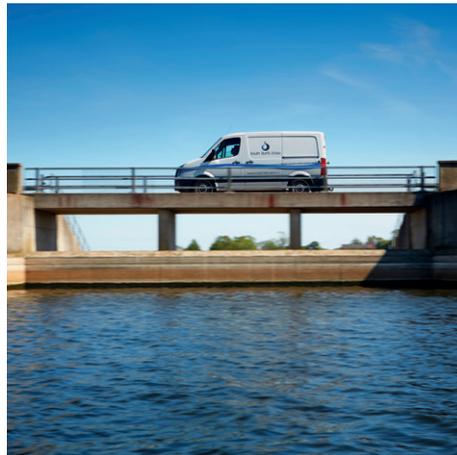




South Staffs Water



Water Resources Management Plan

Annual Review
(2017)



WATER RESOURCES MANAGEMENT PLAN ANNUAL REVIEW 2016/17

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EXECUTIVE SUMMARY

- **Implementation of the 2014 Water Resources Management Plan**

The Company has separate Water Resources Management Plans for both regions of operation; Cambridge (CAM) and South Staffs Water (SSW). This annual report relates to the South Staffs region only. However, some of our performance commitments are combined across the two regions.

The Company has achieved its 2016/17 targets and outputs published in the 2014 Water Resources Management Plan (WRMP14) for the South Staffs region and water resources zone and has not made any changes to the plan.

The WRMP14 did not include risks to the supply demand balance associated with Water Framework Directive legislation, and the No Deterioration principle, in accordance with the guidance from the Environment Agency. However, these issues represent substantial uncertainty and introduce significant risks to the future supply demand balance and the resilience of water supplies for customers. We continue to explore them with the Environment Agency. These risks and the implications will be considered in greater detail in the preparation of the WRMP19.

- **Draft Water Resources Management Plan 2019 (dWRMP)**

The Company started work on the dWRMP2019 and this is scheduled for public consultation in 2018. A comprehensive review of all components of the supply demand balance is under way to produce a plan for the period to 2045.

- **Levels of Service**

The Company has not imposed a temporary use ban in the SST region within report year and does not anticipate one within 2017/18. We have made no change to the planned level of service for temporary use bans.

- **Leakage**

The Company has achieved its Ofwat leakage target in the SST region with an outturn total leakage figure of 69.85 MI/d against a target of 70.5 MI/d.

- **Water Efficiency**

Water efficiency performance is measured by Per Capita Consumption. This is a performance measure which is an average across the Company's two regions of operation. The average Per Capita Consumption (PCC) outturn for 2016/17 is 129.85 ltrs/head/day against a target of 130.15ltrs/h/d. This continues to be a positive movement towards the Company's AMP6 targets for reducing average Per Capita Consumption.

Per Capita Consumption for measured and unmeasured households in the South Staffs region are reported separately in the data table.

The Water efficiency target is applicable across both regions therefore the commentary is repeated in both Annual Reviews.

Further details of the Water Efficiency ODI and performance outturn are published in the 2017 'Annual Performance Report' submitted to Ofwat as a public document.

- **Metering**

New household connections were 2,133 compared to a 2014 WRMP forecast of 2,200 and non-household connections were 180 compared to a forecast of 175.

A total of 5,564 meters were installed in 2016/17 under the domestic free meter options policy against a 2014 WRMP forecast of 5,850. Opportunities are being explored to increase the number of meter installations. One such initiative is the partnering agreement with Walsall Housing Group which is described in more detail in section 5.4.

- **Customer Demand**

Annual average distribution input was 295.59Ml/d (Post MLE) 0.44 higher than the prior year.

Measured non-household consumption showed an increase of 1.62 Ml/d in demand in 2016/17 in comparison to the previous year.

There was a net decrease in household consumption of 0.60l/d

- **Sustainability Reductions**

No reductions have been made to Deployable Output during 2016/17 as a result of Sustainability Changes. However, the Company is on target for implementation of its National Environment Programme (NEP) obligations.

- **Expectations for 2017/18**

For 2017/18 annual average demand in the South Staffs region is expected to follow a similar trend as in previous years with household and non-household demand continuing to reflect an economy that is showing gradual signs of recovery. There are some areas in the South Staffs region with significant planned development such as the Black Country, Lichfield and Burton. The Company has good working relationships with planning authorities, regularly attending workshops and holding meetings with the strategic planners and will continue to do this to keep abreast of the most recent information regarding growth expectations. Growth expectations beyond 2020 will be incorporated in the new WRMP19.

We will continue to identify opportunities to work with housing associations and registered social landlords to promote metering to those who will benefit most from it. As part of this we will continue to work with Walsall Housing Group to expand the meters installed as part of its void

maintenance programmes. Further opportunities will be explored to promote the water efficiency message amongst its 30,000 housing stock.

Our water efficiency strategy and customer engagement in the Cambridge region will continue to follow the successes from previous year's projects. We will aim to target water efficiency initiatives appropriate to different customer segments. This will make water efficiency more cost effective and achieve a greater engagement with customers.

Leakage will continue to be a key Performance Commitment and a priority for the Company. We will continue to review new technology opportunities to aid effective and efficient leakage management throughout AMP6.

- **Forward Look**

The final approved WRMP14 came into effect on 1 April 2015.

The WRMP14 does not forecast a supply demand deficit within the 25 year planning horizon; therefore major resource development or increased demand management measures were not required to meet a supply shortfall for the period 2015-2040.

There are emerging risks to licences and to the surplus supply over forecast demands. These uncertainties arise from changes to Environment Agency policy and the requirements of the Water Framework Directive. These issues represent substantial uncertainty and introduce significant risks to the future supply demand balance. We continue to explore them with the Environment Agency and to minimise the impacts in future WRMPs.

We began consultation on our next plan WRMP19, with customers and stakeholders during 2016-17, and will continue this during 2017/18. This will explore the risks, uncertainties and options for the long term. Our aim is to continue to maintain the highest levels of security of supply to our customers ensuring that all of our customers have a plentiful supply of high quality drinking water.

We will also continue to work hard to maintain leakage below the economic level, and to encourage and support our customers to be water efficient in order to manage demands.

Promoting Water Efficiency and increasing the Company's engagement with customers will continue to be a high priority over the remaining years of AMP6. This will be done through increasing partnering arrangements where possible, having a high profile at community events, offering advice and devices free of charge through various forms and channels.

1 Introduction

Following the acquisition of Cambridge Water by South Staffordshire Water, and unification on 1 April 2013, South Staffordshire Water comprises 2 geographically separate and distinct Water Resources Zones. As the Water Resources Zones are distinctly separate, each has its own Water Resources Management Plan, and an annual review is undertaken separately for each region.

South Staffordshire Water published its current Water Resources Management Plan (WRMP14) for the South Staffs Region resource zone in June 2014, and this plan came into effect from 1 April 2015 for the period 2015/16 to 2039/40. This annual review is the second review of this current WRMP.

Since 2012, Ofwat no longer require annual June Return data, and this is now replaced by annual reporting against a number of Key Performance Indicators (KPIs). The annual outturn data reported in internal and external KPIs covering the period 1 April 2016 to 31 March 2017 is used to inform this review, and the data table presented in Appendix 1 on the request of the Environment Agency. This is consistent with the latest guidance from Defra and the Environment Agency.

This review is a statutory requirement of the Water Industry Act 1991 (as amended by the Water Act 2003), which states that:

Before each anniversary of the date when its plan was last published, the water undertaker shall –

- (a) review its plan; and
- (b) send a statement of the conclusions of its review to the Secretary of State

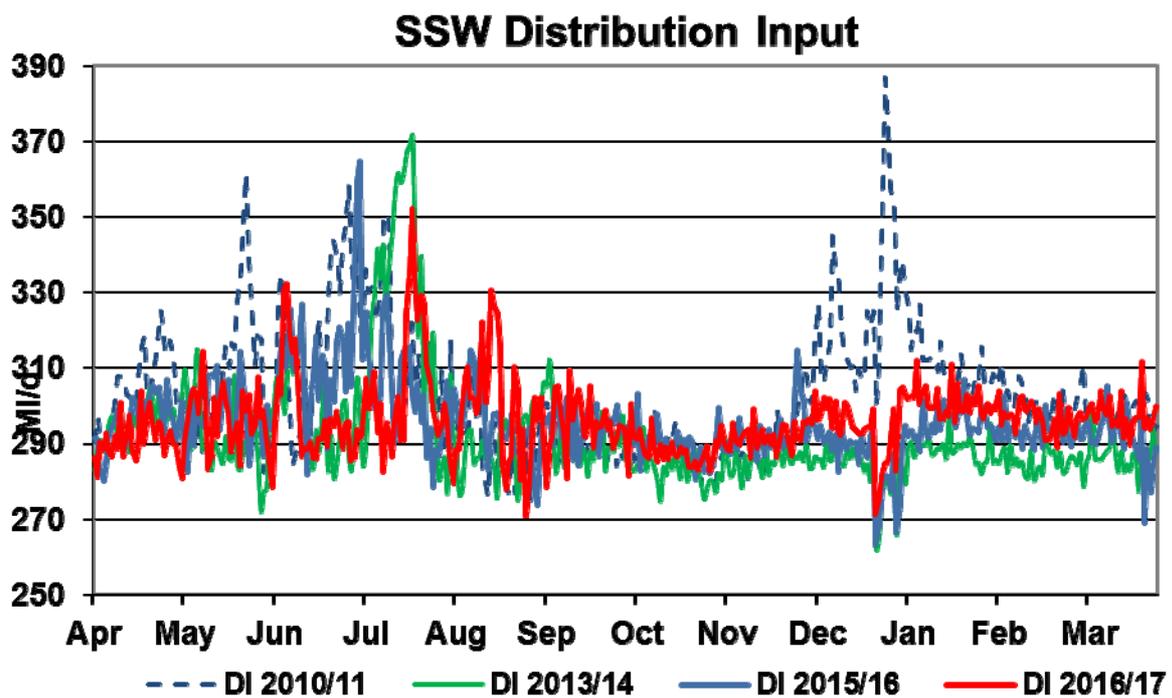
The purpose of the annual review is to identify any material changes to the WRMP, and to report on progress made in updating and implementing the plan, hence this review includes commentary on the plan effective in the reporting period and the transition to the revised plan now published. The review has been undertaken in accordance with the latest guidance published by the Environment Agency, which advises that the following information should be contained in the annual review:

- an overall summary of the supply demand balance situation
- progress on the areas for improvement identified by Defra and the Environment Agency at the time of publication of the final WRMP
- progress with implementation of the WRMP
- changes to the components of the WRMP

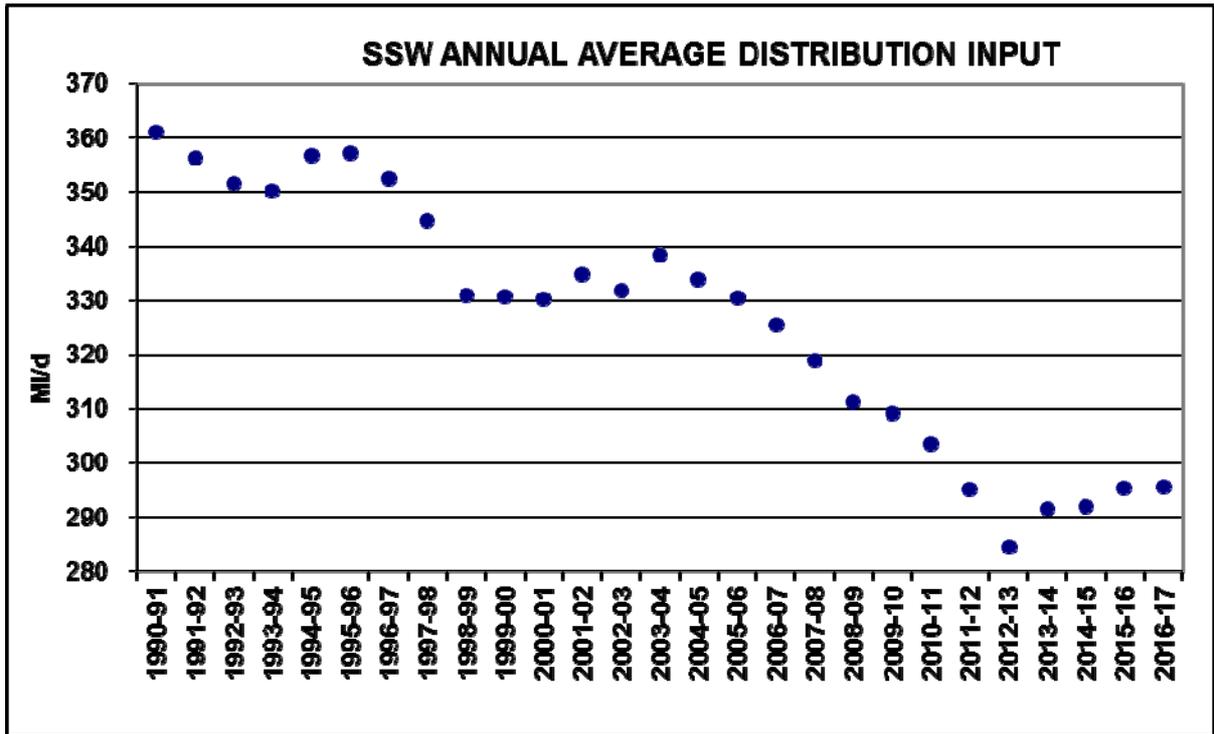
2 Overview of 2016/17

Average distribution input for the year was 295.59MI/d (post MLE) with a peak week demand in the week commencing 17th July 2016 of 331.98 MI/d (MLE not applied).

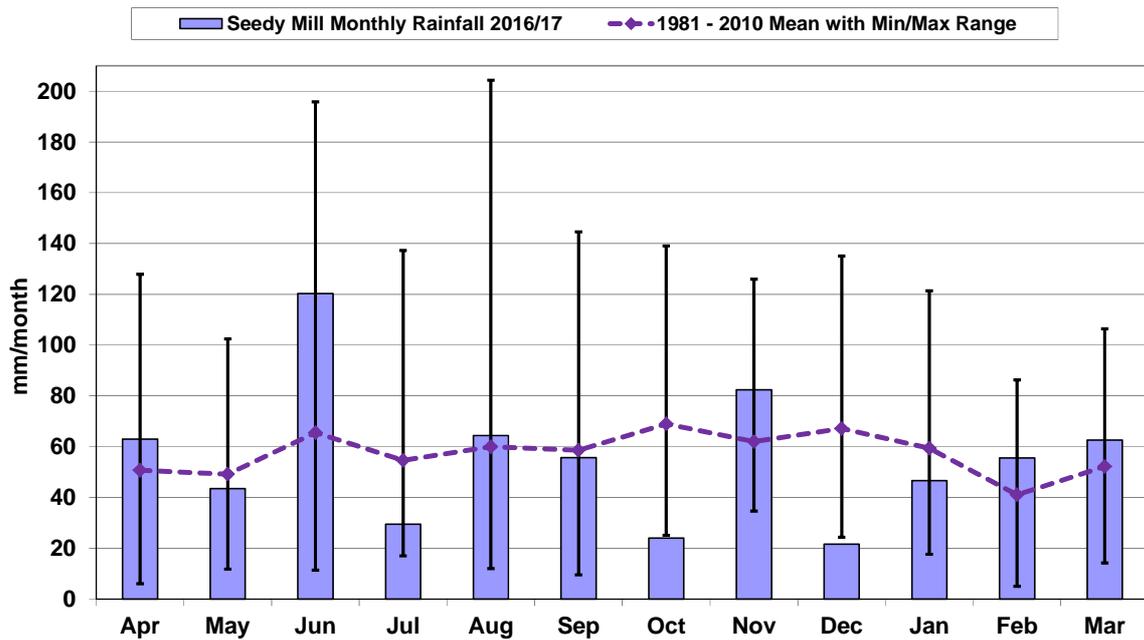
The daily demand profile is shown in the chart below. The last year with elevated summer demands was 2013/14 and that with a winter peak 2010/11. No winter peak was observed in 2016/17 as the weather was generally mild and there remained a low mains burst rate as in the previous years.



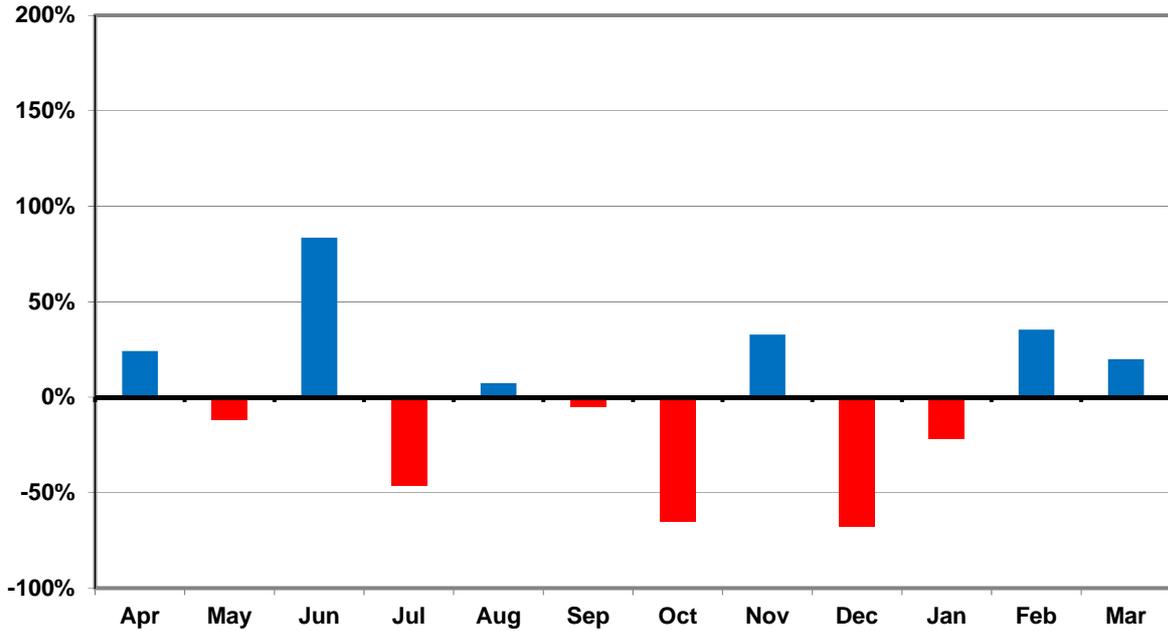
The trend in annual average distribution input between 1990 and 2017 is shown in the following chart.



Monthly Average Rainfall 2016/17 - Seedy Mill WTW



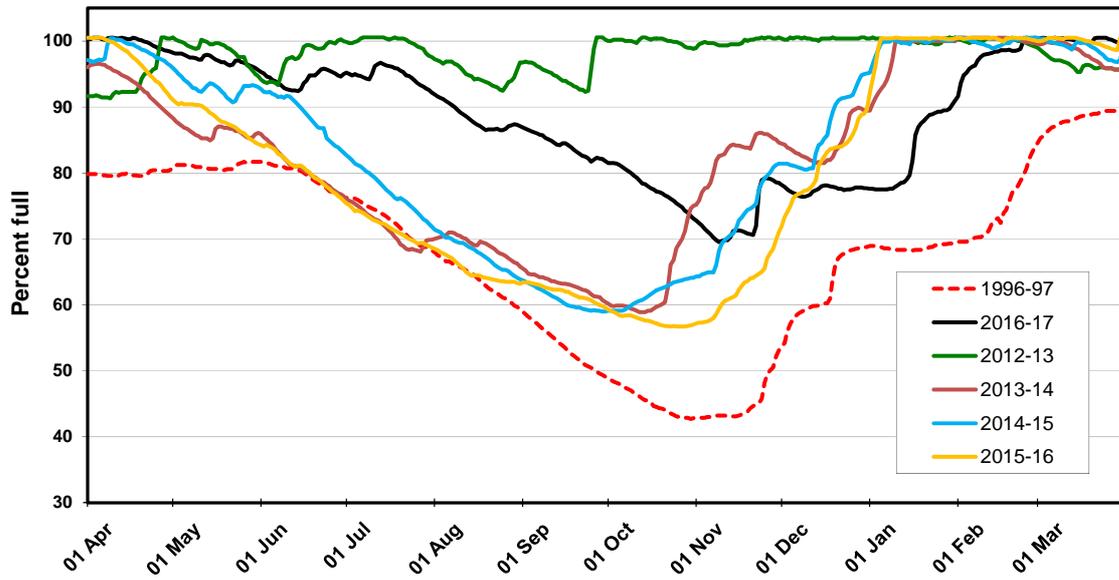
Monthly Rainfall 2016/17 - Seedy Mill WTW
% of 1981 - 2010 LTA



Total annual average rainfall figures (measured at Seedy Mill WTW and shown above) show that overall rainfall for the reported year was average with 98.8% of the long term average between 1981 and 2010. The low autumn and early winter rainfall meant that soil moisture levels remained unusually low late in 2016. Surface water reservoirs ended the year with normal levels. Groundwater levels have also been maintained at normal levels.

The graph below shows the levels in Blithfield Reservoir over the last five years together with the last severe drought in 1996/7. The recharge season for groundwater and reservoirs is generally October to March, but dry winter conditions led to the reservoir starting to fill late and it then remained full between mid February and March.

Blithfield levels for the last five financial years, and 1996-97



3 General Water Resources Components

The guidance from Defra and the Environment Agency suggests a format for reporting on individual items in this annual review. Items are categorised according to whether or not their reporting requirement is triggered by change. The tables below, and in following sections offer comments on all those items listed in the guidance. Additional commentary is included, where appropriate.

Item	Description	Review Criterion	Company Comment on Review
Water resource zones	Any changes to boundaries	Requirement triggered by change	The Company is a single resource zone with the risk of shortages of water being equal across the whole area of supply. There have been no changes to the Company boundary in the review period.
Levels of service	Any changes to the proposed target level of service	Requirement triggered by change	The Company forecasts a temporary use (hosepipe) ban not more than once every 40 years and an ordinary drought order (non-essential use ban) no more than once every 80 years. There have been no changes in the review period to these levels of service.
Progress against outcomes and performance commitments	Where relevant to the delivery of the WRMP, progress against achievement of customer outcomes and performance commitments of the business plan	New requirement to report on ODI progress if applicable.	The Company has a suite of performance commitments of which there are some directly related to the WRMP14; leakage and water efficiency. These are discussed in section 5.

3.1 AMP6 Performance Commitments

For the 2015-2020 business plans, the Company has agreed with the regulator Ofwat, a number of Outcome Delivery Incentives, and associated performance

commitments. Of these, four are Outcomes relating to environmentally sustainable operations; leakage, water efficiency (measured by household pcc), biodiversity and carbon emissions.

Two of these are directly related to the WRMP, our water efficiency commitment and leakage commitment, and these are discussed in Section 5: Demand. Carbon emissions and biodiversity are indirectly linked to Supply in the WRMP as they can be impacted by water resources operations and options; and can feature as improvements that benefit flows for the NEP respectively.

The water efficiency target has been developed to apply across the 2 regions of the Company so that we are able to report on combined progress. The commitment is measured by a reducing average per capita consumption across the regions, which is the overall effect of our water efficiency and customer awareness programme. The target equates to at least the 1 litre/property /day reduction that is defined in the 2014 WRMP.

The Company leakage target is separate for each region and water resources zone, and for 2015-2020 there are financial rewards and penalties associated with achievement of the target. For this purpose, our leakage commitment in the SST region is 70.5 MI/d, 0.04MI/d below the figure defined in the WRMP.

4 Supply

Item	Description	Review Criterion	Company Comment on Review
Deployable output	Any changes to deployable output	Requirement triggered by change	The Company carried out a comprehensive review of deployable output estimation in preparation for the 2014 fWRMP. A summary of the changes is described in Section 4.1 A further review is underway in preparation for the 2019 WRMP.
Climate Change Impact on Supply	Any changes in assessment of impacts	Requirement triggered by change	The Company reviewed the impact of climate change on its sources for the 2014 WRMP. No changes have been made in the period. Further work on the impacts of climate change is underway in preparation for the 2019 WRMP.
Outage	Explain reasons for any outage incidents and any work being done to reduce outage	Requirement	Outage in the review period is described in Section 4.3
Bulk supply	Explain any changes to bulk supply agreements	Requirement triggered by change	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. There have been no changes to bulk supply agreements in the review period.
Sustainability reductions	Detail any alterations to the sustainability changes required	Requirement triggered by change	The Company has a number of sustainability reductions in its water resources management plan for AMP6. In total there is a reduction of 10MI/d associated with a number of sites. Progress in the review period is described in section 4.4.
	Report on progress with implementation of sustainability changes	Requirement	

4.1 Deployable Output

The Company undertook a comprehensive review of its deployable output assessment for the WRMP14 and moved to a new Aquator software platform (previously WRAPSIM). Improvements in the new modelling approach included the incorporation of water lost during the treatment process in the model based on a revised assessment of losses.

Deployable output for the dry year annual average scenario for the WRMP14 has been estimated as 370MI/d. This compares to 363MI/d for the 2009 WRMP (a change of less than 2% from the last assessment). Deployable output for peak week is now assessed as 458.1MI/d which is an increase of 7% compared to the 2009 WRMP figure. The detail of the modelling work to derive these figures is included in the WRMP14.

As part of our borehole asset maintenance programme the Company seeks to monitor the performance of its groundwater sources and to carry out works to restore site outputs and reduce outage where site performance is seen to decline. In last year's annual review we reported that improvements in site yields and reliability arising from works carried out in AMP5 were demonstrated at 4 sites. During 2016/17 the Company completed drilling and testing of a new borehole at its Fradley site. Once negotiations over licence details are resolved and fitting out complete, this will further improve the resilience of groundwater output particularly at peak demand periods. Monitoring has indicated steady but moderate declines at 4 other sites and investigations and works have been initiated and/or scheduled to recover output. The net effect of change due to borehole asset performance is a small overall improvement in dry year annual average and peak output.

Last year we reported that the condition of the Shenstone site was such that it could not be used without significant investment. In 2016/17 the Company further decided to defer investment in the Slade Heath and Somerford sites to remove pesticide pending strategic decisions over its larger surface water treatment works for PR19. Consequently this is considered as reduction in average deployable output (6.6MI/d) although some limited peak output is available using existing temporary treatment plant and the Company is actively reviewing options for restoring partial or full output through different treatment solutions.

In 2016/17 the Company continued a large programme of installation of disinfection treatment at seven groundwater sites. This has resulted in some non availability of sources which is discussed in section 4.3 (outage). It also led to further delays in final implementation of the Churchill blending scheme and, as the extra output was not available for the reporting year has resulted in a further reduction in DO (4.5MI/d). For the report year the reduction at Pipe Hill pending introduction of pesticide treatment is also reported as a deployable output reduction (6.8MI/d). In both cases schemes are forecast to be complete in 2017/18.

The revised status of groundwater yields have been incorporated into Aquator modelling for WRMP19.

4.2 Impact of Climate Change on Supply

The Company updated its assessment of the impacts of climate change on water supply for the 2014 fWRMP. A medium to high vulnerability framework approach was adopted which involved application of Approach 2.2 (targeted sample of UKCP09 based on DI analysis).

The dry year annual average supply demand balance includes a reduction in deployable output of 5.55MI/d by 2039/40 and 6.88MI/d for peak week. The uncertainty around climate change impacts on supply has been included in headroom. Further work to explore the impacts of climate change on supply has begun for the 2019 WRMP.

4.3 Outage

As part of the development of the WRMP14 the Company followed UKWIR best practice to assess outage allowance to be used in the supply demand balance forecasts. The dry year annual average outage allowance was modelled at 9.81MI/d and peak week at 10.26MI/d. Details of the outage assessment undertaken are included in the WRMP14.

Actual outage figures for the report year are reported for the average period scenario. For 2016/17 the Company has collated data from its available records of planned and unplanned outages. The reported average outage figure is 24.78 MI/d. This compares to the planning figure of 9.81 MI/d. This represents a continuation in elevated actual outage levels following on from the latter part of AMP5.

A significant number of the outage events are associated with the Company's programme to install disinfection plant at seven sites. Where sites are out of supply pending start of works this is assessed as unplanned (water quality) outage and accounts for 6.14 MI/d. Where works are ongoing and/or being commissioned this is assessed as planned outage (routine maintenance) or unplanned where new equipment trips, and accounts for 10.6 MI/d

Peak outage in 2016/17 was 23.5 MI/d which also exceeds the WRMP14 planning allowance of 10.26MI/d. This is also as a result of the significant programme of disinfection works at sites.

4.4 Sustainability Reductions

The Environment Agency notified the Company of sustainability changes to include in the WRMP14, and the confirmed reductions totalling 10MI/d were included in the

plan, as indicated below. There were no Sustainability Reductions due to be made in the reporting period. However, they will all be implemented before the end of the AMP6 period. The EA issued revised NEP tables during the period, and these include the sustainability changes which have been included in the WRMP14.

The latest NEP sustainability reductions are indicated in the table below.

NEP Site Name	Sustainability Reduction	Status
Rising Brook	2.0 MI/d	Adaptive management trial
Bourne- Black Brook(Crane Brook tributary)	2.0 MI/d	Adaptive management trial
Checkhill Bogs	4.0 MI/d	Likely
Blakedown Brook	2.0 MI/d compensation release variation only	Likely

4.5 National Environment Programme

The objectives of the NEP are to confirm the extent of environmental impact of water company abstraction, identifying options for restoring good ecological status and to implement the most cost effective options. Where these exist, use is made of Environment Agency regional groundwater models. AMP6 activities include:

- Carry out further investigations to resolve uncertainty in AMP5 conclusions.
- Carry out options appraisal
- Undertake cost benefit analysis of the options
- Carry out adaptive management trials to test success of options
- Design and implement schemes
- Carry out monitoring to evaluate success of adaptive management trials and implementation schemes

The AMP6 programme has been agreed with the Environment Agency and other stakeholders based on investigations carried out in AMP5. Activities follow an agreed stage plan and are reported by the Company's hydroecological consultants via an annual progress report and/or other technical reports. Changes to the programme are agreed at annual liaison meetings. Progress has been previously reported to the

EA in April 2017 via the Environmental Performance Assessments (EPA) to align with the statutory process for sewerage companies.

The Company is studying four separate areas.

4.5.1 Rising Brook

This catchment is in the Staffordshire Trent Valley CAMS area. There are concerns over the possible influence of groundwater abstraction from Company boreholes in the Rugeley Groundwater Unit on low river flows. The AMP5 impact assessment concluded that flow loss due to mining-related fissuring in local pond and stream beds and the depressed groundwater table frequently resulted in a dry reach, near Moors Gorse Pumping Station. This impacted on the achievement of good ecological status.

The AMP6 objectives are to carry out adaptive management trials at the Company's Moors Gorse and Slitting Mill boreholes to determine how abstraction patterns can be changed to improve flows in the upper part of the catchment whilst maintaining flows in the lower reaches. New boreholes constructed at Slitting Mill as part of the asset replacement programme were tested in AMP5.

An alteration to the Rising Brook end date of December 2017 was agreed with the EA to allow an additional extended (6 months) pumping test following M&E installation in the new boreholes planned for 2017/18. An extended programme of ecological, flow and groundwater level monitoring was completed in 2016/17. This was used to monitor a three month shut down test at Moors Gorse in Autumn 2016.

4.5.2 Bourne Brook (also known as Black Brook)

This catchment is in the Tame and Anker CAMS area. There are concerns that groundwater abstraction from Company boreholes, in the Shenstone and Lichfield Groundwater Unit, is impacting on the ecological status of the Bourne Brook water body due to baseflow depletion. The AMP5 impact assessment concluded that flows in the Burntwood Brook and Fotherley Brook are affected by the current levels of PWS abstraction but that these effects are largely compensated quantitatively by discharge from sewage treatment works (STW) within the catchment. However, the STW discharges do affect downstream water quality. Available data suggest that the water quality of Burntwood Brook, lower Crane Brook and Fotherley Brook is poor, and a reduction in water quality is observed downstream of the STWs. High nutrient and sediment loading is also indicative of diffusive agricultural pollution in the catchment. A high level assessment performed as part of the study indicated increased groundwater-derived baseflow alone is unlikely to be sufficient to improve all water quality supporting elements to good status. In addition, accompanying measures to address point and diffuse source pollution within the catchment would be necessary to realise any benefits of additional groundwater inputs on ecology.

A technical note was also prepared in parallel for SSW for the nearby Hopwas Hayes Site of Biological Interest (SOBI) which Staffs Wildlife Trust felt could be impacted by abstraction from the Hopwas groundwater source. The EA and SSW visited the site in February 2015 with Staffs Wildlife Trust and it was concluded that none of the water features present are groundwater-dependent and so no further action was required regarding the Hopwas source.

The AMP6 objectives for the Bourne Brook catchment are to carry out adaptive management trials to augment flows and improve the ecology of the Crane Brook using groundwater from the Company's mothballed site at Sandhills.

To determine what operational regime best avoids future deterioration of the ecological status of nearby streams, an extended programme of ecological, flow and groundwater level monitoring was completed in 2016/17. This was used to evaluate a signal test at Little Hay in May 2016. A discharge main was installed to the Crane Brook and an augmentation trial carried out in the late summer 2016 using groundwater from boreholes at the mothballed public supply source at Sandhills. Further signal tests at Pipe Hill and Bourne Vale will be timed to coincide with planned works after Autumn 2017.

4.5.3 West Midland Sherwood Sandstone (WMSS) groundwater body

This is included in the Worcestershire Middle Severn (WMS) CAMS area. There are concerns over groundwater abstraction from South Staffs Water and Severn Trent Water boreholes in the WMS Groundwater Unit affecting the Water Framework Directive (WFD) Status of a number of Sites of Special Scientific Interest and the good ecological status both of individual surface water bodies and of the groundwater body as a whole.

Blakedown Brook

The AMP5 impact assessment for Blakedown Brook concluded that reductions in groundwater levels are causing reductions in stream flows because of a combination of reduced baseflow and stream leakage into the underlying aquifer. Macroinvertebrate data were found to indicate that the sites on Blakedown Brook are subject to organic pollution and nutrient enrichment and water quality is now considered a significant issue. This could partly be due to the discharges from nearby STWs particularly during low flows. There are many conflicting issues in the catchment (including crayfish, impoundments and modifications, rural and urban discharges) but improving the quality of the water in the main watercourse is likely to result in the biggest benefit.

The AMP6 objectives for the Blakedown Brook catchment are to carry out further monitoring to better understand the upper catchment, and to carry out advanced feasibility on options to improve water quality.

Further investigations were implemented in the upper catchment in 2016/17. These show further recovery in groundwater flows and river flows across the catchment and in the Hurcott and Podmore SSSI.

As a consequence of sustained increase in river flows the reduced use of Hagley Sewage Treatment pumpback is to be investigated in 2016/17 and a programme of additional targeted water quality monitoring has been agreed.

Checkhill Bogs

The impact of our abstractions on **Checkhill Bogs** Site of Special Scientific Interest (SSSI) were first investigated during the AMP3 period with further monitoring during the course of the AMP4 and AMP5 periods. In AMP5, a desk study was also undertaken of the larger **Philley/Spittle Brook** catchment. The December 2014 Philley Brook report concluded that the condition of the SSSI was the principal reason for the failure of the water body as a whole. Measures taken to improve the status of Checkhill Bogs SSSI should therefore help to ensure that Philley Brook achieves Good Ecological Status.

The AMP6 objectives are to ensure a scheme is in place to enable Checkhill Bogs SSSI to achieve a favourable conservation condition (as defined by Natural England), and to ensure downstream flow measures are taken to enable good ecological status is achieved in the Spittle Brook. Also to ensure further feasibility work is used to refine the objectives, specifically identifying areas of the SSSI to focus on and identifying targets to assess the success of the scheme.

During 2016/17 further monitoring and maintenance was carried out of the small timber dams constructed in Unit 1 of the site. Further installations were installed in Units 2 and 3 in preparation for augmentation trails in the lower part of the site over the summer period. Due to wet conditions in the spring persistent flows in the lower part of the site were actively analysed over this period, but conditions did not dry out sufficiently for an active augmentation trail which was delayed as a consequence.

4.5.4 Blithfield Reservoir and Nethertown Fish Pass

The EA undertook further investigations during AMP5 to improve the evidence supporting conclusions from an initial Stage 2 Heavily Modified Water Body Investigation. This included installation of a fish counter at Nethertown weir, further ecological and morphological surveys to look at the impacts of sediment and desk top analysis of the flow regime. This concluded that not all mitigation measures were in place to allow this water resources supply system to achieve good ecological potential.

The AMP6 programme is to carry out further investigations to understand the processes contributing to sedimentation and fish passage along the lower Blithe, to carry out feasibility studies for the necessary engineering works for changes to fish

passage, and compensation flow regimes, where possible evaluated through trials. The AMP6 objective is to identify cost effective options to achieve good ecological potential for implementation at latest during AMP7.

In 2016/17 a series of detailed sediment, morphology and fish habitat surveys were carried out along the Lower Blithe with an extended desk study analysis of this and previous datasets.

5 Demand

Item	Review Criteria	Summary of Company Review
Demand forecasting	Requirement triggered by change	Demand forecasts were comprehensively revised for the 2014 fWRMP for the period from 2015 onwards. These forecasts are lower than previous forecasts. Details are included in the 2014 fWRMP and not repeated here. A further review is underway in preparation for the 2019 WRMP.
Per capita consumption (pcc)	Requirement	Actual pcc over the year is discussed in section 5.2. below
	Requirement triggered by change	The PCC forecast was revised for the WRMP14 for the period from 2015. These forecasts are lower than previous WRMPs, and a downward trend is indicated. A further review is underway in preparation for the 2019 WRMP.
Metering	Requirement	The Company has continued with its metering policies and has installed an additional 7,697 household meters in the report year through its Free meter option scheme and through new connections. Progress with metering is described in this annual review.
Leakage	Requirement	Total leakage for 2016/17 is 69.85 MI/d compared to a target of 70.5MI/d. Progress with leakage reductions is described in this annual review.
Water efficiency	Requirement	<p>Water efficiency performance is reported based on the ODI and performance target agreed in the Company's Business Plan.</p> <p>The performance against target is detailed in section 5.6 along with a commentary against the ODI.</p> <p>The water efficiency strategy is a combined target across both regions therefore is repeated in both Annual Reviews.</p>

5.1 Key Demand Features

Distribution input for 2016/17 was 295.59MI/d (post MLE), 0.44 MI/d higher than the prior year (295.15) MI/d.

The breakdown of the variance in the overall Distribution Input compared to the prior year is set out in the table below (post MLE).

Distribution losses have marginally reduced, whilst the net effect of household consumption is a reduction of 0.60MI/d

Billed measured non-household consumption has risen showing continued signs of recovery over recent years. This followed the initial loss of a number of large water using customers in the first year of AMP5 as a result of the economic downturn.

Miscellaneous water has decreased, particularly in respect of unbilled illegal and legal use of water.

Component	Variance to 2015/16
Distribution losses	-0.08MI/d
Billed unmeasured household consumption	-1.35MI/d
Billed measured household consumption	+0.75MI/d
Billed measured non-household consumption	+1.62MI/d
Billed unmeasured non-household consumption	+0.02MI/d
Miscellaneous	-0.52MI/d
Overall variance in Distribution Input to 2015/16	+0.44MI/d

5.2 Unmeasured Per Capita Consumption

The Company's unmeasured household consumption monitor and estimating model has been developed according to industry best practice as defined in 'Best Practice for Unmeasured Per Capita Consumption Monitors' (99/WM/08/25), and 'Leakage Methodology Review: Variations in Per Capita Consumptions'. The monitor has been in use now for a number of years and gives the Company a comprehensive number of samples to ensure that unmeasured per capita consumption (uPCC) estimates are robust.

The monitor includes 105 District Metered Areas (DMAs) where more than 65% of the demand in each area is from unmeasured households and where there is minimal non-household demand. A minimum requirement of 270 days accurate flow data is required for each DMA. Where there are less than 270 days of flow data each area is reviewed to determine if the data is still valid. Where the data is found to be flawed or inconsistent it is excluded from the analysis.

A total of 89 DMAs are included in the 2016/17 estimate and each area's flow and pressure data has been checked and verified. The uPCC derived from the monitor for the report year is 129.88 l/h/d (+/- 4.29%) or 129.81 l/h/d post MLE. The Company continues to use a consultant to independently review the uPCC estimate each year.

5.3 Population updates

The Company's total household population forecast was reviewed and revised using latest available census data for the 2014 fWRMP. Details of this are included in the 2014 fWRMP and not repeated here. The revisions included an updated base year population estimate and this has been used in deriving reported data for the report year 2016/17.

For the FWRMP14 the Company committed to conducting a bi-annual household water use and occupancy survey for both South Staffs region and Cambridge region.

For the 2016 South Staffs region survey, a sample of 15,000 occupied households were selected further broken down into 9,912 unmeasured, 4,441 metered and 647 recently metered optants (chosen to represent the optants from the last five years) and based on the percentages of each in the entire database. This sample selection was taken from the raw data which included a total of 515,098 households which comprised 339,514 unmeasured and 175,584 metered households.

In order to ensure that different types of property were adequately represented in the sample, the raw data was broken down into categories and subcategories as follows:

- Type of residence (house, flat or other)
- Postcode (first 4 digits)
- ACORN category (1, 5 and other).

Sample finalisation

In order to derive a more representative sample, these categories were then sub-categorised based on three criteria which included type of property (flat, house or other), postcode (first 4 digits) and ACORN category (1, 5 and other). Percentages were extracted for each of these subcategories and these were then multiplied by the sample size (15,000) in order to determine how many addresses from each sub-category should be selected. Random numbers were then assigned to each address within that postal area. The addresses were then sorted by these random numbers and the number needed was then chosen from the top of the list.

The occupancy estimates derived from the survey are tabulated below:

Customer Class	Flat	House	Average
Metered - optant	1.11	1.83	1.75
Metered – new builds	1.44	2.49	2.34
All metered (metered + metered – optant)	1.37	2.06	2.00
Unmeasured	1.41	2.49	2.39

The results of the survey follow previous surveys results which shows that the switching effect from unmeasured households to metered households has been ‘corrected’ by the latest survey.

The next survey is planned for Spring 2020/21.

5.4 Metering

The Company continued to operate a number of metering policies in line with the 2014 FWRMP. These policies are:

- Free meter policy – domestic and commercial customers can opt for a meter free of charge with a 24 month reversion period for domestic customers.
- New supply policy – all new household and non-household properties are metered.
- Sprinkler metering policy – domestic customers wishing to use unattended garden watering devices must be metered.
- Domestic customers with a swimming pool with capacity greater than 10,000 litres must be metered.

Change of occupier metering has been suspended for the second year of AMP6.

The following table compares the actual annual outturn of all metered households against the 2014 WRMP forecasts.

	2015/16	2016/17	2017/18	2018/19	2019/20
Forecast No. of Optants	5,870	5,850	5,825	5,755	5,700
Actual no. of optants	4,044	5,564			

Forecast No. of new supplies	2,100	2,200	2,300	2,300	2,300
Actual no. of new supplies	2,459	2,133			
Forecast No. of CoOM	1,875	1,925	1,975	2,750	2,150
Actual no. of CoOM	0	0			
Forecast meter penetration	34.2%	35.9%	37.5%	39.2%	40.9%
Actual meter penetration (incl. voids)	35.1%	36%			

5.4.1 New Household Connections

The number of new household connections fell slightly from, 2,459 last year to 2,133. The 2016/17 outturn is marginally below the 2014 fWRMP forecast of 2,200 but cumulatively in line with forecast for the first two years of AMP6.

5.4.2 Change of Occupier metering

The change of occupier metering policy specifies that where there has been a complete change in occupation of a household property and no unmetered charges have been raised for the new occupier, the Company may install a meter and charge the customer based on a metered tariff.

In addition the property must be served by a separate supply pipe enabling a meter to be installed in the public highway; either in an existing boundary box or by the replacement of an existing stop tap with a boundary box.

Following the Company's AMP6 Determination the Company reviewed its metering strategy reflecting on the effectiveness of the change of occupier metering policy. As a result the implementation was suspended. This has continued for a second year. Instead we have put greater emphasis on promoting free meter options and attempting to target households in need from an affordability perspective. The Change of Occupier Metering policy will be retained but will not be actively pursued in order to concentrate on a more effective metering policy and one that is focused on customer need.

5.4.3 Meter Optants

A total of 5,564 meters were installed under the free meter options strategy in 2016/17 compared to 4,044 meter optants installed in 2015/16.

5.4.4 Non-Household meters

The number of new metered non-household properties has slightly increased between 2015/16 and 2016/17.

Non - Households	2015/16	2016/17	2017/18	2018/19	2019/20
Forecast No. of Optants	25	25	25	25	25
Actual no. of Optants	38	9			
Forecast No. of new supplies	175	175	200	200	200
Actual no. of new supplies	170	180			
Total Forecast Meters	200	200	225	225	225
Total Actual Meters	208	189			

The Company is attempting to the uptake of free meters to increase the level of opting beyond the normal peak experienced around the time of annual unmeasured bills is underway. Proactive communication with customers to date includes:

- A free metering in-line insert included with unmeasured bill reminders sent out during April. This did not yield significant results and a market research consultant has been tasked with contacting 100 customers to understand the key barriers to customers switching to a meter and understand what messages and communication channels would be most effective in switching customers to take up a meter. The analysis from the research will be used to refine subsequent metering promotion. Other channels currently being tested include text messaging and outbound targeted calling.
- A joint initiative has been established with WHG (Walsall Housing Group) to meter their vacant properties when there is an occupancy change. This has got off to a steady start and is being monitored by both parties to see how the process is working and where it could be refined. The aim is to start rolling this initiative out with other large social landlords in the SST region

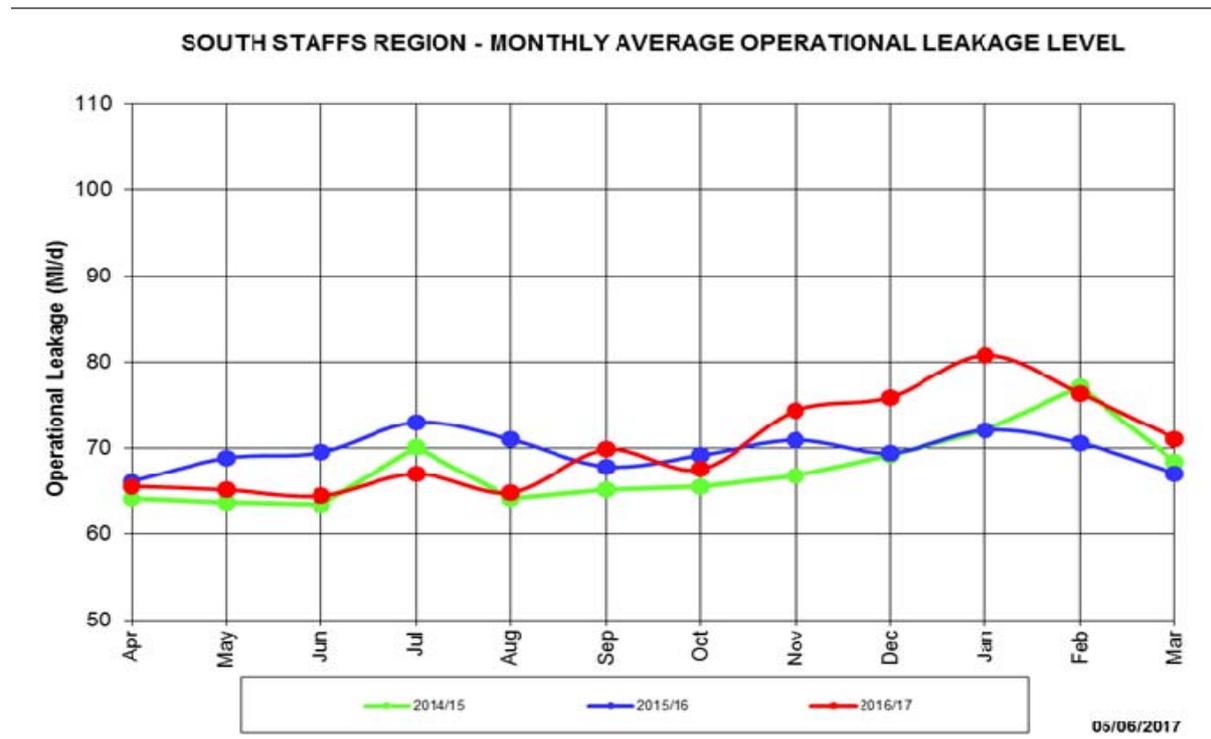
- New 'Switching to a meter' leaflets have been produced for field teams in both regions to discuss/leave with customers at key touch points such as mains rehab schemes stop tap repairs and supply queries.
- The web content for new meter enquires is being refreshed to simplify key steps

The success of these initiatives will help determine what further options may be appropriate.

5.5 Leakage

The annual average total leakage reported for 2016/17 is 69.85 M/l/d compared to the AMP6 leakage target of 70.5Ml/d. The leakage outturn is lower than the target and is attributed to generally a mild winter which resulted in little or no freeze/thaw events. This follows a continued steady leakage position for the last six years.

Operational Leakage Levels



In addition to the above operational tracking, using distribution input meters, additional monitoring is undertaken using DMAs. These independent data sets confirm the same trends, giving improved confidence in the results.

Supply Pipe Leakage

The 2015/16 and 2016/17 allowances are shown below.

SPL	2015/16	2016/17
Underground SPL unmeasured households	38.19 l/prop/d	38.19 l/prop/d
Underground SPL ext. metered households	29.30 l/prop/d	29.29 l/prop/d
Underground SPL other metered households	38.19 l/prop/d	38.19 l/prop/d
Underground SPL void properties	38.19 l/prop/d	38.19 l/prop/d

The Company's supply pipe leakage estimates are based on UKWIR project 05/WM/08/32 (Towards Best Practice for the Assessment of Supply Pipe Leakage) produced by Servelec (Tynemarch) Systems Engineering Ltd.

5.6 Water Efficiency

The Company's Water Efficiency Strategy (WES) and delivery plan for AMP6 has been designed to build on the successes of AMP5 and to incorporate initiatives that increase the Company's customer engagement and supports customers to change water using behaviour, reduce waste and become water efficient. The WES is applied across both regions of operation (South Staffs and Cambridge) with some regional variation to reflect the differing demographics. We continually review our WES to reflect successes and in light of developing best practice in the UK and globally.

The key aspects of the strategy for 2016/17 are summarised in the following text:

- The WES includes engaging with the Metering Strategy Group to develop initiatives to promote metering particularly targeted at those who might benefit from being on a meter.
- An informal partnering agreement continues to be established with Walsall Housing Group (WHG) to support mutual corporate goals. WHG is keen to achieve 'beyond compliance' in its carbon reduction targets and sees SSW as a perfect partner to support water efficiency initiatives, debt management and asset improvements. SSW is keen to maximise metering with WHG as a mutual benefit, increasing meter penetration, reducing water waste and developing a positive relationship with WHG tenants and tackling fuel poverty. There have been 80 meters fitted as part of this partnering arrangement.
- The Company has developed a series of video clips which will be used to promote water efficiency, customer engagement and information. The first of

the video clips show the journey of water from cloud burst to tap and the second is a water efficiency promotional video.

- The Company is in the process of implementing a major project in the Cambridge region to engage with 10,000 household metered customers to provide personalised consumption data. There will be an additional 5,000 properties used as a control sample.

The Company has commissioned 'WaterSmart' to develop a water use information dashboard and portal. Watersmart have been very successful at reducing water use in USA states, particularly during the recent Californian drought. The pilot will be launched in October 2017 and will run for approximately 12 months.

The customer will receive water use reports comparing their water use to other similar households and where appropriate highlight suggested actions to reduce water use. Water efficiency devices and information can be requested. The pilot will be aimed at voluntary sign up and will test the level of customer engagement and support for reducing household water use.

- A number of councils have been approached with a view to develop partnerships where the Company can support the council in achieving corporate goals such as carbon reduction, water use reduction, debt management and asset improvements.
- In order to develop robust water efficiency and metering strategies that focus on customers that would most likely engage a socio-economic and demographic household postcode data base model has been procured. The ACORN based model will support functions across the business to segment the customer base to better enable targeted communications.
- North West Cambridge water harvesting project is entering its second year with significant progress being made.

The development will be monitored and measured to gauge if this level of consumption (Code for Sustainable Homes 5) can be achieved and if it is sustainable. This project is a key aspect of the Company's WES and may be applied in South Staffs region in future years.

- The Company supported the Walsall Housing Group's 'Walsall by the Sea' event for the second year.

The event was aimed at WHG's tenants and providing an afternoon of entertainment and special features such as an opportunity to chat to senior WHG staff, find out about services that WHG provide as well as fun family activities normally associated with a day at the seaside.

The Company supported the event by promoting water efficiency, metering and the Company's 'Assure' scheme. It was well received particularly with tenants experiencing financial difficulty.

- The Company has continued to record the volumetric savings from the various distributions of devices. During 2016/17 the number of devices distributed in the South Staffs region totalled 10,969 saving 0.21MI/d and in the Cambridge region the devices distributed were 4,115 saving 0.08MI/d, giving an overall combined total of 15,084 saving 0.29MI/d.

The Company's water efficiency performance commitment was to deliver a reduction in PCC across both regions measured as an average PCC. The average PCC outturn for 2016/17 is 129.85 ltrs/head/day against a target 130.15 ltrs/h/d.

2017/18 will see the continuation of the majority of these initiatives and the introduction of the WaterSmart pilot and enhanced customer engagement. A summer campaign for promotion of water efficiency is planned for the Cambridge region particularly in light of the recharge deficit and potential for dry weather to continue. A mixture of adverts on buses, on bus shelters and on radio are planned.

The effectiveness of this campaign will be reviewed and the outcomes used to further develop the WES for future years.

6 Headroom and Options

Item	Description	Review Criterion	Summary of Company Review
Target Headroom	Set out any changes to the target headroom forecast	Requirement triggered by change	No changes have been applied to headroom allowances for the WRMP14.
Options	Set out any changes to the options chosen	Requirement	The WRMP14 did not require any interventions due to a supply demand deficit.
	Set out any changes to the options chosen	Requirement triggered by change	There were no options identified in the WRMP14.

6.1 Target Headroom

A comprehensive review of the calculation of target headroom was undertaken for inclusion in the WRMP14. The 2003 UKWIR best practice methodology was followed. The detail of this assessment is included in the WRMP14.

Dry year annual average target headroom for 2016/17 taken from the WRMP14 is 7.83MI/d. Critical period target headroom for 2016/17 taken from the WRMP14 is 8.94MI/d. Target headroom is less than 3.5% of dry year and less than 3% of peak week demand throughout the planning period.

It should be noted that whilst target headroom values have not increased for the WRMP14 a significant element of climate change risk has been included in the baseline supply demand forecast (up to 5.6 MI/d in a dry year and 7.0 MI/d in a peak week by 2039/40). If this element of uncertainty were to have remained in headroom then target headroom would undoubtedly have increased.

2016/17 actual headroom was comfortably above target headroom. Accordingly there were no concerns over the supply demand situation, and the Company reported a Security of Supply Index of 100% for the period.

7 Conclusions

This annual review confirms that 2016/17 overall was a fairly average year in terms of supply and demand. Rainfall was just below average in total for the year, peak demands in summer were relatively modest and the mild winter meant that no exceptional leakage events occurred. There were no concerns over supplies, with normal groundwater levels at drought indicator sites reflecting a similar outlook across the region.

The Company has continued to work hard to meet its Performance Commitments for leakage and water efficiency within the year.

Unplanned outage has continued to exceed planned allowances as a result of significant water quality events in the previous year. Underlying trends are for a reduction in unplanned events as a consequence of asset investment in AMP5 and AMP6. Moreover significant investment in new treatment processes is underway to largely restore outputs by AMP7.

Deployable output with some local exceptions has remained therefore largely as forecast when the temporary losses due to water quality issues are taken into account. There have been local increases in site resilience and reliability as a result of AMP5 maintenance as well as minor declines due to asset age at sites where maintenance is scheduled for a future date. The exceptions are: the Shenstone site where the extent of water quality issues at the site has meant that investment at the site is no longer viable given uncertainty over enactment of the Water Framework Directive and the site has been indefinitely mothballed; Churchill where works to implement final elements of a blend scheme have been delayed to 2017/18 by disinfection works at the same site, and; Slade Heath and Somerford where a scheme to remove pesticide has been deferred to AMP7 (after 2020).

The reported actual figures included in the table in Appendix 1 for 2016/17 are in general consistent with the WRMP14 forecasts for AMP6. These will be considered with other drivers in building supply forecasts for WRMP19.

8 Forward Look

Although 2016/17 is the second year that the WRMP14 is in effect, pre-consultation for the next plan WRMP19 commenced in 2016/17.

There are a number of uncertainties arising from changes to the WRMP guidelines and as a result of changes in policy and the requirements of the Water Framework Directive that will need to be addressed in the next WRMP, and could impact the available surplus in supply over forecast demand.

8.1 Uncertainty

The WRMP14 was produced in accordance with the current Water Resources Planning guidelines, which state that uncertainty around time limited licences and unknown potential sustainability changes cannot be included.

The major area of uncertainty concerns implementation of the 2000 Water Framework Directive. This process is on-going and rules and regulations are being added to or amended on an annual basis ahead of the final compliance date in 2027. Of particular concern has been the interpretation and guidance of the “No Deterioration” requirement and the interpretation that a failure of the Groundwater Body Water Balance Test constitutes failure of the requirement to achieve good status. This poses a significant risk to the resilience of public water supplies without significant investment, more so given the challenge to all water companies simultaneously and the consequent reduction to tradable resources.

We have agreed with the Environment Agency a preliminary programme of investigations to address concern over environmental impacts to the surface water environment which will be addressed through the NEP process. We are also evaluating the potential impacts of groundwater body deficits. Until such time as the regulatory framework is clarified, there remains an unquantifiable long term risk to supplies.

We will continue to work with the Environment Agency to understand this and minimise the impact of this on the WRMP and will continue to review annually.

These uncertainties will be examined during the preparation of the next WRMP, and any significant changes that can be incorporated into the current plan, reported in subsequent annual reviews.

8.2 Outage

Actual outage outturn in the early years of AMP6 continues to exceed the allowance determined for the WRMP14 largely as a result of programmed works relating to nitrate and pesticide treatment and disinfection plant.

Contingency measures are in place to defer maintenance and install temporary treatment in advance of the permanent solution in the event of dry weather impacts on supply or demand.

8.3 Deployable Output

The indications are that our investment in borehole asset maintenance has increased the resilience of the sites where we invested in AMP5. This assessment will be reviewed in preparation for the next water resources plan (WRMP19). The drivers for this to date are turbidity and the bacteriological quality of the raw waters from these old borehole supplies and this work is projected to continue this AMP and in the medium term through AMP7 and AMP8.

The Company is currently undergoing a major review of its surface water treatment works at Seedy Mill and Hampton Loade with the aim of maintaining existing output via refurbished and/or new treatment plant.

During AMP6 we anticipate to agree and or implement a number of environmental schemes under the National Environmental Programme. The final design of these schemes is the subject of on-going intensive study as outlined in Section 4. Nevertheless we anticipate and have planned for local reductions in average abstraction with the objective of producing tangible benefits to the surface water ecology. Where possible the associated abstractions will continue to be operated in a flexible way to provide resilience in the event of short term outage events or drought but this may not always be possible without impacting the local water feature, requiring investment elsewhere.

APPENDIX ONE: ANNUAL AVERAGE OUTTURN DATA 2017/18

Row numbering in line with WRMP structure	Component	Units	DP	Data requirement	Resource zone 1 data
SUPPLY					
Resources					
1AR	Raw water abstracted	MI/d	2dp	Required	321.15
2AR	Raw water imported	MI/d	2dp	Required	0
3AR	Potable water imported	MI/d	2dp	Required	0.018
4AR	Raw Water Losses and Operational Use	MI/d	2dp	Required	0
5AR	Raw water exported	MI/d	2dp	Required	0
5.1AR	Non potable water supplied	MI/d	2dp	Required	1.56
6AR	Potable water exported	MI/d	2dp	Required	1.085
7AR	Deployable output	MI/d	2dp	Optional	360.99
Process Losses					
9AR	Treatment works losses and operational use	MI/d	2dp	Optional	22.90
10AR	Outage experienced	MI/d	2dp	Required	24.78
DEMAND					
11AR	Distribution input	MI/d	2dp	Required	295.59
Consumption					
23AR	Measured non household - consumption (inc MUR)	MI/d	2dp	Required	52.25
24AR	Unmeasured non household - consumption	MI/d	2dp	Required	2.63
25AR	Measured household - consumption (inc MUR)	MI/d	2dp	Required	51.72
26AR	Unmeasured household - consumption	MI/d	2dp	Required	115.88
29AR	Measured household - pcc	l/h/d	0dp	Required	122.74
30AR	Unmeasured household - pcc	l/h/d	0dp	Required	129.81
31AR	Average household - pcc	l/h/d	0dp	Required	126.28
32AR	Water taken unbilled	MI/d	2dp	Required	1.74
33AR	Distribution system operational use	MI/d	2dp	Required	1.51
Leakage					
34AR	Measured non household - uspl	MI/d	2dp	Required	0.82
35AR	Unmeasured non-household - uspl	MI/d	2dp	Required	0.12
36AR	Measured household - uspl	MI/d	2dp	Required	4.38
37AR	Unmeasured household - uspl	MI/d	2dp	Required	13.05
38AR	Void properties - uspl	MI/d	2dp	Required	0.88
39AR	Total mains and trunk mains leakage (Distribution Losses)	MI/d	2dp	Required	49.00
40AR	Total leakage	MI/d	2dp	Required	69.85
41AR	Total leakage	l/prop/d	2dp	Required	118.91

CUSTOMERS					
Properties					
43AR	Unmeasured household - properties	000's	3dp	Optional	341.792
42AR	Measured household - properties	000's	3dp	Optional	191.711
46AR	Unmeasured non household - properties	000's	3dp	Optional	3.014
45AR	Measured non household - properties	000's	3dp	Optional	27.940
44AR	Void household - properties	000's	3dp	Optional	18.296
47AR	Void non households - properties	000's	3dp	Optional	4.662
48AR	Total properties	000's	3dp	Optional	587.414
Population					
50AR	Unmeasured household - population	000's	3dp	Optional	892.702
49AR	Measured household - population	000's	3dp	Optional	421.374
52AR	Unmeasured non household population	000's	3dp	Optional	2.99
51AR	Measured non household - population	000's	3dp	Optional	14.13
53AR	Total population	000's	3dp	Optional	1,331.196
Occupancy					
55AR	Unmeasured household - occupancy rate	h/pr	2dp	Optional	2.61
54AR	Measured household - occupancy rate	h/pr	2dp	Optional	2.20
Metering					
57AR	Total Household Metering penetration (incl. voids)	%	2dp	Required	36.00%
	Total numbers of household meters installed	000's	3dp	Required	195.989