United Utilities

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Water resources review

April 2016 – March 2017

Contents

1. Summary of water resources in 2016/17

Demand

- Regional demand in 2016/17 was higher than in the previous year, but was still between the 'normal year' and 'dry year' forecast for the year.
- We have outperformed our regional leakage target of 463 Ml/d, achieving our lowest ever leakage value of 439 Ml/d in 2016/17.
- We have met our regional water efficiency target, and achieved further savings in West Cumbria through our enhanced water efficiency programme totalling over 3 Ml/d.
- We have installed free meters at 32,447 households; this is below our WRMP forecasts, but an increase of 5,250 households or 19% from the previous year.

Supply

- We have maintained the supply-demand surplus in all of our resource zones.
- As outlined in last year's Water Resources Review, we have removed existing water quality constraints via interventions to increase the supply capability at Castle Carrock Reservoir, and this has led to a benefit to Water Available for Use in our Carlisle Resource Zone.
- The Summergrove scheme, completed in 2015/16, continues to benefit the environment in our West Cumbria Resource Zone by allowing us to reduce our abstractions from Ennerdale Water by 3 Ml/d.

West Cumbria

- We have progressed with the South Egremont borehole project. The boreholes are now partly operational and already enabling some reduction in abstraction from Ennerdale Water. The full completion date, forecast for summer 2016 in last year's Water Resources Review, has been delayed by issues that need to be addressed to ensure full compliance with drinking water quality regulations which is critical for our customers. However we have worked to identify solutions, and once these sources are fully operational by the end of August 2017 we will be able to further reduce our abstraction from Ennerdale Water.
- We gained planning approval for the Thirlmere transfer scheme in November 2016 and awarded all major construction contracts by March 2017, enabling construction on site to start almost a year ahead of target in April 2017. This will ultimately allow us to revoke our abstraction licences at Ennerdale Water and other sites in West Cumbria by March 2022.

Environment

- We have completed modifications at our Swindale Beck intake 18 months ahead of schedule; this award-winning scheme enables us to deliver environmental benefits through reduced abstraction.
- We have continued to deliver the package of compensatory measures in West Cumbria, working with environmental regulators, stakeholders and experts in order to deliver the best solution for the protection of the River Ehen.

Planning for the future

- We prepared an updated Draft Drought Plan in 2016 and, following consultation on this, we submitted a Revised Draft Drought Plan in January 2017. We are currently providing further information to enable Defra to make a decision on the plan.
- We have continued to develop our 2019 Water Resources Management Plan, engaging with customers, regulators and stakeholders on its development, including an extensive pre-consultation exercise in autumn 2016. We are applying new sophisticated techniques to better allow us to explore risk, resilience and uncertainty in developing our long-term plans.

2. Introduction

In this Water Resources Review we report on our water resources position for the year 1 April 2016 – 31 March 2017 (2016/17). In compliance with the Water Industry Act 1991, the primary aim of this report is to provide an annual update to the Water Resources Management Plan. We do this by assessing actual events and performance against the forecasts in our plan. This review describes progress made on implementing the plan and provides commentary on the key issues, following the Environment Agency guidelines[1]. It also includes an annual update of our drought planning progress, and other activities and plans that may influence water resources.

We are sending this annual Water Resources Review to the Secretary of State, to the Environment Agency and to Ofwat. We are also publishing it on our website for interested customers and/or stakeholders.

[1] Water resource management plan annual review and annual data return, Environment Agency and Natural Resources Wales, April 2016

2.1 Background to the Water Resources Management Plan

Our current Water Resources Management Plan was published in March 2015 and became effective from 1 April 2015, superseding the 2009 Water Resources Management Plan as the formally adopted plan. The 2015 Water Resources Management Plan covers the period 2015/16 to 2039/40 and in developing the plan we reviewed customer and stakeholder priorities and changes in our supply system, accounted for future effects of climate change and set out our proposed plan to secure the future for water resources in the North West. The Final Water Resources Management Plan 2015 is available at www.unitedutilities.com/water-resources-plan.

Last year, we reported on progress for the first year of the plan in our annual Water Resources Review for the period 1 April 2015 – 31 March 2016 (2015/16). This year, for the purpose of reporting on 2016/17, actual performance and events are compared to the 2015 Water Resources Management Plan forecasts for the second year of the plan (2016/17), and we present key progress and upcoming activities to continue to deliver the plan.

2.2 Links to our other plans

Our Water Resources Management Plan is one of a number of plans that influence the provision of secure water resources for customers and the environment. As described above, this report also provides an update on, or reference to our:

- Statutory Drought Plan – see Section 10 for an update. Our 2017 revised draft Drought Plan is available at: www.unitedutilities.com/drought-plan;
- PR14 Business Plan – see Section 3.1. A publicly available summary can be found at: www.unitedutilities.com/corporate/about-us/our-future-plans/Our-business-plan/; and
- 2019 Water Resources Management Plan – we update the Water Resources Management Plan every 5 years to reflect the latest guidelines, methods and latest evidence. We're well progressed with the development of our next plan, and provide a short update in Section 11.1.

2.3 Structure of the document

Table 1 below shows the coverage of each section of this report:

Table 1 Report Structure

Section	Coverage
2 – Introduction	This section is an introduction to the 2016/17 Water Resources Review and provides the context for our published plans.
3 – General	Within this section we comment on our performance for 2016/17 against the Customer Promises, Outcomes and Measures of Success. We also give an overview of our activities in 2016/17 towards delivering the 2015 Water Resources Management Plan, discuss the weather we experienced, and the overall supply-demand balance position.
4 – Supply	This includes details of our supply position in 2016/17, including Water Available for Use, outage, and sustainability changes.
5 – Demand	This section outlines the demands we experienced in 2016/17, comparing them to the 'dry year' forecast that we included in our 2015 plan. We discuss our 2016/17 performance for leakage, water efficiency, and customer metering.
6 – Headroom	Within this section we discuss the target headroom component of the supply-demand balance.
7 – Options and other measures	This includes an update on our delivery of the Thirlmere transfer scheme, and the activities to reduce abstraction in West Cumbria until its implementation. We also provide updates on the West Cumbria compensatory measures package and Thirlmere transfer contingency plan.
8 – Supply-demand balance	In this section we pull together all of the material presented in earlier sections into the supply-demand balance. We show the 2016/17 supply-demand balance position for each resource zone and compare it to our forecast position.
9 – West Cumbria summary	West Cumbria is a focal point in our 2015 plan; this section gathers all of the information from other sections of the report to provide a view on our activities and progress within the resource zone.
10 – Making sure we are prepared for drought	This section includes an update on our activities in developing our new 2017 revised draft Drought Plan.
11 – Forward look	Within this section we provide a forward look to the coming activities in 2017/18, and also provide an update on the development of our 2019 Water Resources Management Plan.
12 – Conclusions	This section summarises the key information presented in this review and highlights priorities for the forthcoming year and beyond.
Appendix A	We present the key outturn data for 2016/17 compared to the dry year forecasts for 2016/17, which we have amended to reflect the weather experienced in the year.

3. General

3.1 Our Customer Promises, Outcomes and Measures of Success

We developed Customer Promises and Outcomes as part of our PR14 Business Plan. Each Outcome is underpinned by one or more Measures of Success, which allow customers and stakeholders to judge our performance in delivering against our targets. The Measures of Success that align to our 2015 Water Resources Management Plan are shown below. Our performance for 2016/17 and annual targets between 2017 and 2020 are shown in Table 2, and an introduction to each is below:

Total leakage at or below target:

- This measures leakage levels across the North West compared to our target, which is to maintain leakage at or below an annual target of 462.7 Ml/d.
- Incentivised with financial penalties and rewards.
- More information on our leakage performance for 2016/17 is in Section 5.3.

Security of supply index:

- The Security of Supply Index (SOSI) measures our success in meeting the region's demand for water, and is expressed as an index score out of 100. A score of 100 means we have an adequate supply-demand balance.
- Incentivised with financial penalties only.
- More information on our SOSI performance for 2016/17 is in Section 8.

Thirlmere transfer into West Cumbria:

- This measures our progress in delivery of this major scheme to protect the environment in West Cumbria and ensure the security of future supplies. Progress is measured as a percentage, so that a value of 100 will indicate that the project has been completed and is in use, supplying water from Thirlmere to customers in West Cumbria.
- Incentivised with financial penalties and rewards.
- Our progress with the Thirlmere transfer scheme during 2016/17 is described in Section 7.1.

Contribution to rivers improved:

- This measures the delivery of environmental projects and changes to our abstraction regime to make it more sustainable. It is primarily achieved by delivering a range of projects agreed with the Environment Agency under the National Environment Programme.
- We are also incentivised under this performance commitment to make operational changes to our abstraction, where possible, at four environmentally sensitive sites in the North West.
- Incentivised with financial penalties and rewards.
- More information on our sustainability changes is in Section 4.4, and detail on our Abstraction Incentive Mechanism (AIM) performance for 2016/16 is in Section 4.7.

Number of free water meters installed:

- This measures the number of free water meters we have installed for customers. The target is based upon the numbers originally forecast within our plans.
- As customers who stand to benefit most from a free meter continue to have them installed, the market of potential customers becomes smaller. The figures have been calculated based on the historic decrease in take-up already observed.
- More information on our free meter installation performance for 2016/17 is in Section 5.5.

Per household consumption of water:

- This measures the average consumption per household in litres per property per day (l/prop/d). It allows us to track customer consumption against forecast levels, and over time can provide an indication of the effectiveness of our promotion of water efficiency across the region.
- More information on per household consumption in 2016/17 is in Section 5.2.1.

Table 2 Our Promises, Outcomes and Measures of Success relating to water resources

Promise	Outcome	Measure	Units of Measure	Performance 2015/16	Target 2016/17	Performance 2016/17	Target 2017/18	Target 2018/19	Target 2019/20
Provide you with great water 	You have a reliable supply of water now and in the future 	Total leakage at or below target	Ml/d Variance from 462.7 Ml/d (NB. positive values represent leakage below target)	+10.8	0.0	+23.4	0.0	0.0	0.0
		Security of supply index (SOSI)	Index out of (100.000)	100.000	100.000	100.000	100.000	100.000	100.000
		Thirlmere transfer into West Cumbria	% of project complete based on earned value tied to milestones	2	5	5	21	53	82
We promise to protect and enhance the environment 	The natural environment is protected and improved in the way we deliver our services 	Contribution to rivers improved	km river length	36.8	6.6	36.8	6.6	6.6	159.5
We promise to give you value for money 	Bills for you and future customers are fair 	Number of free water meters installed	Number per year	27,197	59,325	32,447	57,393	47,421	46,054
		Per household consumption of water[2]	litres/ property/ day	303	287-319	305	285-316	282-313	280-311

[2] A range is provided for per household consumption because it depends on the weather conditions experienced in the year. The upper end of the range is consistent with our dry year planning assumption in the 2015 Water Resources Management Plan.

3.2 Weather in 2016/17

Over the full year rainfall was below average across our region, although it was significantly wetter than in 1995/96, and temperatures were above average. The summer period (April to September 2016) was wetter and temperatures higher than the long-term average (although not quite as warm as during 1995/96).

However, the last six months, from October to March, were notably mild and dry, with rainfall well below the long-term average and average temperatures higher than both the long-term average and 1995/96. The rainfall for October to January was 64% of the long term average for the North West, with Haweswater having the driest October to January in the 85 year record, and Thirlmere the second driest on record (1963 was drier in the 123 year record available for that site). During this dry winter period, Haweswater storage crossed through upper drought triggers in January 2017. However significant rainfall in February and March meant that storage recovered and no drought powers or temporary use bans were required for Haweswater or elsewhere in the system.

Table 3 below gives a comparison of temperature and rainfall against the long-term averages and 1995/96. Detail of how the weather we experienced has impacted demands across the region is included in Section 5.2.

Table 3 Comparison of rainfall and temperatures in 2016/17 with long-term averages and 1995/96 values

	April to September	October to March	Full year (April to March)
Regional rainfall (mm)			
2016/17	**723**	**762**	**1,485**
Long-term average	654	906	1,560
1995/96	320	571	891
Average maximum daily temperatures (°C)			
2016/17	**18.5**	**10.1**	**14.3**
Long-term average	16.0	8.5	12.3
1995/96	19.0	8.4	13.7

3.3 Supply and demand in 2016/17

We have maintained a surplus in all our water resource zones for 2016/17, with a Security of Supply Index score of 100. More detail on the individual supply-demand balance components contributing to this score is included in Sections 4 and 5 of this report.

3.4 Progress with our 2015 Water Resources Management Plan

In 2016/17 we have made good progress in delivering our 2015 Water Resources Management Plan. As well as outperforming our regional leakage target and meeting our regional water efficiency target, we have also progressed with the Thirlmere transfer scheme. Our 2015 Plan, informed by the Examination in Public (September 2014), concluded that the Thirlmere transfer scheme should be progressed to address the future supply-demand deficit in West Cumbria. In 2016/17 we have progressed this solution with key activities including:

- planning approval for the project was granted in November 2016;
- completion of a fourth phase of public consultation activities on the scheme;
- opening of our visitor centre in Keswick, in partnership with the West Cumbria Rivers Trust;
- working towards the establishment of a community legacy fund to support projects providing social and economic benefits in the local area;
- establishment of project programme offices at Thirlmere and Cockermouth; and
- awarding major construction contracts in March 2017.

Further detail on the Thirlmere transfer scheme progress is included in Section 7.1.

This year we have continued to progress interim measures and compensatory measures to protect Ennerdale Water in West Cumbria. The South Egremont borehole project is now partly operational and is already delivering some benefit in terms of reduced abstraction from Ennerdale Water. Further work is continuing as we ensure that the blend of Ennerdale and borehole water meets all of the water quality standards for our customers. Further detail of our plan to ensure that the boreholes and treatment process will be fully operational by the end of August 2017 is given in sections 4.1.2 and 7.2.

Further detail on the interim measures, compensatory measures, and Thirlmere transfer scheme is included in Section 7.

Following the publication of our 2015 plan Defra indicated that we should continue to work with the Environment Agency during the delivery of this plan and preparations for the next planning round. We have held regular meetings with the Environment Agency and provided updates on our activities during the reporting period. We are also engaging with the Environment Agency on at least a bi-monthly basis to support development of the 2019 Water Resources Management Plan (see Section 11.1 for more information), which is due to be submitted in draft form for consultation in December 2017.

We have continued to engage with communities in West Cumbria, having held numerous stakeholder events for the Thirlmere transfer scheme (also referred to as the West Cumbria Water Supplies Project) and also as part of the 2016 Drought Plan consultation. Our bespoke Cumbria website (www.unitedutilities.com/cumbria) continues to support our engagement with customers.

We have already outlined our progress in Table 2 for free meter installations. During the year we have seen an increase in the number of customers requesting a meter compared to 2015/16, however we are still below target overall. This is discussed further along with actions to improve performance in Section 5.5.

3.5 Water resource zones

A water resource zone is the largest area across which water resources can be balanced, and within which customers therefore experience the same risk of supply failure from a resource shortfall. Currently we have four:

- *Integrated Resource Zone;*
- *Carlisle Resource Zone;*
- *North Eden Resource Zone; and*
- *West Cumbria Resource Zone.*

The resource zones were assessed for the 2015 Water Resources Management Plan through the Water Resource Zone Integrity Review. There have been no changes in resource zone boundaries since 2004.

We are currently preparing for our 2019 Water Resources Management Plan. Our water resource zone assumptions for the 2019 plan include the completion of the Thirlmere transfer scheme by March 2022. Following this the West Cumbria Resource Zone will cease to exist and this area will be absorbed into a larger Integrated Resource Zone (we are reviewing the future naming convention for this new, larger zone). However, for the purpose of this annual review, there have been no changes to water resource zone boundaries for 2016/17.

3.6 Levels of service

There has been no change to our levels of service, which remain as:

- temporary use bans (often referred to as hosepipe bans, although their remit is broader than this) and drought permits/orders to augment supply no more than once in 20 years;
- drought orders to ban non-essential water use no more than once in 35 years; and
- no standpipes or rota cuts during a repeat of the worst drought on record.

Maintaining this level of service was supported by customer research, with additional research undertaken for the PR14 Business Plan as part of our 2015 Water Resources Management Plan. Our level of service for this planning period (covered by our 2015 plan) remains the same as in the 2009 plan.

We are undertaking further customer research to inform the levels of service that we will adopt in our 2019 Water Resources Management Plan; further details are given in Section 11.1.

4. Supply

4.1 Assessing water available for use

The Water Resources Management Plan is a strategic plan covering a period of 25 years. The supply-demand tables are presented on a year by year basis, but there may be shorter-term variances in the plan components against original forecasts and assumptions. For example, delivery of aspects of the capital programme, the implementation of sustainability reductions, or licence changes, may vary to reflect changing circumstances and/or priorities. Further to this, for some assets there is a shift of capability away from the 2015 Water Resources Management Plan assumptions as new information comes to light. Such aspects are reviewed regularly and we report any changes in the annual Water Resources Review. An explanation of these changes for 2016/17 follows below.

For the 2015 plan we forecast the Water Available for Use[3] (a term used to represent our available supplies in a dry year) across the planning period. To do this we used long-term asset capability assumptions in line with the strategic nature of the plan, and accounted for our anticipated capital maintenance activities. We reflected the expected position following delivery of capital interventions during the 2015-2020 planning period[4] to determine how much water we are able to supply.

[3] Deployable output is a source yield assessment that results from consideration of a particular set of constraints and rules, for example abstraction licence limits and asset capabilities. From deployable output a number of deductions are made, including outage, raw water and process losses, and net exports. This is the calculation used to derive Water Available for Use.

[4] This included activities originally planned to be completed by 2015, which had subsequently been deferred

The pace and delivery of capital interventions can be subject to change, and we expect it to vary with normal business prioritisation of the capital programme. In some cases it is also possible for new asset considerations to arise, which can be increases or decreases to asset capability. Changes are not necessarily associated with asset deterioration, but also the resolution of existing issues (not covered by outage).

To ensure that we fully reflect the situation for the reporting year, and to ensure that an appropriate supply-demand surplus is maintained for the benefit of customers and stakeholders, we closely monitor and review Water Available for Use in line with changing circumstances. This adjustment does not account for any short-term reductions in asset capability that are associated with, and captured as part of, outage management (see Section 4.3).

For 2016/17, we have applied adjustments in Water Available for Use to reflect variances against the original supply forecasts:

- Integrated Resource Zone: a reduction including interim adjustments to reflect the delivery of capital projects and a permanent increase in the statutory compensation flow required from one of our reservoirs: see Section 4.1.1;
- West Cumbria Resource Zone: an interim reduction relating to the delayed South Egremont borehole scheme: see Section 4.1.2;
- Carlisle Resource Zone: a positive adjustment to reflect interventions delivering improved supply capability at Castle Carrock reservoir: see Section 4.1.3; and
- North Eden Resource Zone: no adjustment required: see Section 4.1.4.

The supply-demand surplus is maintained (as detailed in Section 8) and these adjustments (Table 4) are not considered to be a material change from the 2015 Water Resources Management Plan assumptions. Further detail on sustainability changes affecting our Water Available for Use is given in Section 4.4.

Table 4 Summary of current Water Available for Use appraisal and adjustments from our forecast values

Water resource zone	Forecast Water Available For Use for 2016/17 (Ml/d)	Current Water Available For Use appraised for 2016/17 regulatory reporting (Ml/d)	Adjustment (Asset Assumptions) (Ml/d)
Integrated	1964.7	1917.0	-47.7
West Cumbria	59.5	56.5	-3.0
Carlisle	34.0	35.6	+1.6
North Eden	8.7	8.7	0.0

4.1.1 Integrated Resource Zone

Due to the complexity and interconnectivity of the Integrated Resource Zone, any changes identified to asset capability are implemented into the latest Aquator water resources model (appropriate to this part of the planning horizon) to appraise changes in Water Available for Use. This allows us to assess the net impact on Water Available for Use based on the latest position, based on a review of asset capacity assumptions. Aquator modelling of the current position in the Integrated Resource Zone has resulted in a 47 Ml/d reduction in Water Available for Use relative to forecasts, primarily driven by a number of capital

projects that are either underway or temporarily deferred, and so have not yet reached completion. In addition, for some assets there is a shift of capability away from the 2015 Water Resources Management Plan assumptions. The adjustment reflects the net impacts of any model revisions and the changes to capability as outlined above.

We have applied a further reduction of 0.7 Ml/d in Water Available for Use due to an increase in the statutory compensation flow from Holdenwood Reservoir, required for environmental reasons under the Water Framework Directive, which took effect in January 2017 and must be met from our available supplies. The future compensation flow rate is the subject of a current licence application and ongoing studies and discussion with the Environment Agency. In future years the full reduction, to the final agreed flow rate, will be applied to Water Available for Use, but a pro-rata adjustment based on the current interim licenced flow rate has been calculated for 2016/17 for the relevant time period of 1 January to 31 March 2017.

4.1.2 West Cumbria Resource Zone

The South Egremont borehole project was originally scheduled for completion in 2015/16 with a design capacity of 11 Ml/d. The Water Available for Use benefit of 3 Ml/d (this reflects the dry year supply benefit to the resource zone as a whole taking other factors and constraints into account) was therefore included in the forecast Water Available for Use for 2016/17 in the West Cumbria Resource Zone.

In last year's annual Water Resources Review, we reported a forecast delivery date of summer 2016. However, further delays to the completion of this project have occurred mainly due to unforeseen complexities in the water treatment works process. It is critical that these are addressed prior to completion of the scheme, as it is essential that customers receive water that is fully compliant with the required drinking water standards.

The boreholes are now partly operational and delivering some benefit to the resource zone to enable reduced abstraction from Ennerdale Water, which is a key environmental driver of the scheme being delivered to the 11 Ml/d enhanced capacity[5] . However, the boreholes were not fully in service at the maximum capacity of 11 Ml/d during 2016/17, so the Water Available for Use in 2016/17 has not been included in the reports this year. This has resulted in an interim decrease of 3 Ml/d in the Water Available for Use for 2016/17.

Completion of this project is a high priority due to the need to reduce abstraction from Ennerdale Water until completion of the Thirlmere transfer scheme in March 2022. The project team are working to ensure that we use the boreholes as much as possible prior to them becoming fully operational, which is scheduled for the end of August 2017. Therefore, we expect to deliver some Water Available for Use benefit in 2017/18 from this operation and report the full benefit upon delivery of the scheme in line with the 2015 Water Resources Management Plan forecasts. We are in regular liaison with the Environment Agency on the details of our plan to ensure delivery.

[5] The original scheme design was for a capacity of 6.4 Ml/d.

The South Egremont boreholes project is one of several interim measures to reduce abstraction from Ennerdale Water in the 2015 Water Resources Management Plan, further detail on which can be found in Section 7.2.

4.1.3 Carlisle Resource Zone

There is a small increase to Water Available for Use in the Carlisle Resource Zone for the 2016/17 period, reflecting an increase in supply capability in this zone.

In our previous Water Resources Management and Drought Plans, we included water quality constraints on an existing pumped transfer from the River Eden to support storage in Castle Carrock reservoir. Since the development of these plans, in April 2016 we completed modifications to these assets to mitigate water quality risks. The increased reliability means that we are now able to pump at an earlier stage than previously assumed, so that increased use of this transfer is possible. We have assessed the benefit to the supply capability as an increase of 1.6 Ml/d, and the Water Available for Use (WAFU) in Carlisle Resource Zone has therefore increased by this amount in 2016/17. This change was also reflected in our Revised Draft Drought Plan 2017, which was submitted to Defra in January 2017.

4.1.4 North Eden Resource Zone

There are no changes to Water Available for Use in the North Eden Resource Zone away from the 2015 Water Resources Management Plan forecast assumptions.

4.2 Bulk supplies

There are no changes to our existing bulk supply arrangements relative to the allowance we made in our 2015 Water Resources Management Plan. This reflects imports and exports of water, and non-potable exports.

4.3 Outage

The outage allowance determined for Water Resources Management Plan submissions takes into account any asset failures which would affect the ability to supply during a 'dry year'. Actual outages during 2016/17 have occurred at a range of source work types. Only those that would affect supplies during a drought are included in the outage reported. The level of outage experienced this year is 72.9 Ml/d. This is marginally lower than the outage allowance in our 2015 Water Resources Management Plan, and is summarised in Table 5 by resource zone.

Table 5 Outturn outage data for 2016/17 compared with the outage allowances for 2016/17 included our 2015 Water Resources Management Plan

	Carlisle	Integrated Zone	North Eden	West Cumbria	Regional
Outage Experienced (Ml/d)	0.0	72.9	0.0	0.0	72.9
Outage allowance (Ml/d)*	2.0	74.3	0.1	0.9	77.3
Difference (Ml/d)	-2.0	-1.4	-0.1	-0.9	-4.4

*2016/17 dry year outage allowance from the 2015 Water Resources Management Plan

Outages occur for a variety of reasons such as pollution events, poor raw water quality, asset failure necessitating emergency repairs, and routine maintenance. Outages may be planned (i.e. scheduled maintenance) or unplanned. Where planned, operationally a risk assessment is undertaken for each outage request to consider hydrology, headroom, resilience and contingency. The programming of planned outages is often subject to timing constraints relating to seasonal demand and/or completion of dependent outages. The production planning outage process is designed to minimise the risk to water resources and the supply-demand balance whilst at the same time enabling essential repair and maintenance work to be undertaken. A breakdown of the types of outage experienced during 2016/17 is shown in Table 6.

Table 6 Regional outage experienced for 2016/17 by type

Reason for Outage	Planned	Unplanned	Total
Impounding Reservoirs	11.7	0.0	11.7
Asset failure	0.0	13.5	13.5
Maintenance	30.2	14.9	45.1
Pipeline	0.0	0.1	0.1
Raw water quality	0.0	2.5	2.5
Total (Ml/d)	**41.9**	**31.0**	**72.9**

Notes:
Impounding Reservoirs includes the impact of all reservoir drawdowns for maintenance and/or safety reasons.

Asset failures are reactive and include loss of capacity due to faulty equipment such as borehole pumps and process control instrumentation.

Maintenance includes inspections, cleaning and refurbishment activities. Unplanned maintenance is associated with addressing issues that become apparent during other activities (e.g. inspections) that are a risk to asset failure.

Pipeline outages are generally for repairs of leaks and bursts on raw water or potable mains that have an impact on water resources dry year availability

Raw Water Quality outages are due to short-term or seasonal deterioration of raw water quality.

During the 12 month period to 31 March 2017 the majority of the outage experienced was due to planned maintenance. Two specific outages make up a large proportion of the reported outage in 2016/17. There were a number of outage events at Oswestry water treatment works, involving reductions in treatment capacity of up to 50 Ml/d. This included two separate outage periods of over 2 and 4 month durations respectively, to undertake refurbishment of rapid gravity filters, repair of inlet valves and other essential maintenance. A number of outage events were also experienced at Huntington water treatment works during the spring and summer of 2016, resulting in temporary reductions in output capacity whilst essential maintenance work was carried out. This included cleaning and repairs to equipment.

Both Windermere and Ullswater pumping stations have also experienced reductions in their respective maximum capacities during 2016/17, due to a number of individual pumps being out of commission at each site. Whilst the impact of these reductions on the overall outage recorded for 2016/17 is relatively low in terms of supply-demand balance impact over the course of the year, we recognise the importance of these sites to operational management prior to and through dry weather periods. During the dry winter period experienced in 2016/17, there was a key outage at Windermere pumping station caused by asset failure in December 2016, which led to internal flooding of the pumping station which in turn caused loss of pumping capability.

4.4 Sustainability changes

As a result of the Review of Consents process for Habitats Directive sites, undertaken by the Environment Agency and Natural Resources Wales (with Natural England as a statutory consultee), we have had many changes to our abstraction and impoundment licences over recent years to ensure our abstractions do not cause environmental damage. These changes are fully incorporated in the reported Water Available for Use (where appropriate). In some cases we have received new licences, however, interventions to implement these are still underway, as shown in Table 7 below. The Environment Agency is fully engaged on these delivery timescales. We expect to reflect the implementation of the Swindale scheme in the Water Available for Use calculations for 2017/18.

To safeguard sensitive aquatic species and habitats we have a number of additional sustainability reductions scheduled in future years as defined and accounted for in our 2015 Water Resources Management Plan (Table 7). These are mainly associated with the requirements of the EU Water Framework Directive. As sustainability changes are implemented, we will reflect them in our Water Available for Use assessment in subsequent reporting years.

Table 7 Sustainability changes included in the 2015 Water Resources Management Plan

Site	Driver	Sustainability solution	Expected completion date
Integrated Resource Zone			
Haweswater intakes	Habitats Directive	Increased prescribed flow and lower abstraction limits at Swindale Beck	Implementation due by 30 September 2018, but completed by 31 March 2017
River Calder, Barnacre	Water Framework Directive	New prescribed flow to be provided to downstream river before abstraction can occur	1 October 2018 New abstraction licence issued 27 June 2014
Tarnbrook Wyre river intakes, Lancaster	Water Framework Directive	New prescribed flows at the three main intakes	31 March 2020
Afon Cownwy and Marchnant, Lake Vyrnwy	Water Framework Directive	New prescribed flows at the two river intakes and abstraction limited to 75% of available flow above this	31 March 2020
Holden Wood reservoir	Water Framework Directive	Increase to compensation flow provided to downstream river	31 March 2020. On 26 October 2016 we applied to the Environment Agency for the licence change and this was implemented in January 2017. However, a further licence application is now under consideration subject to ongoing analysis and discussion with the Environment Agency.
Poaka Beck reservoir	Water Framework Directive	New compensation flow provided to downstream river	31 March 2020
Readycon Dean reservoir	Water Framework Directive	New compensation flow provided to downstream river	31 March 2020
Horse Coppice reservoir	Water Framework Directive	New compensation flow provided to downstream river	31 March 2020
Carlisle Resource Zone - No sustainability reductions planned			
North Eden Resource Zone – No sustainability reductions planned			
West Cumbria Resource Zone			
Ennerdale Water	Habitats Directive	Revocation of abstraction licence	1 April 2022
Quarry Hill system	Site of Special Scientific Interest (SSSI)	Hands-off lake level in Overwater	1 April 2022 New abstraction licence issued 27 June 2014

4.5 Structural abstraction asset modifications

In 2016/17 we completed a project to undertake significant structural modifications at our Swindale Beck river intake on the Haweswater system, under a Habitats Directive driver. This included a new fish pass, eel pass, intake screen and control system to allow us to meet the new abstraction licence conditions. The result is that we are abstracting less water at this location, allowing more water to flow down the river, especially during periods of fish migration, and the abstraction has less impact on the environment. The Environment Agency delivery date for the scheme was 30 September 2018, however we achieved early delivery on 31 March 2017, ensuring that environmental benefits are realised earlier than planned. This scheme won the Project of the Year in the Natural Environment category and was highly commended in the Partnership of the Year category at the ENDS Environmental Impact awards.

Figure 1 Swindale Beck Intake

4.6 Climate change

In our 2015 Water Resources Management Plan we fully assessed the effects of climate change on water source yields, water demand and target headroom. We worked with the Environment Agency and National Resources Wales to utilise the UK Climate Impacts Programme climate projections ("UKCP09") in the 2015 plan using a best-practice approach.

The impact of climate change on supply availability for 2016/17 is small given the impacts of climate change are lowest at the start of the planning horizon. Climate change impacts remain the same in 2016/17 as forecast in the 2015 Water Resources Management Plan.

4.7 Abstraction incentive mechanism

Ofwat's abstraction incentive mechanism (AIM) is a way of encouraging water companies to manage their abstraction in a more sustainable way.

AIM sites are in environmentally sensitive areas and abstraction at times of low river flow has the potential to cause harm. AIM measures the amount of abstraction that occurs at times of low river flows and compares this to an average baseline period (covering the period between 2007 and 2013); indicating whether current abstraction is higher or lower than the recent past. For each site, we estimate the equivalent length of downstream river that the abstraction reduction contributes to improving.

AIM was initiated by Ofwat as a reputational assessment from 1 April 2016. However, we already have it incorporated in our "kilometres of river improved" environmental Measure of Success (see Table 2 for information), which supports our Promise "to protect and enhance the environment". We have a financial incentive for this Measure of Success, which means that we can be rewarded or penalised depending on

whether abstraction is lower or higher than it was historically. At the time of producing our Measure of Success, the Ofwat definition did not exist, and therefore we developed our own approach based on "AIM principles".

We are committed to reporting our AIM performance in this annual review. We report two sets of AIM performance:

- using our previously developed AIM assessment included in our "kilometres of river improved" Measure of Success (see Table 2 and Table 8); and
- using the Ofwat AIM guidelines (February 2016) (see Table 9).

There are four AIM sites included in our Measure of Success:

- Old Water (River Gelt, Cumbria);
- Ennerdale Water (Cumbria);
- River Calder (Lancashire); and
- Aughertree Springs (Cumbria).

During 2016/17 the river flows at the four AIM sites did not reach the AIM low flow threshold at any time. This is consistent with the weather experienced in the year (see Section 3.2); despite rainfall being below the long-term average for the year, summer rainfall (April to September inclusive) was above average. This benefits the environment as river flows have not dropped to low levels. As a result there has been no abstraction at times of low river flow which results in the maximum length of river improved under AIM as shown in Table 8. The significance of AIM really comes to the fore during dry periods, and we plan to adapt our future abstraction as much as we can during times of lower river flow, whilst still maintaining security of supply.

Table 8 AIM performance - "kilometres of river improved" Measure of Success

Abstraction site	Low flow threshold (Ml/d)	Historic average abstraction below threshold (2007-2013) (Ml/yr)	2016/17 abstraction below threshold (Ml/yr)	Contribution to river improved (km)
Old Water (Carlisle Resource Zone)	8.80	41.92	0.00	0.35
Ennerdale Water (West Cumbria Resource Zone)	80.00	2,200.90	0.00	20.95
River Calder (Integrated Resource Zone)	33.10	34.25	0.00	10.30
Aughertree Springs (West Cumbria Resource Zone)	25.90	0.36	0.00	5.24
TOTAL				**36.84**

Table 9 AIM performance – Ofwat measure

Abstraction site	Low flow threshold (Ml/d)	Historic average abstraction at or below threshold (2007-2013) (Ml/d)	2016/17 abstraction at or below threshold (Ml/d)	AIM performance (Ml)	Normalised AIM performance (no units)	Cumulative AIM performance (Ml)	Cumulative Normalised AIM performance (no units)
Old Water (Carlisle Resource Zone)	8.8	3.27	0.0	0.0	0.0	0.0	0.0
Ennerdale Water (West Cumbria Resource Zone)	80.0	26.03	0.0	0.0	0.0	0.0	0.0
River Calder (Integrated Resource Zone)	33.1	7.09	0.0	0.0	0.0	0.0	0.0
Aughertree Springs (West Cumbria Resource Zone)	25.9	1.09	0.0	0.0	0.0	0.0	0.0
TOTAL				**0.0**	**0.0**	**0.0**	**0.0**

4.8 Distribution, production and resource developments

For the 2016/17 period resource development is ongoing in the West Cumbria supply system. The South Egremont borehole project was originally scheduled for completion during 2015/16, and in last year's annual Water Resources Review completion was forecast for summer 2016. Delays to the completion of this project have occurred in relation to the blending of water from Ennerdale Water with the boreholes and the need to ensure we continue to meet the drinking water quality standards. Enhancements to Ennerdale water treatment works were identified and work has been ongoing to ensure these are delivered as soon as possible; our plans to ensure completion of this project by the end of August 2017 are outlined in section 4.1.2.

In the Carlisle Resource Zone we have removed constraints on existing assets. In April 2016 we completed interventions to remove the water quality constraints on the use of river pumping to support reservoir storage in this zone, so that pumping can continue at a higher storage level. As discussed in Section 4.1.3 we have assessed the additional benefit of this work as an increase of 1.6 Ml/d to Water Available for Use, which we have applied to the Carlisle Resource Zone from 2016/17 onwards.

5. Demand

This section explores the demand experienced in the year, the influences of weather and the other influencing factors on demand, to allow comparison to Water Resources Management Plan forecasts where appropriate. It also summarises our demand management activity in 2016/17.

5.1 2015 Water Resources Management Plan demand forecast

The Water Resources Management Plan focusses on ensuring an adequate supply-demand balance in a 'dry year' and we therefore produced 'dry year' demand forecasts for the 2015 plan. Weather is one of many factors influencing demand, and we have used Met Office models to understand the influence of weather effects on observed demands. In last year's annual Water Resources Review (section 5.1), we reported that due to updates to the Met Office weather demand model we have revised our demand forecast values. The impacts of these updates are a reduced 'dry year' uplift, which results in lower demand, and a subsequent increase in target headroom (due to added uncertainty). In all resource zones, this results in a negligible change to the supply-demand balance.

For this year's annual Water Resources Review, we continue to use the forecasts declared in the 2015/16 review (the "aWRMP16 forecasts"), and compare the observed demands during 2016/17 to the updated forecasts for that year. A comparison of the aWRMP16 forecasts with the previous 2015 Water Resources Management Plan forecasts is included in Appendix A.

5.2 Demand in 2016/17

Distribution input is the average volume of water put into the water supply network. Regional distribution input during 2016/17 was higher than the previous year however it is still between the 'normal year' and 'dry year' forecast (see Figure 2). However, the equivalent 'dry year' distribution input for 2016/17 is 25 Ml/d higher than the updated 'dry year' forecast for the year (see Table 10). Distribution input for the reporting period is influenced by the weather experienced throughout the year, which is discussed later in this section.

During the summer period in 2016/17 rainfall and temperature were above the long term average whilst sunshine duration was slightly below average. Winter was notably dry with rainfall well below the long term average and temperature above the average (see section 3.2). Figure 2 shows how this year compares to historic years in terms of dry year influence. A lower ranking would correlate with a smaller proportion of weather dependent usage, and a higher uplift would be required to bring the demand in line with a dry year.

The outturn data in Appendix A (Table A1) shows a like for like comparison of 2016/17 actual demand and the aWRMP16 'dry year' forecast, adjusted to reflect the weather experienced during the year. The adjustment is only applied to those consumption-based components which are influenced by the weather, and this enables comparison of the outturn data with the forecasts on a like-for-like basis.

Table 10 Comparison of distribution input values to 'dry year' and 'critical period' forecast values

	Carlisle	Integrated	North Eden	West Cumbria	Region Total
Key to table	**2016/17 actual data uplifted to represent an equivalent dry year**				
	2016/17 forecast data (aWRMP16)				
	Difference				
Dry year distribution input	**28**	**1,682**	**7**	**49**	**1,766**
	27	1,662	5	47	1,741
	+1	*+20*	*+2*	*+2*	*+25*
Critical period distribution input	**30**	**1,682**	**7**	**52**	**1,771**
	28	1,662	5	51	1,746
	+2	*+20*	*+2*	*+1*	*+25*

Note: numbers may not sum due to rounding

Figure 2 Demand for water in 2016/17 due to weather with Met Office analysis showing the dry influences of summer in 2016[6] (red) relative to historic data

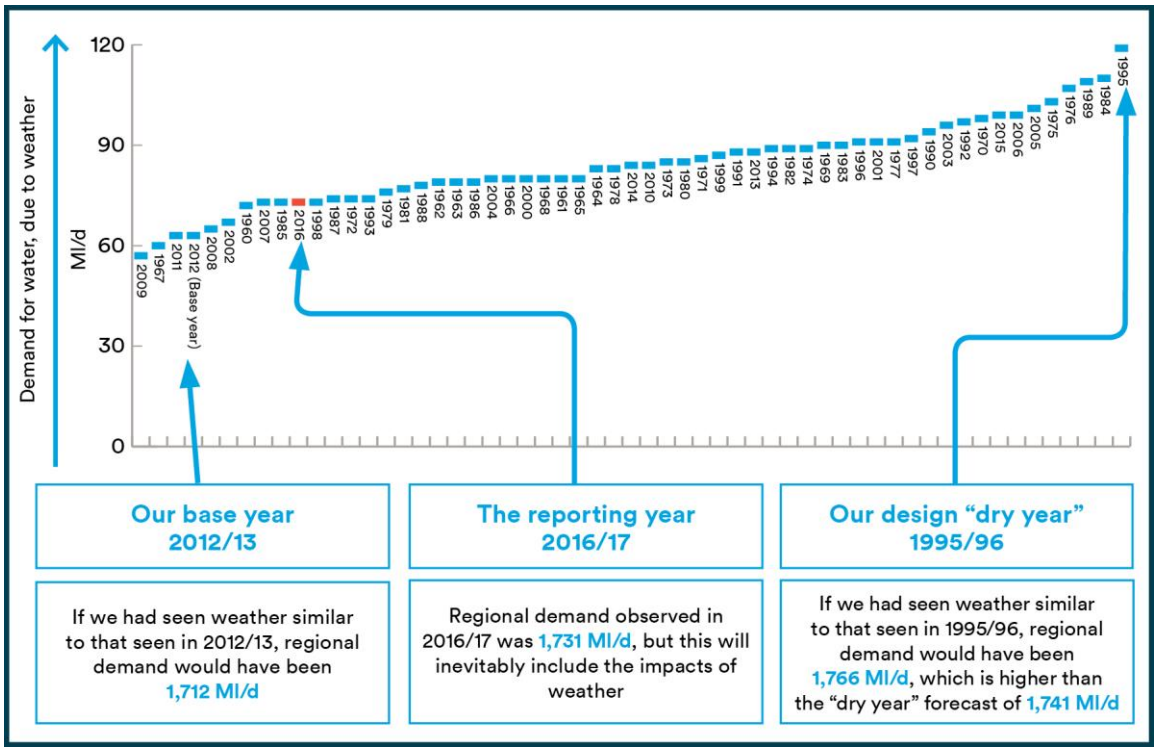
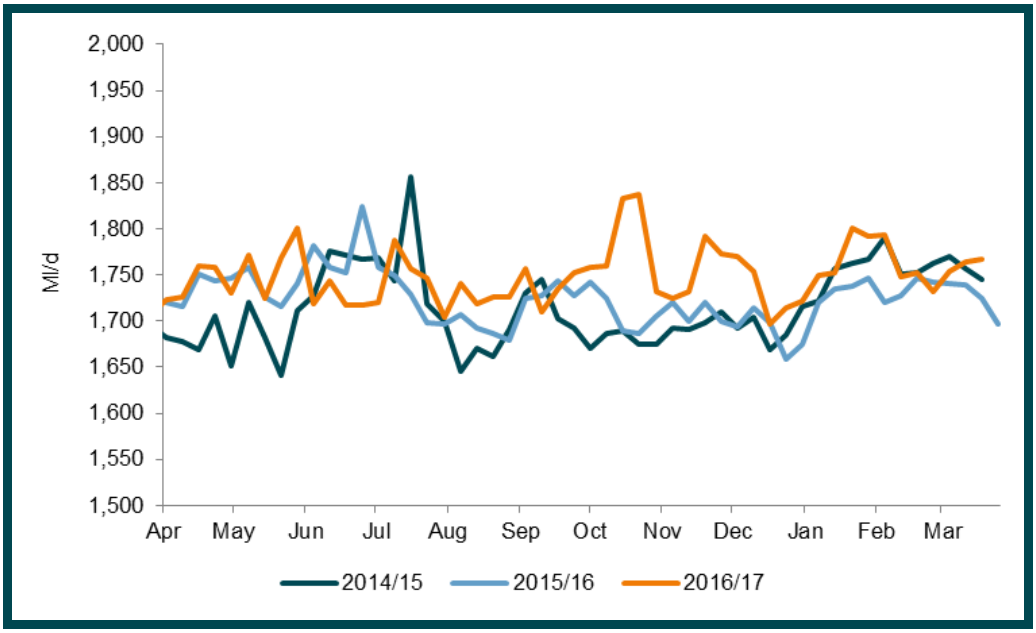


Figure 3 below shows the weekly regional distribution input for the last three years. Average distribution input for 2016/17 has been slightly higher than the previous years. The demand throughout the year has been predominantly higher than the previous two years particularly during the period October to mid-December.

[6] Summer 2016 refers to the summer months, April to September 2016, for the year 1 April 2016 to 31 March 2017.

Figure 3 Weekly regional distribution input for the last 3 years



As well as the weather we have seen changes in different demand components that, overall, comprise an increase in regional distribution input from the previous reporting year. There have been increases in consumption by households, water taken unbilled and miscellaneous water use which, in combination with decreases in leakage, net as an 8.5 Ml/d increase in distribution input from the 2015/16 period.

Demand values need to be compared on a like for like basis. The 2016/17 demand uplifted for a dry year is 1,766 Ml/d, compared to our dry year forecast of 1,741 Ml/d. This shows that on a comparable basis we are within 25 Ml/d of the dry year forecast. Demand is approximately 1.4% higher than the aWRMP16 forecast.

Leakage showed the biggest variance from the forecast at 24 Ml/d below target; this can be explained by our continued efforts to target leakage performance within 2016/17. Our leakage performance is discussed in more detail in section 5.3 below. Similar to the previous year 2015/16, non-household consumption showed a larger deviation against the forecast of 23 Ml/d. This variance may be related to improving economic circumstances. The Office of National Statistics showed that in 2015 the North West's economy was the UK's fastest growing region for gross value added (GVA). This trend is predicted to continue albeit at a reduced rate with Ernst and Young predicting GVA to remain at 2.0% through 2017 to 2019. We anticipate that as the non-household retail market develops from 2017, non-household demand may be lower as retailers develop innovative ways of helping customers reduce their bills.

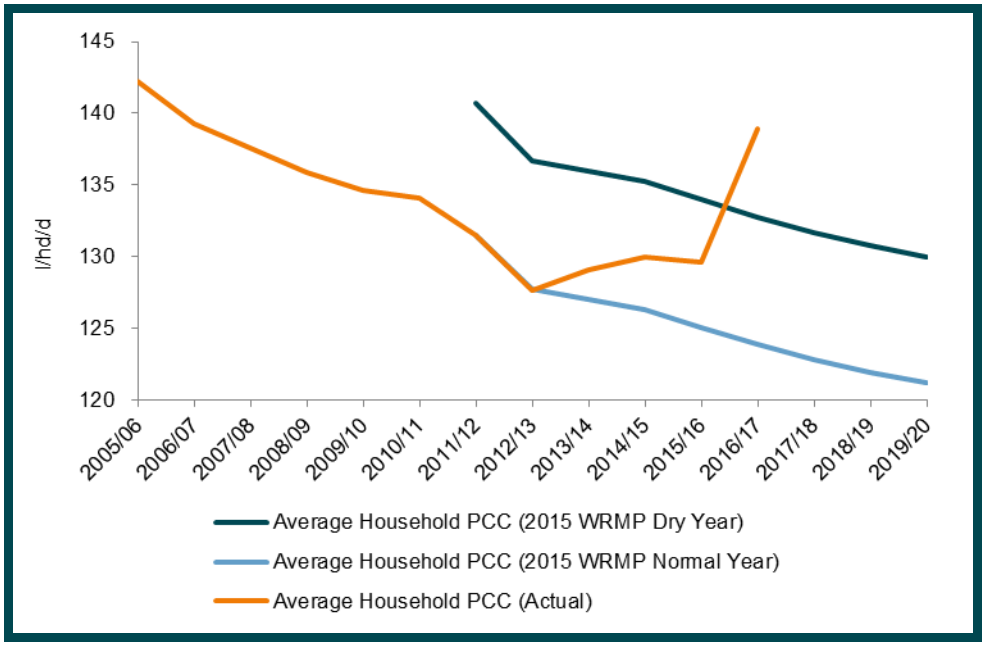
5.2.1 Per capita consumption

Per capita consumption (PCC) is a standard way of monitoring consumption, and in recent years the North West has had one of the lowest rates in the country. In 2016/17 our regional average household per capita consumption was 139 l/hd/d which shows an increase since the previous year. This increase is above the 2015 Water Resources Management Plan forecasts for normal and dry years (Figure 4). Per capita consumption is sensitive to occupancy rate in each zone; occupancy rates are measured through periodic surveys which may become out of date over time. Periodic updates or corrections are made to the

occupancy data which will impact on the per capita consumption calculation. The increase in per capita consumption in 2016/17 was the result of using revised occupancy rates (survey was carried out in 2016[7]). Table 11 below also shows the average per capita consumption for each resource zone for this reporting year compared to 2015/16.

As a company we consider per household consumption to be a better comparator than per capita consumption. This is due to the relative uncertainty around occupancy and population estimates that are used to calculate per capita consumption. For this reason, we chose per household consumption as one of the Measures of Success (see Section 3.1). Per household consumption for 2016/17 was 305 l/prop/d, which is a slight increase on the previous year; it is within 1% of the annual forecast and within the expected bounds of variance of our Measure of Success target. The increase in regional per capita consumption compared to the previous year is 6.9%.

Figure 4 Average household per capita consumption since 2005/06[8]



[7] This was carried out as part of the 2019 Water Resources Management Plan development

[8] A slight decrease in the trend appears from 2014/15 to 2015/16 due to rounding

Table 11 Average household per capita consumption from 2015/16 to 2016/17

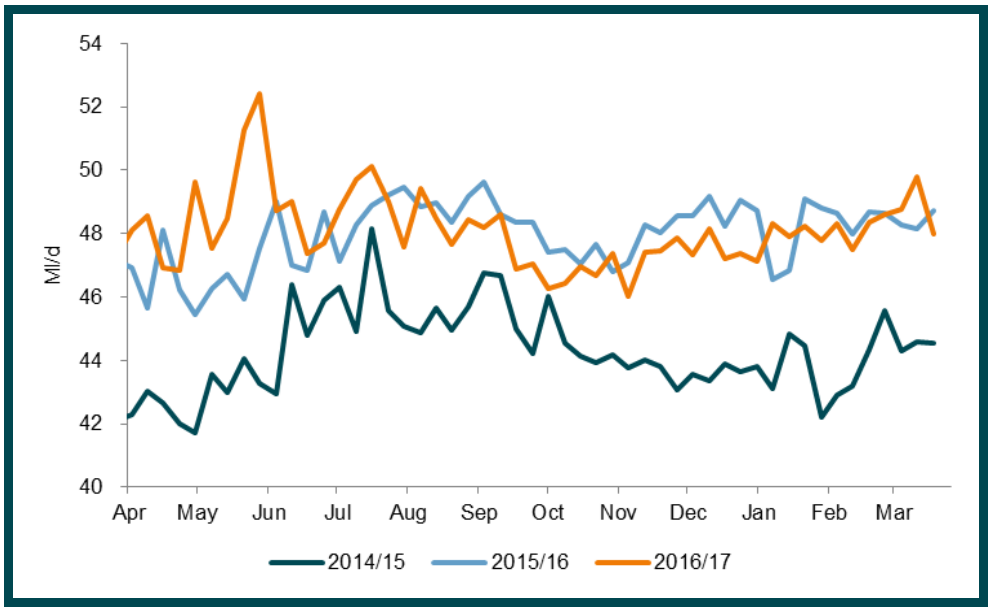
Resource zone	2015/16 (l/hd/d)	2016/17 (l/hd/d)	Change (l/hd/d)
Carlisle	131	139	+8
Integrated	129	139	+10
North Eden	134	139	+5
West Cumbria	147	144	-3
Region	130	139	+9

As shown in Table 11, West Cumbria PCC is higher than the other resource zones, although the gap in the 2016/17 period has narrowed compared to 2015/16. This is associated with a low metering penetration in West Cumbria, as indicated in the outturn data. For commentary on our water efficiency and metering activities in the resource zone please refer to sections 5.4.1 and 5.5.

5.2.2 Changes in demand in West Cumbria

There has been no significant change in distribution input in West Cumbria compared to 2015/16 (Figure 5). This is mirrored by a stable leakage performance compared to the previous year (see section 5.3). We take our responsibility to reduce demand in West Cumbria very seriously given the environmental sensitivity of Ennerdale Water in particular. Therefore plans are in place to recover our performance in this zone throughout 2017/18 to reduce demand below current levels (these commenced in the 2016/17 period, but inherently take time for these to take effect), as described in the sections that follow.

Figure 5 Weekly West Cumbria Resource Zone distribution input for the last 3 years



5.3 Leakage

Through additional investments in the second half of 2015/16 and a mild winter we started the financial year in a favourable position. Throughout the year we have continued to carry out an extensive range of leakage control activities in all water resource zones and as a result, we have achieved our lowest ever level of leakage of 439 Ml/d in 2016/17. This means that we have outperformed the Ofwat published target of 463 Ml/d for 2016/17. We continue to provide a private supply pipe repair/replacement service for household customers. We also offer unlimited free repairs or one free replacement supply pipe in a 12-month period, subject to conditions.

Table 12 below shows leakage in the four water resource zones.

There has been a slight increase in leakage in North Eden compared to the previous year. Historically, leakage in North Eden has been slightly over the forecast levels. The resource zone is very small, with few properties and a water balance across such an area is difficult to reconcile.

Leakage in West Cumbria has been maintained from the 2015/16 position, but remains above the total leakage forecast for this zone. We continue to target West Cumbria to recover our performance in this zone including further analysis into the worst performing DMAs and investigating connectivity and operability on top of our extensive leakage activities in the area.

There has been a reduction in leakage for Carlisle from the 2015/16 average which brings total leakage for this zone closer to the forecast level whilst remaining above it. We are continuing with the extensive pressure management programme and leakage detection to recover performance in this zone throughout 2017/18.

Table 12 Zonal leakage levels 2015/16 to 2016/17 and comparison with 2015 forecast (Ml/d)

Resource zone	Carlisle	Integrated	North Eden	West Cumbria	Region Total
Actual total leakage 2015/16	5.9	427.4	2.6	16.1	451.9
Actual total leakage 2016/17	**5.3**	**414.9**	**3.1**	**16.1**	**439.2**
Change from 2015/16	-0.6	-12.5	+0.5	0.0	-12.6
2016/17 forecast from our 2015 Plan	4.8	441.9	2.0	14.0	462.6
Variance from forecast	+0.5	-27.0	+1.1	+2.1	-23.4

NOTE: Numbers may not sum due to rounding

Regionally there was a decrease in leakage compared to the previous year which has resulted in us achieving our lowest ever leakage level. This leakage value remains significantly below the target and is reflective of our extensive leakage reduction programme and also a mild winter.

5.3.1 Leakage in West Cumbria

We have been working hard to find and fix leaks and achieved further leakage reductions this year across our region. In West Cumbria we have deployed additional resources to carry out a deep dive analysis on the worst performing DMAs, investigate connectivity and operability. Increased resources in West Cumbria include two network integrity inspectors, a permanent network maintenance team covering the Lakes, Carlisle and North Eden, a new permanent pressure analyst and permanent PMV maintenance team.

This is on top of our "business as usual" leakage activities and we will continue with these activities throughout 2017/18. We will also continue with our pressure optimisation programme; currently average zone night pressure is the lowest it has been. Our efforts resulted in a very slight leakage reduction in comparison to the previous year but leakage still remains 2.1 Ml/d above target for this zone. However, leakage per kilometre of water main is still 12% lower than the regional average.

Leakage can be split into district meter areas and the trunk mains upstream of them. District meter areas (DMAs) are the part of the water network where most of the leakage occurs, typically the pipes under roads near where we live and work.

DMA leakage remained higher for the majority of 2016/17 if compared to 2015/16 performance. We have managed to reduce it to the levels observed last year and currently have activities planned for 2017/18 that will enable us to maintain this overall downward trend.

We have an ongoing programme of demand management, including DMA leakage reduction, in West Cumbria. Actions include:

- third-party project to undertake DMA investigations in West Cumbria, to bring a fresh set of eyes and greater scrutiny in the resource zone;
- testing of new PMV controllers;
- improved logging and monitoring of all DMAs with respect to pressure management;
- increased active leakage control by using additional resources to enhance daytime activity. We also continue to survey regularly for leaks in unmetered areas;
- increased active leakage control at night and permanent night detection resources;
- ongoing focus on supply pipe leakage to ensure that repair times are optimised (either through using our contractors to repair or working with the customer to repair via their insurance company);
- an ongoing upstream losses campaign including distribution input meter validation and service reservoir investigations as part of trunk main leakage and losses detection process;
- extensive pressure reduction programme;
- successful use of acoustic technology on trunk mains to locate leaks;
- upstream leakage reduction targeting high leakage tiles;
- drop tests to identify and target leaks at our service reservoirs where appropriate;
- meter verification and a review of the pressure management programme to identify potential for further pressure reduction; and
- data validation including operability investigations, void properties status, industrial users and allowances for concessionary supplies.

We will continue our extensive efforts throughout the 2015-2020 planning period to bring leakage back on track for the 2017/18 period and beyond.

5.4 Water efficiency and impact on consumption

Water efficiency plays an important role in balancing supply and demand. We met the annual baseline target of 2.95 Ml/d for 2016/17, and achieved additional savings of 0.31 Ml/d from enhanced activities in our West Cumbria Resource Zone.

Table 13 summarises the benefits of our water efficiency and metering activity for the year. These actions contribute to the overall change in consumption by customers.

Table 13 Summary of United Utilities water efficiency programme 2016/17

Water Efficiency Activity	Number	Estimated water saving (Ml/d)
Cistern devices distributed to customers	31,865	0.32
Water efficiency customer self-audits	123,103	1.06
Water butts distributed to customers	1,951	0.01
Water Efficiency Education Programme, pupils visited	7,486	0.39
Other promotional events	40	0.02
Crystal packs / water sticks distributed to customers #	1,465	0.00
Retrofit devices distributed to customers	70,600	1.09
Base Service Water Efficiency Programme – Total (including a carry over of 0.05 Ml/d from 2015/16)		**2.95**
Free meter options	32,447	1.10
West Cumbria Sustainable Level of Water Efficiency Programme	17,640	0.24
West Cumbria education programme	1,259	0.07
TOTAL SAVING		**4.36**

NOTES: Numbers may not sum due to rounding;
 # Value is greater than zero, but the savings are small so do not show to two decimal places

During 2016/17, we have demonstrated our commitment to promoting water conservation by the following activities:

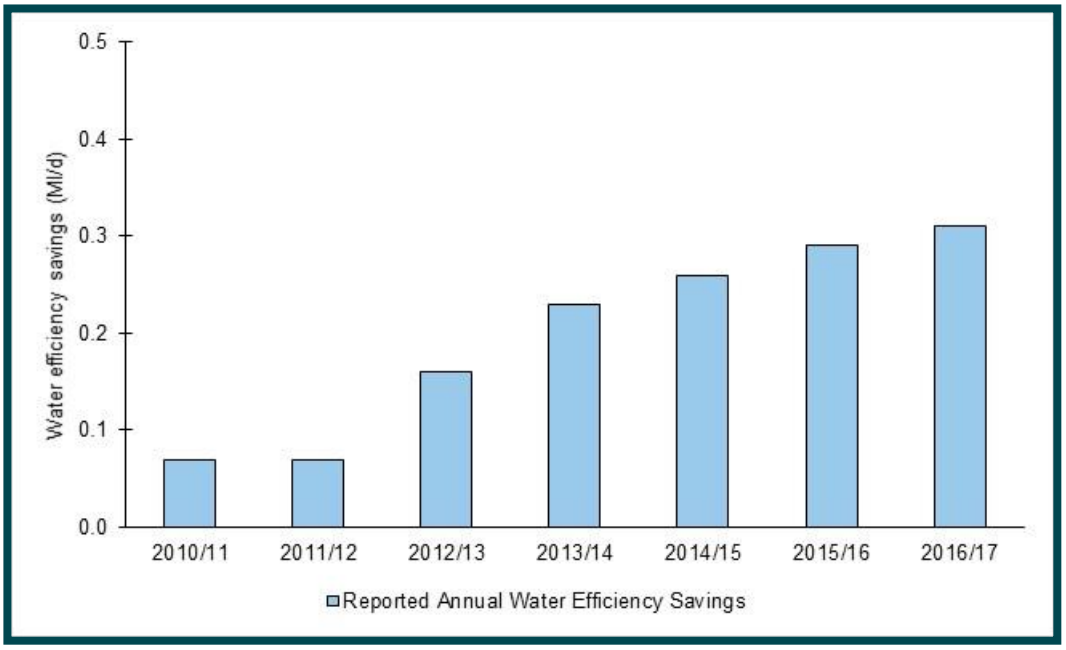
- continuing to leave a pack called “A simple guide to your water meter” (including water saving information) with household customers after a meter is installed;
- carrying out nearly 5,000 audits in customer homes, leading to the installation of over 10,250 water efficient products;
- delivering a water saving education programme to nearly 7,700 Key Stage 2 pupils;
- offering a water usage calculator on our website, used by 63,800 customers in 2016/17, which gave them advice on how to save water across their homes;
- supplying over 35,000 customers with a range of water efficient products including Save-A-Flush’s, Shower Regulators, Tap Inserts, Toothy Timers, Shower Timers, Showerheads and Bathbuoys, to install in their properties;

- attending local events such as the Cheshire Show where we distribute water saving products and engage with customers, impacting water saving behaviours;
- every customer bill received an eight page leaflet. The inserts were slightly different for metered and non-metered bills but both featured information on free meters and free water saving products as a way for customers to save money on their bill; and
- continuing to promote water efficiency through our education programme.

5.4.1 Water efficiency in West Cumbria

In our 2015 Water Resources Management Plan we committed to maintain the enhanced level of demand management activity delivered from 2010-2015. As part of realising on-going benefits we are continuing to undertake enhanced demand management activity to minimise abstraction in West Cumbria. This year we have seen further savings of 0.31 Ml/d in the zone, exceeding the previous year's performance of 0.29 Ml/d. These further savings follow on from successful results in earlier years, in which savings were more than double the cumulative target through the 2010-2015 planning period (see Figure 6).

Figure 6 West Cumbria cumulative water efficiency savings



This year we worked with partners to install water efficient products in housing association properties. During this work over 2,400 products were fitted in people's homes, making a total saving of 0.03 Ml/d.

We promoted water efficiency at a community level in Egremont (see Figure 7) where we developed key messages and creative marketing material (see Figure 9), highlighting the need to save water and promoting our free home water audit service. We launched the campaign at the annual crab fair, where the annual gurning competition is held, a key event in the local community. We engaged with 22 community organisations, local charities, restaurants, shops, local businesses and schools. Street teams carried out community outreach through merchandising community venues, attending local events and door knocking. Ad-vans and ad-bikes drove round Egremont promoting the message (see Figure 8).

Figure 7 Water efficiency promotion at community events

Figure 8 Promoting the message in Egremont

Figure 9 Examples of our marketing material

As with previous years we held a series of give-away days at supermarkets and events in West Cumbria, giving away 2,058 free water efficient showerheads, over 10,700 other water saving products and over 2,131 handy information booklets.

Working in partnership with the Lake District National Park we continue to offer a free Water Workshop, which was delivered to nearly 1,800 key stage 2 pupils in 2016/17. The workshop is extremely interactive, allowing all the children to participate. The programme covers a number of topics from Key Stage 2 Science and Geography.

5.5 Customer metering

We continue to meter all new properties, and under our free meter option scheme household customers can opt for a meter. The number of unmeasured non-households is relatively small following a programme to compulsorily meter unmeasured non-households several years ago (where practical to do so). Household customers therefore drive most of the annual growth in metering.

During 2016/17, we installed meters at:

- 19,947 new households;
- 32,447 households, which opted for a free meter; and
- 793 new non-households.

This year, we are reporting an increase in the number of customers requesting a meter from the previous year 2015/16, from 27,197 to 32,447. However this is still below the forecast of 59,325 in our 2015 Water Resources Management Plan and we consider it unlikely that we will reach the levels of uptake originally forecast even though we are taking additional measures to encourage meter uptake as described in this section. We are currently revising our forecasts as part of the developing the next Water Resources Management Plan due for publication in draft form later this year and have been engaging with the Environment Agency on this work. Bills have reduced from the previous reporting years, which will have reduced the incentive to switch to some degree, serving as a downward pressure on the reported values.

Over the last year we have made significant improvements to our free meter offer; in particular we have:

- employed agents trained in the free meter installation process, which has helped us to significantly improve speed of installation and reduce drop off rate;
- promoted the free meter option within normal billing contacts, including promotion on all envelopes used during our main billing;
- targeted 55,000 customers to promote metering via a range of media (email, letter, text) where we believe these customers would be better off with a meter; and
- promoted our free meter option across the region on a series of 25 billing roadshows and carried out 28,000 Town Action Plan Affordability visits to promote all of the customer assistance schemes we currently have available, which includes the free meter option.

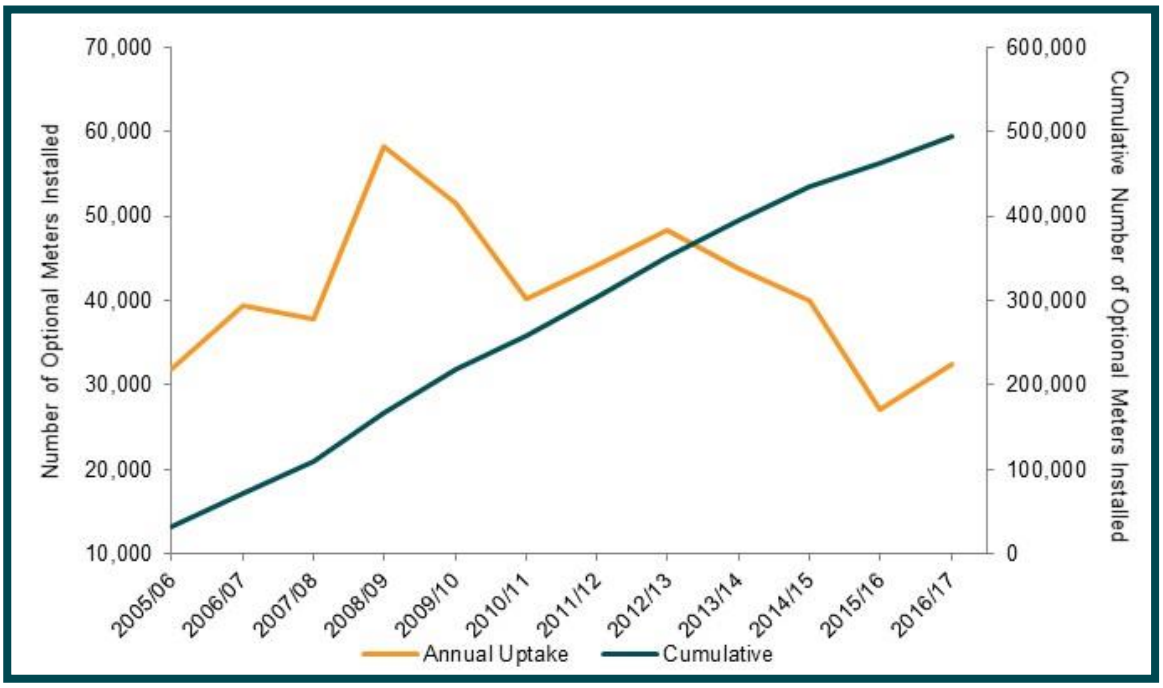
All these actions have helped us to increase free meter uptake by over 5,000 if compared with 2015/16, reducing the gap between actual and forecast uptake of the free meter option.

We continue to offer an extended period of 24 months for all customers to switch back from being metered to unmetered. This gives customers time to decide whether they will benefit from being on a metered

tariff. It is widely accepted that customers with a meter use less water than those without one and this makes the option more attractive. Metering is an opportunity for customer engagement which, if sustained, can also be useful for promoting water efficiency. Metered customers are able to review the impact of their behaviour on their bills, and metering also gives us the opportunity to use flexible tariffs based on consumption patterns. “Paying for what you use” is a well-supported principle.

Figure 10 shows the uptake under our free meter option scheme over the last twelve years. The number of optants each year varies due to a wide range of factors, including water tariffs. This may in part be due to the wider economy, as already discussed in Section 5.2, with peaks in the free meter option uptake observed during the recession when it is likely that customers who would financially benefit would have been encouraged to reduce household bills. However, the number of free meter installations is generally expected to decline in future within the forecasts; as the metering penetration increases, the number of unmetered customers who still stand to benefit most from a free meter reduces. This is reflected in our “Number of free meters installed” Measure of Success (see Table 2), which shows the expected number of new installations to decrease year on year.

Figure 10 Free meter option uptake since 2005/06



To address the lower than expected meter uptake we have initiated a number of actions to improve our performance as outlined above, as well as the following further initiative for 2017/18. Using the findings and understanding from behavioural economics research, we have reviewed our approach to promoting meters to try to tackle this issue in the activities outlined above and in our further plans for 2017/18 below to build on our activities this year.

A pilot trial is being developed by United Utilities Domestic Retail in which customers that opt for a new free water meter will have a ‘lowest bill guarantee’ for a 24-month period. This will ensure that customers will pay the lesser of the existing Rateable Value based charges or our new metered charges. This offer has been designed to reduce the potential ‘loss aversion’ that customers tell us is preventing them from moving to a meter, whilst still offering a potential financial saving to reduce water use, along with the use information that a meter provides. Initially this will be piloted in a small geographical area with a relatively

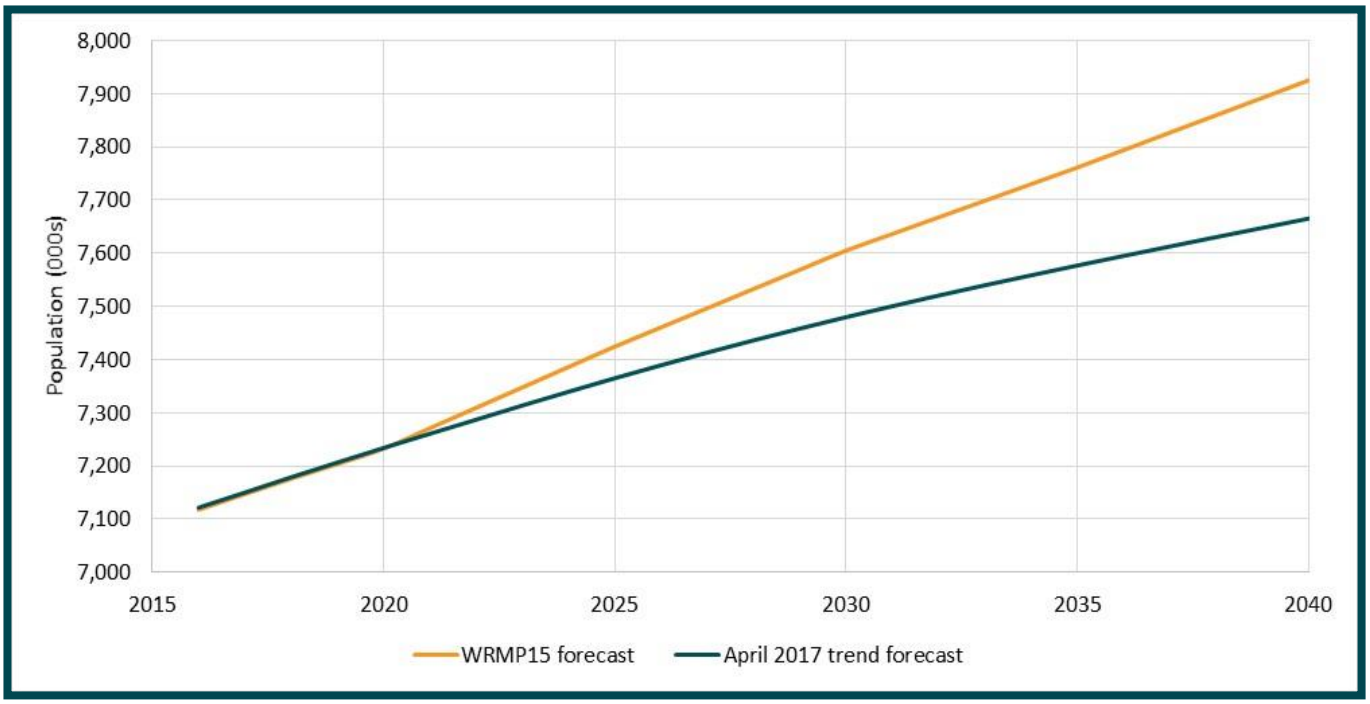
small number of customers, allowing monitoring of the impacts of the trial. If this pilot is effective, it may be extended to a wider customer base in order to increase the uptake of free water meters in future.

5.6 Population and property forecasts

The April 2017 population projections from the specialist demographic analysts have indicated that in the short term there is little variation from the WRMP15 trend projections. By 2040 there is a 3% difference between the WRMP15 and April 2017 plan population projections; given that these are long-range forecasts they are likely to shift over time.

We will continue to review the latest population forecast projections on an annual basis. In line with the Water Resources Planning Guideline (Environment Agency, 2017), we are engaging with Local Authority Districts and Unitary Authorities to ensure that we incorporate data from Local Development Plans. This data will form the basis of a plan-based property and population forecast for our 2019 Water Resources Management Plan. Such forecasts are typically higher than the current trend-based projections.

Figure 11 Latest population forecast (April 2017) against the previous (WRMP15) forecast



6. Headroom

In last year's annual Water Resources Review we outlined changes to the dry year demand and target headroom components of the supply-demand balance due to a revised method of calculating the dry year uplift factor based on Met Office models. We continue to use this approach in 2016/17 and therefore the target headroom values are consistent with the previous forecasts reported on in the 2015/16 annual Water Resources Review.

7. Options and other measures

Our 2015 Water Resources Management Plan outlines the preferred plan to deliver the Thirlmere transfer scheme, along with a set of interim measures to mitigate the potential impacts of our abstraction from Ennerdale Water until the Thirlmere transfer scheme is delivered. We also committed to complete an annual review of the contingency plan that would come into effect in the unlikely event that the Thirlmere transfer scheme is undeliverable. These three key aspects of our 2015 plan are discussed in turn in the sections below.

7.1 Thirlmere transfer scheme

Our 2015 Water Resources Management Plan, informed by the Examination in Public in September 2014, concluded that the Thirlmere transfer scheme (sometimes referred to as the West Cumbria Water Supplies Project) should be progressed to address the future supply-demand deficit in West Cumbria.

Following submission of the full planning application ahead of target in January 2016, and a subsequent period of working closely with the planning authorities to address any queries, we gained planning approval in November 2016. Information on the content of the planning application can still be viewed on our bespoke project website; please visit www.unitedutilities.com/cumbria/our-plans/west-cumbria/planning/planning-submissions/.

We are still on track to meet the project delivery date of 31 March 2022, as included in our 2015 plan, and the project team has made further good progress during 2016/17. The key items of work undertaken this year and/or in progress include:

- approval for the project was granted by all three planning authorities: Allerdale Borough Council, the Lake District National Park Authority and Copeland Borough Council;
- completion of a fourth phase of public consultation activities on the scheme. Our strategy for communication with the local community and other stakeholders has included the following:
    - ongoing use of our project website[9] to provide background information and regular updates on the scheme;
    - distribution of newsletters and further leaflets to over 40,000 properties;
    - over 40 widely advertised public exhibitions;
    - attendance at a series of country shows;
    - meetings and informal liaison with local groups and individuals; and
    - consultation questionnaires, distributed at public events or by post;
- in March 2017 we opened our visitor centre in Keswick, in partnership with the West Cumbria Rivers Trust, to keep the local community informed about our work (Figure 12);
- we are working with partner organisations to establish a community legacy fund to support projects providing social and economic benefits in the local area; details of this fund will be announced in the summer of 2017;
- we have established two project programme offices, at Thirlmere and Cockermouth, to oversee site construction activities;
- we have employed an education officer in conjunction with the West Cumbria Rivers Trust who will be delivering outreach activities to schools and community groups to inform them about the project; and
- all major construction contracts were awarded by the end of March 2017, to enable construction on site to commence in early April, almost a year ahead of the Ofwat target date (Figure 13).

Further information on the work we expect to complete to progress the Thirlmere transfer scheme in the coming year is included in Section 11.

Figure 12 Our visitor centre in Keswick

[9] www.unitedutilities.com/cumbria

Figure 13 Site of planned new Williamsgate Water Treatment Works

7.2 Interim measures in West Cumbria

In order to protect the sensitive habitat in the River Ehen Special Area of Conservation (SAC), we plan to deliver further measures to reduce the abstraction from Ennerdale Water until the Thirlmere transfer scheme is implemented. As part of realising ongoing benefits we have committed to continue with a number of activities. These include:

- continuation of existing enhanced levels of water efficiency promotion (as described in Section 5.4);
- continuation of existing leakage management activities to keep leakage as low as possible, and investigation of new ways of reducing leakage further (as described in Section 5.3.1); and
- we have plans in place to tanker potable water when it is most needed, i.e. when very dry weather is being observed and the lake level in Ennerdale Water is low. This is defined within our Drought Plan. However, this is not something that has been required to date due to the weather conditions experienced.

Two further projects were included in our 2015 plan to bring further abstraction reduction from Ennerdale Water:

- Summergrove: the scheme of improvements allows the further transfer of demand from Ennerdale Water to Crummock Water by allowing us to operate our network differently. This allows a reduction in abstraction from Ennerdale Water by a further 3 Ml/d. This project was completed in March 2016 and has delivered the benefit of reduced abstraction from Ennerdale Water throughout 2016/17; and

- South Egremont boreholes: are being developed at an enhanced capacity of 11 Ml/d. This will reduce abstraction from Ennerdale Water, as well as further bolstering the supply-demand balance and security of supplies in West Cumbria. Delays to the completion of this project have occurred in relation to the blending of water from Ennerdale Water with the boreholes and the need to ensure we continue to meet the drinking water quality standards. However, we are prioritising the completion of this scheme by the end of August 2017: see section 4.1.2 for further details. During

the commissioning phase, particularly since May 2017, the boreholes have been pumped on a regular basis and we will maximise abstraction from this source as much as possible until the boreholes and treatment process are fully operational at the end of August. Once the scheme is fully commissioned we will be able to run the boreholes at their full capacity of 11 Ml/d, offsetting and reducing abstraction from Ennerdale Water by this amount.

7.3 Compensatory measures

During 2014/15 we worked with Natural England and the Environment Agency to commence the delivery of a package of 13 physical ecological and eight research compensatory measures. This was submitted to Defra on 28 February 2014. Implementation of the package of measures commenced in 2014 and will continue to be progressed over the coming years. Defra confirmed in November 2015 that there are Imperative Reasons of Overriding Public Interest (IROPI) to continue abstraction from Ennerdale Water until the Thirlmere transfer scheme is operational in 2022.

The aim of the agreed package of measures is to improve the population of mussels and salmon by enabling more recruitment (survival to successful reproduction), primarily in the River Ehen SAC, and to undertake research and monitoring to understand how this outcome would best be achieved. The compensatory measures will be secured as far as possible within the River Ehen SAC and are therefore planned to both prevent and compensate for potential further damage. Additional measures will provide compensation for salmon in other Cumbrian lakes and rivers, including other Natura 2000 sites. Progress on each measure is reviewed and guided by a project steering group, which comprises representatives from United Utilities, the Environment Agency and Natural England and meets at least twice a year. A formal review of all of the research measures occurs each February, with a review of the wider package in July each year.

Below is a summary of the package of compensatory measures:

Physical measures:

- nine physical ecological measures are largely focused on changing land use and delivering catchment management actions in the area of the River Ehen SAC in order to improve water quality, optimise freshwater mussel and salmon habitat extent and condition and enhance recruitment in both of the interest features; and
- the four offsite physical measures include revocation of abstraction licences and the potential removal of associated infrastructure at Crummock Water and Dash Beck (SAC and SSSI) and at Chapel House Reservoir and Over Water (SSSI) in order to restore natural functioning and improve salmon migration in a number of designated and undesignated Cumbrian lakes and rivers.

Research measures:

- seven research measures have been designed to inform the scope (and in some cases, the need for and feasibility) of the physical measures focused on the River Ehen SAC and elsewhere. The research measures will also enable us, along with the Environment Agency and Natural England, to monitor the effectiveness of the physical measures and improve the body of knowledge regarding factors which threaten the overall coherence of Natura 2000, particularly relating to the River Ehen SAC; and
- there is one research measure to trial the reintroduction of freshwater mussels and artificial encystment to contribute to the body of knowledge associated with freshwater mussel recovery efforts.

During the year 2016/17, we have made further progress implementing the package of compensatory measures to the scope and the timescale agreed with Environment Agency and Natural England:

- a River Ehen Project Officer was appointed, hosted by the West Cumbria Rivers Trust. The Project Officer will facilitate delivery of conservation actions in the River Ehen and Ennerdale Water catchments. She will also support the delivery of other physical and research measures and be key to translating the findings and recommendations of research into practical measures within the catchment which will further minimise risk to and improve the populations of mussels and salmon in the River Ehen SAC. She acts as a key point of contact between the compensatory measures package steering group and the local community;
- we held a workshop in September 2016 bringing together key technical experts of different scientific disciplines who have undertaken surveys and research on the River Ehen. The aim of the workshop was to review and refocus research priorities;
- we have commissioned algal monitoring surveys of locations around Ennerdale Water to better understand where nutrients could be entering the lake. The results of these surveys will inform locations for the Project Officer to target conservation actions;
- we continued to progress an intensive two-year project to assess and map potential juvenile freshwater mussel habitat in the River Ehen SAC, which will now extend into a third year in 2017;
- a four year EngD study hosted by Newcastle University is progressing. The student is investigating the implications of a 'return to natural' flow regime to improve understanding of the likely future flow conditions experienced by the designated species and provide context and data for other research and physical measures; and
- we have commenced feasibility studies for infrastructure removal of the redundant bleaching weir in the River Ehen, and removal of abstraction related infrastructure and weirs at Crummock Water, Dash Beck, Overwater and Chapel House, all sites where abstraction will cease in 2022 when the Thirlmere transfer scheme becomes operational. The River Ehen bleaching weir study will be informed by a detailed digital model of the river which has been completed to better link morphology and changes to the flow regime with important freshwater mussel habitat. The bleaching weir study is due to complete in 2017. We will commence the studies at the other sites in phases.

The package of compensatory measures will provide additional knowledge and ecological actions over and above the actions that are normal practice for the management of the SAC. Outside of this package of measures, considerable research, monitoring and physical action is currently being delivered by United Utilities working in partnership with other organisations, focused on restoring the River Ehen SAC to favourable condition.

We are committed to working with Natural England, the Environment Agency, local stakeholders and experts in order to find the best solution to the protection of the River Ehen SAC and public water supplies in light of emerging evidence.

7.4 Contingency plan

Our 2015 Water Resources Management Plan contains a contingency plan in case the Thirlmere transfer scheme proves undeliverable. The contingency plan involves new groundwater sources in West Cumbria and acquiring existing licences held by a third-party. It may also utilise and retain existing sources with the exception of Ennerdale Water.

We have a high degree of confidence in the deliverability of the Thirlmere transfer scheme, which is one of the reasons why it was selected as our preferred option. The contingency plan has a greater degree of uncertainty with some of the resource components, but we are working with the Environment Agency to improve our collective understanding of resource availability should new sources need to be implemented at a later date.

We completed our annual review of the contingency plan in December 2016. Following the granting of planning approval for the Thirlmere transfer scheme in November 2016, the likelihood of triggering the contingency plan is now very low. However we will continue to liaise with the Environment Agency to assess the availability of groundwater resources in the West Cumbria aquifer. Once the South Egremont groundwater scheme and treatment process is fully operational, monitoring data will be collected as part of the abstraction licence conditions in order to understand the potential effects of new or increased groundwater abstractions in the area. The benefits of a further additional 3 Ml/d to the capacity of the South Egremont scheme will form part of ongoing discussions with the Environment Agency as the monitoring data is assessed.

We will continue to review the contingency plan at least annually in future to reflect changing circumstances over time, and then report on any changes through the annual Water Resources Management Plan process.

8. Supply-demand balance

This section brings together all of the changes and our performance for 2016/17 as detailed in the previous sections. Here we summarise what it means for the supply-demand balance across our four resource zones.

For the 2016/17 reporting period we have maintained a surplus in all four water resource zones, as indicated in Table 14. This means that we have achieved a Security of Supply Index (SOSI) score of 100 for 2016/17.

Table 14 Supply-demand balance for the 2016/17 period by resource zone

Component description		Carlisle (critical period)	Integrated (dry year)	North Eden (dry year)	West Cumbria (critical period)
Supply	Water available for use (Ml/d) #	33.62	1,915.61	8.65	55.56
Demand	2016/17 Dry year demand (Ml/d)	29.65	1,682.46	6.53	52.06
Target Headroom	Target Headroom (Ml/d)	2.55	80.05	0.27	3.10
2016/17 Supply-demand balance	This is the supply-demand balance position for 2016/17 (Ml/d)	**1.43**	**68.40**	**2.85**	**0.40**
2016/17 forecast supply-demand balance	This is the supply-demand balance position for 2016/17 from the WRMP 2015 forecast (Ml/d)	1.42	136.91	4.02	4.87
Difference	Difference between actual and forecast supply-demand balance in 2016/17 (Ml/d)	0.01	-68.51	-1.16	-4.47

 # Note: Environment Agency Water Available for Use definition minus process losses and outage allowance (not actual outage)

9. West Cumbria summary

Protecting the sensitive environment in West Cumbria is the focal point of our 2015 Water Resources Management Plan. In our 2015 plan, informed by the Examination in Public in September 2014, we committed to undertake a host of different activities to protect the environment in both the short and the long-term.

This section summarises our overall performance in West Cumbria, as discussed in the earlier sections of this report. In 2016/17 within the resource zone:

- we have seen the benefits of our water efficiency efforts in the zone, outperforming the water efficiency demand savings to a total of 0.31 Ml/d for the year. This is a further saving of 0.02 Ml/d from our performance in 2015/16;
- total leakage in West Cumbria has not changed significantly since 2015/16, and despite our efforts is still above the target for the zone. However, leakage per kilometre of water main is still 12% lower than the regional average;
- demand in the resource zone has increased slightly from 2015/16 (by around 0.3%);
- two further milestones of the Thirlmere transfer scheme have been achieved ahead of target; and
- we have made further good progress in delivering the package of compensatory measures (see section 7.3).

In the coming year:

- we will continue our ongoing programme of demand management, including increased leakage reduction activities as outlined in section 5.3.1; and
- we will complete delivery of the South Egremont boreholes. As outlined in earlier sections, the scheme is currently delivering some benefit but has been subject to delays. The boreholes and treatment process are now forecast to become fully operational by the end of August 2017 (see sections 4.1.2 and 7.2). Once the boreholes are operational they will offset supply from Ennerdale Water in future years until delivery of the Thirlmere transfer scheme.

10. Making sure we are prepared for drought

10.1 Updating the Drought Plan

Following the publication of our previous Drought Plan in 2014, updated environmental assessments for drought orders and permits identified a reduction to the volume of water available for abstraction from Crummock Water (in West Cumbria). This, along with the development of a new source of water in West Cumbria, the South Egremont boreholes which will support reduced abstraction from Ennerdale Water, constitutes a material change to the published Drought Plan and we therefore submitted a draft plan to Defra on 21 July 2016.

The Draft Drought Plan 2016 was available for public and stakeholder consultation[10] from 3 October 2016 to 14 November 2016 and we received 14 representations. Each representation was considered and a Statement of Response was published[11], setting out each issue raised, how this was considered as part of producing a revised draft Drought Plan along with any revisions made as a result. We submitted a revised

[10] We combined the consultation events on the Drought Plan with the pre-consultation on our 2019 Water Resources Management Plan, for which there is an update in Section 11.1.

[11] www.unitedutilities.com/globalassets/z_corporate-site/about-us-pdfs/statement_of_response_2017_acc17.pdf

draft Drought Plan to Defra in January 2017 incorporating changes resulting from the representations, which are summarised in Appendix 1 of the report[12].

The revised draft Drought Plan submitted also included additional information on drought scenario testing to demonstrate testing of the Drought Plan under a range of drought scenarios, including extreme drought events more severe than those experienced in the historic record. This was included in a new Appendix and ensures compliance with a new Defra direction (Drought Plan (England) Direction 2016) in this area, which was received shortly before submission of the draft Drought Plan prior to consultation.

Subsequently, the Secretary of State has requested further information to determine whether this revised draft Drought Plan 2017 can be adopted as the Final Drought Plan 2017 following amendments. We are currently working to address these recommendations. As part of this activity we are engaging extensively with the Environment Agency and relevant stakeholders (to the recommendations) to define appropriate revisions to the Drought Plan. We will publish an updated Drought Plan in due course once this process concludes.

10.2 Strategic pumping

In Appendix 8 of the revised draft Drought Plan we provided details on our proposed use of strategic pumped resources. We embedded this process by 1st April 2017, which also included a commitment to record additional evidence on our decision-making processes around these resources. However, following lessons learnt following the recent dry winter (October 2016 to March 2017) and subsequent feedback from regulators and stakeholders, we are working to update the commitments around our use of strategic pumping in line with the Defra recommendations.

In the revised draft Drought Plan we also committed to provide an overview of our operational management as part of the Annual Water Resources Management Plan review. We will therefore provide a summary in line with this commitment in the 2017/18 Water Resources Review, drawing on our improved business processes and taking into account the revised processes we will include in the subsequent updates to the Drought Plan we will submit to Defra.

10.3 Drought permit environmental assessments

We hold pre-prepared environmental assessments of drought permits/orders alongside the main Drought Plan and these are developed with groups of local interested stakeholders. As part of our rolling programme of updates to these assessments we have updated those for Windermere and Lune over the last year. Following recommendations from the Windermere study, we have initiated further investigations on the feasibility of mitigation measures to complement the main assessment. This study is being accelerated following feedback from stakeholders about the impacts of the second drought permit scenario for this site and thus the need to ensure appropriate mitigation in the unlikely event that this drought permit should be sought.

[12] The revised draft Drought Plan may be found at www.unitedutilities.com/globalassets/z_corporate-site/about-us-pdfs/revised_draft_drought_plan_2017.pdf

11. Forward look

In this section we give an overview of some of our key activities in 2017/18 noting however that it is not exhaustive.

The key activities in Table 15 are to:

- help to progress the delivery of our 2015 Water Resources Management Plan;
- bring our performance in line with expectations where this review has identified a requirement to do so;
- ensure security of supplies; and
- reduce our abstraction from Ennerdale Water.

Table 15 Key items of activity in 2017/18

Item	Action
South Egremont boreholes	We will complete delivery of the South Egremont boreholes. Delays to the completion of this project have occurred however we have developed an action plan to prioritise the completion of this scheme by the end of August 2017. Once the boreholes are operational they will offset supply from Ennerdale Water in future years until delivery of the Thirlmere transfer scheme.
Demand management activities	We will maintain our water efficiency savings and focus activities in West Cumbria to improve leakage within the zone. In Carlisle we will complete the pressure management programme to realise further benefits in this zone.
Thirlmere transfer scheme	Following the achievement of planning approval for the project, contracts have been awarded and construction on site commenced in April 2017. Site construction activities during 2017/18 are expected to include pipe-laying along several sections of the pipeline route, preparing foundations and drainage for the new water treatment works and installing tunnel shafts and pipework connections. The timing of all construction work is being carefully planned to minimise the impact on the environment and on tourism in the area. In summer 2017 we will be opening a community legacy fund and also a grant fund to support local tree planting initiatives, and we will also be establishing 20 hectares of new woodland at the head of Ennerdale Valley. We will continue our strategy of regular communication with the local community through our project website, visitor centre, meetings and informal liaison as appropriate.
2017 Draft Drought Plan	We submitted our revised draft 2017 Drought Plan to Defra on 12 January 2017, and we are providing further information for them to make a decision on the plan. Once we have received direction from Defra we will publish the plan. Further information can be found at: www.unitedutilities.com/drought-plan.
Thirlmere Transfer contingency plan	We will continue to update the Thirlmere Transfer contingency plan on an annual basis as part of this Water Resources Review.
Customer metering	We have identified a number of actions to improve our uptake of the free meter option in 2017/18. These actions include: • pilot trial of 'price promise' guarantee to cap charges for customers opting for a free meter; • continuing with our extended switch back period of 24 months, to give customers longer to decide whether they will benefit from having a meter; and • continuing to promote metering on envelopes used during our main billing.

11.1 Developing our 2019 Water Resources Management Plan

We're already well underway towards development of our 2019 Water Resources Management Plan. We will submit our next plan to Defra by 1 December 2017, and then following publication we will undertake a consultation process upon the plan.

In developing our next plan, we are actively engaging with customers, stakeholders and regulators. We have already received valuable feedback from our pre-consultation exercise (see below) and we welcome any further views or comments so that we can take these on board as we continue to develop our plan[13].

In 2016/17, the following activities have taken place or are in progress as part of developing our 2019 Water Resources Management Plan:

- we completed an extensive pre-consultation exercise during autumn 2016. We received a number of responses to the pre-consultation, for which we are grateful, and which we will take into account as we develop our plan. We will summarise the feedback and how this has been accounted for in the Water Resource Management Plan report. Our process to pre-consultation included:
    - 4 stakeholder events attended by around 30 stakeholders in total; and
    - circulation of a summary briefing note (Clear English campaign accredited) to stakeholders, and a methodology statement to the Environment Agency, Ofwat and Natural Resources Wales (see www.unitedutilities.com/globalassets/z_corporate-site/about-us-pdfs/water-resources/water-resources-plan-pre-consultation-briefing-note.pdf);

- based on volunteers identified during the pre-consultation period, we have formed a Technical Stakeholder Group to inform the plan through its development. The first meeting was held in March 2017. This group allows us to work more closely with a group of interested stakeholders to gain feedback on the forming plan outside the main consultation period, and to better understand stakeholder views and preferences in creating our plans. This complements our wider stakeholder engagement activities, for example, around the Business Plan or associated with our Drought Plan;

- we've already verified our approach to a number of key areas of our plan and engaged with the Environment Agency in particular on our approaches on at least a bi-monthly basis. During the early part of 2017 we have worked on technical assessment of the various components of our supply-demand balance;

- we have explored and engaged widely to identify all possible supply-demand options to appraise as part of our future plans. This process included a market engagement process and event being launched around the time of pre-consultation in autumn 2016;

[13] Further information about the development of our plan, and contact details can be found at: www.unitedutilities.com/corporate/about-us/our-future-plans/water-resources/developing-our-water-resources-management-plan/.

  - we have identified 328 unconstrained resource management, production management, customer management and distribution management options through internal and 3rd-party engagement; bi-lateral discussions with 3rd-parties (including other Water Supply Companies) have also identified an additional 18 export options;

  - primary screening has been undertaken independently on our behalf by Amec Foster Wheeler (AFW), which has reduced the unconstrained options set to 199 feasible options; and

  - we are now working closely with our internal colleagues, 3rd-parties, regulators, and AFW to determine and develop water available for use benefits, environmental assessments, and option costings (including environmental and social costings). This will allow us to complete secondary screening and to create our constrained options set as the basis for the Options Appraisal process;

- resilience is a key theme in the next Water Resources Management Plan both with regards to dry weather and drought events (typically a system 'stress'), which have traditionally been the focus of Water Resources Management Plans previously, but also to a range of other hazards to the water supply system (typically system 'shocks'). We have been developing approaches to testing our system against more extreme droughts, or droughts which are different from those historically experienced. The Water Resources Management Plan will also summarise the outcomes of assessments to water supplies of other hazards such as flooding, freeze/thaw events and asset failure. These are being completed in combination with the development of our Business Plan;

- we are completing extensive customer research to inform the development of our plan; this process is ongoing, but we have already completed qualitative focus group research and quantitative willingness to pay research on levels of service and options preferences. We are currently working to understand how this impacts our future plans and are currently developing an interactive choice experiment to allow customers to explore plan trade-offs as an interactive exercise or game;

- leakage is an important topic for the Water Resources Management Plan, and we are exploring the costs-benefits of further leakage reductions in the plan, supported by customer research in this area; and

- we have fully participated in a Water UK led study to explore long-term water resources planning and resilience at a national level. This showed that other areas of the country face possibly more severe water resources challenges in the long-term, and this identifies the North West as a potential donor area. This would require use to develop new supply-demand options and other interventions in our region to facilitate such a trade (which could also include imports from elsewhere). We will appraise what such a future path might mean in the next plan. We recognise and understand the concerns stakeholders have raised with us in this area, so will assess the impacts and opportunities for resilience and the environment in our plan.

12. Conclusions

2016/17 is the second year that our 2015 Water Resources Management Plan has been in effect. We've generally made good progress in delivering our plan, in particular outperforming our regional leakage target, meeting our regional water efficiency target and making significant progress with the Thirlmere transfer scheme. We have maintained a supply-demand surplus and a Security of Supply Index score of 100 in all of our resource zones.

In the West Cumbria Resource Zone leakage has decreased very slightly, but remains above target. Recognising this we have identified activities that we need to continue to progress, and we will continue our extensive efforts throughout the 2015-2020 planning period to bring leakage back on track for the 2017/18 period and beyond. Uptake of our free meter option has increased from 2015/16, but is still below target; we will continue with enhanced actions to promote free meter options across the region and monitor progress. In the longer term we have made good progress with the Thirlmere transfer scheme by gaining planning approval in November 2016, and awarding all major construction contracts by March 2017. This has enabled construction on site to start in April 2017, almost a year ahead of target.

There are some further key areas that need particular focus in 2017/18. We will complete delivery of the South Egremont boreholes as a matter of priority; the source is already supplying some water into West Cumbria. Once the boreholes are fully operational in August 2017 they will offset supply from Ennerdale Water in future years until delivery of the Thirlmere transfer scheme, and we have identified actions to enhance demand management activities in the zone as outlined above. Milestones for the Thirlmere transfer scheme, following the start of construction on site in April 2017, include commencement of pipe laying during 2017/18, work on constructing the foundations of the new water treatment works and the launch of our community investment fund in summer 2017.

We have updated our Drought Plan after triggering a material change to the plan, and submitted a revised draft plan to Defra on 12 January 2017. We are currently providing further information to enable Defra to make a decision on the plan.

Our latest Drought Plan and Water Resources Management Plan can be found at the link below:

Water Resources Management Plan 2015
Final Drought Plan 2014
Revised Draft Drought Plan 2017

unitedutilities.com/water-resources-plan

Appendix A

Table A1 Key outturn data, compared with 'dry year' forecasts for 2016/17 amended to reflect the weather experienced in the year

	Carlisle Resource Zone	Integrated Resource Zone	North Eden Resource Zone	West Cumbria Resource Zone	Region
Key to table	**2016/17 actual data**				
	2016/17 forecast data (aWRMP16, *with weather as seen in 2016/17)				
	Difference				
Water available for use (own water sources) (Ml/d)	**36**	**1,917**	**9**	**56**	**2,018**
	32	1,963	9	59	2,063
	+4	*-46*	*0*	*-3*	*-45*
Total population (000's)	**110**	**6,879**	**14**	**148**	**7,150**
	110	6,874	13	150	7,147
	0	*+5*	*+1*	*-2*	*+3*
Number of unmeasured households (000's)	**30**	**1,653**	**3**	**47**	**1,734**
	28	1,586	3	46	1,664
	+2	*+67*	*0*	*+1*	*+70*
Number of metered households (000's)	**16**	**1,134**	**2**	**17**	**1,169**
	18	1,201	3	17	1,239
	-2	*-67*	*-1*	*0*	*-70*
Total household metering penetration (excl. voids)	**35%**	**41%**	**39%**	**26%**	**40%**
	39%	43%	44%	27%	43%
	-4%	*-2%*	*-5%*	*-1%*	*-2%*
Per capita consumption unmeasured households (l/hd/d)*	**155**	**151**	**157**	**156**	**152**
	143	141	169	167	142
	+12	*+10*	*-12*	*-11*	*+10*
Per capita consumption metered households (l/hd/d)*	**111**	**118**	**110**	**110**	**118**
	110	103	125	112	104
	+1	*+15*	*-15*	*-2*	*+14*
Per capita consumption all households (l/hd/d)*	**139**	**139**	**139**	**144**	**139**
	132	125	151	153	126
	+7	*+14*	*-12*	*-9*	*+13*
Per household consumption all households (l/prop/d)*	**299**	**305**	**298**	**310**	**305**
	301	296	291	343	298
	-2	*+9*	*+8*	*-33*	*+7*
Water consumption by households (Ml/d)*	**14**	**849**	**2**	**20**	**884**
	14	826	2	21	863
	0	*+23*	*0*	*-1*	*+21*
Water consumption by non-households (Ml/d)	**7**	**351**	**1**	**9**	**369**
	7	328	1	9	346
	0	*+23*	*0*	*0*	*+23*
Miscellaneous water use (Ml/d)	**1**	**34**	**0**	**3**	**38**
	0	24	0	1	26
	+1	*+10*	*0*	*+2*	*+12*
Total leakage (Ml/d)	**5**	**415**	**3**	**16**	**439**
	5	442	2	14	463
	0	*-27*	*+1*	*+2*	*-24*
Distribution input (Ml/d)*	**27**	**1,649**	**6**	**48**	**1,731**
	26	1,620	5	45	1,698
	+1	*+29*	*+1*	*+3*	*+33*
Security of supply	**In Balance**	**In Balance**	**In Balance**	**In Balance**	**In Balance**
	In Balance	In Balance	In Balance	In Balance	In Balance
	No Change	*No Change*	*No Change*	*No Change*	*No Change*

Note: numbers may not sum due to rounding

Table A2 Comparison of the 2015 plan and the aWRMP16 revised demand and target headroom forecasts for the Integrated Resource Zone (as included in the 2015/16 annual Water Resources Review)

Component	Forecast	2015/16	2016/17	2020/21	2025/26	2030/31	2035/36	2039/40
Water Available For Use	WRMP 2015	1,885.1	1,878.6	1,863.4	1,831.2	1,802.7	1,792.5	1,784.3
Dry Year Demand	WRMP 2015	1,687.8	1,681.3	1,662.3	1,641.8	1,635.5	1,630.3	1,620.4
	aWRMP16	1,668.1	1661.7	1,642.8	1,622.7	1,616.3	1,611.1	1,601.3
	Difference	*-19.7*	*-19.6*	*-19.5*	*-19.1*	*-19.2*	*-19.2*	*-19.1*
Target Headroom	WRMP 2015	60.7	57.4	53.6	53.2	57.1	63.0	68.0
	aWRMP16	82.5	80.1	73.2	72.1	75.5	82.1	87.1
	Difference	*+21.8*	*+22.7*	*+19.6*	*+18.9*	*+18.4*	*+19.1*	*+19.1*
Supply-Demand Balance	WRMP 2015	136.5	139.9	147.6	136.2	110.0	99.2	96.0
	aWRMP16	134.6	136.9	147.3	136.4	110.9	99.4	96.0
	Difference	*-1.9*	*-3.0*	*-0.3*	*+0.2*	*+0.9*	*+0.2*	*0.0*