated to take account of new developments and information since the submission of the DWRMP and DBP. This has been undertaken in accordance with industry best practice as set out in the Tripartite Report[8], updated to take account of Ofwat's latest position as reported in RD02/08[9] and the application of environmental and social costs and benefits[10]. The analysis used the latest available leakage management cost and performance data, and the marginal cost of water production from 2007/08.

As a result it is considered that the Company has fully complied with the PR09 requirements for establishing future economic leakage targets.

[8] Best Practice Principles in the Economic Level of Leakage Calculation, March 2002; produced by WRc on behalf of Ofwat, EA and DEFRA (Tripartite Group)

[9] RD 16/08, Review of leakage target setting, August 2008; Ofwat

[10] Providing Best Practice Guidance on the Inclusion of Externalities in the ELL Calculation, November 2007; produced by RPS Water on behalf of Ofwat

The Company's leakage reporting methodology has also been updated since the DWRMP and DBP to reflect the latest information on the hour-day factor (HDF) used to convert night leakage into average leakage levels. This has resulted in an apparent increase in leakage levels; however this is the result of a data revision rather than a real increase in leakage. The overall water into supply remains unchanged, with the increase in reported leakage simply being the result of a reduction in previously assessed consumption, following application of the statistical process used to combine the top-down integrated flow water balance and the bottom-up night flow leakage assessments.

This results in a change to the 2007/08 total leakage level reported in JR08:

- Reported leakage level, using HDF of 22.0 = 71.54 Ml/d
- Revised leakage level, using HDF of 23.5 = 73.24 Ml/d

The increase in HDF has resulted in an apparent increase in leakage of 1.7 Ml/d.

Overall there has been an increase in the robustness of the assessed level of leakage, as a result of the replacement of the previously used industry default figure for the hour-day factor by a Company specific value.

The resulting SELL has been assessed as being in line with the current level of leakage, equal to 74.4 Ml/d, based on a normalised base year, to remove undue influence of weather events. This result is below the AMP4 target of 75.0 Ml/d.

Although the proposed SELL target of 74.4 Ml/d appears greater than the DWRMP proposal of 73.9 Ml/d (and 73 Ml/d in the Statement of Response) this is not the case as the new target has been assessed using a revised HDF. The new target is effectively lower as this would be equivalent to approximately 72.7 Ml/d, using the same HDF as used in the DWRMP.

The results of this analysis are in line with the Company's long term Strategic Direction Statement, and are considered to be in accordance with both Ofwat and the Company's objective of establishing a long term sustainable economic level of leakage, that takes account of both internal as well as external environmental and social costs and benefits. As part of this analysis the Company has taken account of customer preferences and willingness to pay research.

3.6.3 Leakage Management

Based on the latest SELL appraisal the Company's AMP5 leakage management strategy is to maintain current levels of leakage.

Along side this requirement is the need to continue undertaking works to maintain long term efficiency, which in turn could result in lower future SELL assessments; overcoming the current restriction to economic leakage reductions due to the relatively high transitional costs compared to the low operating cost benefits that would materialise.

This will result in increased knowledge, particularly with the development of a more robust understanding of trunk main leakage, as there is currently a high level of uncertainty in this area.

In addition to these activities, it has also been identified that the Company is at risk of a growth in the natural rate of rise (NRR) of leakage, which will make it more difficult to achieve the assessed SELL in the future than currently assumed. Maintaining long term efficiency will therefore be required to help mitigate this issue, and is to be addressed as part of the AMP5 strategy.

This approach is considered to be in line with the Company's long term Strategic Direction Statement as well as customer expectation, which would ultimately prefer to see lower levels of leakage.

In summary, the Company's AMP5 strategy will be supported by:

- Extended and enhanced coverage of network operational metering to improve assessment and location of trunk main leakage.
- Improvements to the current DMA structure to support maintenance of long term efficiency of leakage identification on distribution mains and services.
- Additional pressure management on a localised cost effective basis, to counter the effects of asset deterioration / natural rate of rise of leakage.
- Further development of the mains renewal targeting processes to maximise the leakage reduction benefits while targeting mains and service renewals to maintain infrastructure asset serviceability.
- Improvements to the leakage monitoring and activity targeting processes.
- Further developments to support more effective leakage detection staff, including focused training, introduction of apprentices, and development of improved performance incentive schemes for both direct and contract staff.
- Further investigation, and appropriate adoption, of new technology.
- Capital maintenance of the existing leakage management infrastructure to support effective future operational activities.

As part of the business planning process, investigations into the costs and benefits of increased levels of mains renewals, specifically targeted at leakage reduction, have been undertaken. However because of the current supply / demand balance economics there is no driver for this in AMP5. The

only mains renewals included in AMP5 are to maintain stable serviceability, specifically driven by managing the burst rate.

4 PLAN CONTENT AND DEVELOPMENT

There are a number of issues relating to the underlying assumptions and development of the Company's Final Water Resources Management Plan which are detailed in the following sections.

4.1 Planning Period

This plan covers the period 2006/7 to 2034/35. The year 2007/8 is the base year for the Final Water Resources Management Plan. Actual data for the base year has been normalised to remove year on year climatic variation. Actual data for 2006/7 are included for reference. The base year is consistent with the Final Business Plan submitted to OFWAT. OFWAT will use 2008/9 as the base year for efficiency modelling, however it is anticipated that the difference between the base years will be small and therefore the implications of the inconsistency will be minimal.

4.2 Single Resource Zone

The Company has agreed with the Environment Agency that the Company is a single resource zone. A map of the Company's area of supply is included in section 2.2. The figure in section 5.5.2 shows bulk supplies and the Hampton Loade transfer.

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, Hampton Loade (River Severn) and Seedy Mill (Blithfield Reservoir) and 27 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 of mains, service reservoirs and boosters has been developed over time to provide security of supply to all customers. This has been achieved by the linking of the Company's five 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. Approximately 85% of the Company's resources feed directly into one of these five strategic service reservoirs for further distribution throughout the area of supply.

The Company has the ability to transfer water from the Hampton Loade works, which is situated outside the supply area at the south-west corner, through the supply system to Burton upon Trent, a large demand center in the north east of the supply area. This is achieved by transferring water through the strategic reservoir system. Water transfers from the Sedgley Beacon Reservoirs, which receive Hampton Loade water, through 45" mains towards Barr Beacon Reservoir via West Bromwich Booster. The water then gravitates northwards via a 36" main connecting to Seedy Mill and gravitates through the

Seedy Mill works on its way to Burton on Trent. Supplies to the Uttoxeter area can be fully maintained by controlled gravity flow from Gentleshaw Reservoir, which receives Seedy Mill water, to Uttoxeter town and onward cascade boosting to Stanton, the northern most tip of the Company's area.

Supplies are maintained to the lower level reservoir supply areas, i.e. below the strategic reservoir level, by large interconnections and control valves. For example, the Springsmire Reservoir area has sufficient groundwater source output to meet demand but can be fully supplied from the adjacent strategic Shavers End Reservoir system through connections at Springsmire Reservoir and at Tansy Green.

In a resource shortage situation, the highly interconnected supply system allows the Company to transfer water between service reservoir systems such that supplies can be maintained to all customers through equalising the fall in all service reservoir water storage reservoirs. The Company's water resources model, WRAPSIM, is set up to represent this ability to transfer water throughout the area of supply.

The Company's Hampton Loade Treatment Works is a shared resource with Severn Trent Water. Severn Trent Water is entitled to one third of the original joint licence from the works. The entitlement is abstracted by South Staffordshire Water at Hampton Loade and transferred to Severn Trent Water from the Sedgley Reservoir to meet demand in Wolverhampton.

4.3 Planning Scenarios

In accordance with the Environment Agency Water Resources Planning Guideline the Company uses the normal year annual average and the dry year annual average scenarios for planning purposes and to build up the supply and demand forecasts. The base year data for 2007/8 is normalised to reflect the unusually low demand due to the poor summer period. The detail of this normalisation approach is described in section 6.2.4

However, the Company considers the peak week scenario to be equally important and also produces forecasts for this scenario.

The Company's area of supply is highly dependent on two surface water sources (Blithfield Reservoir and the River Severn at Hampton Loade), and obtains approximately 50% of its water resources from these sources in the critical dry year.

The design of the network system allows for storage reservoir replenishment within a matter of hours. Therefore short periods of peak demands such as hourly or daily can be recovered within a short period of time. However, because of the relatively low storage capacity of the service reservoirs an increase in demand over a period of a week must be met from increasing the output direct from sources. The Company maintains systems and procedures which enable a rapid response to changes in demand.

Very prolonged periods of high demand and reduced supply such as droughts require additional measures and are planned for in the Company's Drought Plan.

For South Staffordshire Water Plc there is no deficit in the supply demand balance under any of the planning scenarios. In the FWRMP both the dry year annual average and the peak week scenarios show a similar surplus of available headroom throughout the planning period.

Supply stress is a localised distribution issue generated in urban areas by many customers wishing to take large volumes of water at around the same time usually for discretionary purposes such as garden watering. The distribution system is not designed to supply such large volumes of water and as a result pressures in the system drop and customers can experience low pressure and occasionally no water. Supply stress 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, still require investment. These issues are not considered within the FWRMP, but where required this investment is included in the Final Business Plan.

4.4 Reconciliation of Data

For the base year the Company derives water balance components using both the Integrated Flow Method and the Minimum Night Flow Method. There is usually a small difference in the sum of the components for the two methods. The Company uses the Maximum Likelihood Estimation (MLE) approach to reconcile the two methodologies and derive the final figures to be reported. The Company follows the guidance in the UKWIR/NRA Demand Forecasting Methodology Main Report (1995) to do the MLE adjustment and has employed this method for a number of years.

In principle the MLE assigns confidence intervals to the measured components of the water balance and redistributes the reconciliation item between those components in proportion to the confidence interval. The reconciliation item has been very small over recent years and therefore the water balance error is very small also. This gives a high level of confidence in the data. The base year reported figures are the results after the application of the MLE reconciliation. The detail of the MLE for the base year is described in section 6.2.3.

4.5 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).

4.5.1 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 8 and the detail of the uncertainty assigned to each source of uncertainty included in headroom is described in appendix C.

The Environment Agency planning guideline states that uncertainty associated with general sustainability reductions can not be included within the estimation of target headroom. The Company has however, undertaken additional modelling of headroom to determine the sensitivity of the estimate to assumptions regarding uncertainty around reductions in abstraction due to the Water Framework Directive and the EA's Catchment Abstraction Management Strategies.

The Company has undertaken two assessments of headroom:

- Headroom requirement as calculated in accordance with the Environment Agency guidance.
- Alternative headroom requirement to account for uncertainties associated with vulnerable surface water and groundwater licences (factors S1-S3 from the headroom methodology) and not allowed for in the Environment Agency guidance.

4.5.2 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.

The Environment Agency have identified both indicative and definite environmental sustainability reductions for the Company, as described in section 5.3. Definitive reductions have been included in the baseline supply demand balance in line with EA planning guidelines. The EA planning guideline also confirms that companies should undertake sensitivity analysis on the indicative figures. This sensitivity testing is described in section 11.

In the DWRMP the Company took a prudent approach and included additional scenarios to demonstrate sensitivity of changes in the supply-demand balance. These scenarios demonstrate how the DWRMP could change if the overall supply-demand position changed by -10Ml/d or -20Ml/d (up to 6% change). This sensitivity analysis was included in the DWRMP to illustrate which schemes would be selected if the FWRMP had a deficit.

Given that the FWRMP continues to show a surplus of available headroom the Company has not repeated these scenarios, nor has it included any of the option appraisal or least cost planning work that was included as sensitivity testing in the DWRMP. The detail of this work for the DWRMP is included in appendices I, J and K.

4.6 Details of Competitors

There are a number of registered licensed undertakers who have made contact with the Company regarding speculative inquiries for supplying water within the Company's area of supply. However, at the time of preparing this plan there are no licensed water undertakers who actually supply water via the South Staffordshire Water supply system. Therefore, account of implications arising from other licensed water undertakers has not been necessary and is not considered further within this plan.

4.7 Severn Trent Water

Severn Trent Water borders South Staffordshire 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 Final Water Resource Management Plans for the two companies. The Company met with Severn Trent Water as part of the preparation of this FWRMP to discuss and agree the following issues.

The Company's Hampton Loade abstraction licence is a shared resource with Severn Trent Water who are entitled to one third of the original joint licence. This entitlement is reflected in the calculation of deployable output for each company. The Company has confirmed with Severn Trent that the way in which this entitlement is modelled by both companies is consistent.

The Company's water resources model used for calculating deployable output, WRAPSIM, does not include a hydrological model of the River Severn catchment. The River Severn inputs to WRAPSIM are taken from the Severn

Trent model Aquator. 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 Staffordshire 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 Hampton Loade resource can be found in appendix D.

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 has met with Severn Trent to agree planning assumptions on the scale of the imports and exports for the planning period. The detail of these arrangements are included in section 5.5. A schematic showing the approximate locations of these is also included in section 5.5.

5 WATER SUPPLY

5.1 Overview

Overview of Water Supply Components

Deployable Output
The Company's deployable output calculation has been updated following a review of source capacities, and to incorporate Severn Trent Water's revised modelled River Severn flow and Clywedog Reservoir storage data.

The total dry year annual average deployable output figure for the FWRMP is 379.9 Ml/d. This compares to a figure of 398.4 Ml/d reported in the DWRMP.

The total peak week deployable output figure for the FWRMP is 448.9 Ml/d. This compares to a figure of 462.3 Ml/d reported in the DWRMP plan.

Sustainability Reductions
The Company has included a sustainability reduction of 2 Ml/d in the plan, this scheme was defined by the Environment Agency.

Outage
The Company has adopted the UKWIR best practice approach to outage.

Dry year outage has been modelled at 10.9 Ml/d, with peak week at 7.1 Ml/d

Bulk Supplies
Bulk exports total 1.4 Ml/d to Severn Trent Water, reducing to 0.5 Ml/d in 2009/10.

Bulk imports from Severn Trent Water total 0.1 Ml/d

Treatment Works Losses
Treatment works losses have been reassessed following detailed site audits at Hampton Loade and Chilcote.

Dry year losses have been calculated at 16.3 Ml/d, with peak week losses at 20 Ml/d

5.2 Deployable Output

5.2.1 Background

The Company uses a water resources modelling package called WRAPSIM, to calculate deployable output. The use of the water resources model follows the industry best practice approach, as outlined in:

- Reassessment of water company yields (Environment Agency, 1997);
- Surface water yield assessment (NRA, 1995);
- A unified methodology for the determination of deployable output from water sources (UKWIR and Environment Agency, 2000);

The model calculates the water resources that would be available to the Company, given a repeat of the climatic conditions of the last 83 years (1921-2004). The hydrological constraints (simulated river flows and reservoir inflows) are modelled in combination with abstraction licence, infrastructure and asset constraints, given a range of demands. One of the key benefits of using a water resource model is that it enables the conjunctive use benefits of the Company's resource system to be examined.

The Company has a single resource zone and reports both a dry year annual average and peak week deployable output using the model.

5.2.2 Key Components of the WRAPSIM Model

The WRAPSIM model is a mass balance water resources model, comprising interconnected components. These include source nodes, (such as reservoirs, river intakes and groundwater sources), transmission links (trunk mains and booster stations), and demand centres. Individual parameters define the behaviour of each component.

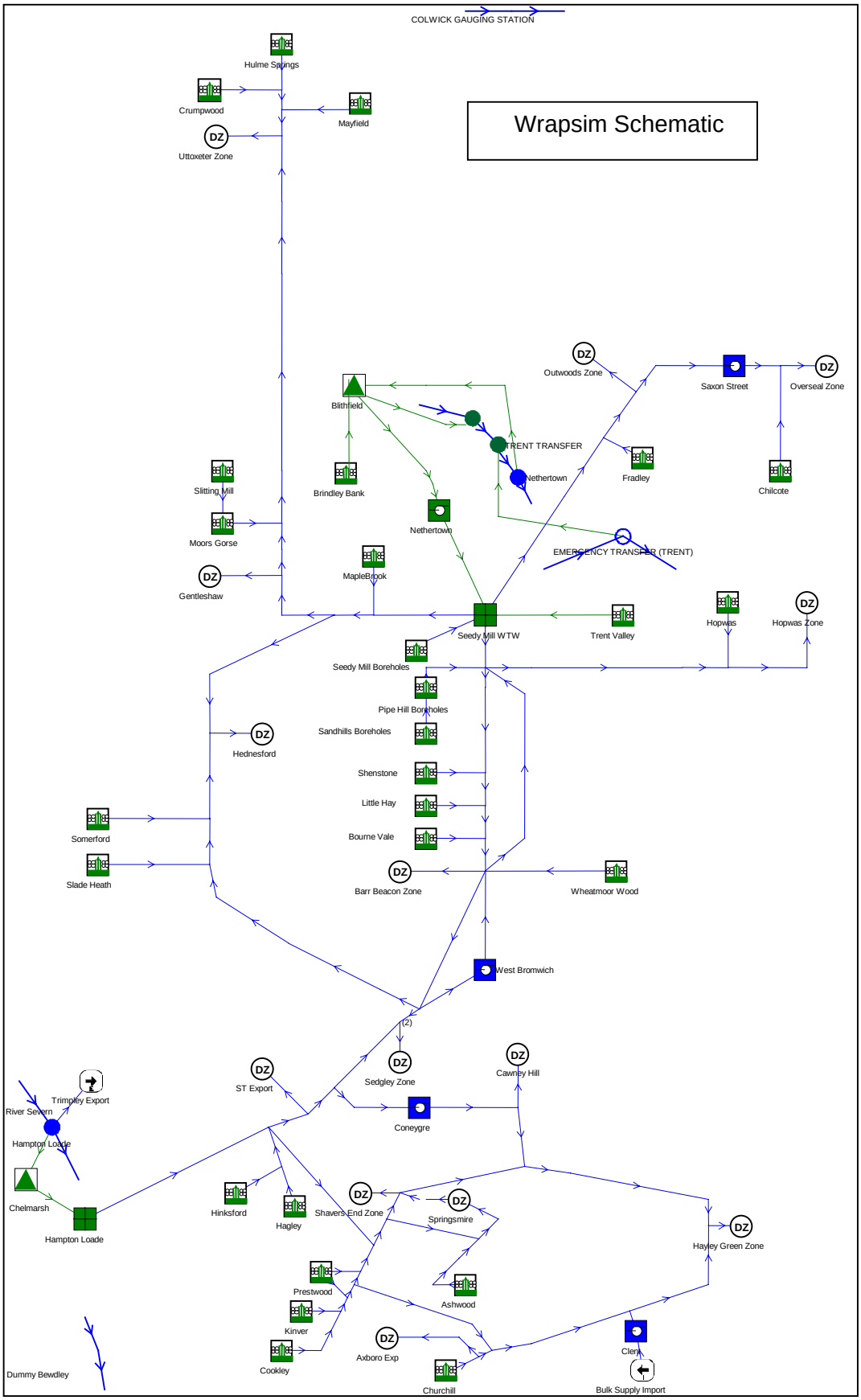
The schematic shown on the following page, illustrates how the Company's water resources system has been represented in WRAPSIM.

The two principal resources are Blithfield Reservoir (supplying Seedy Mill water treatment works) and the Hampton Loade river abstraction from the River Severn. The Hampton Loade abstraction feeds Chelmarsh Reservoir, which is a bankside storage reservoir, before supplying Hampton Loade water treatment works. These surface water sources provide approximately 50% of the Company's water resources in the critical dry year.

There are 27 groundwater sources in the model, which typically supply directly into the supply network. These sources provide approximately 50% of the Company's water resources in the critical dry year.

There are 12 demand nodes in the model, which reflect South Staffs' main water supply zones, fed mainly from service reservoirs of the same name. The key export to Severn Trent into Wolverhampton is also modelled as a demand.

The company's water supply network is flexible: water from Hampton Loade can be pumped northwards to Barr Beacon service reservoir and beyond, or water from Seedy Mill can gravitate in the opposite direction into the Sedgley supply zone. West Bromwich booster is a key component in the network, helping to push Hampton Loade water further north when required.


Wrapsim Schematic
COLWICK GAUGING STATION
Hulme Springs
Crumpwood
Mayfield
DZ
Uttoxeter Zone
Outwoods Zone
Saxon Street
Overseal Zone
Blithfield
TRENT TRANSFER
Nethertown
Fradley
Chilcote
Slitting Mill
Brindley Bank
Nethertown
Moors Gorse
EMERGENCY TRANSFER (TRENT)
Gentleshaw
MapleBrook
Hopwas
Hopwas Zone
Seedy Mill WTW
Trent Valley
Seedy Mill Boreholes
Pipe Hill Boreholes
Sandhills Boreholes
Hednesford
Shenstone
Little Hay
Somerford
Bourne Vale
Slade Heath
Barr Beacon Zone
Wheatmoor Wood
West Bromwich
(2)
Sedgley Zone
Cawney Hill
ST Export
Trimpley Export
River Severn
Coneygre
Hampton Loade
Chelmarsh
Hinksford
Hagley
Shavers End Zone
Springsmire
Hayley Green Zone
Hampton Loade
Prestwood
Ashwood
Kinver
Axboro Exp
Clent
Cookley
Churchill
Bulk Supply Import
Dummy Bewdley

5.2.3 Model Updates Since PR04

Since the PR04 plan the Company has continued to update and improve the model. ENTEC were commissioned to undertake a number of WRAPSIM model developments and related tasks in order to improve the estimation of deployable output. This model development and analysis was undertaken as part of the 2006/7 revision to the Company's Drought Plan, and this work has continued as part of the preparations for the DWRMP and the FWRMP.

The key improvements to the model between PR04 and the DWRMP are summarised below:-

- The Environment Agency revised its control rules for managing a drought order on the River Severn, and these changes were incorporated into the Company's WRAPSIM model.
- The drought trigger curves at Blithfield Reservoir were revised and improved. These changes were derived and implemented as part of the Company's Drought Plan (2007).
- The model structure was updated to reflect operational changes since 2004.
- The inflow sequence for Blithfield Reservoir was updated and improved.
- A more representative simulation of the Nethertown and the Trent abstractions was included.
- The groundwater deployable output constraints in the model were updated.
- The model included the agreement with Severn Trent Water for the transfer of 20 Ml/d of abstraction licence from Hampton Loade to Trimpley.
- Treatment works losses were removed from the model and they were reported in the relevant water resources planning table.

Each of these model improvements is described in more detail in appendix D (Deployable Output Modelling Report)

5.2.4 Model Updates Between the PR09 DWRMP and FWRMP

The following additional updates have been made between the 2008 Draft Water Resources Management Plan and the 2009 Final Water Resources Management Plan. Further details are provided in appendix D (the relevant sections of appendix D are identified in brackets):-

- Minor changes to the groundwater deployable output figures, following a review of operational practice in 2008 (section 7 of appendix D)
- Inclusion in the model of the changes to the deployable output at Hagley and Trent Valley sources, these changes were included arithmetically in the DWRMP due to time constraints (section 7 of appendix D)
- The deployable output of Sandhills source has been reduced to 0 (section 7 of appendix D)
- Minor changes to the treatment works capacity at Hampton Loade, following a review of operation in 2008 (section 13 of appendix D)
- Use of Severn Trent Water's revised (FWRMP) modelled River Severn flow and Clywedog Reservoir storage data (section 13 of appendix D)

5.2.5 Dry Year Annual Average Deployable Output

The updates and improvements to WRAPSIM have resulted in both positive and negative impacts on modelled resource availability. The majority of the changes are due to the reassessment of the constraints on the groundwater deployable output figures. These revisions have ensured that the most up to date information has been used in the FWRMP.

The net effect of all the changes is a reduction in dry year annual average deployable output of –18.5 Ml/d (a decrease of 4.6% on the DWRMP figure).

The total dry year annual average deployable output figure for the FWRMP is 379.9 Ml/d (420.9 Ml/d if the export to Severn Trent Water is included). This compares to a figure of 398.4 Ml/d reported in the DWRMP (439.1 Ml/d including the export to Severn Trent Water).

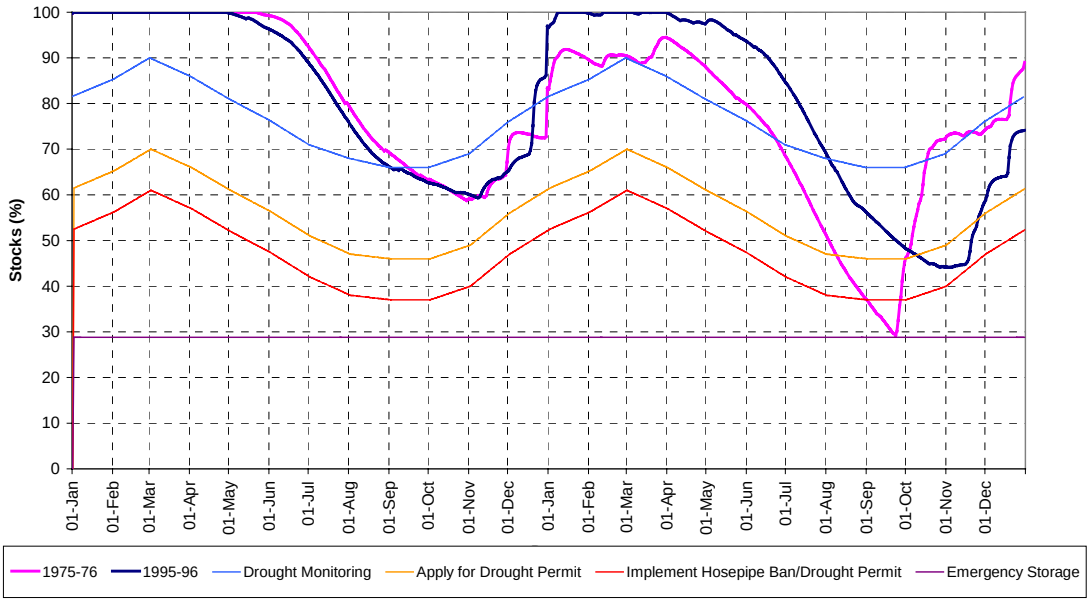
5.2.6 Levels of Service

The Company has not had a hosepipe ban or any other form of supply restriction since 1976. The Company's planned level of service for hosepipe bans is determined by water resources modelling of the historic climate, with current supply availability and demand profile assumptions.

The planned frequency of hosepipe ban restrictions is determined by the modelled frequency that reservoir storage at Blithfield falls below the Implement Hosepipe Ban trigger curve at the reservoir. The Company's water resources modelling of deployable output and levels of service has been updated for the FWRMP however the planned level of service for hosepipe bans remains unchanged at one in every 40 years.

The plot of simulated Blithfield Reservoir storage shown below illustrates the two years in the 83 year record which have been used to define the return period of 1 in 40 years.

Figure A10 Blithfield Reservoir Storage Simulation for Key Drought Years



Although the simulated storage for 1995-6 does not quite cut the implement hosepipe ban trigger, previous sensitivity analysis has shown that this can occur under similar scenarios. For this reason a 1 in 40 year return period for hosepipe bans is believed to be a prudent level of service.

The South Staffordshire Water Drought Plan (2007) identifies that the Company would consider implementation of a ban on non-essential use if Blithfield Reservoir storage levels fell below the Implement Hosepipe Ban 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. Therefore the application for a drought order would be made 1-2 weeks before the hosepipe ban trigger was reached, and it would be implemented 2-3 weeks after a hosepipe ban. 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. For this reason a level of service of 1 in 80 years has been defined for a non-essential use ban.

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.

The modelling assumptions, and the criteria for defining dry year annual average deployable output are explained in full in appendix D.

5.2.7 Peak Week Deployable Output

Peak week deployable output is calculated from the dry year annual average model run and is equal to the peak week modelled demand.

The net effect of the model changes on peak week deployable output is a reduction in peak week deployable output of –13.4 Ml/d (a reduction of 2.9% on the DWRMP figure).

The total peak week deployable output figure for the FWRMP is 448.9 Ml/d (496.9 if the export to Severn Trent Water is included). This compares to a figure of 462.3 Ml/d reported in the PR09 DWRMP plan (510.3 Ml/d including the export to Severn Trent Water).

The main reasons for the reduction in peak week deployable output are; the change in representation of the 20 Ml/d licence transfer to Trimpley, and the reductions in peak week groundwater deployable output at Sandhills, Hagley and Trent Valley. However, there are a number of other smaller changes which also contribute to the revised figure.

For completeness a comparison of the PR09 and PR04 modelled deployable output is shown in the table below.

	Hampton Loade Assumptions	PR09 FWRMP	PR04 FWRMP	Difference
Dry Year	Model output Including the Hampton Loade transfer to STW	420.9	444.7	-23.8
	STW Transfer	-41	-47.0	+6.0
	Company D.O.	379.9	397.7	-17.8
Peak Week	Model output Including the Hampton Loade transfer to STW	496.9	524.6	-27.7
	STW Transfer	-48.0	-49.8	+1.8
	Company D.O.	448.9	474.8	-25.9

5.3 Reductions in Deployable Output

South Staffs Water is committed to achieving a sustainable abstraction regime, which minimises the impact 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.

For AMP4, the Environment Agency identified one environmental scheme, consisting of investigations into the impact of abstraction on Checkhill Bogs SSSI. The Company is on schedule to meet its AMP4 obligations and complete the investigations and options appraisal for the SSSI in 2009/10.

For AMP5, the EA has identified sites where the Company's abstractions may be impacting on the environment. The Environment Agency wrote to the Company in June 2007 to provide an initial list of schemes, and this list was updated in April 2008, June 2008 and November 2008. The Environment Agency has provided the Company with definite changes to abstraction licences, and also indicative changes. Definite changes have been included in the baseline and final WAFU calculations, indicative changes have not (in line with EA planning guidelines). Sensitivity analysis has been undertaken by including the indicative changes in WAFU (section 11). The EA has also identified where investigations into the impact of abstraction is required.

Four schemes have been identified by the EA for South Staffordshire Water AMP5, 3 of these are investigations and the 4th is a remedial scheme to improve the status of the Checkhill Bogs SSSI. Each scheme is described in more detail below.

5.3.1 A Low Flow Alleviation Scheme at Checkhill Bogs SSSI

Checkhill Bogs SSSI is a 12.3 ha wetland complex along the lower reaches of the Spittle Brook, immediately upstream of its confluence with the Smestow Brook, in South Staffordshire. The SSSI consists of two distinct wet woodland areas consisting of alderwood and oakwood, separated by an old mill pond. The Checkhill Bogs SSSI is described as being in an unfavourable condition due to reduced surface water flows and a lowered groundwater table.

The investigations undertaken by the Environment Agency and South Staffs Water suggest that the nearby groundwater abstractions at Ashwood are likely to have caused a lowering of groundwater levels beneath the SSSI, although there is no direct evidence to confirm this. Groundwater modelling scenarios suggest that restoration of the groundwater levels beneath the SSSI will require excessively large reductions in abstraction. Therefore the most appropriate option at this stage is considered to be a compensation borehole

scheme. A nominal 2 Ml/d scheme has been included in the Final Water Resources Management Plan, with a commissioning date of 2014-15.

A 2 Ml/d reduction in abstraction licence (and deployable output) in the vicinity of Checkhill Bogs SSSI has been identified by the EA to enable this scheme to be licensed, and this reduction has been included within the FWRMP at the end of AMP5.

Given the Company's reported surplus in Water Available for Use there is no requirement for a scheme to replace the 2 Ml/d that will be given up for Checkhill. The Environment Agency has confirmed that the local engineering scheme to restore flows in Checkhill Bogs scheme will be funded through the abstraction licence compensation route, not through the periodic review process.

5.3.2 Investigations into Bourne Brook and Hopwas Hayes SSSI

The Bourne Brook and the Hopwas Hayes Site of Biological Importance (SOBI) are located to the north of Birmingham, between Sutton Coldfield and Lichfield. The Environment Agency and Natural England have identified that great crested newt and grass snake habitats at Hopwas Hayes are drying out and the population of these species has been affected. The Environment Agency believes that the site may be affected by South Staffordshire Water's public water supply abstractions from the Lichfield and Shenstone aquifers. The Bourne Brook also flows across these aquifers which are classified as over-abstracted by the Environment Agency in their Catchment Abstraction Management Strategy (CAMS). The Environment Agency is also concerned that habitats in the brook are being affected by the Company's abstractions. The Company has included an investigation programme in its Final Business Plan for PR09. The aim of the investigation is to establish the extent to which public supply abstraction has affected the ecology of the site.

5.3.3 Investigations into the Worcester Middle Severn Triassic Sandstone

The Environment Agency's Worcester Middle Severn CAMS has identified that the groundwater units to the west of Birmingham, in the Stour Valley, are over abstracted. Both South Staffs Water and Severn Trent Water operate significant groundwater abstractions for public supply in this area. The impact of these groundwater abstractions has also been highlighted in the draft Water Framework Directive water body status. The Environment Agency believe that this may be impacting on the ecological status of the water body. The Company has included an investigation programme in its Final Business Plan for PR09. This investigation will be undertaken jointly with Severn Trent Water who also have abstractions within this aquifer. The aim of the investigation is to establish the extent to which public supply abstraction has affected the ecology of water features on the sandstone aquifer.

5.3.4 Investigations into the Rising Brook

The Rising Brook is a non designated tributary of the River Trent situated near Rugeley. There are two South Staffordshire Water public water supply groundwater abstractions located close to the brook and the EA are concerned that habitats in the brook are being affected by the Company's abstractions. The aim of the investigation is to establish the extent to which public supply abstraction has affected the ecology of the Rising Brook.

5.3.5 AMP5 Uncertain Schemes

The Environment Agency has also identified that abstraction licence reductions may be required to address 2 other sites, the River Mease (Special Area of Conservation) and the River Severn Estuary (Special Area of Conservation). The EA have not been able to specify requirements yet, but may do so in future. The EA's expectation is that if these 'uncertain' schemes are required then the Company will reduce abstraction licences in AMP5. These potential schemes have been described in more detail, and considered as a sensitivity in section 11.

The Company will consider the delivery of these schemes if and when they are clarified by the EA, subject to the appropriate funding. If these schemes require opex expenditure then this cannot be logged up, and so their delivery may be delayed until funding can be agreed for AMP6.

5.3.6 Future Sustainability Reductions Beyond AMP5

The Company is aware that there will be increasing pressure on water resources in the future. These pressures have been identified within the Environment Agency's recent Catchment Abstraction Management Strategies, and the ongoing implementation of the Water Framework Directive.

The Environment Agency's water resources planning guidelines state that the uncertainty over the implementation of the Water Framework Directive should not be considered within Company water resources plans. However, a large proportion of the groundwater units from which the Company abstracts are classified by the Environment Agency as over-licenced or over-abstracted and are at risk of requiring reductions in abstraction. The Company believes that there is a great deal of uncertainty over how these issues will be addressed in future and that this uncertainty should be reflected within the plan. As a result the Company has undertaken additional modelling scenarios to examine this potential impact. This sensitivity assessment is described in section 11 of the plan.

5.4 Outage

5.4.1 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)[11], and it has taken account of subsequent improvements to the methodology. The methodology and the key improvements have been described in detail by Mott MacDonald in appendix E (Outage Assessment), and the main elements 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 passed to Mott MacDonald for processing in the outage model.

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.

Mott MacDonald then used 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 Company must then decide what level of uncertainty it is prepared to plan for 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).

5.4.2 Outage Data

The Company has continued to use the outage assessment that was undertaken for the Draft Water Resources Management Plan. There have been no material changes to data, assumptions or methodology.

The Company's outage assessment is based on 5 years of actual data, for the period 2001–2006. 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.

[11] Based on Sir William Halcrow & Partners Ltd, Outage Allowances for Water Resources Planning, WRP-0001/b (1995)

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:-

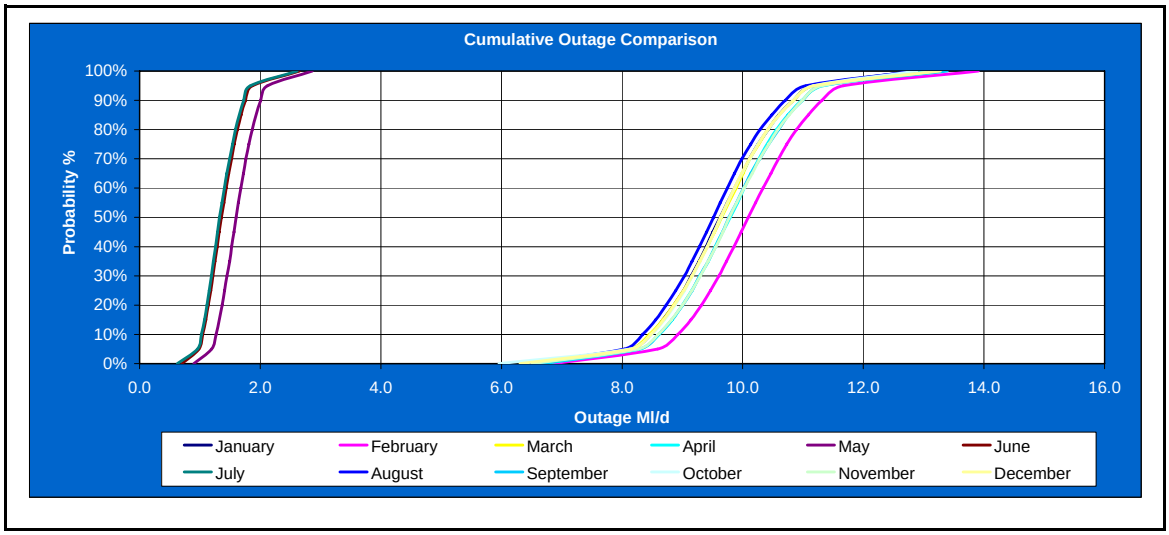
- Power Failure
- Pollution of Source
- Flooding
- Turbidity
- Algae
- Planned Work

The source specific outage data used in the analysis is listed in appendix E (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.

5.4.3 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 E) as a graph of cumulative outage uncertainty by month.

Cumulative Outage Comparison



Critical percentile 95%

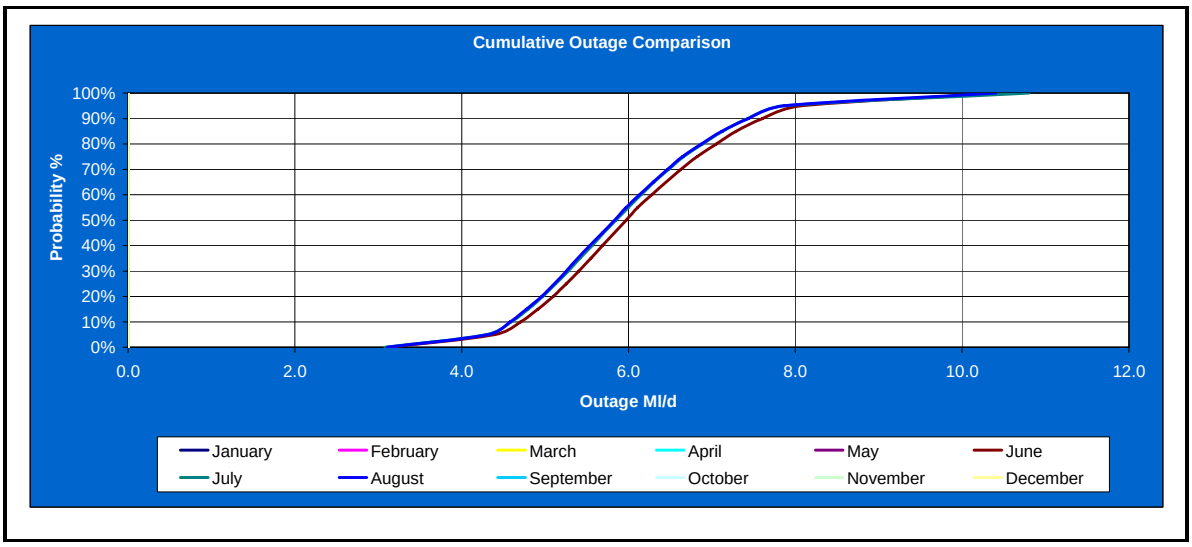
Allowable Outage and Planning Allowances (Ml/d)

Deciles	January	February	March	April	May	June	July	August	September	October	November	December
0%	6.547	6.854	6.517	6.691	0.901	0.702	0.626	6.361	6.621	5.958	6.508	6.308
5%	8.143	8.589	8.123	8.285	1.193	0.983	0.959	8.036	8.289	8.129	8.268	8.152
10%	8.475	8.922	8.450	8.613	1.268	1.047	1.026	8.341	8.601	8.486	8.595	8.472
15%	8.677	9.141	8.678	8.832	1.321	1.097	1.075	8.555	8.826	8.699	8.818	8.691
20%	8.856	9.315	8.852	9.001	1.370	1.141	1.118	8.730	9.005	8.879	9.000	8.864
25%	9.019	9.465	9.018	9.154	1.410	1.180	1.154	8.891	9.162	9.036	9.156	9.023
30%	9.148	9.605	9.161	9.289	1.448	1.216	1.190	9.037	9.289	9.166	9.298	9.158
35%	9.275	9.729	9.286	9.428	1.493	1.250	1.225	9.160	9.427	9.296	9.425	9.292
40%	9.396	9.856	9.412	9.544	1.526	1.287	1.259	9.283	9.549	9.414	9.555	9.416
45%	9.505	9.974	9.534	9.666	1.566	1.319	1.293	9.401	9.666	9.524	9.671	9.527
50%	9.624	10.093	9.647	9.791	1.603	1.356	1.327	9.516	9.771	9.638	9.778	9.631
55%	9.744	10.213	9.769	9.913	1.639	1.396	1.368	9.628	9.895	9.749	9.898	9.746
60%	9.866	10.338	9.890	10.026	1.680	1.437	1.407	9.747	10.013	9.866	10.023	9.863
65%	9.992	10.466	10.006	10.137	1.720	1.480	1.447	9.863	10.138	9.986	10.157	9.982
70%	10.113	10.596	10.120	10.267	1.764	1.525	1.493	9.987	10.285	10.118	10.281	10.112
75%	10.255	10.731	10.265	10.405	1.812	1.569	1.540	10.133	10.431	10.253	10.432	10.255
80%	10.421	10.894	10.419	10.560	1.868	1.624	1.590	10.287	10.596	10.418	10.580	10.414
85%	10.600	11.087	10.605	10.748	1.930	1.683	1.653	10.485	10.759	10.608	10.770	10.605
90%	10.840	11.314	10.845	10.983	2.008	1.759	1.728	10.708	10.994	10.841	10.992	10.846
95%	11.165	11.663	11.174	11.333	2.120	1.873	1.834	11.045	11.310	11.169	11.311	11.178
100%	12.838	13.908	13.337	13.114	2.865	2.650	2.615	12.862	13.391	12.890	13.188	13.277

Dry Year Annual Average Outage Percentiles

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 10.1 Ml/d and 11.3 Ml/d for a range of certainty between 50% - 90%. The peak week outage varies between 5.9 Ml/d and 7.6 Ml/d for a range of certainty between 50% - 90%.

Cumulative Outage Comparison



Critical percentile 95%

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	3.137	3.082	3.107	0.000	0.000	0.000	0.000
5%	0.000	0.000	0.000	0.000	0.000	4.398	4.299	4.317	0.000	0.000	0.000	0.000
10%	0.000	0.000	0.000	0.000	0.000	4.705	4.593	4.578	0.000	0.000	0.000	0.000
15%	0.000	0.000	0.000	0.000	0.000	4.914	4.798	4.777	0.000	0.000	0.000	0.000
20%	0.000	0.000	0.000	0.000	0.000	5.096	4.973	4.958	0.000	0.000	0.000	0.000
25%	0.000	0.000	0.000	0.000	0.000	5.254	5.126	5.110	0.000	0.000	0.000	0.000
30%	0.000	0.000	0.000	0.000	0.000	5.404	5.278	5.254	0.000	0.000	0.000	0.000
35%	0.000	0.000	0.000	0.000	0.000	5.549	5.420	5.393	0.000	0.000	0.000	0.000
40%	0.000	0.000	0.000	0.000	0.000	5.688	5.564	5.536	0.000	0.000	0.000	0.000
45%	0.000	0.000	0.000	0.000	0.000	5.831	5.702	5.687	0.000	0.000	0.000	0.000
50%	0.000	0.000	0.000	0.000	0.000	5.971	5.848	5.833	0.000	0.000	0.000	0.000
55%	0.000	0.000	0.000	0.000	0.000	6.112	5.997	5.971	0.000	0.000	0.000	0.000
60%	0.000	0.000	0.000	0.000	0.000	6.282	6.153	6.132	0.000	0.000	0.000	0.000
65%	0.000	0.000	0.000	0.000	0.000	6.451	6.306	6.296	0.000	0.000	0.000	0.000
70%	0.000	0.000	0.000	0.000	0.000	6.628	6.479	6.466	0.000	0.000	0.000	0.000
75%	0.000	0.000	0.000	0.000	0.000	6.824	6.662	6.648	0.000	0.000	0.000	0.000
80%	0.000	0.000	0.000	0.000	0.000	7.053	6.891	6.875	0.000	0.000	0.000	0.000
85%	0.000	0.000	0.000	0.000	0.000	7.291	7.130	7.118	0.000	0.000	0.000	0.000
90%	0.000	0.000	0.000	0.000	0.000	7.605	7.428	7.437	0.000	0.000	0.000	0.000
95%	0.000	0.000	0.000	0.000	0.000	8.076	7.873	7.866	0.000	0.000	0.000	0.000
100%	0.000	0.000	0.000	0.000	0.000	10.489	10.803	10.407	0.000	0.000	0.000	0.000

Peak Week Outage Percentiles

5.4.4 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	10.09
60	40	10.34
70	30	10.60
80	20	10.89
90	10	11.31
100	0	13.91

Using the 80% level of certainty produces a dry year average figure for outage of 10.89 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	5.97
60	40	6.28
70	30	6.63
80	20	7.05
90	10	7.61
100	0	10.80

Using the 80% level of certainty produces a peak week figure of 7.05 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 is sufficient maintenance expenditure approved by Ofwat in the PR09 determination to maintain the serviceability of supply assets and to maintain outage levels at current levels. In particular, the Company will be seeking to increase maintenance spend on borehole maintenance. This will assist with the maintenance of outage levels and 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 (2.9% of dry year annual average D.O., and 1.6% 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, (Hampton Loade and Seedy Mill). This is because a significant amount of investment has been put in place to minimise supply interruptions at these treatment works, given that Hampton Loade (which abstracts from the River Severn), and Seedy Mill (the treatment works for Blithfield Reservoir) contribute approximately 50% of the Company's supply. The Hampton Loade abstraction from the River Severn is also supported by storage at 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 (3.7% for peak and 6.1% for dry year annual average).

5.5 Water Transfers and Bulk Supplies

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

5.5.1 The Hampton Loade Transfer to Wolverhampton (STW)

The Company's Hampton Loade abstraction licence is a shared resource with Severn Trent Water who are entitled to one third of the original joint licence. South Staffs Water operate the treatment works at Hampton Loade which pumps treated water up to two service reservoirs at Sedgley. Treated water is transferred to Severn Trent Water up to their licence entitlement, and is used by Severn Trent to supply large parts of Wolverhampton.

Both South Staffs and Severn Trent's entitlement from Hampton Loade is included in the modelled calculation of deployable output for each company. This transfer is within the base deployable output assumptions for each Company, and it is not considered as a bulk supply.

South Staffs Water has met with Severn Trent Water to clarify how each company is assessing the Hampton Loade licence entitlement. South Staffordshire water have assumed that Severn Trent Water could take it's full licence entitlement. This approach is consistent with Environment Agency Planning guidelines for bulk supplies, whereby the maximum entitlement should be assumed.

5.5.2 Bulk Imports and Exports

The Company exports a number of small bulk supplies to Severn Trent and receives a number of very small bulk imports back across the border. The Company has met with Severn Trent to agree planning assumptions on the scale of the imports and exports for the planning period.

The approximate locations of the bulk supplies between South Staffs Water and Severn Trent Water are shown on the map on the following page.

The total available bulk export figure from South Staffs to Severn Trent is 1.35 Ml/d. The majority of these are small bulk exports (<0.5 Ml/d) with the exception of the Brindley Bank transfer to Stafford, upto 0.85 Ml/d. The Brindley Bank export is required by Severn Trent until the treatment works at their Milford groundwater source is fully operational. Severn Trent Water believe this will be in 2009/10 and so the Company's Draft Water Resources Management Plan assumes a drop in exports from 1.35 Ml/d to 0.5 Ml/d in 2009-10. The dry year and peak week figure for exports then remains constant at 0.5 Ml/d until the end of the planning period.

The total available bulk imports from Seven Trent Water has been confirmed as 0.1 Ml/d. This is made up of a number of very small imports. The dry year

and peak week figure for imports remains constant at 0.1 Ml/d until the end of the planning period.

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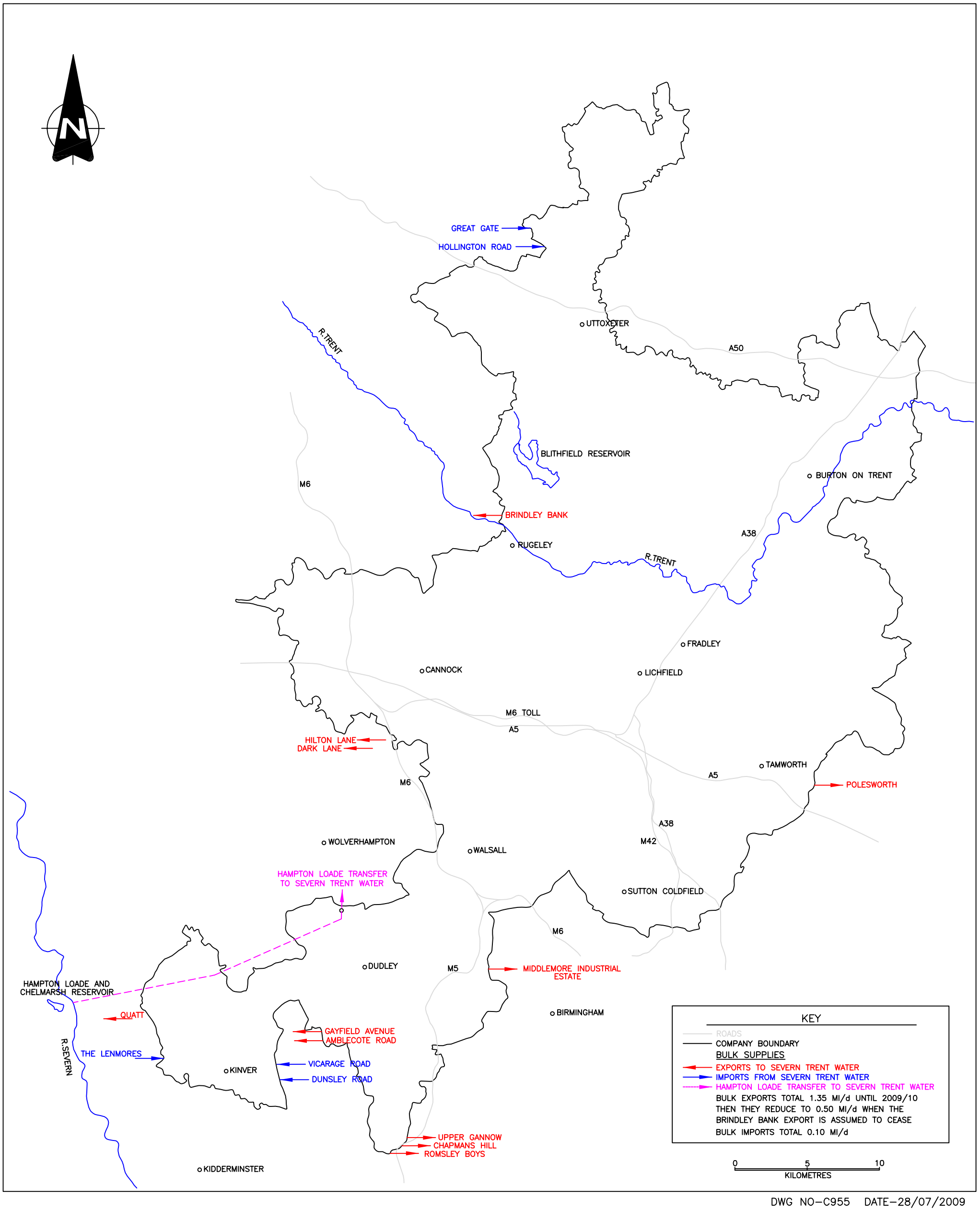
SOUTH STAFFORDSHIRE
WATER PLC

FINAL WATER RESOURCES MANAGEMENT PLAN
BULK SUPPLY LOCATIONS



DWG NO–C955 DATE–28/07/2009

5.5.3 Raw Water Transfers

The Company neither imports or exports raw water to or from Severn Trent Water.

5.6 Treatment Works Losses

5.6.1 Background

Treatment works losses are defined in the Environment Agency's Water Resources Planning Guidelines (April 2007) as the ' the sum of structural water loss and both continuous and intermittent overflows' [at water treatment works].

A total Company figure for treatment works losses of 8.74 Ml/d was reported in the 2004 Water Resources Management Plan, and these losses were taken into account within the Company's modelled deployable output assessment.[12] The PR04 figure was based on estimated losses at Hampton Loade treatment works (River Severn), Seedy Mill treatment works (Blithfield Reservoir), and the Company's groundwater sources. The approach taken for PR09 has involved detailed site audits and represents a significant improvement in the assessment of losses. The increase in the losses figure is a reflection that the previous estimates were too low, but also as a result of a significant change in operation, as filter backwash water is no longer returned to the head of treatment works, in order to comply with new cryptosporidium treatment guidelines. This water is now discharged to waste.

The Company has reported a figure for raw water losses of 0 Ml/d. These losses are included within the assessment of treatment works losses.

5.6.2 PR09 Approach

A detailed review of treatment works losses was initiated in the run up to the DWRMP and this has continued up to the FWRMP submission. The aim of the review was to identify and where possible, measure actual treatment works losses on site.

Results are now available for the Company's largest treatment works at Hampton Loade (River Severn) and Seedy Mill (Blithfield Reservoir). These two sources account for over 50% of the deployable output of the Company, and 90% of the treatment works losses. The review has included a survey of all possible loss points on site, and measurement, calculation or estimation of individual components where possible.

[12] South Staffordshire Water – Reassessment of Deployable Output (Modelling Report) June 2003 (Entec UK Ltd)

The Company has 9 groundwater sources with treatment works and these are also being reviewed. The review at Chilcote works has been completed and the treatment works losses revised slightly as a result.

It is not appropriate to apply the % losses from Chilcote to the other groundwater treatment works, as there are quite different processes at each site. The PR04 estimates have been retained for the other sites, until audits are completed. The losses from groundwater sources are small (c. 2 Ml/d in total), and any variation around this that may result from completion of the audits will not have a material impact on the supply demand balance.

Treatment works losses have been removed from WRAPSIM and are no longer included within the Company's deployable output figure. Losses are now reported explicitly on Table WRP1 (row 4).

5.6.3 Dry Year Assumptions

The dry year losses are summarised on the following table:-

Source	SW/GW	Dry Year TWL (Ml/d)	Comments
Hampton Loade	SW	11.92	Surveyed
Seedy Mill	SW	2.60	Calculated
Chilcote	GW	0.09	Surveyed
Crumpwood	GW	0.04	R04 estimate
Fradley	GW	0.30	PR04 estimate
Little Hay	GW	0.10	PR04 estimate
Moors Gorse	GW	0.03	PR04 estimate
Pipe Hill	GW	0.67	PR04 estimate
Shenstone	GW	0.23	PR04 estimate
Slade Heath	GW	0.02	PR04 estimate
Slitting Mill	GW	0.20	PR04 estimate
		16.2	**Ml/d**

Percentage treatment works losses at Hampton Loade have been calculated following the on-site survey and review of data. The breakdown of losses is shown below, based on an average abstraction rate of 167 Ml/d during the period of measurement.

Components	Losses (Ml/d)	Audit Process
Band screen losses	0.523	Measured flow
Main discharge flow meter	6.233	Measured flow
Losses from plant outages and grid calls	2.191	Calculated frequency, duration and rate estimates.
Bearing water flow	0.432	Calculated from a continuous flow rate estimate
Sample/monitor water losses	0.388	Measured flows
Clear water tank losses	0.0002	Calculated from a duration and a volume estimate
Total	**9.77**	

The losses at Hampton Loade are equivalent to 5.9% of average abstraction over the audit period.

In order to ensure consistency with the Final Water Resources Management Plan, the % losses have been applied to the modelled dry year annual average deployable output for Hampton Loade (203.1 Ml/d) from WRAPSIM, giving a dry year losses figure of 11.9 Ml/d.

Percentage treatment works losses at Seedy Mill have been calculated following the on-site survey and review of data. The breakdown of losses is shown below, based on an average abstraction rate of 67 Ml/d during the period of measurement.

Components	Losses (Ml/d)	Audit Process
Sludge losses	0.017	Volume calculation
Pumping to Waste	0.757	Measured flow
Filter Backwash	1.52	Measured Flow
Supernatant Waste Water	1.695	Measured Flow
Sample/monitor water losses	0.529	Measured flows
Accelator Leakage	0.125	Estimated Flow
Total	**4.6**	

The losses at Seedy Mill are equivalent to 6.8% of average abstraction over the audit period.

In order to ensure consistency with the Final Water Resources Management Plan, the % losses have been applied to the modelled dry year annual

average deployable output of Seedy Mill (38.2 Ml/d) from WRAPSIM, giving a dry year losses figure of 2.6 Ml/d.

The treatment works losses figure for Chilcote (1.3%) has been derived from the site audit, and is based on the recent average abstraction rate (6 Ml/d). The % figure has then been applied to the deployable output of 7 Ml/d, giving a dry year average losses figure of 0.09 Ml/d.

The remaining groundwater figures are estimated, and are the same figures used in the PR04 submission and the DWRMP. However these volumes are very small compared to the losses from Hampton Loade and Seedy Mill treatment works and any changes in these figures are unlikely to have any material effect on the supply/demand balance position. The total dry year annual average treatment works losses is 16.2 Ml/d.

5.6.4 Peak Week Assumptions

The peak week losses are summarised in the following table.

Source	SW/GW	Peak Week TWL (Ml/d)	Comments
Hampton Loade	SW	12.74	Surveyed
Seedy Mill	SW	6.27	Calculated
Chilcote	GW	0.09	Surveyed
Crumpwood	GW	0.04	R04 estimate
Fradley	GW	0.30	PR04 estimate
Little Hay	GW	0.10	PR04 estimate
Moors Gorse	GW	0.03	PR04 estimate
Pipe Hill	GW	0.67	PR04 estimate
Shenstone	GW	0.23	PR04 estimate
Slade Heath	GW	0.02	PR04 estimate
Slitting Mill	GW	0.20	PR04 estimate
		20.7	**Ml/d**

Treatment works losses under peak week conditions have been calculated in the same way as for the dry year annual average scenario. In this case the percentage losses for Hampton Loade (5.9%) have been applied to the modelled peak week deployable output for Hampton Loade (216.0 Ml/d) and Seedy Mill treatment works (92.2Ml/d).

Treatment works losses for groundwater sources are assumed to be the same for peak week as for dry year annual average (1.68 Ml/d).

The total figure for peak week treatment works losses is 20.7 Ml/d.

6 WATER DEMAND

Overview of Water Demand Components

Household consumption
A small increase in household demand is forecast over the 25 year planning period. This will be the net effect of negative and positive pressures such as:

- An increased house building programme under the Regional Spatial Strategy and urban regeneration
- Decreasing household occupancy levels
- Climate Change impacts
- Implementation of the Code for Sustainable Housing
- Metering policies
- Lower water using household appliances

Non-household consumption
The demand forecasts are influenced largely by the non-household demand forecasts. Consultant, Deloitte has been engaged to develop an econometric model to forecast demand by non-household sector. A significant drop in demand has been seen in 2008/9 and a further small decline is forecast for 2009/10. Demand is forecast to remain relatively stable across the AMP5 period at this lower base followed by modest growth over the remainder of the 25 year period.

Metering Strategy
The Company is forecasting growth in domestic meter penetration through the following metering policies:

- Implementation of the change of occupier metering policy. However, numbers have been reduced to 15,500 for the AMP5 period compared to 40,000 in the Draft Water Resources Management Plan (DWRMP).
- Selective metering of domestic customers using unattended garden watering devices (sprinkler metering)
- Compulsorily metering of all new properties
- Continuation of the free meter option policy for domestic customers. However numbers have been reduced to 30,500 in AMP5 compared to 40,000 in the DWRMP.

Meter penetration (excluding voids) will rise from the current position of 20% to 35% by 2014/15 and 77% by 2034/35. The Company will install intelligent meters for new installations and replacements to facilitate the development of tariffs.

The Company's metering proposals help deliver DEFRA's aspiration for per capita consumption to fall to 130 l/person/day by 2030.

Overview of Water Demand Components

Water Efficiency
The Company has included the new OFWAT target for water efficiency of 0.53Ml/d as a saving in the baseline demand forecast. Activity will be targeted at domestic customers at the time of meter installation (excluding new connections) and through water audits offered to non-household customers.

Leakage
The sustainable economic level of leakage (SELL) appraisal has been updated to take account of new developments and information since the submission of the DWRMP and DBP. This has been undertaken in accordance with industry best practice, and includes the application of environmental and social costs and benefits. The analysis used the latest available leakage management cost and performance data, and the marginal cost of water production from 2007/08.

The Company's leakage reporting methodology has also been updated to reflect the latest information on hour-day factor (HDF) used to convert night leakage into average leakage levels. This has resulted in an apparent increase in leakage levels, but this is due to data improvements rather than an increase in actual leakage.

The resulting SELL, used for establishing the AMP5 target, has been assessed as being in line with current levels, equal to 74.4 Ml/d, based on a normalised base year, to remove the undue influence of weather events. This result is below the AMP4 target of 75.0 Ml/d.

6.1 Overview

6.1.1 Summary of the Demand Forecast

The Company's demand forecasts for the next 25 years were developed for the DWRMP submitted to DEFRA in March 2008 and subsequently revised for the DBP in August 2008. These demand forecasts have been further revised for the FBP and FWRMP primarily to reflect the development of the recent economic downturn and to address comments received from OFWAT and others on the DBP and the DWRMP. Details of the changes to the demand forecasts are described in section 6.1.3 below. All the revisions since the DBP have resulted in a reduction in the overall demand forecast.

In accordance with OFWAT and Environment Agency guidance, the Company has presented a baseline demand forecast with total leakage at the current OFWAT target level for the Company and excluding change of occupier metering. The Company's final demand forecast includes leakage at the current SELL, based on a normalised base year, and the impacts of change of occupier metering.

Overall the normal year demand forecasts are predicted to fall from 2008/9 across the AMP5 period. In 2015/16 a small recovery is forecast and demand continues to rise slightly up until 2026/27. After this point demand declines marginally until the end of the planning period. At the end of the 25 year period demand has returned approximately to current levels (99% of 2007/8 demand).

The overall trend of the demand forecast is influenced largely by the non-household demand forecasts. The Company engaged Consultant, Deloitte, to assist with forecasting non-household demand. A model has been produced to forecast demand by non-household sector. Local knowledge relevant to a few of the modelled sectors has been incorporated into the modelled results.

Overall non household demand shows a significant drop in demand in 2008/9 and a further small decline is forecast for 2009/10. This is attributed to the current economic downturn. Demand is forecast to remain relatively stable across the AMP5 period at this lower base followed by a modest recovery across the remainder of the planning period to 2034/35. Within this profile there is a continued reduction in the manufacturing and industrial sectors with a corresponding rise in demand in the service sector.

The non-household demand forecasts include a proportion of the new OFWAT water efficiency target (0.38Ml/d of the 0.53Ml/d target is assigned to non-household demand reductions).

The Company has reviewed its forecasts of new connections taking account of the latest information from the Nathaniel Lichfield scenarios for the West Midlands Regional Spatial Strategy. Growth will be focussed in the urban regeneration of the Black Country and in Burton-upon-Trent which has been designated as a growth point. However, the Company now believes that the combined effects of the worsening economic downturn and the delay in the publication of the Final Regional Spatial Strategy will mean a much slower start to implementation. Build rates at around 75% of the historic annual average are forecast for the first two years of AMP5 with a recovery to average rates in 2012/13 and an uplift in the last two years. Full implementation of the RSS is forecast in AMP6.

The demand forecasts include anticipated improvements in the efficiency of household water using appliances and therefore the consumption of water per person and per household includes integral efficiencies. This will be supported by the adoption of the Code for Sustainable Homes in all new housing developments.

The Company has also included a proportion of the new OFWAT water efficiency target in household demand (0.15Ml/d of the 0.53Ml/d target). As a result there will be a counterbalancing effect against the pressures of increasing numbers of households and increasing population and reducing household size. Household demand is forecast to decline marginally over the

AMP5 period (-1.2%) and then rise by 1.7% over the AMP6 period. Over the 25 year planning period household demand rises by less than 2%.

The Company commenced the phased implementation of change of occupier metering in June 2008. The final demand forecast includes assumed savings due to metering effects for change of occupier metering. These savings have been based on industry research as detailed in the UKWIR report, 'The Impact of Household Metering on Consumption' (2004). The continuation of the Company's other existing metering policies and the introduction of the change of occupier metering programme will mean that meter penetration is forecast to reach around 35% by the end of AMP5 and 77% by 2034/35.

The sustainable economic level of leakage (SELL) appraisal has been updated to take account of new developments and information since the submission of the DWRMP and the DBP. This has been undertaken in accordance with industry best practice as set out in Tripartite Report[13], updated to take account of Ofwat's latest position as reported in RD16/08[14] and the application of environmental and social costs and benefits[15]. The analysis used the latest available leakage management cost and performance data, and the marginal cost of water production from 2007/08.

The Company's leakage reporting methodology has also been updated since the DWRMP and DBP to reflect the latest information on the hour-day factor used to convert night leakage into average leakage levels. This has resulted in an apparent increase in leakage levels; however this is the result of a data revision rather than a real increase in leakage. The overall water into supply remains unchanged, with the increase in reported leakage simply resulting in a reduction in previously assessed consumption levels. Overall there has been an increase in the robustness of the assessed level of leakage, as a result of the replacement of a previously used industry default figure for the hour-day factor by a Company specific value.

The resulting SELL has been assessed as being in line with current leakage levels, equal to 74.4 Ml/d, based on a normalised base year, to remove the undue influence of weather events. This result is below the AMP4 target of 75.0 Ml/d.

Although the proposed SELL target of 74.4 Ml/d appears greater than the DWRMP proposal of 73.9 Ml/d (and 73 Ml/d in the Statement of Response) this is not the case as the new target has been assessed using a revised HDF. The new target is effectively lower as this would be equivalent to approximately 72.7 Ml/d, using the same HDF as used in the DWRMP.

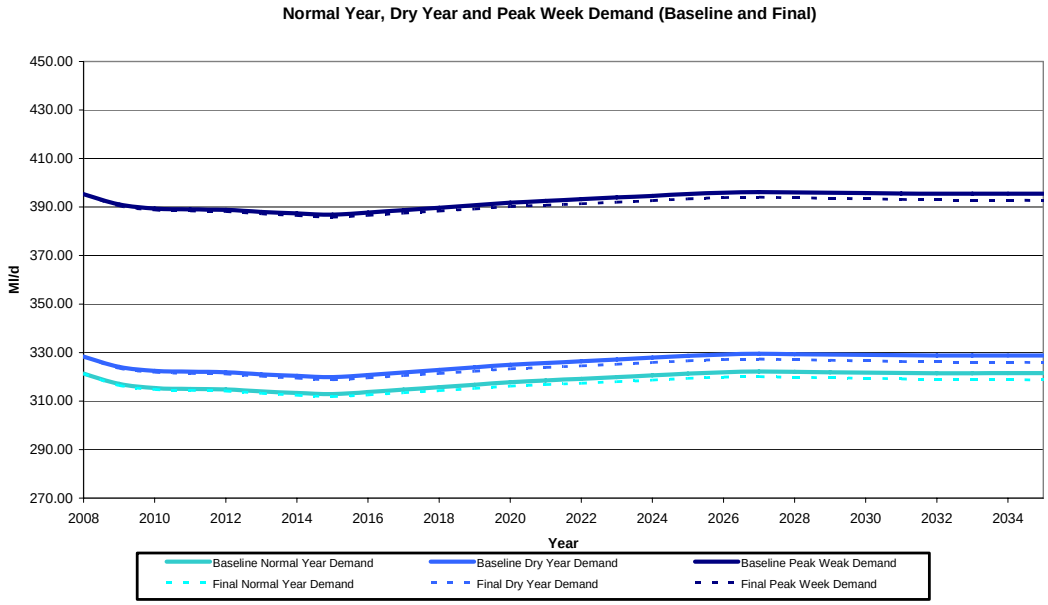
Dry year demand has been derived from normal year demand by applying a factor of 3.9% to household demand. This factor was derived from an in-

[13] Best Practice Principles in the Economic Level of Leakage Calculation, March 2002; produced by WRc on behalf of Ofwat, EA and DEFRA (Tripartite Group)
[14] RD 16/08, Review of leakage target setting, August 2008; Ofwat
[15] Providing Best Practice Guidance on the Inclusion of Externalities in the ELL Calculation, November 2007; produced by RPS Water on behalf of Ofwat

house study using water delivered records from 1990 to date. The ratio of household demand in normal years compared to household demand in the worst dry year experienced to date, 1995, was derived. The adjustment represents an increase of 7Ml/d in the base year raising the normal year annual average demand from 321.3 Ml/d to a dry year demand of 328. 3 Ml/d.

The Company's peak week demand has been calculated using the UKWIR methodology[16]. By modelling historical data Atkins has estimated that the peak demand volume in the base year is 74 Ml/d. The peak week volume has been added to the normal year demand forecast to obtain a critical period peak week forecast. The peak week volume remains unchanged across the planning period.

The following charts illustrate the baseline and final planning demand forecasts for the normal year, dry year, and critical period peak week scenarios.



The key drivers of the final planning forecast are:-

- A small net increase in household demand of less than 2% by 2034/35
- A 15% decrease in non-household demand at the beginning of the forecast period (2010/11) followed by a steady recovery to 90% of the base year demand by 2034/35
- A flat leakage rate (at the sustainable economic level) across the planning period.

[16] Peak water demand forecasting methodology UKWIR (2006) Report Ref. 06/WR/01/7

6.1.2 Changes Between 2004 WRMP and 2009 FWRMP

The Company has introduced a number of changes in the demand forecast since the 2004 WRMP that have resulted in lower demand forecasts. These include demand savings from a larger metering programme, a revised peak demand forecast and a revised SELL.

The differences in the key components of demand between the 2004 WRMP and the 2009 FWRMP are summarised below.

- The Company has adopted a new policy of Change of Occupier Metering.
- Additional demand savings are assumed from increased metering.
- The Company has adopted the per capita consumption target of 125ltrs/head/day for new housing (by the end of the plan) published in the Code for Sustainable Homes and Building Regulations Part G.
- The latest Regional Spatial Strategy housing projections have been incorporated into the plan.
- The demand forecast has included lower per capita consumption projections mainly due to lower water use from toilet flushing and suppressed use from more efficient washing machines and dish washers.
- The Company has calculated a revised Sustainable Economic Level of Leakage (SELL)
- The Company has forecast lower non-household demand.
- A lower peak demand has been calculated following the best practice approach.

6.1.3 Changes between DWRMP and FWRMP

The Company has undertaken further work to improve its demand forecasts since submission of the DWRMP in March 2008. The main driver for the revision is the continuing underlying decline in demand and the current economic downturn that appears to have further exacerbated this in the last six months. Other changes have been made as a result of comments received from OFWAT and others on both the DWRMP and the DBP. The key changes to the demand forecasts since the DWRMP are listed below.

- The Company has revised the normalisation process and applied this to 2007/8 actual data. This has resulted in a lower starting point for the demand forecasts (per capita consumption and distribution input) and a lower demand profile throughout the plan period.

- The Company has contracted consultant, CACI, to provide updated population forecasts. This incorporates latest population growth and migration assumptions from the Office of National Statistics (ONS) and an improved methodology for apportioning population around the boundary of the Company's area of supply. The detail of the population forecasts is discussed in section 6.3.5.

- The Company has reviewed its property forecasts including a reassessment of the latest information from the West Midlands Regional Spatial Strategy (RSS). The Company has reviewed in detail the apportionment of these forecast new properties to Councils within the Company's area of supply and has looked carefully at how to apportion for council areas which straddle the Company's boundary. Additionally, the Company has taken the view that the downturn in the economy will delay further the implementation of the West Midlands Regional Spatial Strategy and that house building will not recover to current levels until later in the AMP5 period. In addition to the economic factors, the final RSS has as yet not been published. As a result of this the Company has revised the profile of new households within the demand forecast to show a slower start to the implementation of the RSS which has extended it further into the future. The numbers of new connections are discussed in section 6.3.2. below.

- The Company has engaged Consultant, Deloitte, to assist with forecasting non-household demand. A model has been produced to forecast demand by non-household sector. Local knowledge has been overlaid on the model to produce the non-household demand forecasts in the FWRMP. There was a significant drop in actual non-household demand in 2007/8 and 2008/9 consumption has been even lower. This is attributed to the economic downturn. A further small decline is forecast for 2009/10 and then demand is forecast to remain stable over the next five years. For the remainder of the planning period there is a slow and steady recovery of some non-household demand as a result of new connections.

- The number of free meter optants has been revised downwards from 40,000 in AMP5 to 30,500. The DWRMP forecasts were seen as too high and not achievable. The figures included in the FWRMP reflect the current outturn which is influenced by customers seeing opting for a meter as a way to control household bills.

- Change of occupier metering has been revised downwards from 40,000 for AMP5 to 15,500 installations for the period. This reflects the downturn in the housing market and the practical difficulties of securing the higher number of properties to meter. The change of occupier metering policy is discussed further in section 3.4.

- Per capita consumptions (pcc) for measured and unmeasured customers have been revised to reflect the changes in the normalised starting point for 2007/8, revised populations, household numbers and resulting household densities. Water efficiency savings due to distribution of cistern devices and self-audit information have been incorporated into the revised

pcc forecasts. The downward trends in pcc remain unchanged and the overall impact has been to reduce the demand forecast. The DEFRA aspiration for per capita consumption to reduce to 130l/person /day is achieved by 2030.

- The calculation of the impact of climate change on demand has been revised to reflect the lower baseline demand forecasts.

- The sustainable economic level of leakage (SELL) appraisal has been updated by WRc to take account of new information since the submission of the DWRMP and DBP. The appraisal used the latest available leakage management cost and performance data, and the marginal cost of water production from 2007/08. The Company's leakage reporting methodology has also been updated to reflect the latest information on the hour-day factor (HDF) used to convert night leakage into average leakage levels. The resulting SELL, used for establishing the AMP5 target, has been assessed as being in line with current leakage levels, equal to 74.4 Ml/d based on a normalised base year, to remove the undue influence of weather events. This result is below the AMP4 target of 75.0 Ml/d. Although the proposed SELL target of 74.4 Ml/d appears greater than the DWRMP proposal of 73.9 Ml/d this is not the case as the new target has been assessed using a revised HDF. The new target is effectively lower as this would be equivalent to approximately 72.7 Ml/d, using the same HDF as used in the DWRMP.

6.2 Introduction

6.2.1 Methodology

The Company has followed the Environment Agency's water resources planning guidelines in preparing the demand forecasts, and relevant UKWIR best practice methodologies.

The Company has presented a baseline demand forecast with total leakage at the current Ofwat target level for the Company and excluding change of occupier metering. The Company's final demand forecast includes leakage at the current SELL, based on a normalised base year, and the impacts of change of occupier metering.

The first step in deriving the demand forecast was to define the components of the base year demand (2007/8). These components are based on actual data (post MLE) reported in the Company's 2008 June Return to OFWAT. The Company has followed the Environment Agency's planning guidelines and normalised the 2007/8 base year distribution input (DI) following abnormally low demand.

The normalised base year demand is then used to forecast normal year demand across the planning period. The Company forecasts normal year demand 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 new housing projections from the Regional Spatial Strategy (RSS). The principles of the UKWIR/NRA (1995) Demand Forecasting Methodology[17] have been followed to project the household and non-household demand for the planning period to 2034/35. 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 applying a peaking volume to the normal year demand.

Climate change impacts have been assessed using industry best practice (CCDeW)[18] and included within the baseline demand forecast and is added to normal year demand.

[17] UKWIR/NRA (1995) Demand Forecasting Methodology

[18] Climate Change and the Demand for Water (CCDeW). DEFRA Research Report. February 2003.

The uncertainty associated with the demand forecast has been accounted for in the headroom analysis in the plan (see section 8) Components D3 (Data uncertainty associated with distribution meters, Overall Demand Forecasting, and Impact of Climate Change on Demand) have been identified as having the most uncertainty and are discussed fully within the Headroom Assessment.

Improvements in the micro-component forecasts for per capita consumption have included the introduction of household surveys for meter optant households and new supply households. This has been introduced since the submission of the 2004 Water Resource Management Plan as it was recognised that micro-component analysis of household demand required a separate analysis for metered households.

Future development of micro-component analysis will be considered as change of occupier metering increases and to reflect the characteristics of new houses built under the new Regional Spatial Strategy and the Code for Sustainable Homes[19] (the Code).

The long-term demand reflects the impact of the Company's metering programme, leakage management, future house designs and per capita consumption targets in the Code for Sustainable Homes.

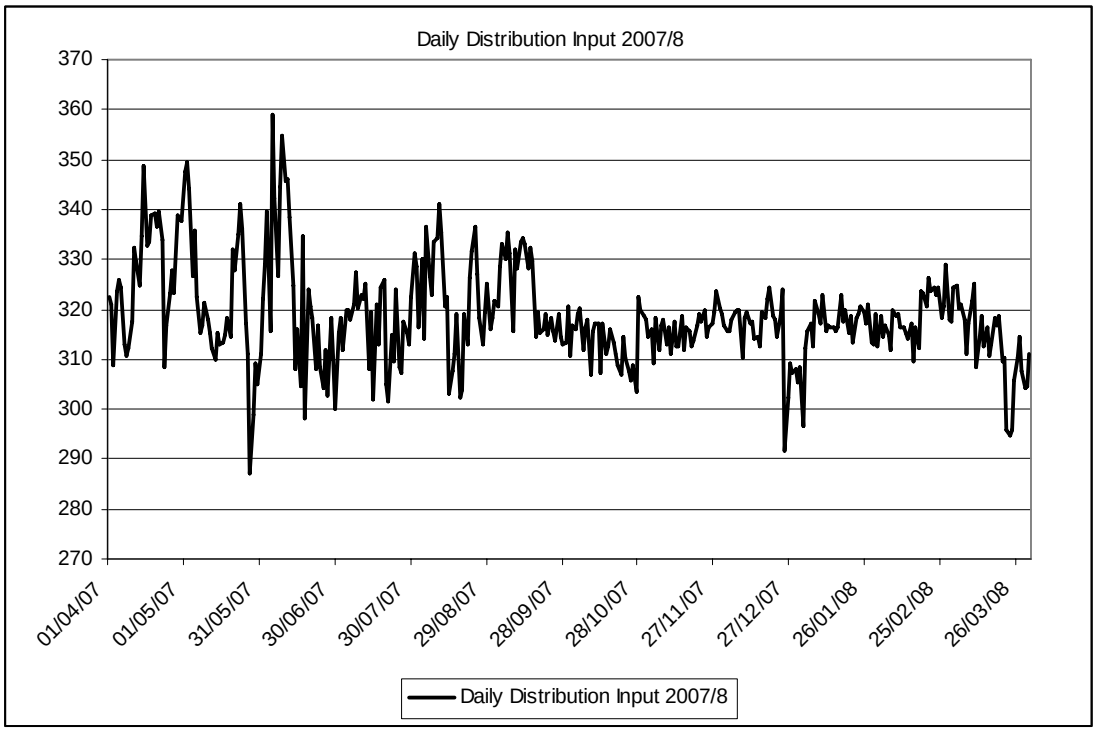
Each part of the demand forecast is summarised in the following sections. Further detail on some aspects of the demand forecasts can be found in appendix F.

6.2.2 Base Year

The Company has used 2007/8 as the base year for the updated demand forecasts in the FWRMP. Base year demand is based on actual demand as reported in the 2008 annual June Return submission to OFWAT for 2007/8. Actual data has been normalised as the demand for 2007/8 was abnormally low. Details of the normalisation are described in section 6.2.4.

Average distribution input for the year 2007/8 was 318.13Ml/d with a peak week in June 2007 of 344.89Ml/d. The annual average distribution input was 6.5Ml/d lower compared to the previous year and peak week demand was 58.3Ml/d lower.

[19] Code for Sustainable Homes. Department for Communities and Local Government. December 2006.



Actual out-turn data for 2007/8 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

6.2.3 Reconciliation of Base Year Data (MLE)

The base year actual data reported in the June Return 2008 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 reconciled items and the assumed accuracy are listed below.

The Company has one resource zone therefore the initial estimate of the water balance has one MLE application as reported in the June Returns.

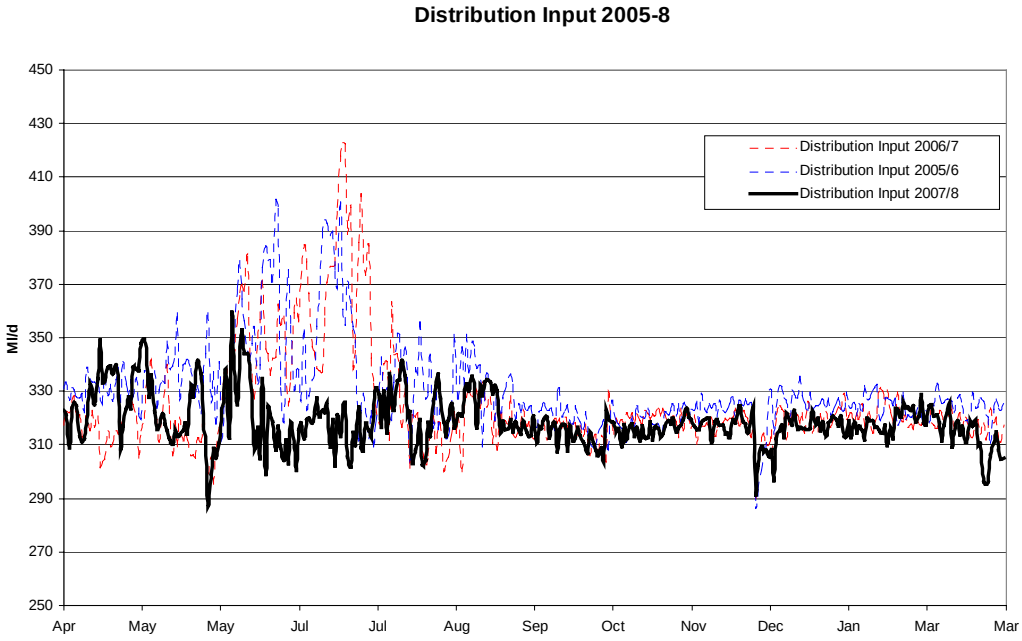
The distribution of the reconciliation adjustment is demonstrated below.

Component	Confidence interval
Unmeasured household (Ml/d)	+/-3%
Unmeasured non-household (Ml/d)	+/-10%
Legally unbilled	+/-25%
Illegally unbilled	+/-25%
Operational use	+/-25%
MNF Calculated Distribution Losses	+/-20%

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

6.2.4 Normalisation

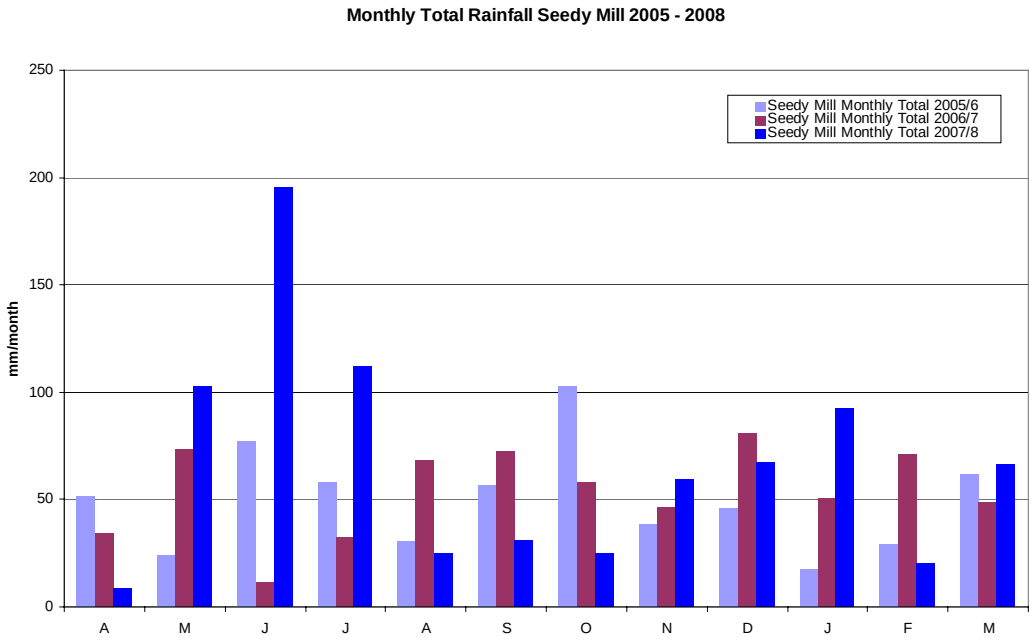
Average distribution input for 2007/8 was 318.13 Ml/d with a peak week in June 2007 of 344.89 Ml/d (the daily demand profile shown in the chart below).



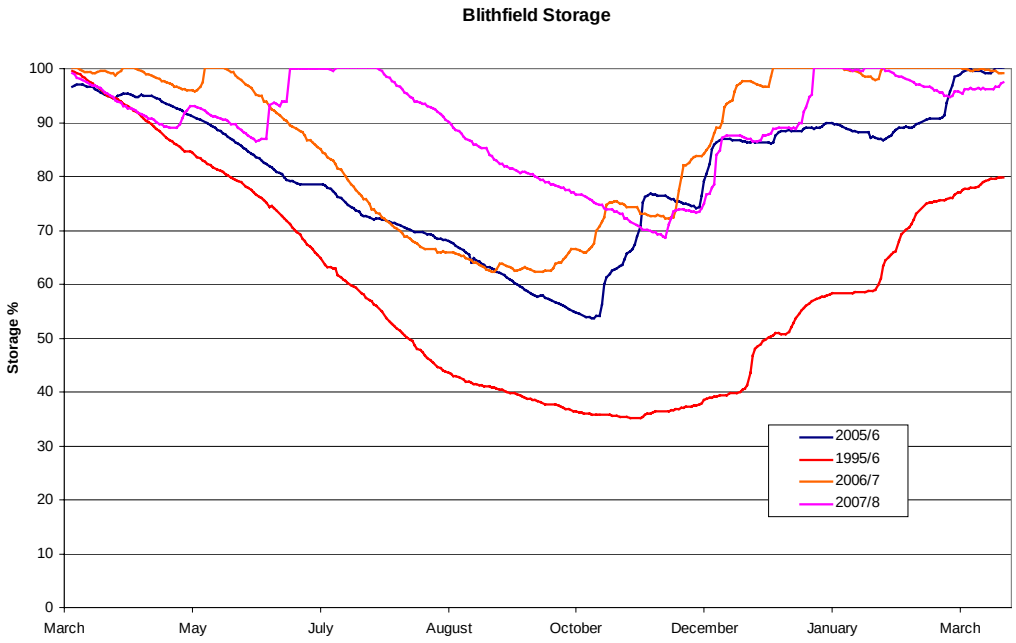
The annual average distribution input fell by 6.5 Ml/d in comparison to 2006/7, the peak week demand decreased significantly by 58.3 Ml/d.

2007/8 was a wet year with rainfall (measured at Seedy Mill) for the year at 114 % of the 10-year annual average. The year was characterised by an exceptionally wet summer with rainfall in May, June and July at over 200% of the long term average. This was followed by a dry autumn, and a wet winter. The wet weather during the summer resulted in an unusually flat summer demand.

A comparison of monthly total rainfall at Seedy Mill with the previous two years confirms that May, June, July, were exceptionally wet, with November, December, January and March being wetter than average. Without the very dry months of April, August, September and October the annual average rainfall figure would have been even wetter. The wetter summer is considered to account for the majority of the lower demand, compared to previous years.

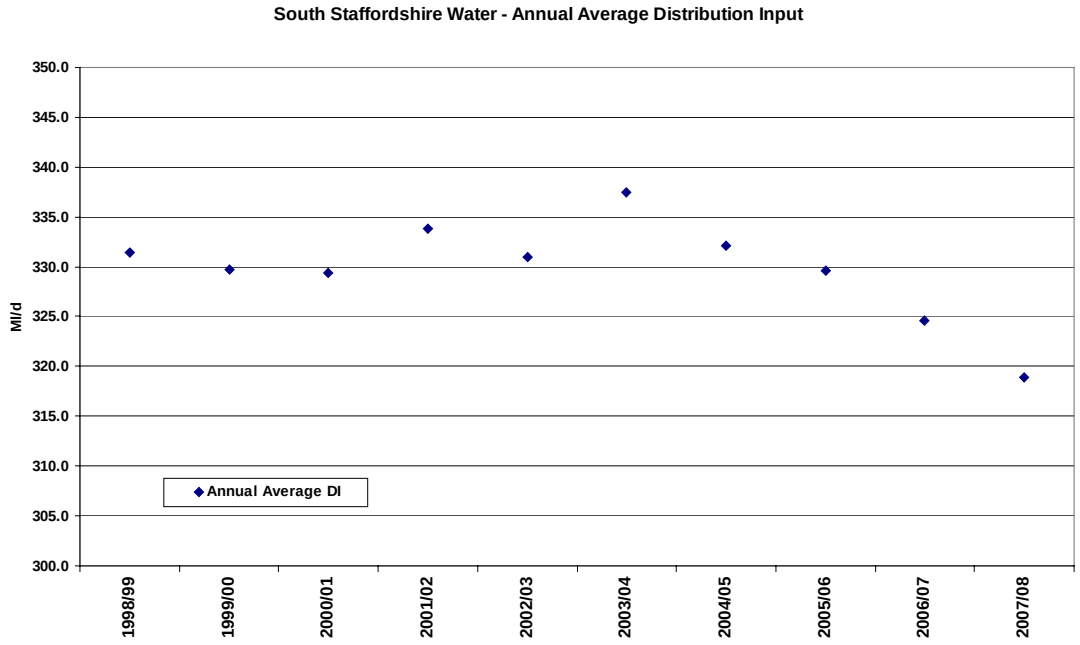


Storage levels at Blithfield Reservoir for 2007/8 are shown below. The plot confirms that 2007/8 was wet year in terms of water resources position, with higher storage than 2005/6, and 2006/7 and significantly higher than 1995/6 (a severe drought).



Given that demand for 2007/8 was relatively low an adjustment has been made to the 2007/8 distribution input to derive a more appropriate normal year demand for the base year from which to start the demand forecasts. This has been achieved by taking a point between the average of the last 2 years and the average of the last 4 years annual average distribution input values as reported in the annual June Return submissions. This produces a normalised annual average distribution input of 321.31 Ml/d for the 2007/8 base year.

The following chart shows actual annual average distribution input for the last nine years and demonstrates that 2007/8 is abnormally low.



The Company has assumed that leakage remains equal to the reported 2008 June Return figure as this will be largely unaffected by wet weather. The remaining normalised demand is distributed between measured and unmeasured household demand.

6.3 Forecast Household Demand

6.3.1 Base Year Household Demand

Unmeasured per capita consumption

Since the publication of the 2004 Water Resources Plan the Company has introduced a new unmeasured consumption monitor.

The Company has employed the services of Tynemarch Engineering to develop a monitoring system and methodology for calculating per capita consumption that is robust and complies fully with best practice and the latest engineering solutions.

The pcc estimate from the new monitor has been used since 2006/7 and will continue to be reviewed to ensure that it reflects the overall customer base and property characteristics.

The main features of the monitor are:

- A total of 82 District Metered Areas (DMA) are being monitored.
- ACORN classification is used to determine Company customer profile.
- Only DMAs consisting of more than 65% unmeasured households by count are included.
- Only DMAs where the demand for unmeasured household water is more than 65% of the total area demand are included.
- Flow and pressure is automatically downloaded via SMS texting directly into the leakage management system.
- There is an automated error flagging system incorporated in flow analysis to highlight meter or logger faults.
- Operational priority for leakage sweeps and leakage repair is given to the pcc DMAs.

The derived unmeasured pcc from the monitor is extrapolated across the overall company base using statistical modelling in the pcc model. The confidence grade assigned to the pcc estimates reported in the June Return is A3 which demonstrates a high level of confidence in the figure.

Measured per capita consumption

Measured per capita consumption is derived from the Company's billing data. The Company has put forward a case for investment in a new monitor for measured households in the FBP submission.

Micro-component per capita consumption

The Company undertakes a detailed survey of micro-component water usage on an annual basis. This allows the actual pcc derived from the consumption monitor to be broken down into micro-components. This annual survey provides data for both unmeasured and measured pcc estimates and is described in appendix F.

6.3.2 Forecast New Household Properties

The West Midlands Regional Spatial Strategy (RSS) is an overarching local authority development framework which is intended to meet future housing, employment and environmental needs from 2006 to 2026.

The primary objective of the strategy is to deliver urban renaissance and to provide sufficient housing to counter the outward movement of people and employment from town centres and major urban areas.

The RSS is currently being developed with the final plan scheduled to be adopted in 2010. The strategy defines future housing development targets, however in most cases the exact quantity will not be known until each Council publishes its Local Development Framework (LDF) in late 2010. This is after the submission of the FWRMP.

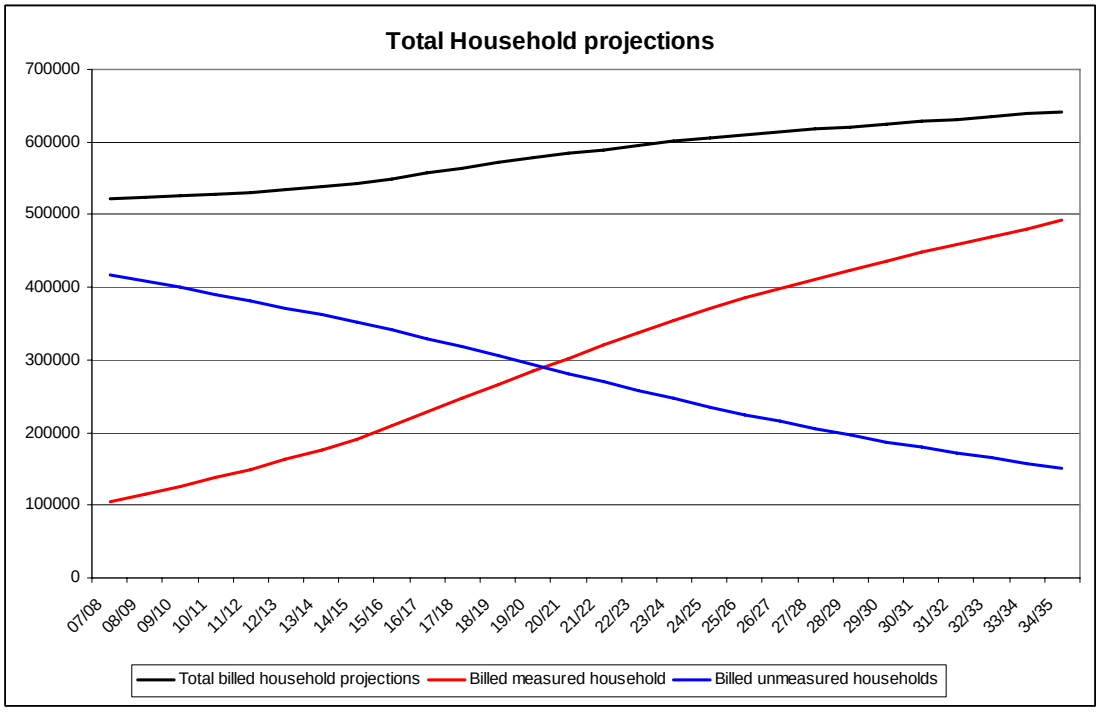
The Company has used the latest and best available housing projections from the RSS (Nathaniel Lichfield), for each of the councils in the Company's supply area. The Company has reviewed in detail the apportionment of projected properties within council areas straddling its boundary. An additional 89,000 new household connections are forecast under the latest RSS for the period to 2026.

The current economic downturn has seen a significant reduction in new household connections for the year 2008/9. The Company believes this trend will continue for a further year before any real recovery in the housing market begins. Therefore the Company has assumed a profile of below average rates of house building for the first two years of the AMP5 period followed by an increase to above average build rates which are maintained until 2025 when the historic average rate of build has been used for the remainder of the planning period.

The current published housing projections are net of demolitions. The assumption made in the RSS is that the ratio of rebuild to demolition is 1:1 and this has been adopted by the Company in forecasting the gross housing

projections. The total increase in household connections is therefore 120,000 by 2034/5.

The RSS housing growth has been incorporated into the Company's total household forecasts shown below.



The Company is aware of current consultations with regards to Eco-Towns. There is a proposal for a large development in Fradley near Lichfield. The detail of this proposal is at an early stage and is one of three alternative sites proposed for the development. The Company has not made any allowances for it in the FWRMP due to the uncertainty around the proposal.

6.3.3 Forecast Metered Households

The Company's metering policies will result in a significant switch from unmetered households to metered households by the end of the planning period. Billed measured households will increase from 100,000 in 07/08 to 474,000 by the end of the plan. Unmeasured households fall from 400,000 in 07/08 to 143,000 with total connected household properties being 642,000 by the year 2034/5.

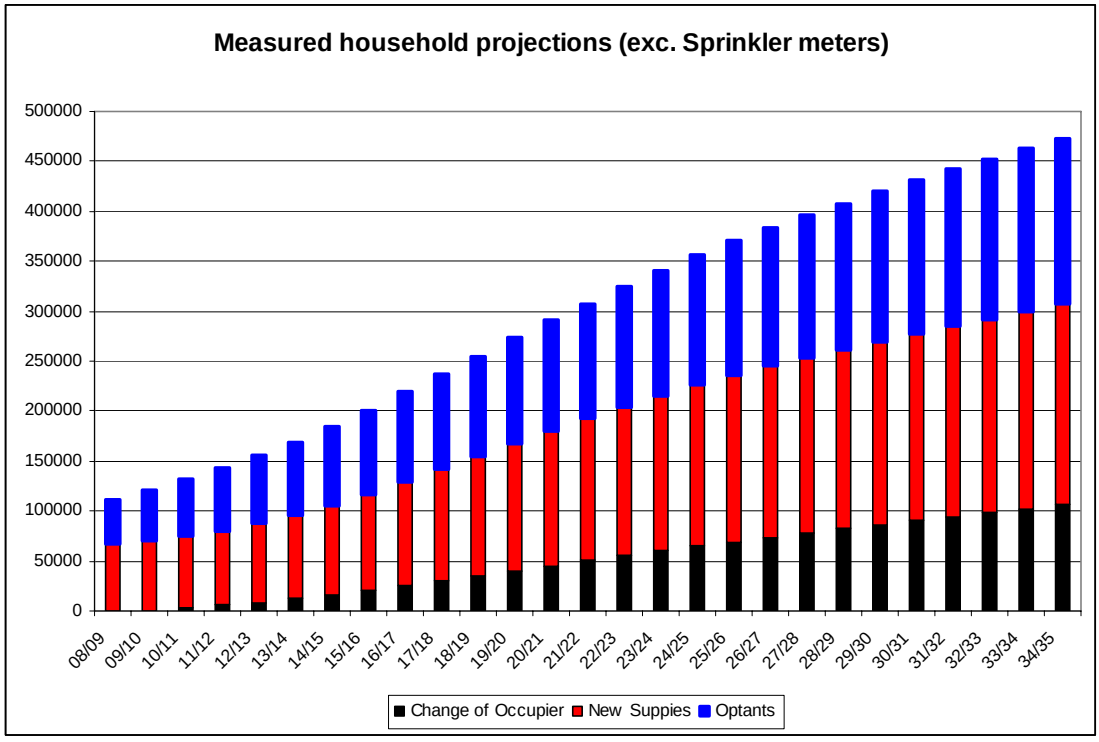
The number of unmeasured households falls as change of occupier metering, optional metering and sprinkler metering increase. Those households that remain unmetered will be the residual that have not been selectively metered, are on a shared supply or have not opted by choice.

Enforcement of the mandatory and selective metering policies will result in meter penetration increasing quickly from 20% of billed properties to 77% by 2034/5.

The measured household profile in the plan is shown below.

Billed Metered households	Base year (07/08)	2034/5
Meter optants properties	37,059	166,194
New supply measured household properties	64,599	200,767
Change of Occupier metering properties (selective metering)	0	106,136
Sprinkler metering household properties (selective metering)	2	632

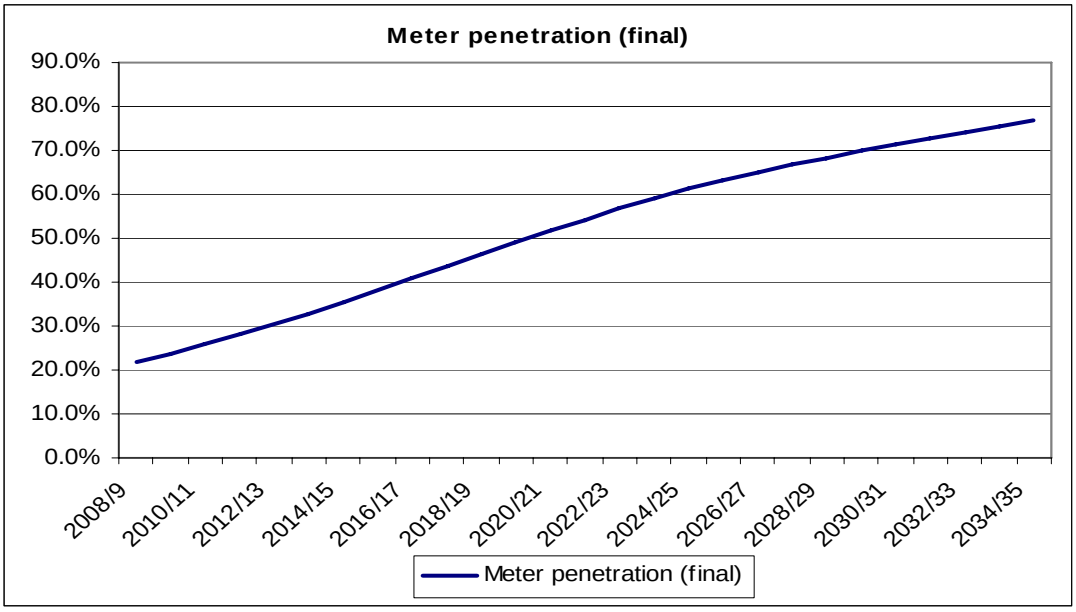
The following chart shows the growth in each category of metered property over the plan period.



The Company is forecasting an increase in numbers of meter optants in the early part of the plan period. This reflects the current higher trends as more customers see this as a way to control household bills in the current economic climate. A decline in the uptake in the later part of the plan is forecast to reflect the smaller unmeasured base from which to opt.

The Company will continue with its policy to meter sprinkler users. However, due to the increased numbers of optants and change of occupier metering it is assumed that the number of properties selectively metered on the basis of sprinkler use will remain very low at around 25 properties per year.

The following chart shows the overall growth in meter penetration.



6.3.4 The Costs of Metering

The costs of the Company's proposed household metering programme are summarised in the following table:

	AMP5	AMP6	AMP7	AMP8	AMP9
New connections					
Total Number in period	20500	40000	35950	22150	18800
Operating costs (final year of period)	£ 154,500	£ 394,500	£ 610,200	£ 743,100	£ 855,900
Optants					
Total Number in period	30500	27500	25000	21500	16000
Installation costs (total in period)	£8,017,230	£7,228,650	£6,571,500	£5,651,490	£4,205,760
Operating costs (final year of period)	£ 267,000	£432,000	£582,000	£711,000	£807,000
Sprinkler meters					
Total Number in period	125	125	125	125	125
Installation costs (total in period)	£42,628	£42,628	£42,628	£42,628	£42,628
Operating Costs (final year of period)	£900	£1,650	£2,400	£3,150	£3,900
Change of occupier meters					
Total Number in period	15500	25000	25000	22500	20000
Installation Costs (total in period)	£5,285,810	£8,525,500	£8,525,500	£7,672,950	£6,820,400
In final year of period	£ 97,500	£247,500	£397,500	£532,500	£652,500

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 and sprinkler metering are part of the Company's existing metering strategy and are 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. The Company's policy on change of occupier metering is described in section 3.4.

6.3.5 Population Forecasts

The Company contracted consultant, CACI, to provide updated population forecasts for the FWRMP and FBP. The updated forecasts are based on the 2001 Census data and incorporate latest population growth and migration assumptions from the Office of National Statistics (ONS) and an improved methodology for apportioning population around the boundary of the Company's area of supply.

Property projections are used by CACI within the modelling to forecast population. The Company provided CACI with the property forecasts for its area of supply based on the projected new builds under the Regional Spatial Strategy to ensure that the population forecasts incorporated the impacts of the RSS. At the DWRMP CACI took no account of additional properties to be built under the RSS and therefore the Company had to make an adjustment to the population estimate to account for this. For the FWRMP the inclusion of the RSS properties within the population modelling means that there is no requirement for such an adjustment.

The projections show an increase in population from 1.257 million in the base year (07/08) to 1.399 million by the end of the plan (an increase of 142,000).

The total population includes a review of non-household population. This accounts for multi-occupancy residential homes and caravan sites derived from ONS data. Non-household population is discussed in section 6.4.1.

6.3.6 Household Densities (occupancies)

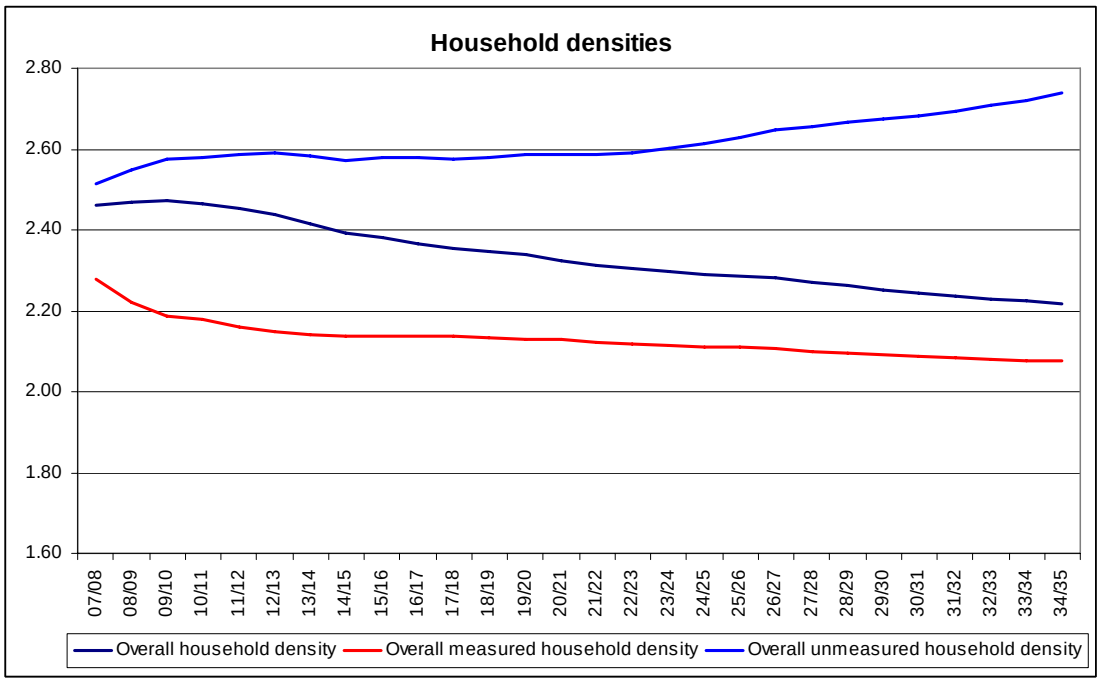
There is an underlying trend for population to grow over the planning period. However overall household densities reduce from 2.46 in 2007/08 to 2.22 in 2034/35 because of the following reasons:

- Increasing number of households
- Population growth is slower than the growth in properties

- Increasing life expectancy
- Smaller household units (single parents, elderly single occupants)
- Life style changes

This is consistent with the national expectation.

The key components of household densities are shown in the following chart.



The household densities of each customer group have an independent profile that reflects the characteristics of that group. However, there is clearly a link between densities of individual groups as customers with different characteristics move between groups.

Within the overall downward profile the unmeasured household density is forecast to rise from 2.52 in 2007/08 to 2.74 by 2034/5. This is because the switching effect of optants (with lower occupancy rates) results in a higher residual unmeasured occupancy rate.

It is assumed that all properties have an equal likelihood of changing occupier and therefore change of occupier metered properties have an average occupancy equal to the average unmeasured density.

It is also assumed that sprinkler metered properties will have an occupancy rate inline with both the unmeasured density and the change of occupier metered properties.

Meter optant households generally have a lower occupancy rate than other households. A further small decline in density is forecast over the plan period for this group of customers.

For the FWRMP the Company has combined the existing new supply customer category with the RSS new supply customer category used in the DWRMP. The density of this new group is forecast to decline reflecting the overall trend towards smaller household units and the fact that the type of new properties built under the RSS will be predominantly starter homes or for young families.

The occupancy rates of the individual household groups are summarised in the following table.

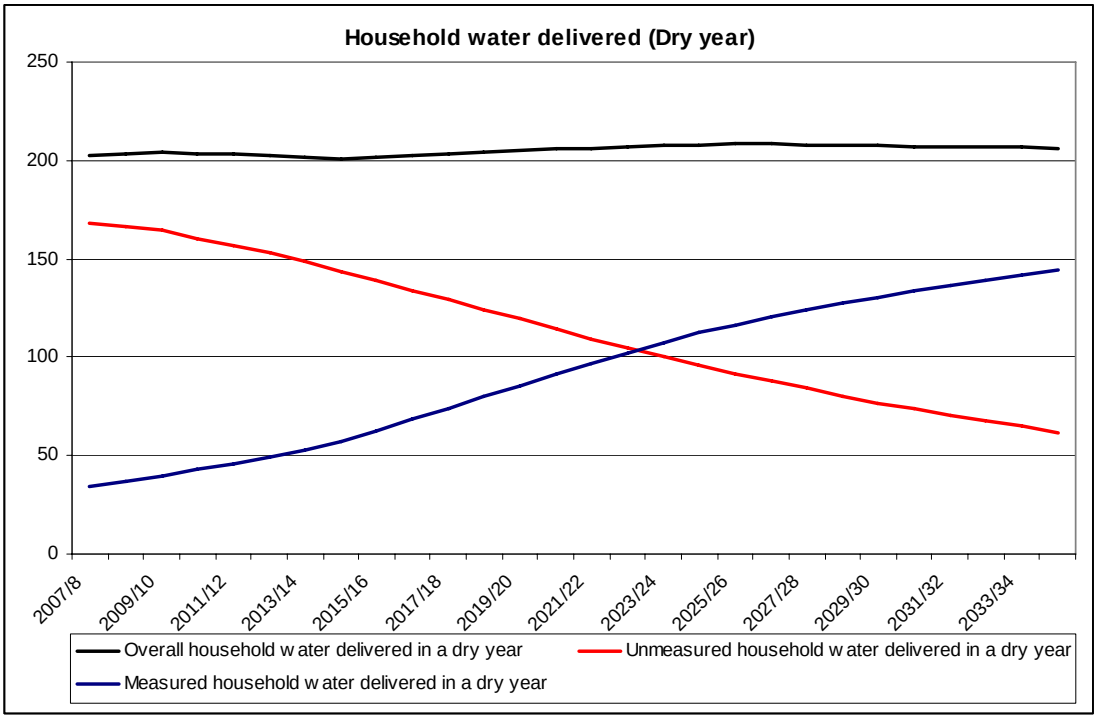
Household Group	Base year 07/08		2034/5	
	Population	Densities	Population	Densities
Unmeasured households	1,011,410	2.52	391,176	2.74
Meter optants households	64,482	1.74	265,910	1.60
New supply measured households	166,942	2.58	421,612	2.10
Change of occupier metering properties (selective metering)	0	0	293,877	2.77
Sprinkler metering household properties (selective metering)	5	2.50	1,737	2.75

6.3.7 Total Household Demand

The overall dry year household demand (water delivered) shows an increase from 202Ml/d in 07/08 to 206Ml/d by the end of the planning period.

Dry year unmeasured household demand falls over the planning period from 168Ml/d in the base year to 62Ml/d by 2034/35. 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 from 34.5Ml/d to 144Ml/d by 2034/35 reflecting the increasing number of metered households.



6.3.8 Measured Household Demand

The total measured household demand is split into 4 separate customer groups.

- Meter optant household demand
- New supply measured household demand
- Change of Occupier metering (selective metering)
- Sprinkler metering households (selective metering)

Each of the demand profiles (consumption volumes excluding supply pipe leakage derived from figures in table WRP6a) associated with the above is summarised in the following table.

Metered household group	Base year (07/08)	2034/5
Meter optant demand	8.8 Ml/d	32.4 Ml/d
New supply measured households (pre RSS)	23.2Ml/d	60.2 Ml/d
Change of occupier metering (selective metering)	0	40.7 Ml/d
Sprinkler metering households (selective metering)	0	0.3 Ml/d
Total measured households	32M/d	133.6 Ml/d

6.3.9 PCC and Micro-components

Per capita consumption forecasts for the different household groups are derived in the following way:

- Unmeasured Households (micro-component analysis)
- Meter optants (micro-component analysis)
- New supply households (micro-components)
- RSS housing (pcc target- Code for Sustainable Homes)
- Change of Occupier metering (90% of unmeasured household pcc)
- Sprinkler Metering households (pcc from consumption reports)

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

Water usage information is gathered from household surveys, industry data or manufacturer's appliance specifications and forecast forward over the planning period to reflect changes in appliance ownership and water use per appliance. Changes in technology and consumer behaviour have been included in the long-term forecasts.

The key outputs from the Company's unmeasured, new supply and meter optant micro-component analysis are highlighted below. Further details are included in appendix F Demand Forecasting Supporting Information.

The micro-components below are normal year excluding climate change.

	Trend	**Base year (07/08)**	**2034/5**	**Driving Assumption**
Unmeasured household water use				
Toilet use	Downward	43.8 ltrs/prop/d	36.6 ltrs/prop/d	Reducing volumes of toilet cisterns
Garden Use	Downward	3.8 ltrs/head/d	3 ltrs/head/d	Reducing ownership of unmetered sprinklers.
Washing Machine use	Downward	18.3 ltrs/head/d	12.8 ltrs/head/d	More efficient machines.
Personal washing	Upward	55.2 ltrs/head/d	57.5 ltrs/head/d	Increase in power shower ownership
Dishwasher use	Upward	8.5 ltrs/head/d	10 ltrs/head/d	Increase in ownership

	Trend	Base year (07/08)	2034/5	Driving Assumption
New supplies				
Toilet use	Downward	32.6 ltrs/prop/d	24.8 ltrs/prop/d	Reducing volumes of toilet cisterns
Washing Machine use	Downward	19.5 ltrs/head/d	14.5 ltrs/head/d	More efficient machines.
Personal washing	Upward	46.3 ltrs/head/d	48 ltrs/head/d	Increase in power shower ownership
Garden water use	Upward	6.8 ltrs/head/d	12.2 ltrs/head/d	Increase in sprinkler ownership
Dishwasher use	Upward	10.1 ltrs/head/d	14.5 ltrs/head/d	Increase in ownership
Meter Optants				
Toilet use	Downward	54.8 ltrs/prop/d	43.5 ltrs/head/d	Reducing volumes of toilet cisterns
Washing Machine use	Downward	15.7 ltrs/head/d	12.6 ltrs/head/d	More efficient machines.
Personal washing	Upwards	31.3 ltrs/head/d	32 ltrs/head/d	Increase in power shower ownership
Garden Use	Upwards	4.2 ltrs/head/d	7.7 ltrs/head/d	Increase in sprinkler ownership
Dishwasher use	Upwards	7 ltrs/head/d	7 ltrs/head/d	Increase in ownership countered by lower water volume machines.

Micro-component analysis is based on normal year demand. Therefore micro-components are forecast under normal year conditions. The resulting pcc figures are adjusted later for the dry year factor. There is little specific information or data regarding micro-component use under dry year demand conditions, however, it is assumed that garden use and personal washing will contribute most to the additional water useage in a dry year.

Climate change impacts are also added to the forecast pcc and not the micro-components. Again there is little specific information or data regarding how

micro-component use may be affected by climate change. However, it is assumed that garden use and personal washing will contribute most to the additional water useage.

It has been assumed that the Code for Sustainable Homes will be adopted for new houses built under the Regional Spatial Strategy. However, it is assumed that there will be a gradual move from the current new supplies pcc towards the pcc targets in the Code rather than an immediate achievement. The Company has assumed that in general it is more realistic to achieve the highest target pcc (125l/h/day).

The overall pcc for new supplies is 130l/h/day in 2007/8 falling to 128l/h/day by the end of the planning period. This is the weighted average new supply pcc including all existing new supplies prior to 2007/8 and all new properties built to the Code of Sustainable Homes thereafter.

The pcc for change of occupier metered properties is derived from the unmeasured pcc with a 10% saving applied.

The base year pcc for sprinkler metered properties is derived from billing records and is forecast to remain at this level across the planning period. No saving due to metering is included since this group has been selectively metered because of their particular water using habits and their desire to continue to use a sprinkler.

The breakdown of pcc by customer group is shown in the following table. These are normal year per capita consumption figures before the dry year adjustment is made and excluding climate change.

Household Group	**07/08 Base year PCC**	**2034/5 PCC**
Unmeasured households	147.9 l/h/d	137.94 l/h/d
Meter optant households	119.4 l/h/d	109.3 l/h/d
New supply measured households	130 l/h/d	127.85 l/h/d
Change of Occupier metering	0	124.15 l/h/d
Sprinkler metering (selective metering)	0	138.16 l/h/d

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 144 ltrs/head/day in the base year to 126 ltrs/head/day by 2034/5 under normal year conditions. This is consistent with DEFRA's vision for pcc in its Future Water strategy for England.

6.4 Forecast Non-Household Demand

6.4.1 Non-Household Population and Properties

A review of non-household population was made during the report year for the 2007 June Return. An additional allowance has been made in the measured non-household population estimate to account for measured residential homes and caravan sites where site meters govern the site supply. The population estimate is derived from ONS data, based on 2001 census data, which reports the number of residents in residential care or residents living on caravan parks in Council areas. The Company has assumed a gradual increase in non-household population over the planning period. There is an overall increase in non-household population to 25,000 by 2034/5. This is based on the growth in properties forecast over the period, and the increase in the ageing population in care homes.

No additional demolition of non-households is included to account for the RSS as there is little or no specific information indicating number of units to be demolished. It is assumed that non-household units that are demolished will be replaced on the basis of one for one or redeveloped as a mixed use site.

6.4.2 Non-Household Demand

The DWRMP showed non-household demand relatively flat across the plan period. Since then the credit crunch and general economic downturn have developed. There was a significant drop in actual demand in 2007/8. In addition to this, data for April 2008 to end January 2009 indicates that 2008/9 consumption will be even lower. This fall in non-household demand equates to a significant drop in income for the Company. Non-household demand and income forecasts have therefore become one of the most important issues for the PR09 FBP.

The Company has engaged Consultant, Deloitte, to assist with forecasting non-household demand. A model has been produced to forecast demand by non-household sector using identified explanatory variables that influence demand/income of non-household customers. Local knowledge relevant to a few of the modelled sectors has been incorporated into the modelled results. A further small decline in demand is forecast for 2009/10 and then demand remains stable over the AMP5 period. The non-household demand forecasts include a proportion of the new OFWAT water efficiency target (0.38Ml/d of the 0.53Ml/d target is assigned to non-household demand reductions).

The models produced by Deloitte Consulting have been constructed using data from 79 of the Company's top 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 79 companies. These were places of worship, electricity generating and building supplies. In addition to this all properties metered since 1990 have been classified by the Company as the mandatory commercial sector. This category

includes a wide range of water uses across the specific sectors. Quarterly data from Q1 1997 to Q3 2008 was included in the model for the sample of 79 customers (over 40 data points per customer).

Explanatory variables were identified as follows for each sector:

- Prior quarter consumption
- Seasonal effects
- 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)

The most significant explanatory factors were the prior quarter consumption and seasonal effects which had the strongest relationships with all of the sector models. More specific explanatory factors had third and fourth order relationships and applied to 6 of 12 sectors.

Forecasts for the specific explanatory variables have been obtained from publicly available sources. These are entered into the model and drive the forecasts. The Treasury summary of GDP forecasts has been used and the Bergen Energi forecasts for energy price. The models produced by Deloitte and presented to the Company in January 2009 have been updated by the Company with the latest Treasury GDP forecast published in February 2009.

Three scenarios have been modelled, a central estimate, a high and a low. 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 and FBP. The forecasts produced cover the period 2008/9 to 2014/15.

The results are shown as percentage changes from the 2007/8 actual consumption figure. It is assumed that the 79 companies used to build the models are representative of the remaining companies within the 12 modelled sectors. The modelled results for the sample companies are extrapolated and applied to the whole sector. For these sectors which were not covered by the sample of 79 companies the same percentage changes have been applied to derive a forecast of demand for the total measured non-household customer base.

In general terms the results for the 12 industry groups that in aggregate form the basis of the data is as follows:

- Food and drink, iron and steel, mining and the service sectors show a projected fall in demand in 2008/09, followed by recovery in 2009/10 and relative constant levels of demand thereafter;

- Chemicals, engineering, laundry and metals show an accelerated fall in demand in 2008/09, followed by a reversion to a slower long-term rate of trend reduction in water demand; and

- Demand in the agriculture and sports/recreation sectors holds up in 2008/09, with agriculture projected then to fall in 2009/10 before resuming the long-term upward trend in demand, and sports/recreation demand remaining broadly flat beyond 2009/10.

The output from the Deloitte 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 Deloitte model for the breweries sector has been amended to take account of specific local knowledge. Consumption over the next five years has been adjusted to remain flat based on 2008/09 levels.

- **Laundries**
  The laundry sector forecast has been adjusted to account for a step change in consumption due to installation of a water recycling plant at one of the large users in this sector.

- **General Engineering**
  The general engineering sector forecast has been adjusted to account for specific local knowledge relating to a further decline in consumption for a large user in this sector for 2009/10 followed by some recovery in 2010/11.

  From 2011/12 the modelled percentage movement year on year has been applied to the 2010/11 starting point.

- **Chemical and Allied Industries**
  The chemical and allied industries sector forecast has been adjusted to account for a reduction in reservation volume for a major user in this sector for 2009/10 followed by some recovery in 2010/11.

  From 2011/12 the modelled percentage movement year on year has been applied to the 2010/11 starting point.

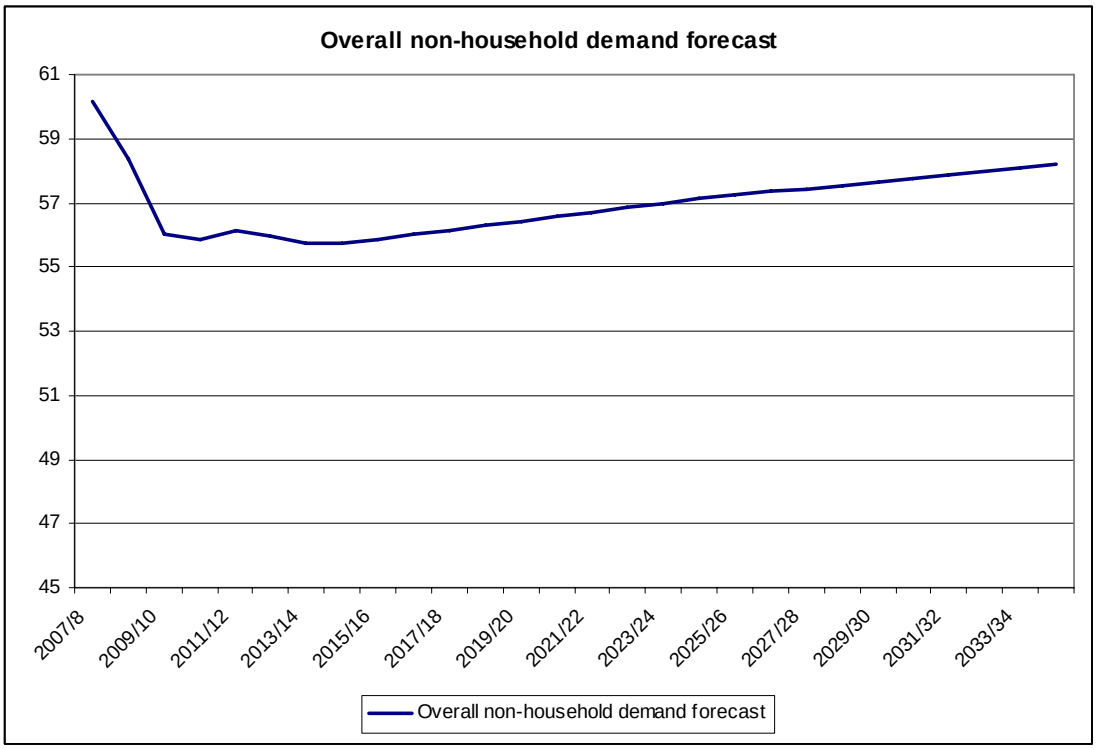
The Company considers that the income and non-household demand forecast is now based on reliable data sources and sophisticated statistical tests to ensure that the most appropriate econometric model is available, using relevant explanatory variables. It has been subject to sensitivity testing and

independent scrutiny. The resultant model is one that the Company will use for internal budgeting purposes; it is not just produced as PR09 evidence. The Company considers the Deloitte model to be a major advancement in the robustness of the demand forecasts for the FWRMP and the FBP.

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
- Additional measured demand from commercial new supplies
- Assumed savings from the water efficiency target
- The impact of climate change on non-household demand.

The following chart shows the overall non-household demand forecast for the planning period.



The following table summarises the non-household demand forecast by sector.

Sector	Actual 2007/8 demand Ml/d	2010/11 forecast Ml/d	2014/15 forecast Ml/d	2034/35 forecast Ml/d
Metal Manufacture	2.85	2.49	2.07	2.07
General Engineering	4.63	4.35	4.20	4.20
Iron and Steel Works	0.88	0.80	0.82	0.82
Breweries	3.78	2.77	2.77	2.77
Chemical and Allied Industries	2.94	2.46	1.60	1.60
Food and Drink	1.59	1.66	1.67	1.67
Mining, Bricks and Cement	1.07	0.95	1.01	1.01
Sundry Supplies - Trade	1.51	1.24	1.24	1.24
Educational	3.47	3.33	3.35	3.35
Agricultural	6.84	5.26	7.37	7.37
Commercial Public Services	2.31	2.21	2.23	2.23
Hospitals	1.77	1.70	1.71	1.71
Laundry	0.95	0.64	0.66	0.66
Sport and Recreation	1.60	1.57	1.56	1.56
Mandatory Commercial	12.82	11.03	11.61	14.11

Sector	Actual 2007/8 demand Ml/d	2010/11 forecast Ml/d	2014/15 forecast Ml/d	2034/35 forecast Ml/d
Commercial optants and frees	8.33	7.01	7.08	7.58
MUR	3.47	2.91	2.85	2.67
USPL	0.55	0.56	0.59	0.70
Climate change	0.00	0.10	0.31	1.19
Unmeasured non-household (including USPL and Climate change)	3.53	3.39	3.14	1.83
Water efficiency	0.00	-0.76	-2.28	-2.28

6.5 Leakage

6.5.1 Introduction

The Company policy is to manage leakage at the economic level. The latest assessment of the sustainable economic level of leakage (SELL) has been included in the final demand forecast.

The SELL appraisal has been updated to take account of new developments and information since the submission of the DWRMP and DBP. This has been undertaken in accordance with industry best practice as set out in the Tripartite Report[20], updated to take account of Ofwat's latest position as reported in RD16/08[21] and the application of environmental and social costs and benefits[22]. The analysis used the latest available leakage management cost and performance data, and the marginal cost of water production from 2007/08.

[20] Best Practice Principles in the Economic Level of Leakage Calculation, March 2002; produced by WRc on behalf of Ofwat, EA and DEFRA (Tripartite Group)
[21] RD 16/08, Review of leakage target setting, August 2008; Ofwat
[22] Providing Best Practice Guidance on the Inclusion of Externalities in the ELL Calculation, November 2007; produced by RPS Water on behalf of Ofwat

The Company undertook the updated economic leakage appraisal with support from a number of external resources. The primary support came from WRc, who undertook the ELL assessment using the latest 2007/08 APLE model. Additional support, used to finalise conclusions on the SELL and develop the future leakage management strategy, was provided by Tynemarch, on trunk main and supply pipe leakage assessment, WRc on the benefits of mains renewals and RPS Water on the influence of the natural rate of rise of leakage. Further details have been reported in the PR09 FBP, Part C4, submitted to Ofwat in April 2009. An extract of Part C4 is included in the FWRMP as Appendix G.

The Company's leakage reporting methodology has also been updated since the DWRMP and DBP to reflect the latest information on the hour-day factor (HDF) used to convert night leakage into average leakage levels. The hour-day factor has been revised from an industry default value of 22.0 to a Company specific value of 23.5. This has resulted in an apparent increase in leakage levels; however this is the result of a data revision rather than a real increase in leakage. The overall water into supply remains unchanged, with the increase in reported leakage simply being the result of a reduction in previously assessed consumption, following application of the statistical process used to combine the top-down integrated flow water balance and the bottom-up night flow leakage assessments.

This results in a change to the 2007/08 total leakage level reported in JR08:

- Reported leakage level, using HDF of 22.0 = 71.54 Ml/d
- Revised leakage level, using HDF of 23.5 = 73.24 Ml/d

The increase in HDF has resulted in an apparent increase in leakage of 1.7 Ml/d.

Overall there has been an increase in the robustness of the assessed level of leakage, as a result of the replacement of the previously used industry default figure for the hour-day factor by a Company specific value.

The resulting SELL has been assessed as being in line with the current level of leakage, equal to 74.4 Ml/d, based on a normalised base year, to remove undue influence of weather events. This result is below the AMP4 target of 75.0 Ml/d.

Although the proposed SELL target of 74.4 Ml/d appears greater than the DWRMP proposal of 73.9 Ml/d (and 73 Ml/d in the Statement of Response) this is not the case as the new target has been assessed using a revised HDF. The new target is effectively lower as this would be equivalent to approximately 72.7 Ml/d, using the same HDF as used in the DWRMP.

The results of this analysis are in line with the Company's long term Strategic Direction Statement, and are considered to be in accordance with both Ofwat and the Company's objective of establishing a long term sustainable economic level of leakage, that takes account of both internal as well as external environmental and social costs and benefits. As part of this analysis the Company has taken account of customer preferences and willingness to pay research.

6.5.2 Leakage Management Strategy

Based on the latest SELL appraisal the Company's AMP5 leakage management strategy is to maintain current levels of leakage.

Along side this requirement is the need to continue undertaking works to maintain long term efficiency, which in turn could result in lower future SELL assessments; overcoming the current restriction to economic leakage reductions due to the relatively high transitional costs compared to the low operating cost benefits that would materialise.

This will result in increased knowledge, particularly with the development of a more robust understanding of trunk main leakage, as there is currently a high level of uncertainty in this area.

In addition to these activities, it has also been identified that the Company is at risk of a growth in the natural rate of rise (NRR) of leakage, which will make it more difficult to achieve the assessed SELL in the future than currently assumed. Maintaining long term efficiency will therefore be required to help mitigate this issue, and is to be addressed as part of the AMP5 strategy.

This approach is considered to be in line with the Company's long term Strategic Direction Statement as well as customer expectation, which would ultimately prefer to see lower levels of leakage.

In summary, the Company's AMP5 strategy will be supported by:

- Extended and enhanced coverage of network operational metering to improve assessment and location of trunk main leakage.
- Improvements to the current DMA structure to support maintenance of long term efficiency of leakage identification on distribution mains and services.
- Additional pressure management on a localised cost effective basis, to counter the effects of asset deterioration / natural rate of rise of leakage.
- Further development of the mains renewal targeting processes to maximise the leakage reduction benefits while targeting mains and service renewals to maintain infrastructure asset serviceability.
- Improvements to the leakage monitoring and activity targeting processes.

- Further developments to support more effective leakage detection staff, including focused training, introduction of apprentices, and development of improved performance incentive schemes for both direct and contract staff.

- Further investigation, and appropriate adoption, of new technology.

- Capital maintenance of the existing leakage management infrastructure to support effective future operational activities.

As part of the business planning process, investigations into the costs and benefits of increased levels of mains renewals, specifically targeted at leakage reduction, have been undertaken. However because of the current supply / demand balance economics there is no driver for this in AMP5. The only mains renewals included in AMP5 are to maintain stable serviceability, specifically driven by managing the burst rate.

6.6 Miscellaneous Water Use

Miscellaneous water use is described as water used in the following ways:

- Distribution system operational use (mains flushing and water quality etc)

- Water taken legally but unbilled (fire stations and standpipe use)

- Water taken illegally (water theft illegal connections etc).

The estimate of total miscellaneous water use has been derived from an in house study and developed over the last two years. This component is assumed to remain constant over the planning period and for all demand scenarios.

Further details are provided in appendix F: Demand Forecasting Supporting Information.

6.7 Climate Change Impacts on Demand

To calculate the impact of climate change on demand the Company has followed the guidance from the DEFRA report, (CCDeW)[23]. Climate change impacts are added to the normal year demand forecasts.

The report details the predicted impacts on components of demand from climate change in percentage terms. The Company has applied the percentages to customer groups as highlighted in the report with the resulting additional allowances applied to demand.

[23] Climate Change and the Demand for Water (CCDeW). DEFRA Research Report. February 2003.

The total impact of climate change on annual average demand has been calculated as an additional 5.5 Ml/d at the end of the planning period. This is made up of 4.26Ml/d on household demand and 1.22 Ml/d on non-household demand. This is taking the likely effects of climate change as a central estimate. The uncertainty of this estimate is included in the headroom assessment.

6.8 Water Efficiency in the Demand Forecast

6.8.1 Introduction

The Company has included as an integral part of the baseline demand forecasts significant water efficiency savings. This is in the form of volumetric savings on household appliance use in the micro-component forecasts and is reflected in the pcc forecasts. The Company believes that technological improvements will lead to more water efficient appliances becoming the norm in future. However, it is not possible to disaggregate the savings from this in order to report specific water efficiency savings.

The Company currently undertakes a wide range of water efficiency activities which it reports annually in table 1 of the June Return submission to OFWAT. This activity is consistent with the OFWAT Water Efficiency Good Practice Register and is appropriate for the Company's water resource situation and moderate water stressed status.

Details of the Company's water efficiency policy are included in section 3.5.

6.8.2 Base Year Company Water Efficiency Activities

The Company currently undertakes a wide range of water efficiency activities consistent with its supply-demand position and in accordance with the OFWAT Good Practice Register. The current range of activities has included to date:

- Provision of cistern devices on request to customers.
- Promotion of water butts.
- Provision of household self-audit information.
- Provision of non-household self-audit information.
- Provision of water efficiency advice during Water Regulations inspections.
- Water saving tips and information on the Company website
- Suite of information leaflets on specific water efficiency.
- Promotion and enforcement of sprinkler metering policy.
- Water efficiency information advertised in appropriate press.

- Part of the nationwide B&Q water efficiency campaign during 2007.
- The Company's Education Centre offers schools a structured curriculum based educational programme that incorporates water efficiency in the overall visit. The Company provides educational materials and facilities that teach students the value of water and water conservation.
- The Company is an active member of the water industry Water Efficiency Network which meets quarterly. This is a useful forum to keep abreast of developing technologies and strategies and share ideas.
- Use of a publicity trailer for community events at which water efficiency information and promotional materials are provided.

This range of customer awareness and water efficiency campaigns will continue to be a base activity with similar campaigns being run each year but varied depending on circumstances.

6.8.3 Future Company Water Efficiency Activity

The Company has included the OFWAT water efficiency targets in the baseline demand forecasts for the period 2009/10 to 2014/15 (0.53Ml/d per year). Demand savings have been included in both the non-household demand forecasts (0.38Ml/d) and the household demand forecasts (0.15Ml/d). Household demand savings have been assumed to be achieved through the provision of free cistern devices to properties when metered on change of occupier and when optional meters are installed in addition to the activities listed above. For the household demand savings a profile has been used to reflect the asset life of the devices to be used to derive the savings. Therefore, activity has been included for six years but the resulting demand savings are profiled over a period of 15 years.

The impact of these new water efficiency changes is to include an additional component of demand reduction, compared to the DBP. This has no material impact on the overall supply demand balance, which remains in surplus throughout the period.

The Company proposes to seek opportunities to work with local authorities and housing associations to deliver projects of mutual benefit. The Company will take every opportunity to work with the Consumer Council for Water, Waterwise and the Water Saving Group to develop and deliver effective messages for customers. The Company proposes to explore a number of opportunities through small scale trials in 2009/10 and will conclude the detail of its ongoing water efficiency strategy for implementation in 2010/11. Innovation in water efficiency is evolving and the Company's strategy is expected to change over time as new ideas come to the fore.

The Company's normal year demand forecast excluding climate change includes reducing per capita consumption demonstrating that the use of water by customers is expected to become more efficient over time. DEFRA's

aspiration for 130 l/head/d per capita consumption by 2030 is achieved in the Company's demand forecasts.

6.9 Water Neutrality

Water neutrality is the concept where total water use after new development is equal to or less than the total water use before development. For South Staffs Water the overall demand forecast remains lower than the 2007/8 base year throughout the planning period and there is no growth in demand beyond that point. Therefore the supply demand balance maintains water neutrality throughout the planning period.

The Company recognises the challenge of achieving water neutrality and considers that there are a number of factors which contribute towards this including:

- Adoption of the Code for Sustainable Homes and the Building Regulations: Part G for new buildings
- Adoption of more water efficient water using appliances in per capita consumption forecasts
- Achievement of water efficiency targets
- Implementation of change of occupier metering and continuation of existing metering policies
- More efficient non-household water use.

The Company believes that the combined effect of these factors will ensure water neutrality over time.

6.10 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 an in-house study using water delivered records from 1990 to date. The ratio of household demand in normal years compared to household demand in the worst dry year experienced to date (1995) was derived. The resulting 3.9% factor has been applied to both the measured and unmeasured household demand in a normal year. This factor has not changed since the 2004 WRMP since 1995 remains the worst dry year on record fro the Company.

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

	Base Year 2007/8	2034/35
Unmeasured Household demand Ml/d		
Normal year	149.59	55.28
Dry year	155.42	57.44
Measured Household consumption (Ml/d)		
Normal year	30.84	128.62
Dry year	32.05	133.64
Total dry year adjustment (Ml/d)	**7.04**	**7.18**

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

6.11 Critical Period (peak week) Demand

In the 2004 WRMP the Company forecast a deficit in the supply demand balance under peak week demand conditions. The work undertaken for the 2009 DWRMP and FWRMP demonstrates that there is no longer a forecast deficit for peak week.

The Environment Agency planning guideline states that companies that do not forecast a deficit under peak conditions do not need to present demand or supply forecasts for this scenario. However, the Company believes it is appropriate to include information on the peak week scenario within the FWRMP to demonstrate what has changed and to give confidence in the updated position.

The Company has calculated peak demand using the UKWIR methodology[24]. The methodology employs statistical analysis of peak demand in order to provide an estimated peaking factor or a peak volume which could be used for demand forecasting.

In general, it is most appropriate to use peak volume when dealing with household-driven peaks caused by a driver that is not strongly related to average demand. Since it is the case for South Staffs that peak demand is driven by household demand a peaking volume was derived.

The consultant Atkins was employed to undertake the assessment using historical demand data from 1976. Following normalisation of historical demand data to provide a representative average demand, regression analysis was undertaken and the results used to obtain a predictive model equation. This equation used the parameters of June temperature, July temperature, June sunshine hours, July sunshine hours, total rainfall in the period May to July and a year factor to account for time-related trends.

[24] Peak water demand forecasting methodology UKWIR (2006) Report Ref. 06/WR/01/7

The model was then applied to historical demands under base year conditions and a return period analysis performed to determine the value of peak volume for a chosen return period. The results of the analysis are summarized in the following table.

Return Period	Peak Volume Ml/d	2007/8 Base year equivalent peak demand (Ml/d)
1 in 40	74	395.31
1 in 20	68.1	389.41
1 in 10	61.6	382.91

Atkins' report on the peak volume analysis has been provided to the Environment Agency.

The Company has selected to use the peak volume equivalent to the 1:40 years return period to ensure consistency with the Company's level of service for hose pipe bans. This is also the most conservative peak volume and assumes the worst case. The Company has used a base year peak demand volume of 74Ml/d.

Peak week demand is derived by applying the peak volume (Ml/d) to the normal year demand forecasts including climate change to represent the additional demand in a critical period. The peak volume of 74Ml/d has been used throughout the plan period. In the DWRMP the peak volume was reduced across the plan period by applying a suppression factor to the measured household proportion. This gave a small reduction of less than 3% by the end of the plan period. Since the resulting reduction is not material it has been decided not to apply any change across the forecast period for the FWRMP. This minor change has no significant impact on the supply demand position.

7 CLIMATE CHANGE

7.1 Overview

Overview of Climate Change Impacts

Impact on Groundwater Resources
The Company's groundwater sources are not constrained by groundwater levels and there is significant pumping water level headroom. Therefore no detailed climate change assessment of groundwater level or recharge has been undertaken. The Company will consider undertaking further work on the potential impacts of climate change on recharge once the UKCIP09 scenario data is published and a methodology for its assessment developed.

Impact on Surface Water Sources
The surface water climate change assessment has been undertaken by modelling the impact on surface water flows relating to the Company's River Severn abstraction and Blithfield Reservoir. The perturbed data for both these sources has been derived using the best practice rainfall-runoff modelling methodology. The impact of these flow changes on deployable output has been modelled using WRAPSIM:

- The modelled impact on dry year deployable output by 2035 in baseline WAFU is less than 1 Ml/d, with an uncertainty around this value of + 22.5 Ml/d and –21.8 Ml/d
- The impact of climate change on baseline peak week deployable output is also small (<1 Ml/d in total) however this has not been included in the FWRMP in line with Environment Agency planning guidelines. The uncertainty around this value of +26.5 Ml/d and –25.8 Ml/d is included in headroom.

Impact on Demand
The Company has followed the industry best practice methodology in calculating the impact of climate change on demand. The total impact of climate change on annual average demand has been calculated as an additional 5.58 Ml/d at the end of the planning period.

7.2 Methodology for Water Resources

The Company has followed the Environment Agency's Water Resources Planning Guidelines[25] and the associated UKWIR methodology[26] in

[25] Water Resources Planning Guidelines (Chapter 8). Environment Agency (2008)
[26] Effects of Climate Change on River Flows and Groundwater Recharge. UKWIR (2007) Report Ref. 06/CL/04/8

determining the potential impact of climate change on our water resources base (Deployable Output). The Company does not have a water resources model for the River Severn and is reliant on outputs from Severn Trent Water's water resources model, for the derivation of flow constraints on the river. Severn Trent Water has, by agreement with the EA, adopted a slightly different approach to the determination of climate change impacts for the River Severn, and South Staffs Water has used these results as an input to our climate change modelling. The approach is described below in more detail.

The Company's climate change assessments have been undertaken using the UKWIR06 scenarios. Climate change is not a significant component of the supply demand balance and it does not drive investment. Nevertheless the Company is intending to update its climate change assessment with UKCP09 data when this is made available (later in 2009), and once Severn Trent Water have reassessed climate change on the River Severn using the UKCIP09 outputs. The Company will report any changes in the next annual update of the Water Resources Plan, however given the limited impact of the existing scenarios, the Company does not expect any material change to the supply demand balance.

7.2.1 Groundwater

The groundwater sources operated by South Staffs Water are currently unaffected by droughts, because the regional fluctuation in groundwater levels within the Sherwood Sandstone is typically 1-3m, and the groundwater sources have significant additional pumping water level headroom (above pumps). Given the existing range of groundwater level fluctuation it is clear that even a doubling of this range would not result in any material impact on deployable output. The deployable output of these sources is largely constrained by abstraction licence conditions and by pumping or treatment capacity. Therefore a detailed climate change assessment of groundwater level or recharge has not been undertaken.

The Company believes that it is more likely for any future changes in recharge to impact on the Environment Agency's licensing policy (by reducing licence availability and hence introducing the need for sustainability reductions on licences).

The potential impact of future groundwater licence reductions (based on historic climate) has been examined using the Headroom model (components S1-S3), however these components have not been included in the baseline headroom assessment used in the supply demand balance, as the Environment Agency's Planning Guidelines state that companies should not make any allowance for sustainability reductions.

The Company will consider undertaking further work on the potential impacts of climate change on recharge once the UKCIP09 scenario data has been studied.

7.2.2 Surface Water

The surface water climate change assessment has been undertaken by obtaining perturbed surface water flows relating to the Company's River Severn abstraction (from STW) and Blithfield Reservoir, and by modelling the impacts of these changes on deployable output using WRAPSIM.

Three different climate change scenarios (mid, wet and dry) have been run in WRAPSIM and the climate change impacted deployable output values have been derived and applied to the base WAFU forecast and to headroom (see below). The methodology includes the application of the UKWIR06 climate change scenarios which are based on climate projections for 6 global climate models (UKWIR, 2007).

7.3 Potential Impacts on the River Severn (Hampton Loade WTW)

South Staffs Water does not have a detailed hydrological model for the Severn catchment and the Company is reliant on the output from Severn Trent Water's model (AQUATOR) when examining the flow constraints on abstraction at Hampton Loade. For their FWRMP Severn Trent Water have undertaken the rainfall runoff climate change method, and the results of this assessment have been made available to South Staffs Water, for the mid, dry and wet scenarios.

7.3.1 Rainfall Runoff Assessment (from Severn Trent Water)

The following text has been provided by Severn Trent Water to describe the approach taken (part of Appendix I in Severn Trent Water's FWRMP).

'Surface water DO assessment

Projections for the variation in surface water deployable output due to climate change have been made using the rainfall runoff modelling method. This method is referred to as Method 2 in the UKWIR Report "Effects of Climate Change on River Flows and Groundwater Recharge: Guidelines for Resource Assessment and UKWIR06 Scenarios", Report Ref. No. 06/CL/04/8 and is the preferred method recommended by the EA in the 2008 WRPG. It provides a more detailed assessment of the potential impacts of climate change than Method 1, which was used to provide an initial estimation of climate change in the draft version of WRMP09.

Method 2 is based on the six climate models (shown in table I1.1) from which monthly rainfall and potential evaporation (PET) factors may be derived for specific river catchments. In the 2008 WRPG, the EA defines the 'mid', 'wet' and 'dry' scenarios as follows:

- *'mid' is the average rainfall and potential evaporation changes from all 6 models, for each month*
- *'wet' is the average change plus one standard deviation for rainfall changes and minus one standard deviation for changes in potential evaporation*
- *'dry' is the average change minus one standard deviation for rainfall changes and plus one standard deviation for changes in potential evaporation*

In our analysis of the six models used in the rainfall runoff methodology, we have found that the EA 'wet' and 'dry' scenarios are close to but not quite as severe as the "maximum" and "minimum" changes projected by the individual models each month (table I1.1). However, each model shows considerable variation in its rainfall projections from month to month. Using the EA method, a change in rainfall close to the "maximum" for each month could mean that the overall 'wet' scenario would have much more rainfall than predicted by any individual model. Similarly the 'dry' scenario would have much less rainfall. This issue is illustrated in table I1.1, which shows the model values for the Wye basin. The exact changes would be different for catchments elsewhere, but study of all areas in the Trent and Severn basins showed a similar pattern. Note that values in the "Year" column are averaged from the 12 monthly changes.

Table I1.1 Rainfall percentage changes from climate models for the Wye catchment

Model	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
HadCM3	-10	40	11	-4	-17	5	-13	-16	-9	28	1	-9	1
CGCM2	10	2	16	-2	-14	1	-3	-2	11	-5	5	9	2
CSIRO-mk2	32	-10	-10	-7	-7	7	12	3	-6	16	3	0	3
GFDL-R30	7	26	6	-16	6	8	-28	-16	7	14	8	-1	2
CCSR/NIES	22	-4	9	13	4	-11	-5	-13	-1	5	26	11	5
ECHAM4/OPYC3	27	9	-6	3	-10	-15	-11	-25	-36	5	7	-1	-4
EA Wet	30	29	14	8	3	9	5	-1	11	22	17	9	13
EA Mid	15	10	4	-2	-6	-1	-8	-11	-5	10	8	2	1
EA Dry	-1	-8	-6	-12	-16	-11	-21	-22	-22	-1	-1	-6	-10

The EA 'wet' scenario shows an increase in rainfall in every month except one, with an increase of 13% for the year as a whole, while the EA 'dry' scenario shows a decrease in every month and an annual reduction of 10%. These annual figures compare to a range of the models from a drop of 4% to a rise of 5%. Furthermore, the individual models all show a combination of increases and decreases, with between 4 and 7 months showing decreases. Each individual model therefore has some scope for increased rainfall, with some months partially compensating for reductions in other months. However, the EA 'dry' scenario does not reflect this.

With agreement from the EA we have applied a revised methodology to calculate deployable output under the three climate change scenarios. We considered it more appropriate to select two individual models to represent 'wet' and 'dry' conditions. The models we adopted are:

- *'wet' – CCSR/NIES (the "wettest" of the models)*
- *'dry' – ECHAM4/OPY3 (the "driest" of the models)*
- *'mid' – average of the 6 models (i.e. the EA scenario)*

Catchment modelling has been used in many studies to extend existing flow records in order to predict flows given various climate scenarios. Many of the time series used in the Aquator models have been derived from the rainfall runoff model HYSIM, which uses rainfall and potential evaporation data to simulate flows in the hydrological system. For the rainfall runoff modelling, the Severn, Trent and Wye catchments have been subdivided into the various "HYSIM catchments". The catchment rainfall and PET for each HYSIM catchment have been modified by applying the appropriate factors for each scenario, using the existing calibrated model parameters. Where there are artificial influences these were left unchanged. In reality it must be expected that climate change will lead to changes in abstractions and discharges, and also to runoff due to changes in cropping patterns for example, but at present there is insufficient information to allow such changes to be modelled. It has also been necessary to assume that the models remain valid under different climatic conditions.'

7.3.2 The Output From Aquator

The AQUATOR model output includes a 86 year simulated flow record at Bewdley on the Severn, with simulated river regulation releases and reservoir storage at Clywedog. The latest model output for each climate change scenario has been provided by Severn Trent Water, based on updated scenarios for Severn Trent's FWRMP. These latest outputs have been used to constrain abstraction from Hampton Loade within the Company's deployable output model (WRAPSIM).

7.4 Potential Impacts on Blithfield Reservoir

South Staffs Water has used a hydrological simulation model called HYSIM to derive the climate change perturbed inflows to Blithfield Reservoir (method 2b of the UKWIR methodology). This work was undertaken by Entec for South Staffs Water.

The perturbed inflows for Blithfield were used as an input into WRAPSIM, along with the perturbed River Severn flows, and WRAPSIM was re-run for each climate change scenario (mid, wet and dry) to derive the revised deployable output values. Further details of methodology used are included in appendix H: Impact of Climate Change on Deployable Output.

7.5 Surface Water Results

The following table summarises the modelled deployable output for each climate change scenario up to 2020's, and includes the base deployable output for comparison.

Climate Change Scenarios to the 2020's

	Base D.O. (Ml/d)	Climate Change Scenarios (Ml/d)		
		Wet	Mid	Dry
Dry Year	419.7	438.2	419.1	400.6
Peak Week	495.4	517.3	494.8	472.9

All D.O. figures are total D.O. (including the STW allowance). The deployable output used in the climate change assessments was amended slightly (1.2 Ml/d average and 1.5 Ml/d peak) following the climate change work (see section 5.2 for final values). Given the minor changes, the climate change modelling has not been re-run. The figures quoted here are those used in the climate change modelling.

The FWRMP requires estimates of deployable output (impacted by climate change) for each year between 2007-8 and 2034-5. The projections used to derive the UKWIR06 scenarios correspond to the thirty year period 2011-2040 centered on the 2020's (2025), therefore it has been necessary to extrapolate the modelled deployable outputs up to 2035. The extrapolated values have been derived by following the Environment Agency's Water Resources Planning Guidelines (2008).

From 2020-21 to 2039-40 deployable output is estimated according to the underlying trend in climate change, by scaling the change in deployable output using the following equation (Equation 1):

$$\textit{Scale Factor} = \frac{\text{Year} - 1975}{2025 - 1975} \qquad \text{[Eq. 1]}$$

To avoid a step change in 2007-8 between observed deployable output and the underlying trend, D.O. has been interpolated linearly between 2007-8 and 2020-21 using the equation below (Equation 2):

$$\textit{Scale Factor} = \frac{\text{Year} - 2007}{2021 - 2007} \qquad \text{[Eq. 2]}$$

7.6 Climate Change in Water Available For Use (WAFU)

The mid climate change scenario is one of the factors used to calculate WAFU in the baseline supply demand balance. Negative climate change impacts are subtracted from deployable output, and positive climate change impacts are added to deployable output. The mid climate change scenario modelled in WRAPSIM has produced the following impact up to 2025.

Mid Range Scenario to the 2025

	Base D.O. (Ml/d)	D.O. in 2025 (Mid CC Scenario)	Impact of Mid Scenario on D.O. in 2025 (Ml/d)
Dry Year	419.7	419.1	-0.6
Peak Week	495.4	494.8	-0.6

The mid climate change scenario has been extrapolated up to 2035 as shown in the following table.

Mid Range Scenario to 2035

	Base D.O. (Ml/d)	D.O. in 2035 (Mid CC Scenario)	Impact of Mid Scenario on D.O. in 2035 (Ml/d)
Dry Year	419.7	419.0	-0.7
Peak Week	495.4	494.7	-0.7

The mid range impacts of climate change on peak week deployable output have not been included in the FWRMP in line with Environment Agency planning guidelines.

7.7 Climate Change in Headroom

The wet and dry climate change scenarios modelled in WRAPSIM represent the range of uncertainty around the mid range scenario up to 2025. The range of uncertainty used in the headroom assessment is based on the difference between the wet/dry scenarios and the mid range scenario, as shown in the table below.

Wet and Dry Scenarios to 2025

	Base D.O. (Ml/d)	Range of Uncertainty by 2025 (Wet) (Ml/d)	Range of Uncertainty by 2025 (Dry) (Ml/d)
Dry Year	419.7	+19.1	-18.5
Peak Week	495.4	+22.5	-21.9

The wet and dry uncertainty has been extrapolated up to 2035 as shown below.

Wet and Dry Scenarios to 2035

	Base D.O. (Ml/d)	Range of Uncertainty by 2035 (Wet) (Ml/d)	Range of Uncertainty by 2035 (Dry) (Ml/d)
Dry Year	419.7	+22.5	-21.8
Peak Week	495.4	+26.6	-25.8

This uncertainty range has been incorporated into both dry year average and peak week headroom by assuming a triangular distribution with the upper and lower limits defined by the wet and dry scenario results. Further details are provided in appendix C: Headroom Assessment.

7.8 Impact of Climate Change on Demand

To calculate the impact of climate change on demand the Company has followed the guidance from the DEFRA CCDeW[27] report. Climate change impacts are added to the normal year demand forecasts.

The report details the predicted impacts on demand from climate change in percentage terms. The DEFRA study indicates a 1.5% increase in total average demand by the end of the 2020s and a further 1-2% increase by 2050s for the Midlands. The Company has applied the percentages to customer groups as highlighted in the report with the resulting additional allowances applied to normal year demand.

The UKCIP scenarios used in the CCDeW analysis did not include enough detail to allow a full analysis of extreme events in terms of magnitude or frequency and therefore the DEFRA study has provided only limited guidance on the likely impact of extreme events on demand. Therefore, the Company has made no additional adjustment for climate change impacts on dry year demand.

It has been predicted that changes in domestic demand will result from increased frequency of use of personal washing, garden watering, car washing and miscellaneous use.

There is no account taken of changes in behaviour which might influence the ownership rates of water using appliances and therefore there is some capping of the impacts. For example, if you do not own a sprinkler then you cannot use it more frequently. Also, for some appliances there is a level above which demand will not increase e.g. there are only so many showers you can take in one day.

In reality behaviour will be dynamic and there will be additional influences on consumption which will operate to further increase demand but may also act to reduce it. It is possible that people will become more aware of the amount of water they use and more receptive to water efficiency appliances and initiatives and that this will have a netting off effect on some of the pressures to increase demand due to climate change.

The DEFRA study forecasts that the increase in domestic demand as a result of climate change in the Midlands will be 1.8% by 2025 and 3.7% by 2055 for

[27] Climate Change and the Demand for Water (CCDeW). DEFRA Research Report. February 2003.

average demand situations. The impacts are applied proportionally to measured and unmeasured customers.

Commercial sectors which are potentially sensitive to climate change and which are likely to impact on public water supply have been identified in the DEFRA study as breweries, soft drinks manufacturers and hotels and the leisure sector. It is assumed that consumption of drinks will increase and there will be greater evaporation from swimming pools etc. However, these changes are not well understood.

Predicted impacts in overall industrial demand for the Midlands region are 1.7% by 2025 rising to 3.4% by 2055. Climate change impact factors for the most sensitive sectors listed above are up to 6% by 2025.

The DEFRA study predicted there to be potential for significant increased demand by the agricultural sector as a result of climate change – up to 23% increase by 2025 in the Midlands. The main increase in demand will result from increased spray irrigation. However, currently only a small proportion of water taken by the agricultural sector is provided by public water supply.

There is a great deal of uncertainty over how changes in the agricultural economy will affect the extent of the impacts of climate change. For instance changes in international trade and cultivation of different crops may provide significant mitigation against some of these predicted impacts. Additionally, it is not known what proportion of the current consumption by the agricultural sector is due to spray irrigation.

The total impact of climate change on demand has been calculated as an additional 5.58 Ml/d at the end of the planning period (1.22Ml/d for non-household demand and 4.36 Ml/d for household demand). This central estimate has been applied to the baseline and final demand forecasts, and the uncertainty around these forecasts is included in headroom.

8 TARGET HEADROOM

8.1 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. Additional components have been included for population growth, leakage and for water efficiency assumptions, and minor changes have been made to the supply side components.

Following comments from OFWAT the Company has accepted a higher level of risk in the base year regarding the headroom estimate. This is now 10%, compared to 5% in the DWRMP. The level of certainty remains at 90% until 2020 and then reduces gradually to 80% between 2020 and 2035.

Headroom is now between 2.8% – 3.2% of dry year demand, and between 2.8% – 3.3% of peak week demand.

8.2 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)[28], as defined in the Environment Agency's Water Resources Planning Guidelines (2007). 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 9.

[28] Uncertainty and Risk in Supply Demand Forcasting, UKWIR (2003) Report Ref. CL-09n

The uncertainty around each element of headroom was assessed internally by the Company and the @RISK model was populated and run by Mott MacDonald.

Each element of headroom has been reviewed, and updated where appropriate for the FWRMP. Additional components have been included for population growth, leakage and for water efficiency assumptions, and minor changes have been made to the supply side components. The level of uncertainty relating to surface water supply data has also been increased.

The input data are listed below, along with the chosen probability distribution.

	Dry Year Annual Average Headroom	**Peak Week Headroom**	**Distribution used**
***S1/1**	Vulnerable surface water licences	Vulnerable surface water licences	Triangular
***S2/1**	General sustainability	N/A	Discrete
***S3/1**	Time Limited Licences	Time Limited Licences	Discrete
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
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 baseline headroom assessment, they are used in sensitivity analysis.

The input data are detailed in appendix C, which also includes the key changes from PR04, and the modelling approach used by Mott MacDonald.

8.3 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 (2007, section 9.3).

The guidance states that 'it is neither practical or affordable to plan for 100 percent 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'.

Following comments from OFWAT the Company has accepted a higher level of risk regarding the target headroom estimate. This is now 10% at the beginning of the planning period, compared to 5% in the DWRMP. The Company has retained the profile of risk used in the DWRMP across the planning period. The level of risk remains at 10% until 2020 and then progressively increases to reach 20% in 2034/35. This is considered to be a prudent level of risk, which reduces over time as the Company will work to reduce future uncertainties.

8.4 Headroom Results

The dry year annual average and peak week target headroom results are presented in detail in appendix C and summarised in the tables below.

	2010	2015	2020	2025	2030	2035
Dry Year (Ml/d)	9.9	12.4	17.1	16.0	14.3	13.3
Peak Week (Ml/d)	11.7	12.4	14.4	12.9	11.4	10.6

Target headroom starts off at relatively low values and rises steadily as more elements of uncertainty contribute to the analysis. However after 2020 the level of certainty adopted by the Company begins to decline down to 80%. This has the affect of reducing target headroom to lower levels at the end of the planning period.

The Company notes that the target headroom values derived are low. Headroom is now c.3% of dry year and peak week demand throughout the

period. This compares to values between 2.3% - 6.7% of dry year demand and 7.3% - 9.0% of peak week demand in the PR04 Water Resources Management Plan. The main reasons for the lower target headroom values are listed below:

- Losses in deployable output resulting from algal blooms on Blithfield Reservoir have been removed from headroom and included in outage as these are temporary restrictions. This element previously accounted for 60% of peak week headroom.

- The Company has now accepted a lower level of certainty (a higher level of risk) after 2020 compared to the PR04 plan. The level of certainty reduces from 90% in 2020 down to 80% in 2035. This has reduced both the peak week and annual average headroom assessment in later years compared to PR04, where the level of certainty was a constant 95%.

- General sustainability reductions (S2/2) were included in the dry year average headroom assessment in the PR04 plan. These reductions (previously about 30% of the total uncertainty) have been removed and are accounted for in the general sensitivity analysis undertaken in this plan (section).

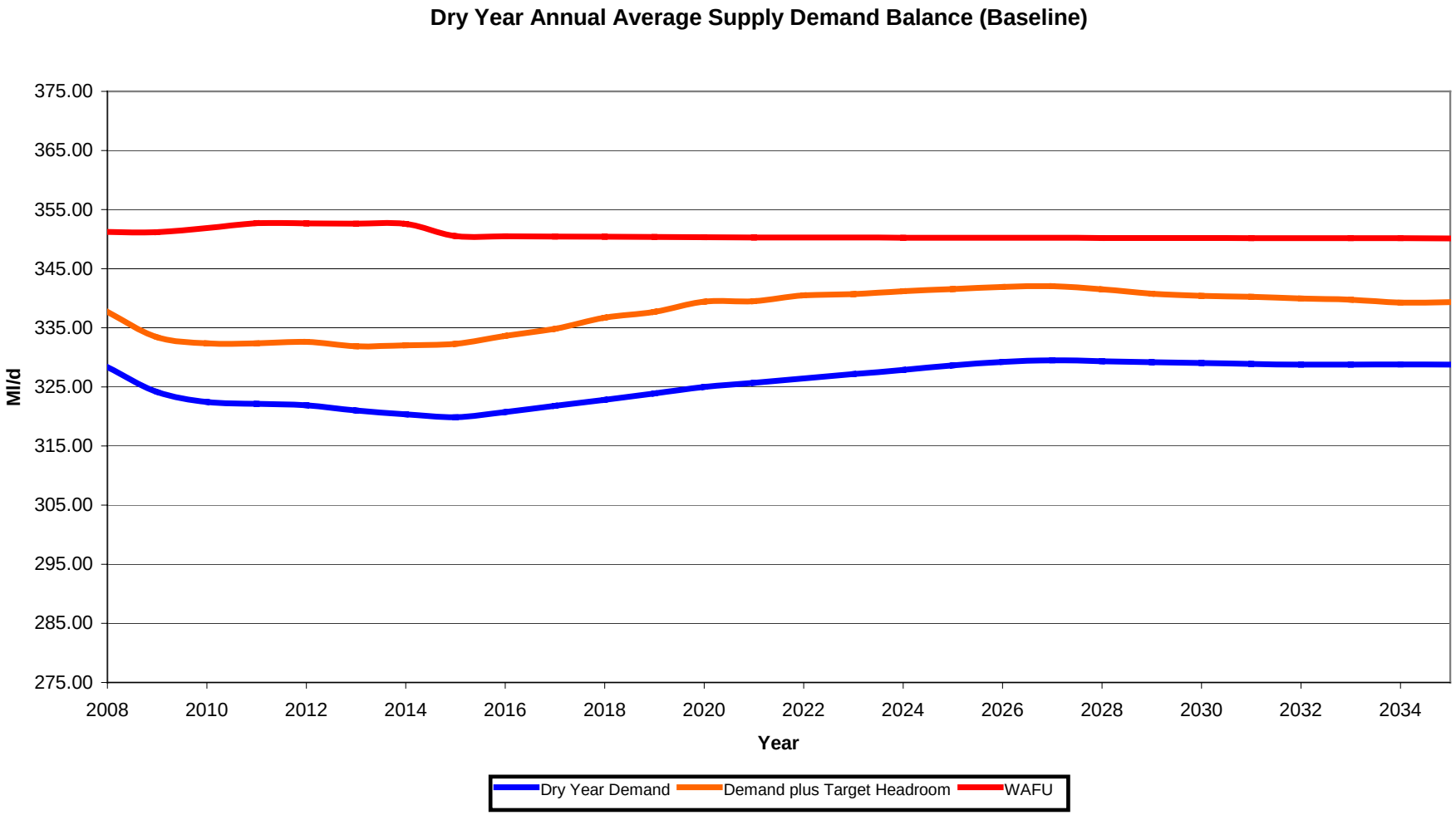
The additional components included in headroom for the FWRMP act to increase headroom, compared to the DWRMP. However these increases are largely offset by the acceptance of a higher level of risk at the start of the planning period (10% instead of 5%), in line with OFWAT comments.

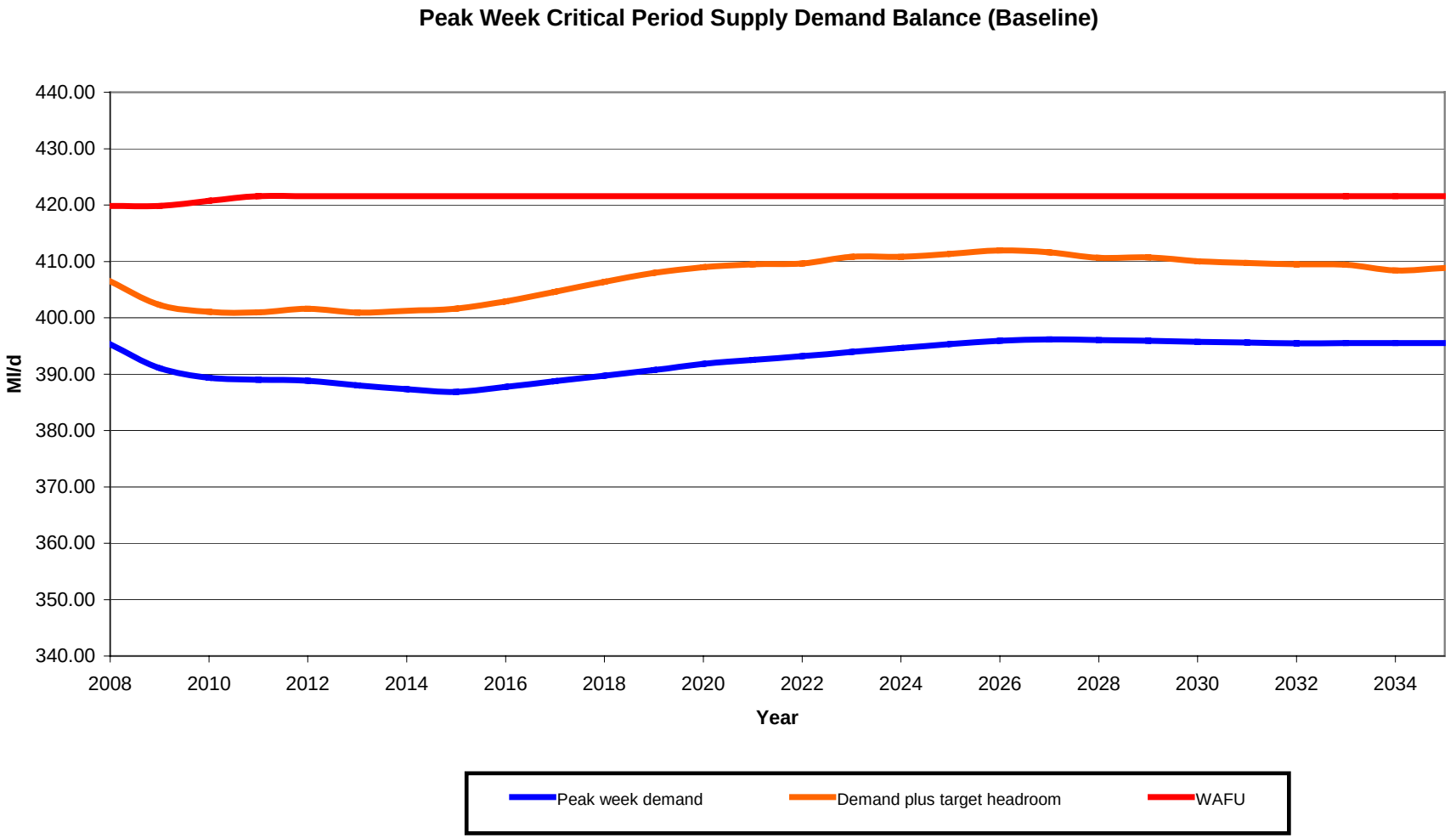
8.5 Headroom and Levels of Service

The baseline dry year and peak week supply demand balance presented in section 9 includes the target headroom figures described above. Section 9 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 one hosepipe ban in every 40 years. The Company's target headroom is therefore consistent with the Company's stated level of service.

9 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 as illustrated in the following graphs.


Dry Year Annual Average Supply Demand Balance (Baseline)
375.00
365.00
355.00
345.00
335.00
325.00
315.00
305.00
295.00
285.00
275.00
Ml/d
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
Year
Dry Year Demand
Demand plus Target Headroom
WAFU


Peak Week Critical Period Supply Demand Balance (Baseline)
440.00
430.00
420.00
410.00
400.00
390.00
380.00
370.00
360.00
350.00
340.00
Ml/d
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
Year
Peak week demand
Demand plus target headroom
WAFU

10 FINAL WATER RESOURCES STRATEGY

As section 9: 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.

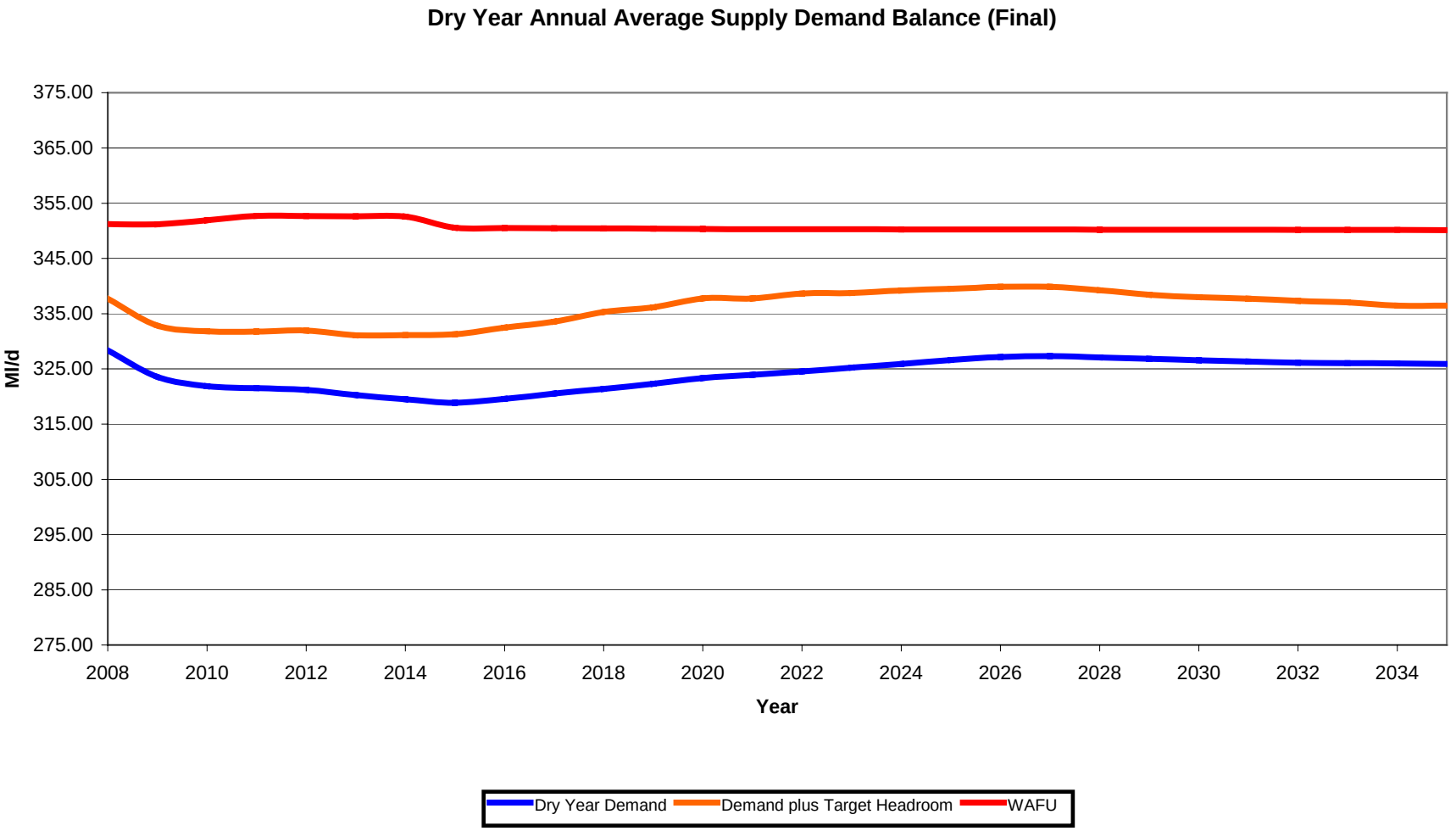
This healthy supply demand balance position does not mean that ongoing investment in the supply demand balance category is required to a lesser extent in future. Investment must be maintained to meet the increasing challenges of ongoing leakage control, the costs of providing connections for new housing under the Regional Spatial Strategy, delivery of the Company's metering strategies and water efficiency activities.

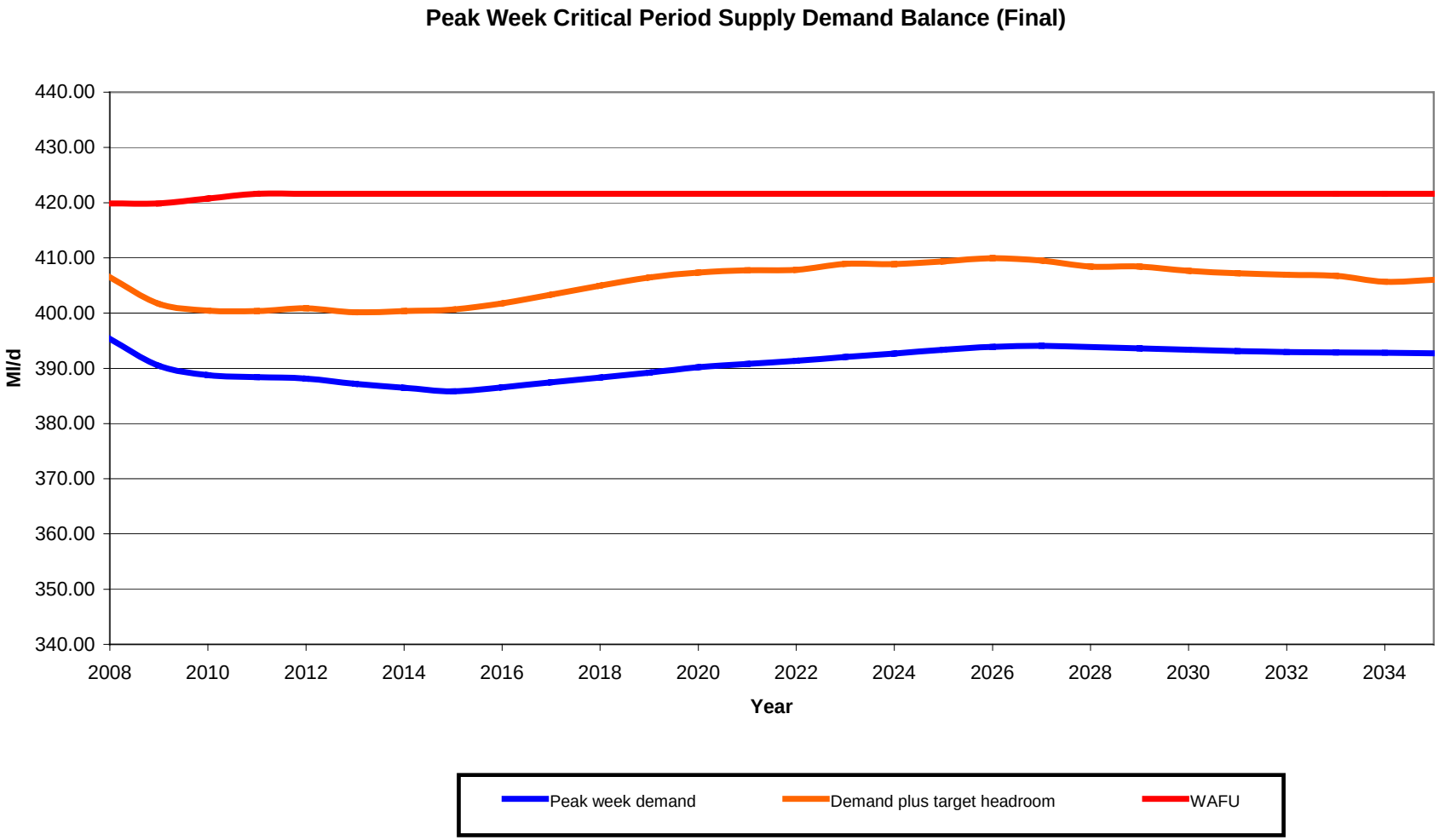
There are two important differences between the baseline and the final planning scenarios. These are:-

- Change of occupier metering is not included in the baseline forecast, in line with Environment Agency planning guidelines. The impact of introducing change of occupier metering is to increase meter penetration at the end of the planning period from 60% in the baseline forecasts to 77% in the final scenario.

- The OFWAT leakage target for 2009/10 of 75.0Ml/d has been included in the baseline forecasts, in line with Environment Agency planning guidelines. The SELL of 74.4Ml/d has been used in the final demand forecast.

The final supply demand balance reflects this reduction in demand 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.


Dry Year Annual Average Supply Demand Balance (Final)
375.00
365.00
355.00
345.00
335.00
325.00
315.00
305.00
295.00
285.00
275.00
Ml/d
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
Year
Dry Year Demand
Demand plus Target Headroom
WAFU


Peak Week Critical Period Supply Demand Balance (Final)
440.00
430.00
420.00
410.00
400.00
390.00
380.00
370.00
360.00
350.00
340.00
Ml/d
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
Year
Peak week demand
Demand plus target headroom
WAFU

11 SENSITIVITY TESTING

11.1 Overview

For the DWRMP the Company examined the sensitivity of the supply demand balance in two areas, (i) data uncertainty (in headroom) and (ii) key assumptions.

The total uncertainty was illustrated by considering two supply demand scenarios, with a nominal reduction in the supply demand balance of 10 Ml/d and 20 Mll/d. These reductions were applied to Water Available For Use for ease of presentation, across the planning period.

Although the DWRMP showed a surplus of supply over the entire period, this sensitivity analysis was very useful because it allowed the Company to test the least cost sequence of options that would be used to meet a supply demand imbalance, if the balance should change in future. A comprehensive range of supply and demand management schemes were identified, described and costed in the DWRMP.

This FWRMP continues to show a surplus of supply over demand, therefore the Company has not repeated the full scenario sensitivity analysis and least cost planning of options as described above. However the DWRMP sensitivity testing, including the supply demand scenarios, the range of scheme options and the least cost planning assessment is included in appendix I and K for reference.

For the FWRMP, the Company has revised the headroom components as described in section 8. It has also revised components S1-S3 that although not included in the FWRMP supply demand balance, are presented to illustrate the potential impact of future environmentally driven licence reductions. These components (S1-S3) are described in section 11.2 below.

The Company has not undertaken sensitivity analysis on the two indicative sustainability schemes identified In the Environment Agency's National Environment Programme (The River Severn Estuary and the River Mease). The Environment Agency has confirmed that if these schemes are implemented in AMP5 the impact in the Company's abstraction licences would be negligible.

11.2 Uncertainty over Future Abstraction Licence Reductions

Headroom is the calculated planning allowance that is required to provide a buffer for the uncertainty around factors included in the supply-demand balance estimation. Data uncertainty is considered in detail in the calculation of headroom. The output from the headroom modelling is described in section 8 and the detail of the uncertainty assigned to each source of uncertainty included in headroom is described in appendix C.

Planning guidance from the Environment Agency is very clear on the uncertainties which can be included within the calculation of headroom. The guidance explicitly excludes uncertainty for addressing environmental problems which may arise from implementation of the Water Framework Directive. The Environment Agency position on this is that they believe that there are mechanisms in place which will ensure that the effects of reductions in allowable abstractions do not impact on a company's water available for use. South Staffordshire Water fundamentally disagrees with this assumption.

A large proportion of the groundwater units from which the Company abstracts are classified by the Environment Agency as over-licenced and over-abstracted and are at risk of requiring reductions in abstraction. There is in fact a great deal of uncertainty over how these issues will be addressed in future and the Company believes that this uncertainty should be reflected within headroom.

The Company has undertaken two additional modelling scenarios to calculate headroom including its concerns over potential future reductions in abstraction. The uncertainty around these issues is characterised in components S1–S3. The assumptions used to derive the scenarios are detailed in appendix C, and are derived from the Environment Agency's Catchment Abstraction Management Strategies (CAMS). The two scenarios are:

Scenario A: Assuming all of the licence changes in the relevant CAMS

Scenario B: Assuming 50% of the licence changes in the relevant CAMS

The inclusion of factors S1-3 in the estimation of headroom significantly increases the target headroom allowance for dry year as can be seen from the table below.

Dry Year Annual Average Headroom (S1-S3) Sensitivity to Future Abstraction Licence Reductions (in Ml/d)

	2014/15	2019/20	2024/25	2029/30	2034/35
Target headroom excl S1-S3	12.4	14.4	12.9	11.6	10.6
Scenario A Target headroom incl S1-S3	25.1	53.2	60.7	66.4	61.8
Scenario B Target headroom incl S1-S3	18.3	34.9	38.7	42.4	39.3

The FWRMP supply demand surplus ranges between 6 Ml/d and 20 Ml/d for the Dry Year Annual Average scenario. The sensitivity analysis on headroom

confirms that the supply demand balance would be in deficit in AMP6 and that significant additional investment would be required to replace lost resource if this scale of licence reductions is targeted by the Environment Agency in future.

11.3 Strategic Environmental Assessment

The EU Directive 2001/42/EC on assessment of effects of certain plans and programmes on the environment (the 'SEA Directive') came into force in the UK on 20 July 2004 through the Environmental Assessment of Plans and Programmes Regulations 2004.

For the DWRMP the Company took a precautionary approach and prepared an SEA even though the draft plan showed a surplus of supply over demand for the entire planning period. This approach was undertaken so that the Company could be prepared for any changes to the supply demand balance which might arise between the Draft Water Resources Management Plan and the Final Water Resources Management Plan. So if schemes were required for the FWRMP then the SEA process would influence which options were chosen by taking appropriate consideration of potential environmental impact.

To date the Company has completed stages A-D of the SEA process as follows:

- Stage A – Setting the context and objectives, establishing the baseline and deciding on the scope. Stage A has been undertaken through the preparation of (and consultation on) a Scoping Report.
- Stage B – Developing and refining alternatives and assessing effects; Stage B has been documented in an Environmental Report.
- Stage C – Preparing the Environmental Report; Stage C has been documented in an Environmental Report.
- Stage D – Consultation on the draft plan or programme and the Environmental Report; the Environmental Report has been subject to public consultation in parallel with the Draft Water Resources Management Plan.

In this FWRMP the Company has continued to demonstrate that it has sufficient resources to meet forecast demand for annual average and peak week conditions throughout the plan period. Given that there is no requirement for either supply-side or demand-side interventions there will be no significant environmental effects arising from the implementation of the FWRMP. Therefore the Company does not believe that Stage E (monitoring the implementation) is required, as there is no supply/demand shortfall over the planning period.

For completeness a summary of the SEA Scoping Document and the Environmental Report is included as appendix L.

A copy of the SEA Scoping Document, Environmental Report and the consultation responses is available on the Company's website south-staffs-water.co.uk.

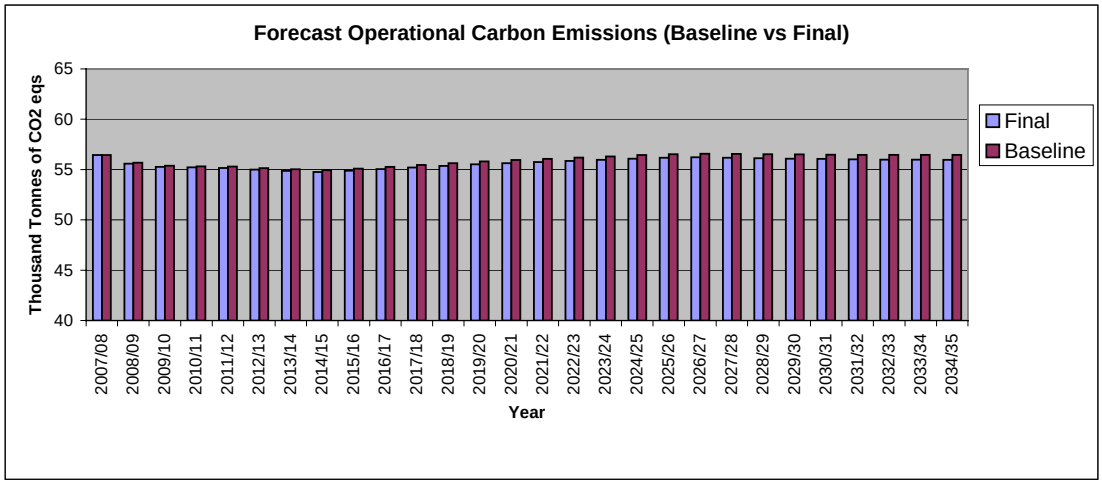
12 CARBON EMMISSIONS

The Company's total operational carbon emissions for the year 2008/9 have been calculated using the UKWIR carbon accounting methodology (GHG Estimating Tool Ref. No. 08/CL/01/5). This is based on the Defra total carbon emissions from pumping and treating water and all support and admin activities, not the net emissions for treating and pumping water only.

Carbon Emissions 2008/9	
Element	**Defra (Kg CO2 eqs)**
Drinking water treatment and pumping emissions	57217283
Total emissions including drinking water, sludge, administration and transport	61134707
Volume of drinking water supplied (Ml)	127067 Ml
Emissions from drinking water and pumping per Ml of drinking water treated	450.29
Total emissions per Ml of drinking water treated including drinking water and pumping, sludge, administration and transport	481.12

Total emissions for 2008/9 have been divided by the volume of water pumped in that year 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.



Normal year annual average demand across the planning period is forecast to be essentially flat. There is a small reduction in demand across the period

(0.8% in 2034/35) due to change of occupier metering and leakage management implementation in the final scenario.

The baseline forecast is 56.4 thousand tonnes (CO2 equivalent per year) at the end of the planning period, with a final planning forecast of 55.9 thousand tonnes in 2035. This is compared to 59.2 thousand tonnes in the DWRMP. This reduction for the FWRMP is a direct result of the lower demand now forecast in the FWRMP.

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.

The Company is currently exploring the potential for the installation of a wind turbine at one of its sites to provide approximately 9636000KWh of renewable energy per year. A met mast has been erected on the site to monitor wind speeds to determine the feasibility of the proposal. However OFWAT have confirmed that this potential scheme cannot form part of the regulated water business, therefore the potential benefits have not been included within the FWRMP.