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Annual water resources review
April 2018 - March 2019

Contents

1. Summary of water resources in 2018/19

Supply and Demand

- Regional demand in 2018/19 was higher than in the previous year, and higher than our dry year forecasts for 2018/19. The increase was partly due to increased household consumption during an extended period of dry weather in summer 2018.
- Despite starting the year with increased leakage due to 'freeze-thaw' events occurring at the end of 2017/18, we have outperformed our regional leakage target of 463 Ml/d again this year. We have now achieved our regional leakage target for 13 consecutive years.
- We have achieved regional water efficiency savings totalling over 4.5 Ml/d, an increase of around 50% to savings achieved during 2017/18. This includes increased estimated savings in West Cumbria through our enhanced water efficiency programme.
- We have installed free meters at 32,069 households and continued to promote free meters to our customers.
- We have maintained the supply-demand surplus in all of our resource zones.

West Cumbria

- The South Egremont borehole project was completed in summer 2017 and has continued to be fully operational throughout 2018/19. A revised mode of operating this scheme was agreed with the Environment Agency and is now covered by a formal agreement and revised abstraction licence. This ensures a resilient supply of water and provides environmental benefit by enabling reduced abstraction from Ennerdale Water.
- Good progress has continued on construction of the Thirlmere transfer scheme and we are currently on track to outperform against our project targets. This will ultimately allow us to revoke our abstraction licences at Ennerdale Water and other sites in West Cumbria by the target date of March 2022.

Environment

- We completed significant modifications at our River Calder abstraction intake, meeting the Environment Agency delivery date of 1 October 2018. This enabled 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

- Our Final Drought Plan 2018 was published in June 2018, and is available on our website. We have already started some initial work towards our next update of the Drought Plan.
- We published our draft Water Resources Management Plan 2019, focusing on the strategic plan for the period 2020 – 2045, in March 2018 following an extensive pre-consultation exercise with customers, regulators and stakeholders. Following a further 12-week consultation period on the draft plan, we published our revised draft plan in August 2018, and this will subsequently become the final plan for 2020 – 2045, pending approval by the Secretary of State.

2. Introduction

In this Water Resources Review we report on our water resources position for the year 1 April 2018 – 31 March 2019 (2018/19). In compliance with the Water Industry Act 1991, the primary aim of this report is to provide an annual update to our current Water Resources Management Plan published in 2015. 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], and includes an update of our drought planning progress.

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, May 2019

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: https://www.unitedutilities.com/corporate/about-us/our-future-plans/water-resources/.

In this review, actual performance and events are compared to the 2015 Water Resources Management Plan forecasts for the fourth year of the plan covering the period 1 April 2018 – 31 March 2019 (2018/19). We will present key progress and upcoming activities to continue to deliver the 2015 plan, and to make an early start on delivering our next (2019) 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 1 for an update. Our Final Drought Plan 2018 is available at: www.unitedutilities.com/drought-plan;
- PR14 Business Plan – see Section 3.1. A publicly available summary can be found at: https://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. Following consultation, our revised draft Water Resources Management Plan was published in August 2018 and is available at: https://www.unitedutilities.com/corporate/about-us/our-future-plans/water-resources/developing-our-water-resources-management-plan/. Subject to approval from the Secretary of State, we expect to publish this document in the coming months as our final plan covering the period 2020 to 2045. We provide an overview of our 2019 Water Resources Management Plan 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 2018/19 Water Resources Review and provides the context for our published plans.
3 – General	Within this section we comment on our performance for 2018/19 against the Customer Promises, Outcomes and Measures of Success. We also give an overview of our activities in 2018/19 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 2018/19, including Water Available for Use, outage, and sustainability changes.
5 – Demand	This section outlines the demands we experienced in 2018/19, comparing them to the 'dry year' forecast that we included in our 2015 plan. We discuss our 2018/19 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 – 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 an overview of our activities and progress within the resource zone.
9 – Supply-demand balance	In this section we summarise all of the material presented in earlier sections that is used to determine the supply-demand balance. We show the 2018/19 supply-demand balance position for each resource zone and compare it to our forecast position.
10 – Making sure we are prepared for drought	This section includes an update on our activities in developing our next Drought Plan, following publication of our Final Drought Plan 2018.
11 – Forward look	Within this section we provide a forward look to the coming activities in 2019/20, and also provide an overview of our 2019 Water Resources Management Plan which is due to be published in summer 2019, subject to approval by the Secretary of State.
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 2018/19 compared to the dry year forecasts for 2018/19.

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.

Further details of our Customer Promises and Outcomes can be found on our website, please visit: https://www.unitedutilities.com/corporate/about-us/our-future-plans/Our-business-plan/.

Our performance for 2018/19 and annual targets between 2018 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 2018/19 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 2018/19 is in Section 9.

Thirlmere transfer into West Cumbria:

- This measures our progress in the 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 2018/19 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 2018/19 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 2018/19 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 2018/19 is in Section 5.2.3.

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

Promise	Outcome	Measure	Units of Measure	Performance 2015/16	Performance 2016/17	Performance 2017/18	Target 2018/19	Performance 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	+23.4	+9.1	0.0	+6.7	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	24.7	53	56.7	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	36.9	82.6	80.6	6.6	50.5	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	32,447	36,615	47,421	32,069	46,054
		Per household consumption of water[2]	litres/ property/ day	303	305	310	282-313	314	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 2018/19

Over the full year rainfall was below average across our region and temperatures were above average. In particular the summer period (May to August 2018) represented a significant divergence from the long term weather pattern for the North West. It was the joint hottest year on record together with 2006, 2003 and 1976, and the fourth driest period across the region in 81 years of record, with our region receiving just 67% of the long term average rainfall. This prolonged period of significantly hot and dry weather was experienced across England, with the Met Office reporting that the year was the warmest summer on record, giving a provisional figure of 17.1°C as of 31 August as its mean temperature measure for the whole country, beating the previous record of 17.01°C of 1976[3].

The effects of this weather situation contributed to a series of concurrent events that we managed in a coordinated way across multiple incidents, ranging from an exceptional increase in water demand of almost half a billion litres per day to a major multi-agency incident response to moorland fires. At one stage, despite a co-ordinated response and the efforts of our customers who responded to our calls to use water efficiently, there was a possibility that we might have had to impose a temporary use ban if the extreme dry weather had continued. However due to a timely change in the weather pattern this was avoided and we maintained an unrestricted service for customers in the North West during 2018/19.

Further details of how the weather we experienced has impacted supply and demand across the region is included in Sections 4 and 5.

Although January 2019 started the year off as below average rainfall, the winter period (October 2018 to March 2019) was wetter than the long-term average, and the average maximum daily temperature was higher than both the long-term average and 1995/96.

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

Table 3 Comparison of rainfall and temperatures in 2018/19 with long-term averages and 1995/96 values

	April to September	October to March	Full year (April to March)
Regional rainfall (mm)			
2018/19	**531**	**921**	**1,452**
Long-term average	654	906	1,560
1995/96	320	571	891
Average maximum daily temperatures (°C)			
2018/19	**20.1**	**10.6**	**15.4**
Long-term average	16.0	8.5	12.3
1995/96	19.0	8.4	13.7

[3] https://www.metoffice.gov.uk/news/releases/2018/end-of-summer-stats

3.3 Supply and demand in 2018/19

We have maintained a surplus in all our water resource zones for 2018/19, 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 1 and 1 of this report.

3.4 Progress with our 2015 Water Resources Management Plan

In 2018/19 we have made good progress in delivering our 2015 Water Resources Management Plan. As well as outperforming our regional leakage target and achieving further water efficiency savings, we have also progressed with the Thirlmere transfer scheme. Our 2015 Plan concluded that the Thirlmere transfer scheme should be progressed to address the future supply-demand deficit in West Cumbria. Further progress during 2018/19 has included:

- Securing planning permission in summer 2018 for a required reroute of the raw water aqueduct pipeline identified earlier in the year;
- Substantial progress on construction of the raw water aqueduct, including completion of three of the five required tunnel sections;
- Further progress on construction of our new Williamsgate Water Treatment Works, and commencement of construction of two new service reservoirs;
- Continued support from our community legacy fund to projects providing social and economic benefits in the local area, working in partnership with local organisations to support tree planting projects and other community initiatives.

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. We completed the South Egremont borehole project in summer 2017 and the scheme has continued to supply water throughout 2018/19 in line with our agreed mode of operation. This delivers environmental benefit in terms of reduced abstraction from Ennerdale Water. Further detail on the mode of operation of this scheme is provided in sections 4.1.2 and 7.2.

Further detail on the interim measures, compensatory measures and Thirlmere transfer scheme is included in Section 1.

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 have engaged with the Environment Agency on at least a bi-monthly basis during the development of our 2019 Water Resources Management Plan (see Section 11.1 for more information). Our draft plan was published in March 2018, and following a 12-week consultation period we published a revised draft plan in August 2018. This will become our 2019 Final Water Resources Management Plan subject to approval from the Secretary of State.

We have continued to engage with communities in West Cumbria, having undertaken further stakeholder consultation on both the Thirlmere transfer scheme (also referred to as the West Cumbria Water Supplies Project) and our Final Drought Plan 2018. 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 a decrease in the number of customers requesting a meter compared to 2017/18, even though we are taking additional measures to encourage meter uptake as described 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 hope to publish our final 2019 Water Resources Management Plan in summer 2019 (Subject to approval by the Secretary of State). Our water resource zone assumptions for the 2019 plan include the completion of the Thirlmere transfer scheme by March 2022. Following completion of this scheme West Cumbria Resource Zone will cease to exist and this area will be absorbed into the existing Integrated Resource Zone. The new, combined zone will be named the Strategic Resource Zone. However, for the purpose of this annual review, there have been no changes to water resource zone boundaries for 2018/19.

3.6 Levels of service

There has been no change to our minimum stated 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 have undertaken further customer research to inform the levels of service that we will adopt in our 2019 Water Resources Management Plan; further details of our proposals 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 planning period of 25 years. In the 2015 plan we forecasted the Water Available for Use[4] (a term used to represent our available supplies in a dry year) across the planning period. 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, Water Available for Use may change from that reported in the 2015 Water Resources Management Plan assumptions if 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 2018/19 follows below.

As a strategic plan, in developing the 2015 Water Resources Management Plan we used long-term asset capability assumptions in line with the strategic nature of the plan, and accounted for our anticipated

[4] 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.

capital maintenance activities. We reflected the expected position following delivery of capital interventions during the 2015-2020 planning period and beyond[5] to determine how much water we are able to supply.

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.

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 2018/19, we have applied adjustments in Water Available for Use to reflect variances against the original supply forecasts, which are explained further in Sections 4.1.1 to 4.1.4. The supply-demand surplus is maintained (as detailed in Section 9) and these adjustments (Table 4) are not considered to be a material change from the 2015 Water Resources Management Plan assumptions. The values in Table 4 also reflect small decreases in Water Available for Use since 2017/18 due to the forecast year on year impacts of climate change. 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 2018/19 (Ml/d)	Current Water Available For Use appraised for 2018/19 regulatory reporting (Ml/d)	Adjustment (Asset Assumptions) (Ml/d)
Integrated	1945.8	1910.6	-35.2
West Cumbria	58.8	55.7	-3.1
Carlisle	33.8	35.0	+1.2
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 for our current system, based on a review of asset capacity assumptions. Aquator modelling of the current position in the Integrated Resource Zone has resulted in a 35.2 Ml/d reduction in Water Available for Use relative to forecasts, partly due to capital projects that have not yet

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

reached completion and also, for some assets, changes to capability assumptions from our 2015 Water Resources Management Plan modelled assessment which have been reflected in our 2019 plan. The adjustment is lower than in 2017/18; this reflects improved system representation in the Integrated Resource Zone model, including changes in asset capacities to reflect system performance during the 2018 dry weather and improved representation of compensation over-releases within Aquator.

4.1.2 West Cumbria Resource Zone

The South Egremont borehole project was completed in summer 2017 with a design capacity of 11 Ml/d. However, due to issues relating to the hardness of blended water from the boreholes with the supply from Ennerdale Water, an alternative mode of operation has been adopted with no more than 4 Ml/d normally being supplied from the boreholes. At times when Ennerdale Water is below drought trigger 2 the output from the boreholes will be increased to the full scheme capacity of 11 Ml/d. This way of operating provides a more acceptable water blend, ensures a resilient supply of water and provides the required environmental protection through reduced abstraction. Water has continued to be supplied from the boreholes throughout 2018/19, in line with this agreed mode of operation.

The revised mode of operation retains most of the expected Water Available for Use benefit of the scheme, however in line with the Final Drought Plan 2018 we have also included operational changes in the use of Crummock Water that offset this benefit leading to a net reduction of 3.1 Ml/d overall, confirmed by water resource modelling of the current position, which has been included in the forecast Water Available for Use for 2018/19 in the West Cumbria Resource Zone.

The South Egremont boreholes project is one of several 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 2018/19 period, compared to our 2015 Water Resources Management Plan forecast value for the year. This figure includes the benefit of previous Water Available for Use changes declared in the 2016/17 Annual Water Resources Review and as also reflected in the Final Drought Plan 2018. The adjustment to Water Available for Use has been reviewed for 2018/19 using the Aquator water resources model for the Carlisle Resource Zone; the net increase is slightly lower than for 2017/18 due to improved modelling of reservoir inflows and river flows, and a reduction in the River Eden to Castle Carrock pumping capacity.

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

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.

The outage allowance determined for Water Resources Management Plan submissions takes into account any outage events which would affect the ability to supply during a 'dry year'. Similarly our assessment of actual outages during 2018/19 includes only those outage events that affected supplies during the year, which was in fact a dry year as outlined in section 3.2.

For 2018/19 we have adopted an improved method of estimating the overall level of outage occurring during the year. The traditional method of summing the impacts of all relevant outage events assumes that the reduction in capacity of an individual asset equates to a reduction in deployable output of the same magnitude over the period of occurrence. However, our Integrated resource zone operates as a conjunctive use system and in practice the impact of outage events on deployable output is variable, depending on a variety of factors including seasonal demand patterns and prevailing system conditions. A more realistic approach, therefore, is to assess the impact of the actual sequence of outage events over the year by simulating these in our Aquator water resources model. This enables us to determine the reduction in deployable output which would result from the 2018/19 profile of outage events occurring in our current system during the drought year of 1984 (the year which constrains deployable output in the Integrated resource zone), which then equates to the actual outage for the year.

The level of outage experienced in 2018/19, determined through water resources modelling as outlined above, is 79 Ml/d for the Integrated resource zone. There were no outage events affecting supplies in the other three resource zones, and therefore the overall regional outage level is 79 Ml/d, as summarised in Table 5. This is higher than the outage allowance in our 2015 Water Resources Management Plan, noting that the allowance is risk-based and thus may be anticipated on occasion to be exceeded. It is also worth noting that the latest outage allowances calculated for our 2019 Water Resources Management Plan have increased compared to those in the 2015 plan. Unforeseen and unavoidable asset failures, and extensions to capital project work completion dates, have contributed to the total outage slightly exceeding the allowance (by about 2.2%). However, outage events experienced have been carefully managed to minimise the overall short term loss of deployable output during 2018/19.

Table 5 Outturn outage data for 2018/19 compared with the outage allowances for 2018/19 included in our 2015 Water Resources Management Plan

	Carlisle	Integrated Zone	North Eden	West Cumbria	Regional
Outage Experienced (Ml/d)	0.0	79.0	0.0	0.0	79.0
Outage allowance (Ml/d)*	2.0	74.3	0.1	0.9	77.3
Difference (Ml/d)	-2.0	+4.7	-0.1	-0.9	+1.7

*2018/19 dry year outage allowance from the 2015 Water Resources Management Plan

During the summer of 2018, we experienced resilience challenges in the Quarry Hill supply system which supplies water to the northern part of our West Cumbria resource zone. We have since undertaken an in-depth review of the causes of the problem, and have implemented a number of key actions to minimise the risk of loss of supply from the Quarry Hill system prior to the delivery of the Thirlmere transfer scheme. These include: weekly review of surface and ground water source levels; development of operational trigger points to reduce demand on the Quarry Hill system; installation of UV disinfection to increase treatment flexibility; installation of a control valve to allow a wider range of draw-off flow rates; and network rezoning to reduce demand on the Quarry Hill system.

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 that our abstractions do not cause environmental damage. These changes are fully incorporated in the reported Water Available for Use. In some cases we have received new licences, however, interventions to implement these are still underway, as shown in Table 6 below. The Environment Agency is fully engaged on these delivery timescales.

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 6). These are mainly associated with the requirements of the Water Framework Directive. As sustainability changes are implemented, we will reflect them in our Water Available for Use assessment in subsequent reporting years.

Table 6 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	Implemented on 1 April 2018
River Calder, Barnacre	Water Framework Directive	New prescribed flow to be provided to downstream river before abstraction can occur	Implemented on 25 September 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	Implemented. New impoundment licence issued by the Environment Agency on 25 October 2017
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	16 December 2022
Crummock Water	Habitats Directive	Revocation of abstraction licence	16 December 2022
Quarry Hill system: Overwater	Site of Special Scientific Interest (SSSI)	Hands-off lake level in Overwater	1 April 2022 New abstraction licence issued 27 June 2014
Quarry Hill system: Overwater	Habitats Directive	Revocation of abstraction licence	16 December 2022
Quarry Hill system: Chapel House reservoir	Habitats Directive	Revocation of abstraction licence	16 December 2022

4.5 Structural abstraction asset modifications

In 2018/19 we completed a project to undertake significant structural modifications at our River Calder abstraction intake near Garstang in Lancashire, under both local priority and eel drivers. This included new eel passes, a new intake screen and provision of a downstream flow release 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 so that the abstraction has less impact on the environment. The Environment Agency delivery date for the scheme was 1 October 2018 which we achieved.

Figure 1 River Calder Intake - New intake structure under construction

Figure 2 River Calder Intake - New eel pass

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 2018/19 is small given that the impacts of climate change are lower in the early years of the planning horizon. Climate change impacts remain the same in 2018/19 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 1st 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 7); and
- Using the Ofwat AIM guidelines (February 2016) (see Table 8).

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).

The summer of 2018 was very dry, resulting in river flows at three of the AIM sites (Ennerdale, River Calder and Aughertree Springs) reaching their AIM low flow thresholds. This is consistent with the weather experienced in the year (see Section 3.2). The AIM low flow threshold was not reached at Old Water during 2018/19.

- At Ennerdale the AIM river flow threshold was reached on 38 days during 2018/19. Over this period we abstracted less water in total than during the baseline period resulting in good AIM performance using the "kilometres of river improved" metric. On the days when AIM was

implemented we abstracted at a lower average daily rate, resulting in good AIM performance using the Ofwat AIM approach;

- At the River Calder the AIM river flow threshold was reached on 57 days during 2018/19. Over this period we abstracted more water in total than during the baseline period resulting in poor AIM performance using the "kilometres of river improved" metric. On the days when AIM was implemented we abstracted at a lower average daily rate, resulting in good AIM performance using the Ofwat AIM approach; and
- At Aughertree Springs the AIM river flow threshold was reached on 40 days during 2018/19. Over this period we abstracted more water in total than during the baseline period resulting in poor AIM performance using the "kilometres of river improved" metric. On the days when AIM was implemented we abstracted at a lower average daily rate, resulting in good AIM performance using the Ofwat AIM approach.

The overall company AIM performance for 2018/19 in terms of kilometres of river improved across all four AIM sites is slightly negative; with the good performance at Old Water and Ennerdale being slightly outweighed by the poor performance at the River Calder and Aughertree Springs.

The reason for the poor performance at the River Calder and Aughertree Springs is a result of the prolonged period during which river flows dropped to the AIM low flow threshold compared to the historic period. Our "kilometres of river improved" metric looks at the total volume of water abstracted during AIM periods and hence is influenced by the number of days that AIM is implemented; whereas the Ofwat approach uses the daily average volume of water abstracted during AIM periods which removes the influence of the duration of AIM periods - the different approaches result in different outcomes as can be seen by comparing Table 7 and Table 8.

Following the completion of the River Calder intake improvements (see Section 4.5) which has resolved the sustainability issue at this site, it will not form part of AIM in 2019/20.

Table 7 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)	2018/19 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	724.89	14.05
River Calder (Integrated Resource Zone)	33.10	34.25	357.95	-10.30
Aughertree Springs (West Cumbria Resource Zone)	25.90	0.36	30.20	-5.24
TOTAL				**-1.14**

Table 8 AIM performance – Ofwat measure

Abstraction site	Low flow threshold (Ml/d)	Historic average abstraction at or below threshold (2007 2013) (Ml/d)	2018/19 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	23.43	-264.08	-0.27	-287.41	-0.37
River Calder (Integrated Resource Zone)	33.1	7.09	0.0	-45.96	-0.11	-45.96	-0.11
Aughertree Springs (West Cumbria Resource Zone)	25.9	1.09	0.0	-13.26	-0.31	-13.26	-0.31
TOTAL				**-323.30**	**-0.69**	**-346.63**	**-0.79**

4.8 Distribution, production and resource developments

In the West Cumbria Resource Zone we completed the delivery of the South Egremont borehole scheme in summer 2017; water has continued to be supplied from the boreholes throughout 2018/19, enabling abstraction from Ennerdale Water to be reduced. As outlined previously, a revised mode of operation has been adopted in which supply from the boreholes is limited to 4 Ml/d in normal operation, but increased to the full scheme capacity of 11 Ml/d when Ennerdale Water is below drought trigger 2. The benefit to Water Available for Use has been offset by other developments in the resource zone, relating to operational changes in the use of Crummock Water in line with the Final Drought Plan 2018, resulting in a net reduction of 3.1 Ml/d to Water Available for Use in the resource zone compared to the original forecasts, as outlined in section 4.1.2.

5. Demand

This section explores the demand experienced in the year, the influences of weather and the other influencing factors on demand for water, to allow comparison to Water Resources Management Plan forecasts where appropriate. It also summarises our demand management activity in 2018/19.

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 for water, and we have used Met Office models to understand the influence of weather effects on observed demands. We used the weather seen in the summer of 1995/96 to define the dry year.

For this year's annual Water Resources Review, we continue to use the forecasts declared in the 2015/16 review (the "aWRMP16 forecasts") relating to updated Met Office weather-demand models, and compare the observed demands during 2018/19 to the updated forecasts for that year based on these revisions.

5.2 Demand in 2018/19

Distribution input is the average volume of water put into the water supply network. Regional distribution input during 2018/19 was around 36 Ml/d higher than the previous reporting year and is higher than our dry year demand forecasts for the year (see Table 9 – but note that we have also tested the impact of higher demands through our Water Resources Management Plan process). There are two key elements in explaining this, as shown in Figure 3 and explained further below.

Figure 3 Key elements in explaining why distribution input during 2018/19 is high

Weather driven increases in consumption/usage, due to the weather patterns in a particular year

Underlying increases in consumption/usage, due to behaviour, population growth etc.

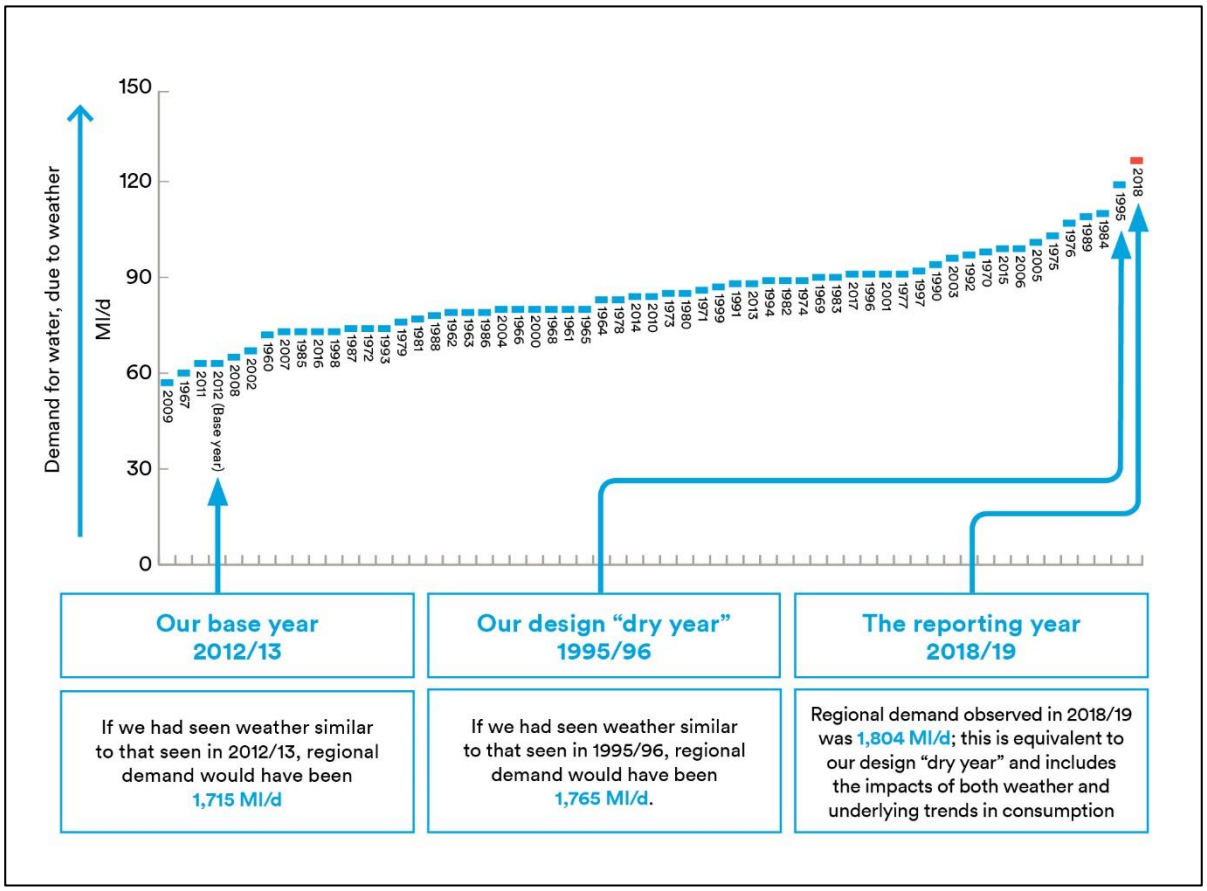
5.2.1 Weather-driven increases in consumption/usage

During the summer period in 2018/19, regional rainfall was below average (although higher than in 1995/96), whilst temperature was above the long term average and also warmer than in 1995/96. As outlined in section 3.2, during the period May to August 2018 our region was affected by a prolonged period of hot, dry weather and this led to an exceptional increase in water demand, with a peak in late June of almost half a billion litres per day above the annual average demand.

For 2018/19, the Met Office modelling has identified that the weather-related component of demand (known as “weather dependent usage”) in 2018/19 was the highest in the last 59 years. However, while previously we have attributed all of the weather-related component of demand to household consumption due to increased garden watering etc., we have seen increases in non-household consumption this year, which are potentially attributed to the extended period of dry weather seen in 2018.

Figure 4 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. However, for 2018/19 the warmer and drier than average summer has contributed to the significant increase in distribution input compared to 2017/18, and no uplift is required as 2018/19 is categorised as being a “dry year”.

Figure 4 Demand for water in 2018/19 due to weather with Met Office analysis showing the influences of the dry summer in 2018[6] (red) relative to historic data



In previous years, we have applied an uplift factor in order to compare the demand for the reporting year with our dry year forecast on a like for like basis. However, as 2018/19 has been confirmed as a dry year following Met Office analysis, no adjustment is required and the actual demands can be compared directly with our dry year forecast for the year. The 2018/19 regional demand was 1,804 Ml/d, compared to our dry year forecast of 1,730 Ml/d. This shows that on a comparable basis we are within 74 Ml/d of the dry year forecast (approximately 4.3% higher than the aWRMP16 forecast). This is within the margin of uncertainty allowed for within our target headroom component (see section 1 for more information); uncertainty is inherent within future forecasts of demand. It is also worth noting that in our latest demand forecasts, prepared for our 2019 Water Resources Management Plan (see Section 11.1), the dry year forecast for 2018/19 is higher than that of aWRMP16, at 1,745 Ml/d (or 1,767 Ml/d including target headroom).

The outturn data in Appendix A (Table A1) shows a comparison of 2018/19 actual demand and the aWRMP16 'dry year' forecast, which can be compared directly on a like for like basis as 2018/19 has been confirmed as being a dry year. A comparison of distribution input values is given in Table 9.

[6] Summer 2018 refers to the summer months, April to September 2018, for the year 1 April 2018 to 31 March 2019.

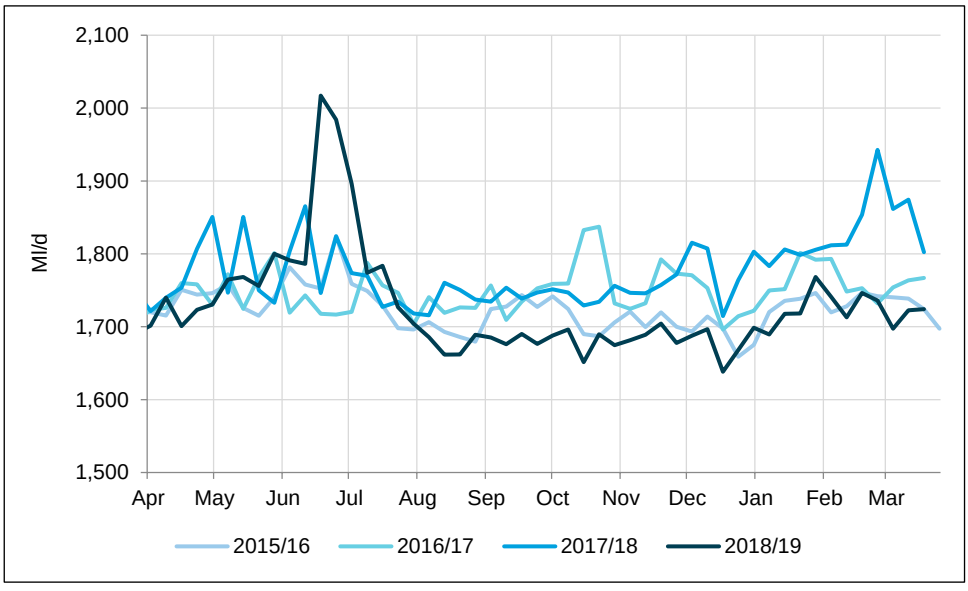
Table 9 Comparison of distribution input values to "dry year" and "critical period" forecast values

	Carlisle	Integrated	North Eden	West Cumbria	Region Total
Key to table	**2018/19 actual data**				
	2018/19 forecast data (aWRMP16 revision)				
	Difference				
Dry year distribution input	**29**	**1,720**	**7**	**49**	**1,804**
	26	1,651	5	47	1,730
	+3	*+69*	*+2*	*+2*	*+74*
Critical period distribution input	**31**	**1,720**	**7**	**52**	**1,809**
	28	1,651	5	50	1,734
	+3	*+69*	*+2*	*+2*	*+75*

Note: numbers may not sum due to rounding

Figure 5 below shows the weekly regional distribution input for the last three years. Average distribution input for 2018/19 has been higher than the previous years. The demand throughout the year has been generally lower than the previous two years, except during the dry weather event of May to August 2018 when significant demand increases occurred as outlined earlier.

Figure 5 Weekly regional distribution input for the last 3 years

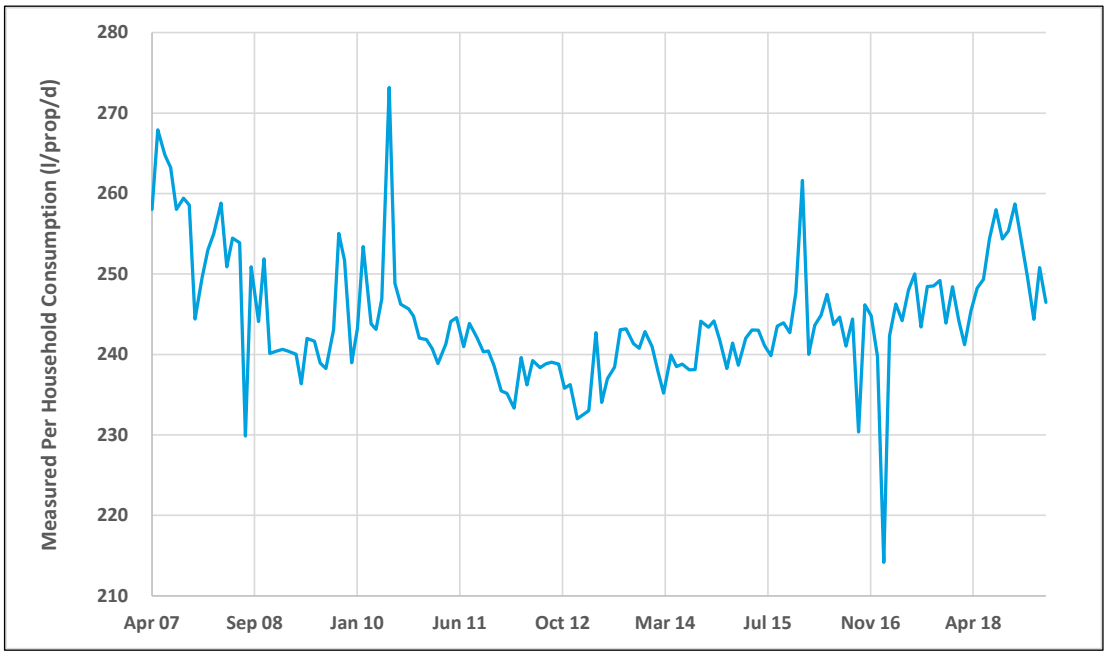


We continue to work with the Met Office on analysis to understand the impact of weather on water use. In addition, we are participating along with other UK water companies in a collaborative study to investigate the impacts of the dry weather event of 2018 on demand, and any implications for the use of peak factors in demand planning.

5.2.2 Underlying increases in consumption/usage

As discussed in the section above, the increase in demand for water is partly influenced by the impact of weather, but also reflects an underlying trend of increases in consumption due to population growth, changes in water usage patterns and other factors, which we have observed over the last few years (see Figure 6). Decreases in unmeasured consumption (both household and non-household) have been outweighed by underlying increases in measured consumption by households and non-households (although, as discussed above, the large increases in these components in 2018 is primarily due to the impact of the extended period of dry weather) and this has contributed to the increase relative to the 2017/18 period.

Figure 6 Trends in measured per household consumption since 2007



In 2018/19, non-household consumption showed an increase of 36 Ml/d against the forecast. 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 the latest forecasts from Ernst and Young predicting annual growth in GVA of 1.5% between 2018 and 2020.

There is some uncertainty related to non-household water efficiency, as market separation is still in its relative infancy, and there is not yet a clear understanding of the impact retailers will have in promotion and delivery of water efficiency activities to non-households. We will continue to engage with retailers in terms of water efficiency activities related to non-household customers.

5.2.3 Per capita and per household consumption

Per capita consumption (PCC) is a commonly used metric in the UK water industry, and will become common to all water companies in 2020. In recent years the North West has had one of the lowest rates of per capita consumption, delivering industry upper quartile performance levels in 2014/15 and 2015/16. In 2018/19, our regional average household per capita consumption was 144 litres/person/day which shows a small increase (1%) since the previous year. This increase is above the 2015 Water Resources Management Plan forecasts for normal and dry years (Figure 8). Per capita consumption is sensitive to the household

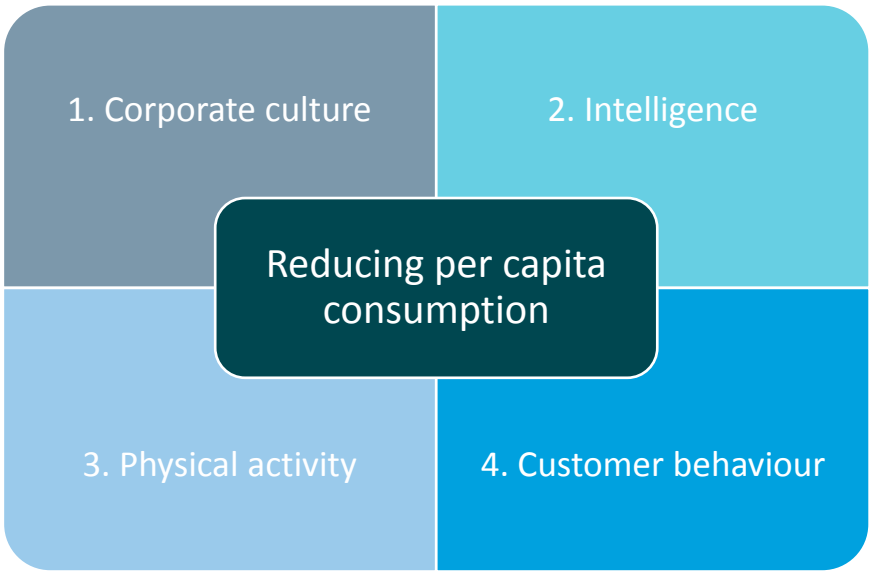
occupancy rate in each resource zone; occupancy rates are measured through periodic surveys which may become out of date over time. Periodic updates or corrections are made to the occupancy data which will impact on the per capita consumption calculation. The large increase in per capita consumption from 2016/17 was the result of using revised occupancy rates (survey was carried out in 2016[7]). Table 10 below also shows the average per capita consumption for each resource zone for this reporting year compared to the previous reporting year.

We chose per household consumption as one of the Measures of Success for the five-year investment period from 2015/16 to 2019/20 (see Section 3.1). Per household consumption for 2018/19 was 314 l/prop/d, which is a slight increase on the previous year. However, taking into account the influence of weather experienced during the year, it is within 5% of the annual forecast and within the expected bounds of variance of our Measure of Success target for per household consumption. Both per capita consumption and per household consumption may be influenced by increased water use and customer-side leakage due to the severe 'freeze-thaw' events at the end of 2017/18, which impacted the position at the start of 2018/19, and a prolonged period of exceptionally warm and dry weather in summer 2018 as outlined previously.

Ofwat produced guidance in March 2018 for the consistent reporting of per capita consumption (as well as leakage) across the industry. We have incorporated a number of data improvements and methodology changes and are working towards compliance with the new guidance.

Our strategy to reduce per capita consumption focusses on four key areas, as shown in Figure 7.

Figure 7 Key focus areas for our per capita consumption strategy



1. Leading by example, with a strong corporate culture of efficient water use;
2. Increasing our knowledge and understanding of the factors influencing PCC;

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

3. Promoting physical interventions such as meter installation and Automatic Meter Reading (AMR) leak alarms to reduce household plumbing losses; and
4. Working with customers to promote metering and encourage water efficiency in both households and non-households.

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

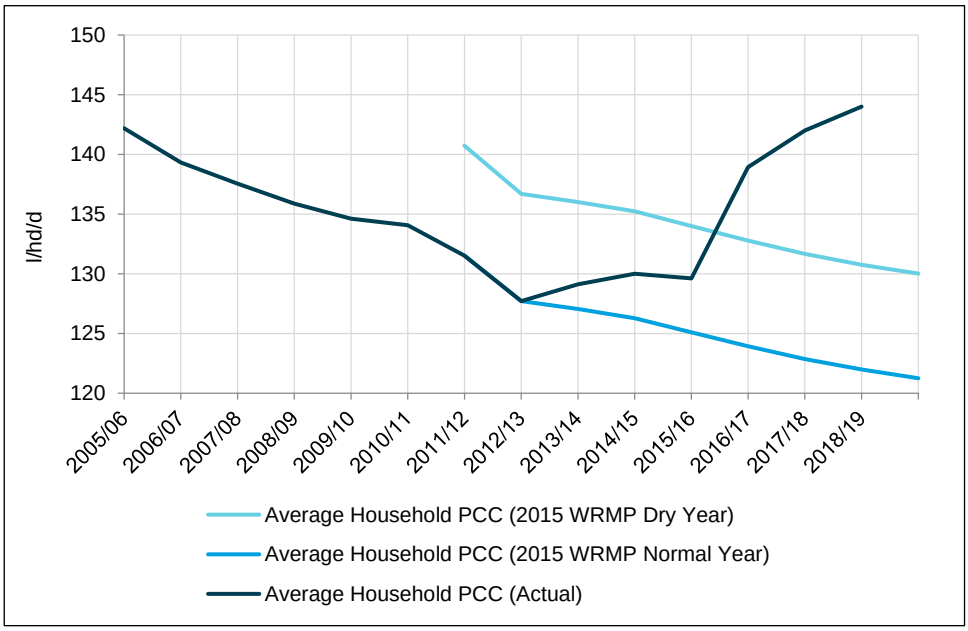


Table 10 Average household per capita consumption from 2017/18 to 2018/19

Resource zone	2017/18 (l/hd/d)	2018/19 (l/hd/d)	Change (l/hd/d)
Carlisle	141	144	+3
Integrated	142	144	+2
North Eden	137	134	-3
West Cumbria	148	145	-3
Region	142	144	+2

As shown in Table 10, West Cumbria PCC is higher than the other resource zones, however the gap in the 2018/19 period has decreased compared to 2017/18. The reductions in PCC in West Cumbria and North Eden may reflect our notable customer campaigns to encourage water efficiency particularly during the dry weather that we experienced during the summer of 2018. However, the higher PCC in West Cumbria relative to other zones is also associated with a higher proportion of unmeasured households, as indicated

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

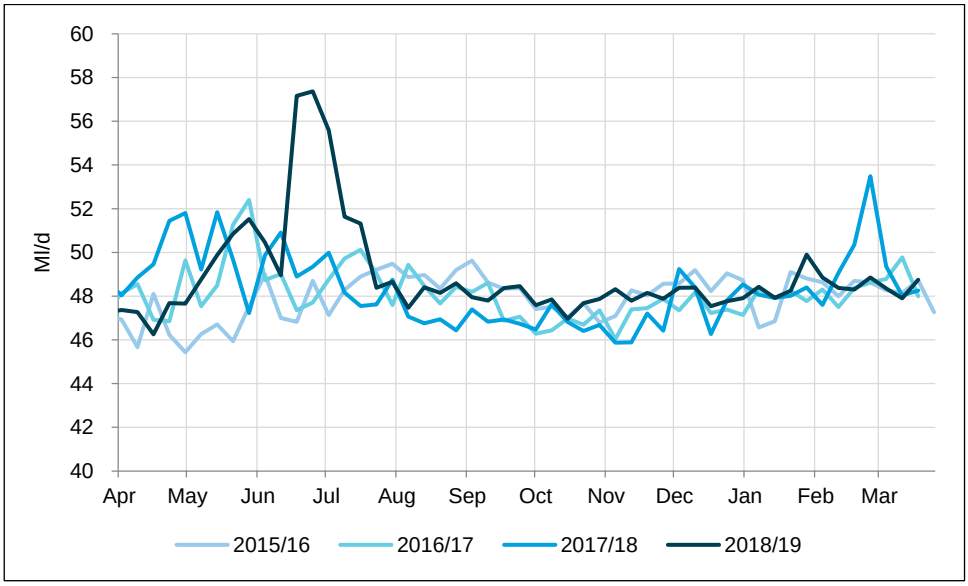
in the outturn data. For commentary on our water efficiency and metering activities in the resource zone please refer to sections 5.4.1 and 5.5.

5.2.4 Changes in demand in West Cumbria

There has been no significant change in distribution input for the year as a whole in West Cumbria, compared to 2017/18, despite a period of exceptionally high demand during the dry weather of summer 2018 (Figure 9). A slight increase in reporting year distribution input is partly due to an increase in leakage of around 0.8 Ml/d in the zone, despite our continuing efforts and targeted leakage reduction activities in Cumbria (See section 5.3.1 for further information). However, our auditors have recently recommended a review of the inputs to the water balance for reporting in 2019/20, and so we will be carrying out further investigations into the changes in the water balance components particularly in our West Cumbria resource zone.

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 resource zone throughout 2019/20 to reduce demand below current levels (these commenced in the 2015/16 period, but inherently it takes time for these to take effect), as described in the sections that follow.

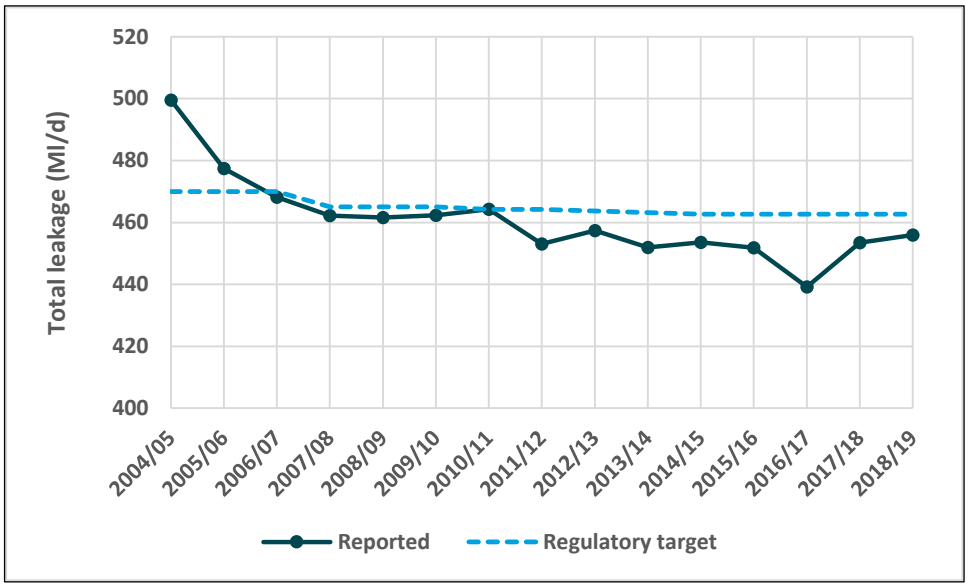
Figure 9 Weekly West Cumbria Resource Zone distribution input for the last 3 years



5.3 Leakage

As shown in Figure 10, we have now achieved our regional leakage target for 13 consecutive years.

Figure 10 Total leakage against our regulatory target back to 2004/05



However, 2018/19 was a challenging year for leakage management. The continuing impact of the intense freeze-thaw event in March 2018 meant that we started 2018/19 in a less favourable position than at the start of 2017/18. The extended period of dry weather through the summer of 2018 meant that we experienced increased leakage levels across multiple District Metered Areas (DMAs), due to bursts caused by ground movement and/or shrinkage in the dry weather.

We actively monitor leakage levels and highlighted the potential risks to performance early in the year. This allowed an action plan to be developed and implemented, with performance against this plan being monitored and the plan adapted throughout the year. To support this plan, we built on existing baseline leakage control activities with:

- Additional internal and contract detection resources, working overtime;
- An increased number of repair gangs (at times, we were operating with double our 'normal' level);
- Targeted trunk main leakage surveys, including the use of leakage sniffer dogs (Snipe and Denzel, who can accurately pinpoint the exact location of the leak by recognising the tiniest traces of chlorine) and satellite imagery (to geo-locate potential areas of leakage to a range of about 80 metres);
- The installation of an increased number of mobile acoustic loggers, as well as multiple fixed loggers, in our network to detect leaks that wouldn't be found using traditional manual techniques; and
- The continued use of our Event Recognition in Water Network (ERWAN) technology, which helps to predict where issues will occur and resolve these issues proactively before customers experience a problem.

Through constant monitoring, routine reporting, comprehensive governance and early action we have outperformed against our regulatory leakage target of 462.7 Ml/d for 2018/19.

Table 11 below shows leakage in the four water resource zones.

There has been no significant change 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 Carlisle has been reduced by 0.2 Ml/d from the 2017/18 position (a 4% reduction), but remains above the total leakage forecast for this resource zone. We are continuing with the extensive pressure management programme and leakage detection to recover performance in this zone throughout 2019/20.

There has been an increase of 0.8 Ml/d (5%) in leakage for West Cumbria from the 2017/18 position, and total leakage for this zone is above the forecast level. 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.

Table 11 Zonal leakage levels 2017/18 to 2018/19 and comparison with 2015 forecast (Ml/d)

Resource zone	Carlisle	Integrated	North Eden	West Cumbria	Region Total
Actual total leakage 2017/18	5.4	430.0	3.0	15.3	453.5
Actual total leakage 2018/19	**5.2**	**431.7**	**3.0**	**16.2**	**456.0**
Change from 2017/18	-0.2	+1.7	0.0	+0.8	+2.5
2018/19 forecast from our 2015 Plan	4.8	441.9	2.0	14.0	462.7
Variance from forecast	+0.4	-10.2	+1.0	+2.2	-6.7

NOTE: Numbers may not sum due to rounding

Regionally, there was an increase in leakage compared to the previous year. This reflects a more severe winter than in the previous year, with a number of 'freeze-thaw' events occurring during early 2018. However, due to our extensive leakage reduction programme the leakage value remains below the target (by over 6 Ml/d).

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 certain conditions.

A number of projects are underway to ensure compliance with Ofwat's guidance for water companies to report leakage consistently across the industry. We have confirmed to Ofwat that we have all the necessary plans in place to comply with the standard definition for 2019/20.

5.3.1 Leakage in West Cumbria

We have been working hard to find and fix leaks during a challenging year for leakage management in West Cumbria. We started the year recovering from the extreme events during March caused by the freeze-thaw and then observed a much higher level of leakage break-out than usual during May, June and July due to the ground heave caused by exceptional levels of soil moisture deficit.

In West Cumbria we are operating with over five times the leakage detection resources than in the rest of our region. We now have 13 day leakage technicians, and have recently implemented a new 2 man night leakage team, supported by 2 network maintenance technicians covering the Lakes, Carlisle and North Eden focussing on optimising pressure across the network to reduce burst frequency and leakage. Throughout 2018/19 we have continued with our pressure optimisation programme; currently average zone night pressure is the lowest it has been.

Our efforts resulted in mitigating a significant potential increase so that leakage only increased by 0.8 Ml/d, returning to previous years' levels whilst still remaining 2.2 Ml/d above target for this zone. However, leakage per kilometre of water main is now 14% 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.

We have recently developed a Cumbria Leakage Action Plan for 2019/20, including the following actions:

Detection and Repair Resources

- Continue with increased resources: 1 leakage/pressure analyst, 13 day leakage technicians, 2 night leakage technicians, 2 network maintenance technicians, 2 repair agents, 3 repair gangs, plus plumbing team for supply pipe leakage repairs;
- Improve performance management of detection and repair gangs through implementation of a new work management system;

Pressure Management

- Improved logging and monitoring of all DMAs with respect to pressure management;
- A review of the pressure management programme to identify potential for further pressure reduction;

Upstream Leakage

- An ongoing focus on upstream losses data including distribution input meter validation at water treatment works as part of trunk main leakage and losses detection process;
- Upstream leakage reduction targeting high leakage tiles;
- Drop tests to identify and target leaks at our service reservoirs where appropriate;

DMA leakage data

- Improvements in DMA leakage data through DMA meter replacement, logger replacement and data validation;
- Detailed investigations into specific DMA leakage data including operability investigations, void properties status, industrial users and allowances for concessionary supplies;
- Action plan developed to tackle both highest leakage DMAs and DMAs that remain significantly higher than background leakage;
- We also continue to survey regularly for leaks in unmetered areas;

New approaches

- Use of hydraulic modelling combined with rapid logging to detect leaks that have not been found using traditional acoustic techniques;
- Further implementation of both temporary and permanent acoustic loggers; and
- Use of new trunk main correlators and sniffer dogs for extremely rural mains.

We have made some positive progress in the first two months of 2019/20 and are predicting a reduction in leakage in West Cumbria during the final year of the 2015 Water Resources Management Plan. We will continue our extensive efforts to bring leakage back on track for the 2019/20 period and beyond.

5.4 Water efficiency and impact on consumption

Water efficiency plays an important role in balancing supply and demand. We achieved an estimated saving of 4.11 Ml/d for 2018/19, and achieved additional estimated savings of 0.41 Ml/d from enhanced activities in our West Cumbria Resource Zone.

Table 12 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 12 Summary of United Utilities water efficiency programme 2018/19

Water Efficiency Activity	Number	Estimated water saving (Ml/d)
Cistern devices distributed to customers	41,556	0.35
Water efficiency customer self-audits	152,830	1.29
Water butts distributed to customers	3,566	0.01
Water Efficiency Education Programme, pupils visited	8,883	0.46
Other promotional events	8,722	0.06
Crystal packs / water sticks distributed to customers	19,962	0.01
Retrofit devices distributed to customers	152,363	1.93
Base Service Water Efficiency Programme – Total		**4.11**
Free meter options	32,069	1.09
West Cumbria Sustainable Level of Water Efficiency Programme	17,107	0.27
West Cumbria education programme	3,566	0.14
TOTAL ESTIMATED SAVING		**5.61**

NOTES: Numbers may not sum due to rounding;

Our estimated savings in Table 12 above are calculated based on Ofwat guidance. In some cases the savings per device are modest, however the products are relatively inexpensive and distributing them, often at events, provides an opportunity to engage with our customers and raise the profile of water efficiency. In all projects we share lessons learnt to ensure the continued use of best practice in targeting our water efficiency activities.

During 2018/19, 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;

- Delivering a water saving education programme to 8,883 Key Stage 2 pupils;
- Offering a water usage calculator on our website, used by 77,791 customers in 2018/19, which gave them advice on how to save water across their homes;
- Supplying over 58,090 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;
- Continuing to promote water efficiency through our education programme;
- Every customer bill received information on saving water (see Figure 11). 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;
- Promoting water efficiency throughout the year via a number of digital campaigns, as well as using traditional press advertising, radio adverts, and bus backs advertising (see Figure 12);
- We held summer roadshows over 35 days at 18 locations, promoting water saving messages (see Figure 13). We spent 5 days at the Tatton Flower Show sharing gardening tips on saving water and more than 15,000 customers made a pledge to save water. We also promoted the Refill campaign to encourage the use of refillable bottes instead of plastic;
- From July through to October 2018 we had television adverts playing on ITV with the strapline "every drop saves a lot", promoting efficient use of water. We also had outdoor advertising in major sites in Manchester and Liverpool to support the TV ads and promote the H_2O hero message (see Figure 14); and
- We continued our roadshows into the autumn, promoting water saving at 37 supermarkets and giving away 9,310 water efficiency devices, across the region.

Figure 11 Bill inserts

Figure 12 Examples of water efficiency promotions

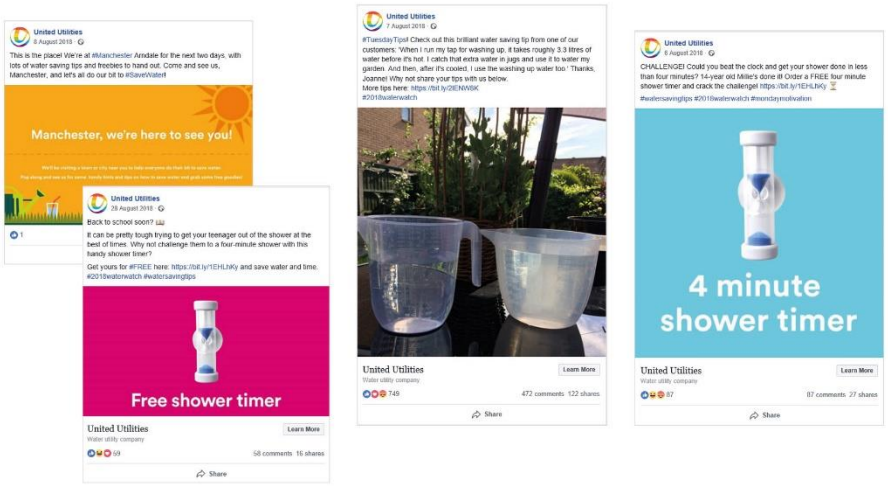
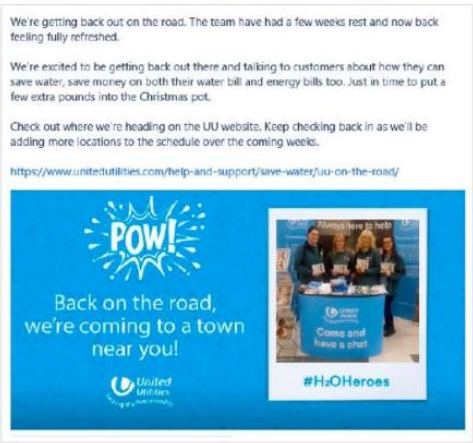


Figure 13 Examples of summer roadshows

Figure 14 Examples of outdoor advertising

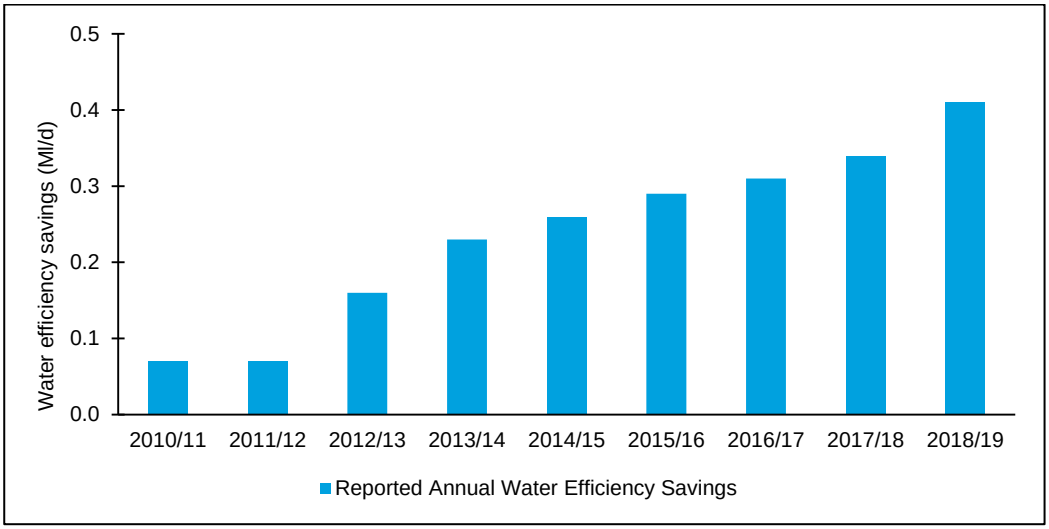
Figure 15 Promotion on social media of our roadshows, keeping our customers up to date



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 ongoing benefits we are continuing to undertake enhanced demand management activity to minimise abstraction in West Cumbria. This year we have seen further savings of 0.41 Ml/d in the zone, exceeding the previous year's performance of 0.34 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 16).

Figure 16 West Cumbria cumulative water efficiency savings



This year we visited 3267 customer homes in West Cumbria, where we carried out water usage audits and installed over 8,500 products, which included water efficient showerheads, shower regulators, shower timers, toothy timers, Bath Buoys, tap inserts, Save-A-Flushes and left handy information booklets with hints and tips on how to save more water in the future.

Figure 17 Water efficiency leaflet used in West Cumbria home audits

Working in partnership with the Lake District National Park we continue to offer a free Water Workshop, which was delivered to over 2,170 key stage 2 pupils in 2018/19. 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.

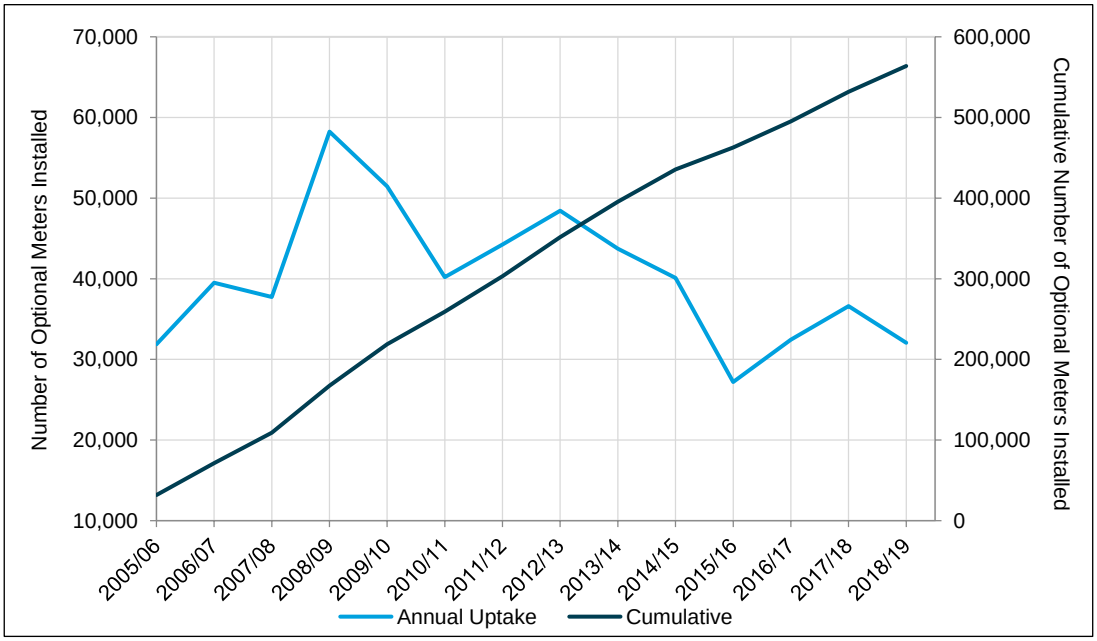
During 2018/19, we installed meters at:

- 31,523 new households;
- 32,069 households, which opted for a free meter; and
- 891 new non-households.

This year, we are reporting a decrease in the number of customers requesting a meter from the previous year 2017/18, from 36,615 to 32,069, even though we are taking additional measures to encourage meter uptake as described in this section. We have generated forecasts of future new development and free meter opting rates as part of developing the next Water Resources Management Plan. We will compare performance in future annual reviews once the next plan comes into effect from 2020 onwards.

Figure 18 shows the uptake under our free meter option scheme over the last thirteen years. The number of optants each year varies due to a wide range of factors, including changes in tariffs and movements in the wider economy, as already discussed in Section 5.2. Peaks in the free meter option uptake are observed during times of 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 continue 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 18 Free meter option uptake since 2005/06



To address the lower than expected meter uptake we have continued to progress a number of actions to improve our performance. Using the findings and understanding from behavioural economics research, we have reviewed our approach to promoting meters to try to tackle this issue and improve the uptake rate of meters.

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.

A pilot trial has been carried out in which customers that opt for a new free water meter will have a 'Lowest Bill Guarantee' for a 24-month period. This ensures 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. After a successful trial, we are currently building the systems required to implement the Lowest Bill Guarantee, enabling region-wide roll out during the period 2020 – 2025.

During the year we have rolled out a range of communication campaigns to promote the Free Meter Option with customer groups most likely to benefit. We have used a range of engagement techniques, including a 'metering myths' campaign. This campaign, fronted by Gloria Hunniford, aimed to dispel common myths about water meters.

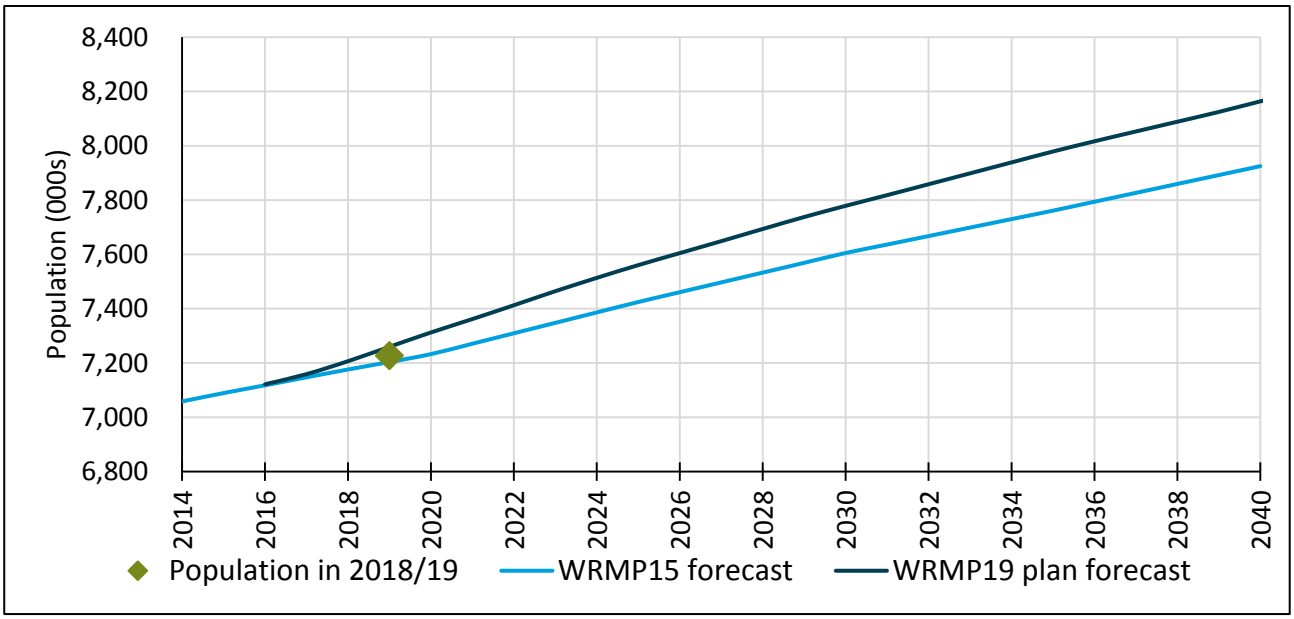
We are also working on a new personalised water usage report for metered customers. The reports will visualise consumption patterns for customers and provide a space to trial and promote individualised interventions to change behaviour around water use, to help customers reduce water use and save money.

5.6 Population and property forecasts

The latest population projections prepared by our specialist demographic analysts have indicated that in the short term there is little variation from the 2015 Water Resources Management Plan (WRMP15) trend projections. By 2040 there is a 6% difference between the WRMP15 and April 2018 trend-based population projections; given that these are long-range forecasts they are likely to shift over time.

We continue to review the latest population forecast projections on an annual basis. In line with the Water Resources Planning Guideline (Environment Agency, 2017), we have engaged with Local Authority Districts and Unitary Authorities to ensure that we incorporate data from Local Development Plans in our revised forecasts. Using this data we have produced a plan-based property and population forecast for our 2019 Water Resources Management Plan, which is higher than the current trend-based projections. A comparison of the WRMP15 population projections and the latest plan-based projections, as adopted in our revised draft 2019 Water Resources Management Plan, is shown in Figure 19.

Figure 19 Latest population forecasts (WRMP19 plan-based) against the previous (WRMP15) forecast



6. Headroom

In the annual Water Resources Review for 2015/16 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, however for the reporting year 2018/19 we have carried out a further adjustment to the target headroom component in line with auditor recommendations. The demand forecast uncertainty factor has been removed from the target headroom calculation for each resource zone, to reflect the fact that higher than expected demands in 2018/19 have in effect utilised this element of the supply-demand uncertainty margin or headroom component.

For each resource zone an adjustment has therefore been applied to the target headroom values reported on in the 2015/16 annual Water Resources Review for the year 2018/19, as shown in Table 13.

Table 13 Summary of current headroom and adjustments from Water Resources Management Plan values

Water resource zone	Water Resources Management Plan Target Headroom for 2018/19 (Ml/d)	Adjusted Headroom for 2018/19 regulatory reporting (Ml/d)	Headroom Adjustment (Ml/d)
Integrated	75.98	50.21	-25.77
West Cumbria	2.80	2.21	-0.59
Carlisle	2.35	1.93	-0.42
North Eden	0.25	0.17	-0.08

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 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 https://www.unitedutilities.com/cumbria/our-plans/west-cumbria/planning/. Construction on the scheme commenced in early 2017.

Good progress was achieved by the project team in 2017/18 and this has continued during 2018/19; we are therefore on track to meet or outperform the project delivery date of 31 March 2022, as included in our 2015 plan. The key items of work undertaken this year and/or in progress include:

- A further reroute of the raw water aqueduct pipeline was identified early in 2018 and planning permission was secured over the summer.
- Construction of the raw water aqueduct is now 60% complete with just over 11km remaining to be constructed in 2019.
- Three of the five tunnel sections required for the project are now complete, including the tunnel under the River Greta and a 1.25km tunnel in the Castlerigg area (Figure 20).
- Work at the new Williamsgate WTW is continuing to programme, with construction now also underway at the two service reservoirs (Figure 21).
- Steering group arrangements with the local planning authorities, Natural England and the Environment Agency are working well and helping with the discharge of the planning conditions and securing other permit requirements.
- Our website and free interactive visitor centre in Keswick continue to support our ongoing public consultation activities on the scheme.
- Our legacy fund continues to support projects providing social and economic benefits in the local area, through partnerships with local organisations such as the Cumbria Community Foundation. We have established a woodland and hedgerow planting fund, managed by Cumbria Woodlands, and we are supporting other local tree planting initiatives including the Wild Ennerdale project.

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 20 Tunnelling at Castlerigg

Figure 21 Construction of Moota Hill Service Reservoir

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 during the construction of the Thirlmere transfer scheme. As part of realising ongoing benefits we have committed to continue with a number of activities until the Thirlmere scheme is implemented. These include:

- Continuation of existing enhanced levels of water efficiency promotion (as described in Section 5.4); and
- 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).

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 since delivered the benefit of reduced abstraction from Ennerdale Water; and

- South Egremont boreholes: following completion of this scheme in 2017, water is available from this source at a capacity of up to 11 Ml/d. However, in response to customer contacts during the commissioning phase of the scheme, a revised mode of operation has been adopted to ensure an more acceptable blend of water with the existing abstraction from Ennerdale Water. The boreholes are therefore normally operated at an output of 4 Ml/d, with abstraction increased to the full capacity of 11 Ml/d when the level of Ennerdale Water drops below drought trigger 2.
  The agreed mode of operation of the South Egremont borehole scheme has been formalised by a revised abstraction licence and agreement under Section 20 of the Water Resources Act, both

issued by the Environment Agency on 29 March 2019. Details are also outlined on our website. In line with the agreement, we are continuing to monitor the effects of our abstraction on groundwater levels and we provide regular updates to the Environment Agency on the results of this monitoring. Our annual report for 2018/19 was submitted in November 2018 as supporting information with our licence application for the scheme, and a further data update was provided in May 2019.

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.

Figure 22 Physical measures – Examples of leaky dams

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 to contribute to the body of knowledge associated with freshwater mussel recovery efforts.

During the year 2018/19, we have made further progress implementing the package of compensatory measures to the scope and the timescale agreed with the Environment Agency and Natural England:

- The River Ehen Project Officer, hosted by the West Cumbria Rivers Trust, has continued to facilitate the delivery of conservation actions in the River Ehen and Ennerdale Water catchments.
- Further algal monitoring surveys of locations around Ennerdale Water were undertaken. These surveys are complemented by a passive gel phosphorus monitoring survey which has been undertaken by Lancaster University. These studies aim to identify areas where nutrients could be entering the lake and river catchments and therefore, areas for the Project Officer to target catchment interventions.
- An intensive three-year project to assess and map potential juvenile freshwater mussel habitat in the River Ehen SAC reported in autumn 2018. A more targeted survey programme will be repeated in 2023, after abstraction from Ennerdale has ceased, following recommendations made by the study.
- A four year EngD study hosted by Newcastle University is progressing and will complete in 2020. 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.
- An additional four year EngD study hosted by Newcastle University has progressed. The student is investigating the physical impacts of infrastructure removal at Crummock Water and communicating the impacts of water resource infrastructure removal with stakeholders.
- We have continued to progress 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, Overwater and Chapel House, all sites where abstraction will cease in 2022 when the Thirlmere transfer scheme becomes operational. The programme for these studies has been extended and they are due to be completed in 2019.
- A four year Research Officer post hosted by the Freshwater Biological Association commenced in January 2019. The role will develop and deliver a programme of research and trials of reintroduction techniques for freshwater mussels (*Margaritifera margaritifera*) and monitoring of their survival. This is primarily

focussed on the River Irt in West Cumbria. The research role is complemented by a River Irt Project Officer role which is currently being hosted by the West Cumbria Rivers Trust. The Project Officer role aims to develop and implement catchment interventions to benefit reintroduced mussels and to work with the Research Officer to undertake environmental monitoring.

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 for the protection of the River Ehen SAC and public water supplies in the 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 is based around the local sources alternative from our last Water Resources Management Plan, and 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 recently undertaken our annual review of the contingency plan. Following the granting of planning approval for the Thirlmere transfer scheme in November 2016, and good progress made to date, we are confident of delivering the project to the required timescales. It is therefore now considered very unlikely that the contingency plan will be required. Given this position, we do not consider it necessary to continue detailed liaison with the Environment Agency on the availability of additional groundwater resources in the West Cumbria aquifer. Monitoring data will be collected as part of the South Egremont boreholes abstraction licence conditions in order to understand the effects of groundwater abstraction.

We have reviewed the contingency plan annually during the period covered by our 2015 Water Resources Management Plan to date. However in view of the good progress made on the Thirlmere transfer scheme and the high level of confidence that this project will be delivered on time, we have agreed with the Environment Agency that no further updates to the contingency plan will be required.

7.5 Flood mitigation studies

We have an agreement in principle with the Environment Agency to explore the risks and advantages of using reservoirs for flood mitigation. We have agreed to a pilot project at Watergrove Reservoir. We plan to make releases of water at certain times of year, when the water level in the reservoir reaches pre-agreed trigger levels. This will be offset by reduced compensation flows at other times of year, to improve reservoir yield and protect customer supplies. Details of the releases and compensation flow reduction triggers, timescales, and volumes are under negotiation.

We anticipate operating the pilot project at Watergrove Reservoir for a period, whilst capturing any learning and recommendations which might need to be applied to the project.

8. 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 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 2018/19 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 0.41 Ml/d for the year. This is a further saving of 0.07 Ml/d from our performance in 2017/18;
- Total leakage in West Cumbria has increased by 0.8 Ml/d (5%) since 2017/18, and is still above the target for the zone, despite our targeted leakage activities in this zone. However leakage per kilometre of water main is 14% lower than the regional average for 2018/19;
- Demand in the resource zone has increased slightly from 2017/18 (by about 1.7%);
- Following completion of the South Egremont borehole scheme in summer 2017, water has continued to be supplied from this source throughout 2018/19, enabling us to reduce our abstraction from Ennerdale Water during the year;
- Progress on the Thirlmere transfer scheme has continued to be 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 continue with construction of the Thirlmere transfer scheme.

9. Supply-demand balance

This section brings together all of the changes and our performance for 2018/19 as detailed in the previous sections. Here we summarise what it means for the supply-demand balance across our four resource zones.

For the 2018/19 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 2018/19.

The supply-demand balance (or surplus) for all four of our Resource Zones is lower than the forecasts in our 2015 Water Resources Management Plan. This is due to a combination of reasons as outlined in the previous sections, the key factors being:

- Reported distribution input for 2018/19 was higher than dry year demand forecasts in all four resource zones, partly due to increased household consumption during the period of exceptionally dry weather in summer 2018 but also reflecting underlying increases due to population growth, changes in water use patterns and other factors; and
- Water Available for Use was lower than the forecasts for two of our resource zones (Integrated and West Cumbria), due to improved system representation in our models and also due to changes in the assumed timescales for delivery of capital projects and planned outages.

Table 14 Supply-demand balance for the 2018/19 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) #	33.00	1,915.29	8.65	54.76
Demand	2018/19 Dry year demand (Ml/d)	30.60	1,719.93	6.59	52.19
Target Headroom	Target Headroom (Ml/d)	1.93	50.21	0.17	2.21
2018/19 Supply-demand balance	This is the supply-demand balance position for 2018/19 (Ml/d)	**0.48**	**60.38**	**2.89**	**0.36**
2018/19 forecast supply-demand balance	This is the supply-demand balance position for 2018/19 from the WRMP 2015 forecast (Ml/d)	1.68	138.52	4.08	4.81
Difference	Difference between actual and forecast supply-demand balance in 2018/19 (Ml/d)	-1.20	-78.14	-1.19	-4.45

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

10. Making sure we are prepared for drought

10.1 Updating the Drought Plan

We published our Final Drought Plan 2018 in June 2018. This followed extensive public and stakeholder consultation, updated environmental assessments for drought orders and permits and a new source of water in West Cumbria (South Egremont boreholes), which will support reduced abstraction from Ennerdale Water. Our final plan includes 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.

Our Final Drought Plan 2018 can be found at www.unitedutilities.com/drought-plan.

Our Drought Plan was implemented during the dry weather event of summer 2018 and lessons were learnt throughout this period. Changes are therefore proposed through this annual review (see Section 10.1.1 in particular) and will also be considered as part of our next Drought Plan update (see below).

The Environment Agency have recently published their 'Drought permits and drought orders' supplementary guidance, and are due to publish new Drought Plan guidelines in autumn 2019. We have already started some preparatory work on our next Drought Plan update, and this will incorporate the new guidelines once they are published. The aim is for our next published plan to align with the implementation of the Thirlmere transfer scheme.

As part of our update to the Drought Plan, we are reviewing drought permits and new guidance on exceptional shortage of rain and this is discussed further in Section 10.3.

10.1.1 The Removal of Ennerdale Tankering

In July 2018 we made a request to the Environment Agency for a change in the approach set out in our Drought Plan in the management of water supply in the West Cumbria Zone in response to the prolonged dry weather in the North West. This can be summarised as:

- Remove Trigger 3 & 4 action to implement the tankering of water into the zone, which would contribute 0.6 Ml/d at trigger 3, and 2 Ml/d at trigger 4;
- Instead, increase the contribution to supply from the South Egremont Boreholes from the current 4 Ml/d up to 11 Ml/d when trigger 2 is crossed, in line with the Section 20 agreement (see Section 7.2).

It should be noted that alternative measures to protect water supply and the environment may be required once Trigger 4 is passed, which would be agreed through a Drought Order process.

The Environment Agency reviewed this proposal and met on the 27th June 2018. This briefing concluded with support of this proposal, due to providing a suitable and sustainable alternative option to protect water supply in West Cumbria, without adverse risk to the environment, particularly the requirements of the River Ehen SAC, and its freshwater mussel population. Following this agreement we have been requested by both Defra and the Environment Agency to update our Drought Plan to reflect this new operational approach.

The tanker movements provide limited additional water into the system; at Trigger 3 this would be approximately 24 tanker movements per day delivering an additional 0.6 Ml/d in to the zone. At Trigger 4 this would increase to 76 tankers per day delivering 2 Ml/d. Tankering would also cause disruption to the local area and is not considered sustainable.

A HRA Stage 3 Alternative Options report was prepared in support of a potential drought order at Ennerdale and the current Drought Plan. This document includes a minor update from that which was submitted in support of the WRMP Examination in Public (EiP). Specifically, Section 6.3 of the report discusses tankering. It concludes that the potential contribution to reducing the number of days that the River Ehen is at minimum compensation flow as a result of tankering 2Ml/d is negligible (less than 1 day). Therefore, there are no Habitats Regulations implications of removing tankering from the current Drought Plan. This is due to the assessment concluding that tankering provided no benefits to the SAC (in terms of reducing the number of days that the River Ehen is at compensation flow if a drought order were to be implemented).

The following activities are therefore being undertaken as a sustainable alternative to the tankering option:

Increased water supply via South Egremont Boreholes

The tankering options set out in our Drought Plan were developed before the company knew the reliable yield from the boreholes. The Environment Agency now support our proposal that the South Egremont Boreholes have the potential to yield 11 Ml/d, which is significantly more than can be achieved by tankering.

Lessons learnt following the customer response to changes in the water supply in 2017, have shown that communications to customers and/or stakeholders are required in advance of any changes to clearly give reasons for switching to increased borehole supply.

Compensation flow from Ennerdale

In normal weather periods, against a statutory compensation flow of 80 Ml/d we would have a flow setting of 83 Ml/d within which we would have a low alarm set point and a 'low low' alarm set point. These descending set points prompt an alarm to the controller from the alarm monitoring and control team and are designed to enable response to site before we drop below the statutory compensation flow.

The relatively high margin has to take into account the following scenarios:

- Standby controller starting position and including travel time due to the isolated rural nature of the site;
- Offshore wind causing water movement away from the weir or against the current in the river; and
- The gauging station is 600m downstream of the weir so natural processes can interfere with flows for example wind, land drainage and water losses.

The need for close control of reservoir storage is now competing equally with compensation for environmental protection. We have reset the flow set point to within 1 Ml/d of the statutory flow required (71 Ml/d against 70 Ml/d). The alarm set points are low alarm 70.2 Ml/d and 'low low' 69.5 Ml/d. These very close settings show our commitment to managing this system and to responding rapidly to events out of hours and at night. In conclusion, we are operating to closer margins above the required compensation flow with more careful monitoring and faster response times, thus saving up to 2 Ml/d of over-releases to conserve reservoir storage.

It should be noted that compensation flows may appear high at times due to wind from the lake sending pulses of water down the fish pass, which show as continuous spikes on the hydrograph. This variation in flows has been accepted by the Environment Agency.

Leakage and water efficiency

We continue to promote water efficiency and leakage efforts throughout the year in West Cumbria. Please see section 5.3.1 and 5.4.1 for further information in this area. Water efficiency and voluntary use restrictions will continue to be increased at trigger 2 and temporary use bans would be introduced at trigger 4.

In conclusion, the activities set out above are a sustainable and agreed approach to protect the SAC by reducing abstraction pressure on Ennerdale as an alternative to the tankering option currently stipulated in the Drought Plan.

10.1.2 Water use restrictions update

In 2018 we initiated a three week notification and representation period for the implementation of a temporary use ban (TUB) as per our Drought Plan. Towards the end of this period we received sufficient rainfall to enable us to withdraw the remaining notification and representation period and not implement a TUB. We have reviewed our TUB processes after the experience in 2018 and the lessons learnt showed:

- The situation can be dynamic and ever changing through changing weather forecasts, customer demand forecasts and moorland fires;
- Many customers and stakeholders did not understand the reason for a three week wait and started to adhere to it straight away;
- Many customers thought the TUB was already implemented;

- A three week window can encourage the wrong behaviour, increasing demand before a ban is implemented;
- It is difficult to project trigger crossing precisely three weeks ahead;
- Priority services customers should be exempt from a TUB; and
- Digital communications were shown to be effective and we sent over 2.2m text, email, voice messages and letters to customers within 24 hours of announcing the potential ban.

Therefore, our lessons learnt have evidenced that our approach to implementing TUBs should be more flexible. Our new approach is to initiate a working week (5 day) or 48 hour notification period depending on the situation being experienced. We would also exempt all our priority services customers, to ensure these vulnerable customers are not impacted. This should allow us to:

- Be flexible to the situation being experienced;
- Have more confidence a TUB is required, as projections to trigger crossing can be more precise, preventing unnecessary impact to customers; and
- The new approach should be clearer to customers to understand.

The representation period of three weeks will be maintained to ensure those customers who should be exempt, still have the time available to represent themselves.

The Environment Agency released new drought permit and order guidance in May 2019, this guidance has implications about the positioning of TUBs compared to drought permit applications. We will look to adhere to this new guidance as we start preparations for the next Drought Plan this summer.

10.2 Strategic pumping

In Appendix 8 of the Final Drought Plan we agreed to hold regular meetings with the Environment Agency and the Windermere stakeholders to review strategic pumping. These meetings are ongoing, with United Utilities presenting our approach to strategic pumping at each. All parties agree that these meetings are beneficial and are to be continued for the coming year.

10.3 Drought permits

10.3.1 Windermere Licence Review

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. Following recommendations from the Windermere assessment, updated during 2016/17, we initiated further investigations into the feasibility of mitigation measures to complement the main assessment. This study concluded that dredging is a viable mitigation option so an environmental assessment of dredging was commissioned; this will be considered further in our next Drought Plan revision. We have also commissioned a review of the abstraction licence at Windermere, which has investigated different hands-off flow scenarios. A series of workshops with the stakeholders and consultant have been undertaken and the final report of the review has been presented to all parties. Our final presentation of this review to the Environment Agency and other stakeholders took place on the 25th June 2019. Our response to Defra will be sent by mid July 2019.

10.3.2 Ullswater Drought Permit

In the dry weather of 2018, queries were raised around the water resource benefits of the Ullswater drought permit. Following lessons learnt exercises, we have completed a hydrological review of the most effective use of the Ullswater drought permit. Using the Environment Agency's data this initial view has

shown the drought permit to provide benefit in the period of January to May, and little benefit in summer and autumn (when licensed hands-off flows in the River Eamont are lower). This hydrological review is in the process of being verified with the Environment Agency. Once this has been completed we will commission an update to the shelf copy environmental assessment report (including Habitats Regulations Assessment and environmental monitoring plan). This study will be undertaken in consultation with the Environment Agency and Natural England and should be complete in spring 2020. The results of this will then be well positioned to be incorporated in the next Drought Plan.

10.3.3 Exceptional Shortage of Rainfall Guidance

On the 3rd May the Environment Agency released new guidance regarding drought permits and drought orders, including supplementary guidance on exceptional shortage of rain within Appendix D. This sets out the principles that water companies and the Environment Agency should consider in their assessment of whether there has been an exceptional shortage of rain as part of an application for a drought permit or drought order. An important variation is:

"Assessment of the rainfall deficit should be undertaken using areal rainfall data for the catchment or area of interest."

Currently the rainfall deficit is assessed using up to 11 rain gauges across our catchment, depending on the area of interest. The Environment Agency uses quality-controlled historical gridded rainfall datasets produced by the Met Office, together with in-house calculated gridded data, as its source of areal rainfall data. Water companies can request access to this data from the Environment Agency under Section 197 of the Water Resources Act 1991. We are collaboratively working with our local Environment Agency to gain access to this data and incorporate it into the exceptional shortage of rainfall evidence we would provide with drought permit or drought order applications.

10.4 Drought Vulnerability Framework

The Drought Vulnerability Framework (DVF) was developed by UKWIR on behalf of the Environment Agency and Natural Resources Wales. The framework provides approaches and methods for generating Drought Response Surfaces (DRS), which provide visual representations of the interactions between rainfall deficits, drought timing and the resulting stress on water supply systems in terms of number of days of emergency use restrictions.

We have commissioned consultants to carry out a drought vulnerability assessment of our four water resource zones in accordance with the DVF. Phase 1 of the study (screening and method selection) is now complete, and work is already well underway on phase 2 which involves generating DRS at resource zone level, using stochastic data sets to test system responses to a wide range of plausible droughts, including events more severe than historically recorded. The assessment will also determine drought resilience at a sub-resource zone level, by focussing on a range of different reservoir systems. We will be sharing the outcomes of this work with the Environment Agency and Natural Resources Wales, and we also to intend to incorporate the DVF into our next Drought Plan update.

As part of our drought vulnerability assessment studies, we intend to review whether our future Water Resources Management Plans need to include a dry year critical period (DYCP) scenario for the current Integrated Resource Zone (which will become the Strategic Resource Zone in future plans), taking into account seasonal demand patterns experienced in recent years. This review is carried out at the start of each Water Resources Management planning cycle and has previously concluded that a DYCP scenario is

not required for the Strategic Resource Zone. We will report back on our findings in future updates to the Water Resources Management Plan.

11. Forward look

In this section we give an overview of some of our key activities in 2019/20 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;
- Reduce our abstraction from Ennerdale Water; and
- Publish our final 2019 Water Resources Management Plan, which will come into effect in 2020/21.

The activities in Table 15 will ensure security of supplies by managing future demand, securing supplies particularly in our current West Cumbria resource zone, and ensuring that we are prepared for the future through regular updates to our Drought Plan and Water Resources Management Plan.

Table 15 Key items of activity in 2019/20

Item	Action
South Egremont boreholes	Following completion of the South Egremont borehole scheme in summer 2017 and formal agreement of the revised mode of operation, we will continue to offset supply from Ennerdale Water by abstracting from the boreholes in line with the agreement.
Demand management activities	We will maintain our water efficiency savings and continue with our enhanced leakage management activities, particularly those under the Cumbria Leakage Action Plan to achieve further leakage reductions in our Cumbrian resource zones.
Thirlmere transfer scheme	Following the success of the construction activity in 2018/19, similar progress is expected to continue. During 2019/20 we expect to complete the construction of the transfer main, including the remaining tunnel sections near Cockermouth and Keswick. Work will also continue through 2019/20 on the new Williamsgate water treatment works and the new service reservoirs. Subject to any potential construction delays we aim to complete construction in early 2020/21 and to achieve project completion towards the end of that year. In all construction work we will continue to carefully consider the impact on the environment and on tourism in the area. We will continue our strategy of regular communication with the local community through our project website, visitor centre, meetings and informal liaison as appropriate.
Final Drought Plan 2018	We published our Final Drought Plan 2018 in June 2018 and this is available at www.unitedutilities.com/drought-plan. In 2019/20 we will continue with the work which we have already commenced on the next update of our Drought Plan.
Thirlmere Transfer contingency plan	Following the granting of planning approval for the Thirlmere transfer scheme, and good progress made on the project throughout 2017 and to date, the likelihood of triggering the Thirlmere Transfer contingency plan is now very low. We updated the contingency plan in March 2019 and have now agreed with the Environment Agency that no further updates will be required.
Customer metering	We will continue with a number of actions to improve our uptake of the free meter option in 2019/20. These actions include: • Continuing the pilot trial of a 'Lowest Bill Guarantee' offer, to cap charges for 24 months for customers opting for a free meter, to larger numbers of customers; • Further promotion of metering through communication campaigns such as 'metering myths'; and • Continuing with our extended switch back period of 24 months, to give customers longer to decide whether they will benefit from having a meter.
Water Resources Management Plan 2019	Subject to approval by the Secretary of State, we aim to publish our next Water Resources Management Plan in summer 2019.

11.1 Our 2019 Water Resources Management Plan

Over the last three years we have carried out extensive and detailed work on the development of our 2019 Water Resources Management Plan[9]. This work is nearing completion and we expect to publish our Final Water Resources Management Plan in the coming months, subject to approval by the Secretary of State.

Our initial draft plan was published in March 2018 taking into account the valuable feedback which we received from customers, stakeholders and regulators through an extensive pre-consultation exercise. Following a further 12-week consultation process upon the draft plan, we published a Statement of Response to the consultation feedback along with our revised draft plan in August 2018. Subject to approval by the Secretary of State this will now become our Final 2019 Water Resources Management Plan, covering the period 2020 to 2045 and beyond.

In February 2019, following submission of our Revised Draft Water Resources Management Plan, Defra wrote to us asking for further information in support of our plan and asked us to share this additional information with those stakeholders who commented on our draft Water Resources Management Plan. We responded to Defra in April 2019, and published our response on our website[10].

Compared to our previous Water Resources Management Plans, our new plan is based on even more extensive and earlier stakeholder consultation, more innovative customer research using different techniques, and new sophisticated computer modelling techniques. We have assessed the resilience of our water supply system to more extreme droughts, or droughts which are different from those historically experienced, and a range of other potential hazards, such as flooding, freeze-thaw events and asset failure. We have explored future opportunities for water trading with other water companies.

Our new plan takes a long-term 25-year strategic view and reflects the merging of the previous West Cumbria and Integrated Resource Zones, as a result of the Thirlmere transfer scheme which we expect to deliver early in the 25-year planning period. We are now calling this the Strategic Resource Zone to draw distinction with the previous zones. For the first time, we've also included a new, smaller resource zone called Barepot to reflect non-potable supplies (those not to drinking water standard) to commercial customers in West Cumbria. Whilst we have other non-potable or commercial supplies, those at Barepot lack connectivity into an existing resource zone.

The key points of our Final 2019 Water Resources Management Plan are summarised below:

- Our baseline forecast of the amount of water available to meet the projected demand shows a surplus over the 20 years from 2020 to 2040, with a very small deficit occurring from 2041 to 2045. These figures account for future economic and population growth, and climate change.

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

[10] https://www.unitedutilities.com/globalassets/z_corporate-site/about-us-pdfs/response-to-defra-letter-for-further-information-final.acc19.pdf

- Our demand management plans offset upward pressures on demand and this deficit. We are proposing leakage reductions of 20% by 2025, and just over 40% by 2045, whilst working to do more on water efficiency.
- The proposed leakage reductions will enable us to offer an improved level of service for the frequency of occurrence of drought permits and drought orders from 2025, from an average of 1 in 20 years (or 5% annual chance) to an average of 1 in 40 years (or 2.5% annual chance).
- We have tested our plan to ensure our supply system is resilient to a range of hazards other than drought. We have identified a cost-effective solution, supported by customers and stakeholders, in order to address the most significant water supply resilience risk (Manchester and Pennines).
- We've explored what a future water trade from the North West to other parts of the UK would look like. We have presented how an alternative future could look in an adaptive pathway and will continue to work with other companies to explore these opportunities.

We are continuing to deliver the outcomes of the current (2015) plan and will continue to report on these through this annual water resources review process. Our new (2019) plan will take effect from 1 April 2020 and will be used as the basis for future annual reporting from that date. However, for next year's annual review covering the period 1 April 2019 to 31 March 2020, we recognise that there is an overlap as we anticipate that our 2019 Water Resources Management Plan will be published during the year. We will therefore take the 2019 plan into consideration when reporting on our water resources progress for 2019/20 in the next annual review.

11.2 Delivering our 2019 plan

Our business plan for Price Review 2019, submitted in December 2018, was awarded fast track status in January 2019 following Ofwat's initial assessment of water company plans (we were one of only three companies to achieve this status). This gives us the opportunity to make additional, early investment towards achieving our objectives for the next five-year time period. We have already initiated a number of 'early start' activities in preparation for delivering our 2019 Water Resources Management Plan. These include:

- Continued shadow reporting on new Outcome Delivery Incentives (ODIs) in preparation for our next five-year investment cycle from 2020-2025; and
- Early start activities to get ready for delivering WRMP19 (e.g. leakage sensors and strategic mains replacement, deployment of around 44,000 acoustic/noise loggers to enhance our current leakage detection approaches).

Although the activities above are targeted towards delivery of our 2019 Water Resources Management Plan, an early start on this work should also help in achieving our leakage targets and maintaining a supply-demand balance in all of our resource zones during the remainder of the period covered by the 2015 plan.

12. Conclusions

2018/19 is the fourth 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, achieving further water efficiency savings 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, despite a period of exceptionally dry weather in summer 2018.

In the West Cumbria Resource Zone, we completed delivery of the South Egremont boreholes in summer 2017; the boreholes are now fully operational and are supplying water into the resource zone in line with the formally agreed mode of operation. This has enabled us to offset supply and reduce abstraction from Ennerdale Water during 2018/19. Leakage has slightly increased compared to 2017/18, and is above the target for the resource zone, despite our extensive efforts through the Cumbria Leakage Action Plan. Uptake of our free meter option has decreased from 2017/18, and is below target, despite our continued activities and media campaigns to promote this option to customers. We will continue our extensive efforts throughout the 2015-2020 planning period to bring leakage in West Cumbria back on track for the 2019/20 period and beyond, in particular through the implementation of our Cumbria Leakage Action Plan. We will also continue with enhanced actions to promote free meter options across the region and monitor progress.

In the longer term we have continued to make good progress with the Thirlmere transfer scheme, meeting project milestones on time or ahead of schedule despite challenging weather conditions at times. During 2019/20 we will continue to progress with the Thirlmere transfer scheme. Activities will include completion of the transfer main including the remaining tunnel sections under the River Derwent and the A66, along

with further work on the construction of the new water treatment works and two new clean water service reservoirs.

Our draft 2019 Water Resources Management Plan was published in March 2018. Following a 12-week consultation period we prepared a revised draft and a Statement of Response. We published our revised draft in August 2018, and subject to approval by the Secretary of State this will become our Final Plan for the period 2020 – 2045.

We have updated our Drought Plan after triggering a material change to the plan, and following consultation with the Environment Agency and other key stakeholders we published our Final Drought Plan 2018 on our website in June 2018. We are currently working on the next update to our Drought 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 2018

unitedutilities.com/water-resources-plan

Appendix A

Table A1 Key outturn data, compared with 'dry year' forecasts for 2018/19

	Carlisle Resource Zone	Integrated Resource Zone	North Eden Resource Zone	West Cumbria Resource Zone	Region
Key to table	**2018/19 actual data**				
	2018/19 dry year forecast data (aWRMP16)				
	Difference				
Water available for use (own water sources) (Ml/d)	**35**	**1,911**	**9**	**56**	**2,010**
	32	1,951	9	58	2,049
	+3	*-40*	*0*	*-2*	*-39*
Total population (000's)	**110**	**6,956**	**14**	**147**	**7,227**
	110	6,930	13	150	7,203
	0	*+26*	*+1*	*-3*	*+24*
Number of unmeasured households (000's)	**30**	**1,577**	**3**	**46**	**1,656**
	26	1,479	3	44	1,553
	+4	*+98*	*0*	*+2*	*+103*
Number of metered households (000's)	**18**	**1,228**	**2**	**18**	**1,267**
	20	1,338	3	19	1,380
	-2	*-110*	*-1*	*-1*	*-113*
Total household metering penetration (incl. voids)	**36%**	**41%**	**39%**	**27%**	**40%**
	43%	47%	47%	30%	45%
	-7%	*-6%*	*-8%*	*-3%*	*-5%*
Per capita consumption unmeasured households (l/hd/d)*	**158**	**156**	**147**	**156**	**156**
	150	148	178	176	149
	+8	*+8*	*-31*	*-20*	*+7*
Per capita consumption metered households (l/hd/d)*	**120**	**126**	**115**	**118**	**126**
	114	108	129	117	108
	+6	*+18*	*-14*	*+1*	*+18*
Per capita consumption all households (l/hd/d)*	**144**	**144**	**134**	**145**	**144**
	136	130	155	159	131
	+8	*+14*	*-21*	*-14*	*+13*
Per household consumption all households (l/prop/d)*	**307**	**314**	**288**	**312**	**314**
	312	305	300	356	307
	-5	*+9*	*-12*	*-44*	*+8*
Water consumption by households (Ml/d)*	**15**	**882**	**2**	**20**	**918**
	15	861	2	23	900
	0	*+21*	*0*	*-3*	*+18*
Water consumption by non-households (Ml/d)	**7**	**359**	**1**	**9**	**377**
	7	324	1	9	341
	0	*+35*	*0*	*0*	*+36*
Miscellaneous water use (Ml/d)	**1**	**29**	**1**	**3**	**35**
	0	24	0	1	26
	+1	*+5*	*+1*	*+2*	*+9*
Total leakage (Ml/d)	**5**	**432**	**3**	**16**	**456**
	5	442	2	14	463
	0	*-10*	*+1*	*+2*	*-7*
Distribution input (Ml/d)*	**29**	**1,720**	**7**	**49**	**1,804**
	27	1,651	5	47	1,730
	+2	*+69*	*+2*	*+2*	*+74*
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