WATER RESOURCES MANAGEMENT PLAN

ANNUAL REVIEW 2022

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1 EXECUTIVE SUMMARY

We are a community focussed water company, with a strong history in supporting and maintaining good relationships with our customers. We also have a changing role in delivering a resilient water supply across the South East region, with our bulk supplies to our neighbouring water company, and the development of the Havant Thicket winter storage reservoir in collaboration with Southern Water, which is due for completion early 2029.

Our Water Resource Management Plan (WRMP) 19 was published in November 2019 and sets out how we plan to maintain our supply demand balance up to a 1 in 200 year dry weather scenario between 2020 and 2045. Our Annual Review 2020 highlighted that in 2019-20, we had not achieved certain WRMP19 targets (PCC), but that we had over performed significantly on other WRMP19 targets (leakage). In addition to this, our proposed AMP7 supply schemes have been undergoing environmental assessment and further analysis which has meant adjustment to the implementation schedule of these schemes.

In consultation with the Environment Agency, we decided that producing a set of revised planning tables was the most appropriate way to identify whether a risk was present to our proposed bulk supply commitment to Southern Water or the supply of water to customers may not be fully resilient up to a 1 in 200 drought event. Our Revised WRMP19 makes use of our most recent data, knowledge and methodologies, using our new forecasts which have recently been updated in May 2022 as we produce our WRMP24.

This Annual Review compares our outturn values for 2021-22 with our forecast Revised WRMP19 values, and how these may differ from our original WRMP19.

There is no doubt that the impact of Covid during 2020-21 was significant on the operation of our business. It affected both how we could work as a business and how our customers consumed water. This meant a significant change in the pattern of water use, with people using water in their domestic property throughout the day and a large drop off in commercial water use due to the closure of businesses. To some degree, these challenges persisted into 2021-22. Despite this we maintained our supply with no significant impacts to our customers. Furthermore, we have moved forward with our Havant Thicket delivery plan.

The key headlines within this Annual Review are:

- Despite the challenges of Covid we maintained a surplus in our outturn supply demand balances of 25.94 Ml/d and 48.75 Ml/d for the annual average and critical period scenarios respectively, so our customers were not at risk. However it is recognised that if Southern Water had taken the full 30 Ml/d of bulk supplies, the annual average supply-demand balance would have been more finely balanced.
- Our outturn value for PCC is 160.3 l/h/d, which is above our Revised WRMP19 forecast of 154.3 l/h/d. Whilst not on target, this is a significantly improved position compared to 2020-21, when average household PCC was 15 l/h/d higher than target. We will continue to implement our PCC recovery plan.
- Driven by a cold winter, our outturn leakage figure is 26.93 Ml/d, which is higher than our Revised WRMP19 target by around 1.6 Ml/d. Despite this, we remain in a good position to achieve our leakage targets throughout AMP7, with a recovery plan in place.
- Our Revised WRMP19 shows that with the adjustments we have made, we would be in a headroom deficit for 2022-23 and 2023-24 if we experienced a 1 in 200 year drought scenario. Whilst of some concern, this is an improved position compared with the deficits in our June 2021 Revised WRMP19.

Whilst the risk of a 1 in 200 year event occurring within the next few years is low, as such events take multiple dry winters to evolve to such a severity, we will continue to progress

mitigation measures in parallel with ensuring the development of a robust WRMP24 for 2025 and beyond.

2 GENERAL

2.1 Introduction

The Water Act 2003 places a duty on all water companies to prepare a Water Resources Management Plan (WRMP). As part of the WRMP process, it is a statutory requirement to review progress against the Plan and report it to the Secretary of State in an Annual Review.

We published our Final WRMP in November 2019 (WRMP19)[1], which has recently been updated to reflect both our current company position and advances in industry-wide approaches to improve our data and forecasts. This Annual Review will set out how we have updated our WRMP19, and our performance in 2021-22 in comparison to this. Updated guidance published in March 2022[2] sets out the content of the Annual Review and the submission procedure.

In accordance with the guidance, this review will:

- Highlight any changes that have been made since the development of WRMP19;
- Report on the actions that the Environment Agency and Defra asked us to work on after the publication of our final WRMP19 and Annual Review 2020;
- Report on progress against our forecast data for 2021/22 in our revised WRMP19 (Revised WRMP19); and,
- Report on the overall summary of the supply-demand situation
- Provide a forward-look for our WRMP programme

Our annual return data is used to confirm our Supply Demand Balance Index (SDBI), an Environmental Performance Assessment measure, previously called Security of Supply Index (SoSI). Our annual review and annual returns data will also be used in future to monitor our progress in delivering the National Framework measures for England, such as reductions in per capita consumption, leakage and increases in water supply.

2.2 Supply Area

Portsmouth Water is a community focussed water company, with a strong history in supporting and maintaining good relationships with our customers. We also have a changing role in the South East region. We support our neighbouring water company, Southern Water, with bulk supplies of wholesome water so that they can reduce their abstractions on world renowned chalk rivers. Additionally, we are developing Havant Thicket winter storage reservoir in collaboration with Southern Water, which is due for completion early 2029, to enable a further bulk supply into their Hampshire zone.

Our supply area is made up of a single Water Resource Zone (WRZ). The distribution system includes significant strategic treated water storage and a spine main that runs East to West across our Region. This system ensures that all of our customers in the supply area shown in Figure 1 experience the same level of service.

[1] https://www.portsmouthwater.co.uk/wp-content/uploads/2019/11/Final-Water-ResourcesManagement-Plan-2019.pdf

[2] Water resources management plan annual review and annual data return, Guidance for water companies in England and Wales. Developed by the Environment Agency and Natural Resource Wales (March 2022)

Figure 1: Portsmouth Water's supply area

There have been no changes to the company area or WRZ configurations since WRMP19. However some customers on new housing estates are supplied by New Appointments and Variation companies (NAVs).

2.1 Levels of Service and our drought plan

When dry weather conditions persist, causing groundwater levels to pass predefined trigger levels, we will implement our drought plan. Continued dry weather would result in a steady escalation of restrictions on household and commercial users of water, designed to reduce their demand for water. These restrictions range from Temporary Use Bans (TUBs) such as bans on the use of hosepipes to Non-Essential Use Bans (NEUBs, also referred to as ordinary drought orders) that may start to impact businesses in the local area.

As a last resort, water companies may also ask for emergency drought orders in order to allow the use of standpipes and rota cuts to further reduce the demand for water. These actions are part of the Emergency Plan and not the Drought Plan. We have agreed with our customers the frequency at which demand restrictions might need to be implemented. The agreed Levels of Service (LoS) are:

- Temporary Use Bans to be implemented no more frequently than in a 1 in 20 year drought event.
- Non-Essential Use Bans to be implemented no more frequently than in a 1 in 80 year drought event.
- Emergency Drought Orders to be implemented no more frequently than in a 1 in 200 year drought event.

In advance of the implementation of TuBs, we would be engaging with our customers to make them aware of the implications of the dry weather episode on the water resource situation for the company and be asking them to reduce their water consumption voluntarily. In approaching customers, we would use the full range of media types to efficiently reach as many sections of our customer base as possible.

Given that we did not introduce any water restrictions on customer usage in 2021-22, we have upheld our performance commitment in the Business Plan.

Our new 2022 drought plan has been published since the last annual review, which complies with the latest drought planning guidance from regulators (Defra and Environment Agency, December 2020). The structure and tone of this plan has substantially changed in order to meet the evolving requirements, including the need for plans to be clearer and easier for customers and other stakeholders to follow.

There have been no changes to our previously agreed LoS or supply side drought permit options. However we have on-going programmes of work that were agreed with the Environment Agency and Natural England as part our permission to publish. We are continuing to liaise with Southern Water regarding their new drought triggers work on the Itchen and we aim to provide the Environment Agency with a joint position statement later this summer, which will form an addendum to our drought plan. We also have on-going environmental assessment work taking place alongside the development of our draft WRMP24, which will be used to update our drought plan appendices once finalised.

3 WATER RESOURCE POSITION

In this section we provide a general view of the water resource position during 2021-22.

We experienced a dry start to the year with virtually no rainfall recorded at the Havant Station (E11470) during April. This was followed by a wet summer, a warm dry September, intense rainfall in October and then cold snaps and dry spells over the winter. There was still some degree of lockdown restrictions in place until September but the removal of travel bans and unseasonably wet conditions meant that demand was reduced during the summer months. We went into the year with groundwater levels looking healthy, however despite the wet summer we dropped below average towards the end of the year.

The following section explains weather fluctuations, groundwater levels and Covid impacts in more detail.

3.1 Rainfall & Groundwater Levels

Groundwater levels are a good indicator of the water available from the chalk aquifer from which we abstract the majority of our water for supply. We therefore monitor the levels on a daily basis and compare them to the 30 year long term average (LTA) and the Drought Trigger line, as shown in Figure 2.

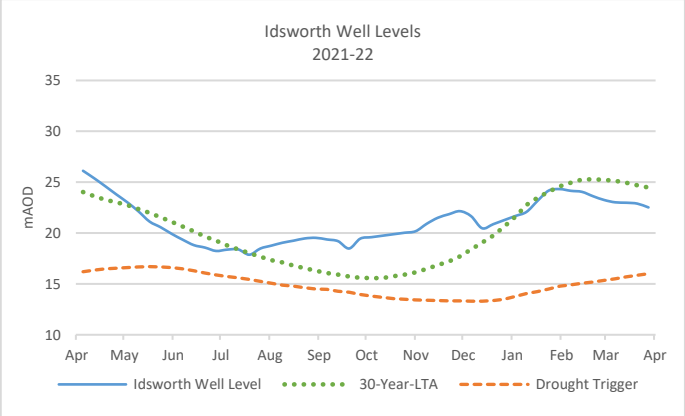

Figure 2: Groundwater levels

The effect of passing this trigger would have been to start proactively working with our customers directly and through the media, asking them to use less water voluntarily.

As the graph in Figure 2 shows, we started the year in a healthy resource position due to the wet winter at the start of the 2021 calendar year, which recharged our groundwater supplies.

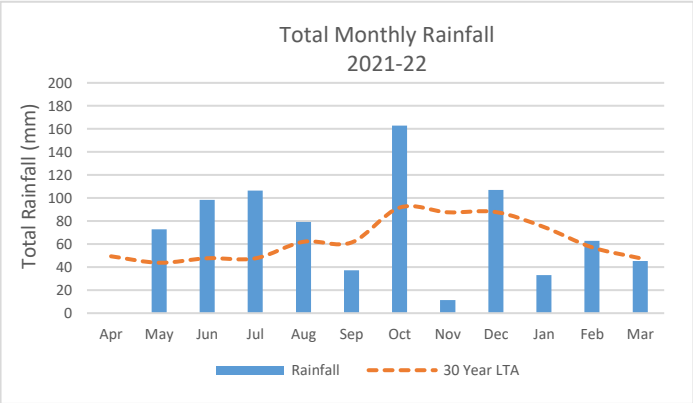

Figure 3: Total monthly rainfall

As shown in Figure 2 and Figure 3, a particularly dry April led to groundwater levels dropping below the LTA, although an unseasonably wet summer resulted in significant aquifer recharge and a recovery to above LTA. Whilst September was relatively dry, a very wet October (including Storm Aurore that caused widespread flooding) meant that our groundwater levels continued to rise. However, dry conditions prevailed in November and January, and as a consequence, we moved into April with groundwater levels having dropped below the LTA again.

This data clearly shows that 2021-22 was not considered a 'dry year' for reporting purposes.

3.2 Overview of the Impacts of coronavirus

As a company we have had to evolve alongside Covid and have now had time to adapt to the challenges it presents. As lockdown restrictions eased, we have been able to operate at a relatively normal capacity. This includes an increase of staff working within our offices, continuation of meter readings and fittings, and completion of priority repair and renewal works. That being said, lockdown restrictions and the ways in which our customers operate has still influenced water consumption. Change in usage habits compared to pre-Covid has resulted in a volumetric step up in household demand.

More detail of the impacts of Covid are provided in the relevant sections throughout this report. However, the following points summarise changes compared to 'expected' results based on our demand models.

- **Distribution input** – We saw a 2% increase in Distribution Input (DI) demand compared to that expected in the year by our demand model. We estimate that this 2% increase is due to Covid related impacts (with no variation due to weather).
- **Household demand** - We have seen an 8% increase in household consumption compared to the model. The impacts of covid account for the entire 8% increase, with benign weather conditions. This is an increase of c.10 Ml/d in normal water usage, although we did not see the high peak demands experienced in 2020.
- **Non-household demand** - We have seen a 13% reduction in non-household demand compared to the model. The impacts of Covid account for the entire 13% reduction with c.10 Ml/d less demand during restriction periods. However, we have seen a gradual bounce-back in demand as restrictions eased during 2021/22, with usage almost back to pre-Covid levels. Peak demand in 2021 was lower than 2020 due to benign weather.

Table 1 below shows our estimates of the overall changes in demand by customer category for each month. Note that household demand is consistently higher than expected whilst non-household demand is lower.

Effect of Covid				
Month	HH Demand	NHH Demand	Leakage	DI
April	10%	-10%	0%	4%
May	7%	7%	0%	6%
June	-6%	-21%	0%	-7%
July	-4%	-24%	0%	-7%
August	12%	-8%	0%	6%
September	6%	-11%	0%	2%
October	9%	-20%	0%	1%
November	13%	-19%	0%	4%
December	11%	-16%	0%	4%
January	13%	-13%	0%	5%
February	10%	-8%	0%	4%
March	14%	-9%	0%	7%
Average	**8%**	**-13%**	**0%**	**2%**

Effect of Weather				
Month	HH Demand	NHH Demand	Leakage	DI
April	1%	1%	5%	2%
May	-8%	-8%	4%	-6%
June	3%	3%	-9%	1%
July	0%	0%	-13%	-2%
August	0%	0%	-9%	-1%
September	0%	0%	5%	1%
October	0%	0%	-2%	0%
November	0%	0%	-8%	-1%
December	0%	0%	3%	0%
January	0%	0%	2%	0%
February	0%	0%	16%	2%
March	0%	0%	16%	2%
Average	**0%**	**0%**	**1%**	**0%**

Table 1: Effect of covid and weather on demand and DI

Despite the ongoing challenges of Covid we maintained supplies with no significant impacts to our customers. Furthermore, we have moved forward with our Havant Thicket delivery plan.

3.3 Daily Water Balance

In order to ensure sufficient production capacity is available to deliver the water required by our customers we use a live tool called the daily water balance. In the tool we have a rolling demand forecast that is used to plan production capacity requirements. Actual demand is overlain in the tool to improve future demand forecasts.

Figure 4 shows the data from the tool for 2021-22. It shows actual demand (DI) in blue and our available supply production capacity in amber.

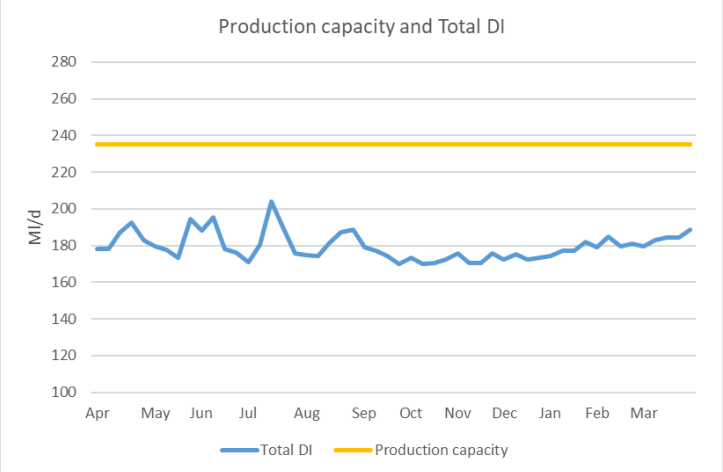

Figure 4: DI and production capacity forecast

As you can see in Figure 4, our production capacity remained the same throughout the year whilst total DI remained consistently below this. Above average rainfall during the summer meant the peak demand was significantly below demand forecast, which meant our network remained unstressed.

4 WRMP19 AND OUR REVISED WRMP19

In this section we discuss feedback we received from our WRMP Annual Review 2020, which reported on our 2019-20 performance, and the work subsequently undertaken as a result.

4.1 Background

Our WRMP19 sets out how we plan to maintain our supply demand balance up to a 1 in 200 year drought scenario between 2020 and 2045. Our Annual Review 2020 highlighted that in 2019-20, we had not reached certain WRMP19 targets (PCC), but that we over performed significantly on other WRMP19 targets (leakage). In addition to this, our proposed AMP7 supply schemes had been undergoing environmental assessments and further analysis which meant that adjustment to the implementation schedule of these schemes was required.

Feedback from Defra, Ofwat and the Environment Agency on the annual review 2020 was centred around concerns that the revised delivery schedule of schemes and the relatively high PCC could present a risk to our proposed bulk supply commitment of an additional 9 Ml/d to Southern Water in 2024 and that our supply of water to customers may not be fully resilient up to a 1 in 200 drought event.

Our recommended action from Defra, Ofwat and the Environment Agency was to:

"keep track of the water available for bulk supplies to the region as a whole, and focus on demand management activities to minimise the risks to these proposed transfers."

Furthermore, the Environment Agency specifically stated that:

"The company should review the water available for the bulk supplies to Southern Water as given the multiple issues identified there is a risk to bulk transfer and potentially to security of supply that Portsmouth Water need to recognise, investigate and address. The company need to report progress through quarterly meetings and AR2021."

In consultation with the Environment Agency we decided that producing a set of revised planning tables was the most appropriate way to identify whether a risk was present. By creating revised planning tables we could fully understand if there is a security of supply risk to our own customers, and to the bulk supplies to Southern Water in each drought scenario, and if so, identify potential mitigation measures to put in place until WRMP24 is implemented in 2025.

Our Revised WRMP19 tables draw upon our most recent data, knowledge and methodologies, developed through workstreams associated with our emerging draft WRMP24. We believe this is the most appropriate information to use to give us an accurate view of our current position. In particular, our Revised WRMP19 includes:

- Updated demand forecast, using outturn data and WRMP24 methodologies;
- Revised demand modelling to include a range of drought scenarios for calculation of baseline demand and demand option benefits;
- Re-calculation of target headroom figures to reflect uncertainty in new demand forecasts;
- Updated outage assessment, using WRMP24 methodologies;
- Updated leakage forecast, using outturn data and WRMP24 methodologies;
- Updated demand management options using current AMP7 strategies and WRMP24 forecasts;
- Updated deployable output and supply option schedule and benefits following further scheme analysis, including via our new Pywr system simulation model; and

- Use of our Pywr model to define the benefits from Temporary Use Bans (TUBS) and Non-Essential Use Bans (NEUBS) during the relevant drought scenarios.

Through the use of industry best practice techniques, this work has refined our view of the original WRMP19 'options' that were selected to maintain the supply-demand balance. This refinement is captured in Table 2.

Option code	Preferred Final Plan Option name	AMP7 (2020/21-2024/25)	AMP8 (2025/26-2029/30)	Revised WRMP 2019 adjustment
CO46	Household water efficiency programme (partnering approach, home visit)	2020–21		New basket of demand side options and benefits to reflect latest WRSE Group related work streams. Including; • Revised water efficiency programme • Virtual home visits • Change of Occupier metering • Further fixed network noise loggers to reduce leakage • The targeted provision of water saving devices
CO46b	Waterwise programme	2020–21		
CO26	Subsidy to customers that purchase water efficient appliances (washing machines and dishwashers, showers and WCs)	2020–21		
CO34	Water saving devices – Retrofitting existing toilets	2020–21		
CO06a	Metering on change of occupancy – existing meter pits	2020–21		
DO04a	Fixed network of permanent noise loggers connected to telemetry - Tranche 1	2020–21		
CO40	Water saving devices – spray taps	2020–21		
CO84	Voids metering	2020–21		
CO78	Voluntary restraint and leakage action	2020–21		
CO79	Mandatory restraint	2020–21		New view on the effectiveness of mandatory restraint from Pywr modelling
CO80	Imposition of Drought Direction Restrictions (mandatory commercial restraint)	2020–21		
RO68	Source S – Drought Permit	2020–21		Completed analysis and environmental reports. Revised yield benefit following Pywr modelling.
RO21a	Source O – Maximising DO	2020–21		Delivery now expected to be 2024-25 with a revised yield benefit following a feasibility review and Pywr modelling.
RO23a	Source H – Maximising DO	2020–21		Delivered and in place for 2022-23.
RO24a	Source C– Maximising DO	2020–21		Delivery now expected to be 2024-25 with a revised yield benefit following feasibility review and Pywr modelling.
RO22a	Source J – Maximising DO	2024–25		Updated assumptions regarding yield benefit and operation following a feasibility review and Pywr modelling. No change to implementation date.
DO04b	Fixed network of permanent noise loggers connected to telemetry - Tranche 2		2025–26	New basket of demand side options and benefits to reflect latest WRSE Group related work streams.
CO06	Metering on Change of Occupancy - all properties		2025–26	
RO13	Havant Thicket Winter Storage Reservoir		2029–30	Revised DO based on updated designs and further Pywr modelling

Table 2: Preferred Final and Revised WRMP19 Options

It is recognised that as a result of this work there have been updates to our Revised WRMP19 relative to our Final WRMP19, and the reasons for these updates are summarised throughout this Annual Review report where appropriate.

Following Annual Review guidance, such changes to components of the water balance and/or supply-demand balance as a result of better understanding are not routinely considered a 'material' change of the WRMP.

The initial development of our Revised WRMP19 took place as a separate piece of work to the 2021 annual report and was separately shared with stakeholders and regulators at the end of June 2021. The full report can be found on our website. An updated Revised WRMP19 report (and tables) was shared with regulators in December 2021. Furthermore a final set of adjustments to Revised WRMP19 tables took place in May 2022 and the results have been presented to regulators in June 2022.

Where appropriate we have summarised the results of the Revised WRMP19 work in this document. Throughout the project, we have been working closely with the Environment Agency to ensure that our approach is acceptable and answers the regulators original concerns.

The values in our May 2022 Revised WRMP19 tables now represent our most up-to-date position, and supersede the values in our original WRMP19. Therefore, we have compared our outturn data to our Revised WRMP19 values, and supplied our original WRMP19 values for illustrative purposes only to show how they have changed.

5 BASELINE SUPPLY

In this section we review the elements of our performance that collectively account for our supply capability. We identify the outturn performance we have achieved from our sites against the Revised WRMP19, and subsequently explain the reasons for any difference between these values and our original WRMP19.

A summary of the differences between our Final WRMP19 and Revised WRMP19 **dry year** (1 in 20 year event) baseline supply is provided in the table below, alongside the outturn values of 2021-22.

Baseline Dry Year Supply 2021-22 assumptions	Final WRMP19		Revised WRMP19		Outturn Values	
	Annual Average Ml/d	Critical Period Ml/d	Annual Average Ml/d	Critical Period Ml/d	Annual Average Ml/d	Critical Period Ml/d
Deployable Output	226.39	280.00	229.46	286.1	227.56	283.5
Outage	12.2	11.6	6.7	6.4	7.8	9.12
Treatment works losses	2.4	2.4	2.4	2.4	6.84	4.65
Bulk supply exports	30	30	30	30	4.63	7.55
Total baseline Water Available For use (WAFU)	**181.79**	**236.00**	**190.36**	**247.3**	**208.29**	**262.18**

Table 3: Baseline supply – Final WRMP19, Revised WRMP19 and outturn comparisons

From the table it can be seen that our outturn WAFU was greater than both the final WRMP19 and revised WRMP19 requirements owing to reduced bulk exports.

The following sections provide details on the various contributing components of our baseline supply capabilities displayed in the table above, and explain our outturn values.

5.1 Deployable Output as Baseline supply

A full review of Deployable Output (DO) was undertaken in 2017 for WRMP19, which was taken forwards for use in the June 2021 Revised WRMP19. In the review we explored 'conventional plus event-based DO or time-series' in line with Risk Composition 2 within the UKWIR guidance[3], which allowed us to consider the implications of alternative/more severe droughts than those in the historic record through the consideration of stochastic data. Full details of this method are provided in WRMP19 and the DO Assessment.

A review of our water resource zone DO assessment has now been carried out for WRMP24 using our new Pywr system simulation model, and the subsequent changes are now accounted for in our May 2022 Revised WRMP19 tables and the outturn DO calculation for the remainder of AMP7.

5.1.1 Outturn Deployable Output

This section summarises the adjustments made at an individual site basis when calculating our outturn DO.

Source U was not included within the WRMP DO numbers, as it was converted to a solely raw water augmentation source prior to 2017. However, two sources (Source I and Source E) have experienced long term outages due to water quality issues since 2017 and have been removed from the outturn DO for 2021-22.

The total adjustments made to the WRMP19 DO values are shown in Table 4.

DO Reductions	Annual average Ml/d	Critical period Ml/d
Final plan 2021-22 dry year DO in Revised WRMP19	229.46	286.1
Source I: Long term outage	-1.5	-2.1
Source E: Long term outage	-0.4	-0.5
Outturn 2021-22 dry year DO against Revised WRMP19	**227.56**	**283.5**

Table 4: Outturn dry year DO for 2021-22

The outturn DO values for the 2021-22 dry year are 227.56 Ml/d and 283.5 M/d for the annual average and critical period, respectively.

5.1.2 DWI Notices

We have had a number of DWI notices served on our treatment works for parameters including cryptosporidium, hydrocarbons and risks to disinfection. Each site has a programme of works designed to deal with the issues, including treatment upgrades, installation of monitors where required, increased monitoring and changes to company processes. None of

[3] UKWIR, 2016, "WRMP 2019 Methods – Risk Based Planning", UKWIR Ref. 16/WR/02/11.

the DWI notices and associated works currently have any impact on the resilience of supply from a WRMP perspective. However the planned site review and investigation of aluminium issues at Source A might lead to a requirement for works in the future that could temporarily impact available DO.

5.2 Outage as Baseline supply

Outage is defined as a temporary loss of deployable output at a source works. It can relate to planned or unplanned events and covers a wide range of influences from power failure to short term pollution incidents.

5.2.1 Revised WRMP19 Outage

Our Revised WRMP19 uses the new consistent approach to outage assessment which was developed for the Water Resources South East (WRSE) regional resilience plan, and which each of the member companies will use for the development of their WRMP24. This provides the most up to date industry approach and latest company knowledge.

For the Final WRMP19, data was analysed for the period 2007-2016. For the Revised WRMP19, we based our assessment on data from 2013-2020. This period was selected to provide a good balance between data quality and length of data set. The new outage assessment includes the benefits of our Final WRMP19 preferred options, as well as accounting for the actions we have undertaken during AMP6 and in support of our Business Plan to consider resilience and additional requirements both in the short and long term.

The assessment methodology and results were presented to the Environment Agency to ensure they found the approach acceptable for use in the Revised WRMP19.

Outage allowances have been calculated for the dry year annual average (DYAA) and dry year critical period (DYCP) scenarios. The calculated outage allowance values are shown in Table 5 and they represent the scenario with a probability of 90% (or an exceedance probability of 10%).

Outage allowance scenario	Final WRMP19		Revised WRMP19	
	Value in Ml/d	As a % of DO	Value in Ml/d	As a % of DO
DYAA	12.2	5.4	6.7	2.9
DYCP	11.6	4.1	6.4	2.2

Table 5: Outage allowance for the Final and Revised WRMP19

The revised outage allowance is lower than the published Final WRMP19 allowance for the following reasons:

- All long duration events were capped at 90 days.
- Events were separated into long and short duration events, with specific probability distributions for both. This prevented the skewing of duration distributions, which artificially increases the outage allowance.
- The choice of distributions used were reviewed for all site/hazard combinations with a contribution to outage >0.2 Ml/d.
- Length of data record used in the assessment was also reviewed. In order to balance data quality with capturing a sufficient period of data, the record from 2013 to 2020 has been used for the revised assessment to determine the outage allowance.

The revised outage allowance is currently being used towards preparation of our draft WRMP24, which will be out for public consultation later this year.

5.2.2 Outturn Outage

In the WRMP guidance, outturn Outage falls into three categories;

- Less than 3 months and which has not been undertaken for maintenance or other planned reasons
- Less than 6 months and should have an action plan to recover the losses
- Longer than 6 months but the mitigation plan has been agreed by regulators

Therefore outages longer than 6 months without an agreed mitigation plan are not included in our outturn outage figures, but have been accounted for in reductions to the DO detailed in section 5.1.1.

In the 2021 Annual Review Source H was considered to be a long term outage (water quality concerns) with a plan to bring the site back on line. Source H is now back on line, although for the majority of the review year it was still off line and therefore remains within the outturn outage calculation for 2021-22.

This makes the 2021-22 actual outage 7.8 Ml/d annual average and 9.12 Ml/d critical period, compared with our Revised WRMP19 outage allowance of 6.7 Ml/d average and 6.4 Ml/d critical period (see Table 5).

5.2.3 Managing outage

We understand the need to manage outage carefully as it is an important component of our supply demand balance. A major threat to outage at our treatment works is from oil spills, and so one of the studies we undertook in AMP6 explored the most effective solution to ensure resilience to this risk. Although no properties are at risk of supply on an average day, some 100,000 customers would be at risk of short term low pressure at peak demand. Our 2020-25 Business Plan therefore includes £2.4m to address the risk and improve resilience at peak demand.

As part of this investment, we are involved in three Catchment Partnerships which include initiatives to reduce domestic oil pollution for example through the offer of subsidised surveys of old oil tanks and/or subsidised replacement of oil tanks with plastic double bunded tanks. We have also recently installed VOC monitors at all sites at risk from pollution, in order to be able to better monitor the pollution plume and make an informed decision on when the site can be started up again. This is likely to reduce the outage durations of any future pollution events related to oil spills.

Furthermore, we are implementing a new system called Storage and Production Optimisation in Real Time (“SPORT”). The SPORT system will continuously analyse and select the optimum pump combinations from the multiple inter-connected sources we operate to balance reservoirs and meet customer demand. Where outage occurs, the SPORT system will allow automated capability to restart works, and where this is not possible, SPORT will analyse and modify the optimum pump combinations on available pumps. Only where reservoirs cannot be balanced within defined limits will out of hours responses be required.

5.3 Bulk Supplies as Baseline supply

We currently operate two bulk supplies to Southern Water. One is feeding East into their Sussex Zone, with a capacity of 15Ml/d which is available on a 'best endeavours' basis, with a sweetening flow of 1 Ml/d required at all times. Our second bulk supply to Southern Water is from our Source A, sending water West into their Hampshire Zone. It is also up to 15Ml/d with water volumes guaranteed through a reservation basis, implemented between our respective company production teams.

In addition to our current bulk supplies, we are also committed to supplying Southern Water with additional bulk supplies in the future to support their Hampshire zone as they continue to reduce abstraction from their chalk rivers. One of these additional bulk supplies is due to commence in 2024, at a volume of 9 Ml/d. The other will be in association with the development of Havant Thicket, increasing bulk supplies by a further 21 Ml/d in 2029, of which the Bulk Supply Agreement has been delivered as a critical element of the project.

5.3.1 Outturn bulk supplies

For conservative planning purposes, in the Final and Revised WRMP19 plans the exports were assumed to be 15 Ml/d for both annual average and critical period, totalling 30 Ml/d to Southern Water. In 2021-22 we have exported significantly less than the 30Ml/d the plans allow for, as shown in Table 6. This difference has supported our surplus in our outturn supply demand balance.

	WRMP19 2021-22	Outturn value 2021-22
Annual average	30 Ml/d	4.63 Ml/d
Critical period	30 Ml/d	7.55 Ml/d

Table 6: Total bulk supply exports to SWS

The critical period value is defined as being the volume supplied to Southern Water during the peak week (i.e. the week at which total distribution input was at its highest).

5.4 Treatment works losses and operational use as Baseline supply

Treatment losses is the term used to describe water that is taken from the environment, but does not enter supply due to requirements of the treatment process or maintenance and upkeep of the distribution network.

To calculate losses, we subtract the bulk supplies and distribution input values from the total raw water abstracted. Table 7 below shows the numbers used to derive our outturn average and critical period values for 2021-22. Distribution input is detailed further in section 9.

As with the bulk supplies, the critical period is defined as the peak week at which total distribution input was at its highest. The impact of covid on distribution input is explained in section 9.2.

Losses	Annual average Ml/d	Critical Period (Ml/d)
Raw water abstracted	188.66	219.74
Bulk Supplies	4.63	7.55
Distribution Input	177.19	207.54
Treatment works losses and operational use	**6.84**	**4.65**

Table 7: Calculation of outturn treatment works losses and operational use

5.5 Sustainability Schemes as Baseline supply

Portsmouth Water's area of supply includes numerous protected rivers, harbours and coastlines, highlighted in Figure 5.

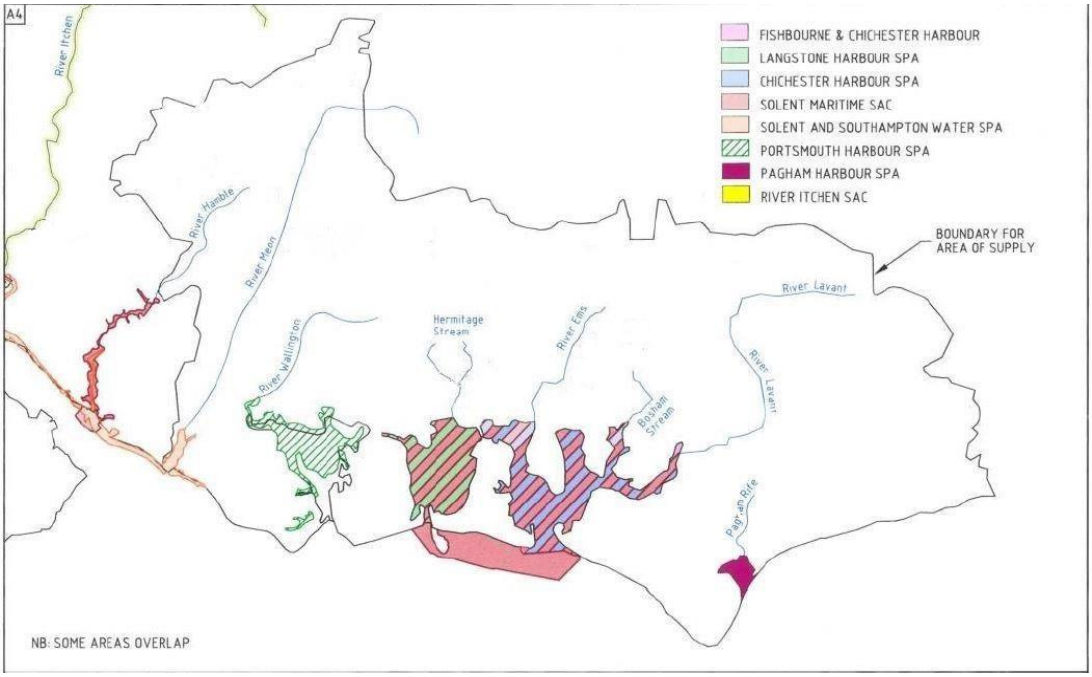

Figure 5: Protected areas within Portsmouth Water's area of supply

The Company has complied with all previous sustainability reductions and has voluntarily reduced a number of abstraction licences in the past.

5.5.1 AMP7 WINEP Schemes

In this section we set out which activities were included in the Water Industry National Environmental Programmes (WINEP) for AMP7 and our progress against our delivery targets.

In 2018, the Environment Agency set out which activities were to be included in our WINEP3. This included three water resource schemes to be undertaken during AMP7. The schemes remain in their investigatory phases, and so have no impact on the DO forecasts of 2021-22. However, they are outlined in the following sections.

Scheme 1; Source F WFD No Deterioration

This WINEP investigation is required to investigate and undertake options appraisal for preventing deterioration of ecological status from flow pressures, in the two waterbodies identified by the EA as being impacted by abstraction at our Source F. In June 2020 we appointed a consultant, Wood, to undertake this WFD No Deterioration investigation on our behalf. Phase 1 of the project was completed which included a summary of previous investigations, a review of impacts of abstraction in the Meon catchment, a review of ecology data, and an assessment of the predicted future abstraction growth from the site.

From previous investigations and an initial review of current data it may be concluded that the river is not adversely impacted by current rates of abstraction. However, it cannot be concluded at this stage that there is no risk of future increases in abstraction within and beyond the Meon catchment that could potentially further reduce river flows in the Meon. As the Meon is already failing the EFI (at Q50 and below), any further increase in abstraction

impact is considered to present a risk of deterioration according to the Environment Agency guidance. Since failures of the EFI do not appear to have manifested in ecological impacts, this might suggest that a local flow target may be more appropriate for the river than the EFI.

During 2021-22 the focus on the Source F WINEP study initially shifted to a review of the Meon catchment as a whole, and then to a holistic (but preliminary) review of licences across the Portsmouth Water supply area. This allowed us to estimate the uncertainty associated with the environmental ambition and emerging licence capping scenarios promoted by the Environment Agency. These estimates are being used within the WRSE regional planning processes and will strongly influence our draft WRMP24.

The delivery date for the Source F WINEP study is the end of March 2025. However, it is possible delivery will need to move to AMP8 to allow the licence to be formally reviewed alongside some of our other licences. This would take place via the AMP8 WINEP process and allow the best value environmental solution(s) across catchments and the wider Portsmouth Water supply area to be identified.

Schemes 2 & 3; River Itchen CSMG & River Itchen Salmon Action Plan

In our annual review 2020-21 we reported how a WINEP investigation was scheduled to be undertaken to assess the impact surface and groundwater abstraction has on the flow of the river Itchen. Alongside Southern Water and South East Water we developed a scope, and commissioned Wood to undertake the assessment during 2020-22. In April 2022, Wood published their first draft report titled 'River Itchen CSMG flow target and Salmon Five Point Approach WINEP investigations'.

During the course of the investigation, stakeholders partook in eight Project Steering Group (PSG) meetings during the Impact Assessment and Options Appraisal stage. The PSG discussed how reducing or ceasing abstraction at certain points along the river would impact flow in the Itchen in order to meet flow standards. Based on provided data, models were run to show the water demand within the catchment and the viability towards achieving flow standards.

It was concluded that a 'light touch' options appraisal is the most appropriate for this WINEP study because its aim was to indicate the scale of the problem and the possible costs and timescales associated with the water resource imports that would be needed to replace local abstractions. Groundwater and river flow models have shown with a high degree of confidence that the flows in the river Itchen are not compliant with either EA EFI ASB3 or Natural England's CSMG environmental river flow standards in the upper reaches of the River Arle SSSI Unit, throughout the Candover Stream SSSI Unit, and in the Middle/Lower Itchen SSSI Units. For standards to be met, licence reduction would have to occur for roughly 40% of the time with greater reduction during periods of low flow. No other types of flow support mitigation are considered to be acceptable as they would not permit the achievement of Natural England's 'natural functioning' Favourable Condition Table conservation objectives.

New water resource strategic schemes are currently under consideration within regional modelling that will inform our WRMP24 (and South East Water and Southern Water's WRMP24s). The water companies could provide additional alternative supply but at high capital and operational costs with significant extra carbon associated with construction, treatment and pumping operations. These strategic schemes may be in operation by 2030-2040 bringing additional supply from Havant Thicket Reservoir, recycled water, new small groundwater schemes and the Thames Transfer Strategic Regional Option (SRO). Planning for both environmental and public water supply resilience will be very important in the face of future climate change and more extreme droughts.

Work continues to investigate other types of holistic catchment mitigation and improved land stewardship which should lead to significant water quality improvements and the creation of more resilient habitats. However, whilst essential for water quality these measures will not generate significant additional water resource or river flows during dry periods. The timescale for any implementation of CSMG targets, associated licence changes, and day-to-day management remains a key question for water company planning, and Environment Agency regulation. For the River Itchen, further detailed work is required to assess how CSMG licencing would be implemented and regulated in real time. In particular, more research and operational trials are needed to explore if and how the 'battery' of water from alternative distant reservoir(s) could be imported regularly and flexibly in response to the variable supply shortfalls from constrained local sources within the catchment.

6 SUPPLY OPTIONS

In this section we discuss the progress made in understanding and delivering the enhanced DO schemes identified in the final WRMP19.

Our Final WRMP19 required a number of supply-side interventions to ensure the supply of our customers and of the bulk supplies we have committed to exporting to Southern Water. Since publishing the Final WRMP19, we have made significant advancements in our understanding of the DO benefits using our Pywr simulation model, and have also had to update the implementation timelines of these schemes. The updated knowledge is accounted for within the Revised WRMP19 May 2022 tables. The differences between the 1 in 200 year benefits are provided in Table 8 below for comparison.

Supply Side Scheme	Final WRMP19			Revised WRMP19 (May 2022 tables)		
	Assumed DO benefit (average) Ml/d	Assumed DO benefit (critical period) Ml/d	Implementation date	Assumed DO benefit (average) Ml/d	Assumed DO benefit (critical period) Ml/d	Implementation date
GW schemes total benefit (maximising DO at Source O, C, H & J)	20.3	22.8	2019-20	13.3	10.5	Source H recently implemented. Source O, C and J to be implemented in 2023-24.
Drought Permit at Source S	8.5	8.5	2017-18	3.6	4.5	2020-21
Havant Thicket winter storage reservoir	23	50	2029-30	21.1	21.3	2029-30
TUBS/NEUBs (at 2021/22)	20.66	43.22	All	16.6	21.5	All

Table 8: Final WRMP19 and Revised WRMP19 supply-side option benefits and implementation (1 in 200 yr)

The following sections provide details on current progress and updated knowledge for each of these supply-side options.

6.1 Maximising DO at Source C, Source H, Source O and Source J

6.1.1 WRMP19 assumptions

DO resilience schemes were proposed at four of our groundwater sites in our Final WRMP19 with proposed solutions to target the following improvements:

- **Source O Water Treatment Works (WTW):** At present, when groundwater levels drop below the adit level, turbidity issues are experienced at this site. This scheme is to mitigate that impact and therefore provide an additional 1.8 Ml/d in a 1 in 20 year drought, increasing the total output in a 1:20 to 5.5 Ml/d. The 1.8 Ml/d applies to the drought conditions on a sliding scale where the target is an ADO of 4.6 Ml/d additional yield for a 1:200 year drought.
- **Source C WTW:** At present, air and turbidity issues are experienced when running the larger borehole pumps; this scheme is to mitigate that impact and therefore provide an additional 4 Ml/d between 1:20 and 1:200 drought conditions.
- **Source H WTW:** Turbidity issues are experienced when running at higher flows. This scheme is to mitigate that impact and therefore provide an additional 2 Ml/d between 1:20 and 1:200 drought conditions.
- **Source J:** This scheme is intended to provide resilience to supplies once the committed bulk transfer to Southern Water from Source A increases from 15Ml/d to 24 Ml/d in 2024-25. The scheme had originally been intended as a straightforward increase in abstraction capability designed to allow the Source J source as a whole to increase output by 12.5 Ml/d, closer to its licensed limit of 22.73Ml/d under drought conditions. Currently the source Deployable Output is limited by the Deepest Advisable Pumped Water Level (DAPWL) in borehole 3, to around 8.5Ml/d under severe drought conditions.

6.1.2 Revised WRMP19 assumptions

In November 2020 we commenced our 'Deployable Output Recovery Scheme' project (AECOM, 2021). The objective of this was to determine the maximum 1 in 200 year deployable output from our Sources O, H and C, utilising the current assets and treatment processes ensuring regulatory and process compliance. The project was completed by AECOM in March 2021 giving us a clearer understanding of what each of the schemes would achieve in a 1 in 200 year drought event.

With respect to Source J, we completed an initial desk study in May 2020, followed by further desk studies, groundwater modelling and a site visit between January and March 2021. Through this programme of work we were able to demonstrate that there is no long term average risk to the Chalk aquifer. We have now progressed negotiations with landowners for the preferred drilling locations and completed the investigation application. The next steps of the programme are:

1) Deliver pilot borehole drilling and step testing in the coming months, including water quality samples during step testing.
2) Carry out a revised feasibility assessment following the yield and water quality testing results from the pilot boreholes, including a review of available versus required treatment capacity.
3) Deliver production borehole drilling and testing, licensing and development of headworks/transfer infrastructure as required.

The estimated benefits for schemes at Sources, O, H, C and J had previously assumed there are no pipeline transfer constraints within our supply network. During autumn 2021 we were able to model the schemes within our Pywr model. This provides a more accurate estimate of scheme benefits by including a representation of our supply network. The results indicate that the combined benefit of the schemes under the DYAA scenario is 5.7 Ml/d in a 1 in 20 year

drought event rising to 13.3 Ml/d in a 1 in 200 year event. The combined benefit of the schemes under the DYCP scenario is 4.4 Ml/d in a 1 in 20 year drought event rising to 10.5 Ml/d in a 1 in 200 year event. The DYCP scenario benefits are lower than originally anticipated because water from the schemes cannot be fully transferred to the parts of our Water Resource Zone where this water is most needed.

The Pywr modelled benefits are used within the Revised WRMP19 tables and they have also formed part of our upload to the regional modelling towards our draft WRMP24.

6.2 Drought Permit at Source S

Source S is our drought permit source, which was estimated to provide 8.5 Ml/d benefit to the DYAA and DYCP scenarios in droughts equivalent to, or worse than, a 1 in 125 year event. The nature of the option remains unchanged from our Final WRMP19. However we have undertaken further work to demonstrate:

- that the source has operated at rates close to those required in the past.
- there is sufficient time to mobilise temporary treatment infrastructure as a drought develops.
- the environmental impact of the drought permit and the necessary monitoring and mitigation.

Furthermore we have used our Pywr model to check for constraints within our supply network. The results indicate that Source S permit may only provide a benefit of up to 4.5 Ml/d under the DYAA and DYCP scenario in droughts equivalent to, or worse than, a 1 in 125 year event.

This is because the water from the Source S permit cannot be fully transferred to the parts of our Water Resource Zone where this water is most needed. The Pywr modelled benefits are used within the Revised WRMP19 tables and the final supply demand balance.

We are working closely with Southern Water on the environmental monitoring to maximise opportunities for joint efficiencies with a source they operate nearby. We have also provided the reports and progress updates to the Environment Agency through our regular meetings.

Further information is available within our final 2022 Drought Plan.

6.4 Havant Thicket winter storage reservoir

Havant Thicket Winter Storage Reservoir is a significant construction project being undertaken as a collaboration between Portsmouth Water and Southern Water. It will provide resilient water supplies to the region, supporting reduced abstraction on chalk rivers. The project has an overall biodiversity net gain and will offer a new community leisure facility for the area.

Planning permission for the reservoir has just been granted and the implementation date of this option has not been adjusted for the Revised WRMP19. However, since publication of the Final WRMP19, there is more clarity on the operational methodology of the completed reservoir and initial assumptions have been revised.

For our June 2021 Revised WRMP19, and based on a simple Pywr model that only contained Havant Thicket with an export to Southern Water, we estimated benefits of 21 Ml/d average and 25 Ml/d critical period up to the 1 in 200 year drought condition. The modelling update in autumn 2021 incorporates a representation of our wider supply network and therefore provides an improved understanding of Havant Thicket yield, which ranges from 16 Ml/d up to 21 Ml/d depending on the scenario and drought severity. The new Pywr model estimates a lower benefit than previously assumed.

The latest Pywr modelled benefits are used within the Revised WRMP19 tables and the final supply demand balance. We have also used our Pywr simulation model to identify a network upgrade option that unlocks further benefit from Havant Thicket. This option has now been included within the regional modelling that will inform our draft WRMP24, although it has not been included within our Revised WRMP19 tables.

In order to be able to fully explore the full range of conjunctive benefits provided by the reservoir, we are currently delivering a project to develop a single Pywr model that incorporates our network and Southern waters South Hampshire zone. This model will be used to inform future June reports as well as both company's WRMP24 and the ongoing development of the Enhanced Havant Thicket Strategic Resource Option.

6.5 Temporary Use Bans and Non-Essential Use Bans

Our Drought Plan describes how we use Temporary Use Bans (TUBs) and Non-Essential Use Bans (NEUBs) to lower the demand for water and conserve supplies as a drought develops.

We have used the regional Pywr simulation model to identify the supply benefit of TUBs and NEUBs. Our Revised WRMP19 now includes this benefit as a supply side option in line with our levels of service.

7 BASELINE DEMAND

In this section we discuss how we have used the latest methodologies to assess baseline demand and applied that view to this report.

Since the publication of our Final WRMP19 in 2019, we have produced an updated demand side forecast to input into the WRSE regional model for the development of the regional resilience plan, and subsequent WRMP24. We have followed the most recent methodologies and used the latest data which has been audited both internally and externally by WRSE. The forecasts included previous outturn values in order to produce forecasts starting prior to 2020. It is therefore appropriate to use this data as the basis for our Revised WRMP19. The base year for the demand forecast in the Revised WRMP19 is 2019-20 and we have used updated methodologies for calculating Per Capita Consumption (PCC) and leakage.

It is important to note that the base year outturn values were pre-covid. Therefore the forecasts do not include any effects from the change in consumption patterns due to the pandemic, which are described further in section 9.2. Due to the uncertainty in future covid impacts on baseline demand, we have included this uncertainty as a component within our target headroom assessment instead of making adjustments to the baseline demand forecast itself.

The profiles below in Figures 6 and 7 show the baseline demand forecasts for the Final WRMP19, and how our updates in approaches, which we summarise in the following sections, have amended demand forecasts for the Revised WRMP19.

NB. For illustrative purposes, in this document we have provided the annual average scenario for a 1:200 year event. Table 9 shows the difference between the Final WRMP19 and Revised WRMP19 forecasts.

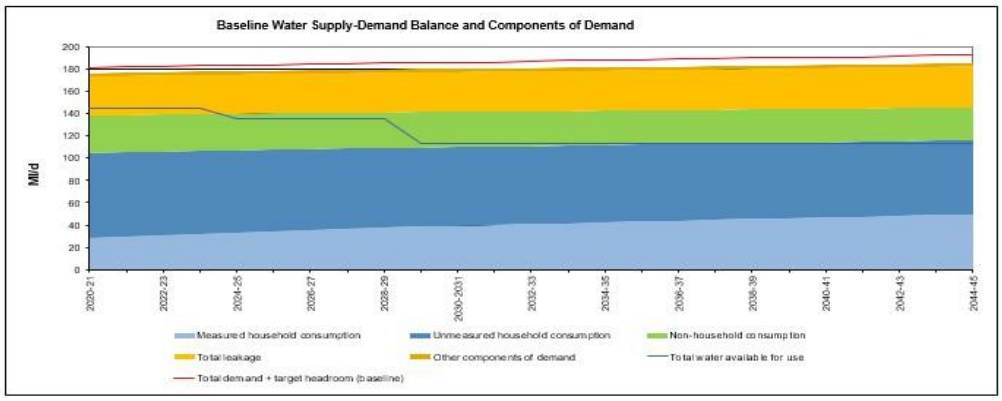

Figure 6: Final WRMP19 - Components of the baseline demand forecast (1 in 200 year)

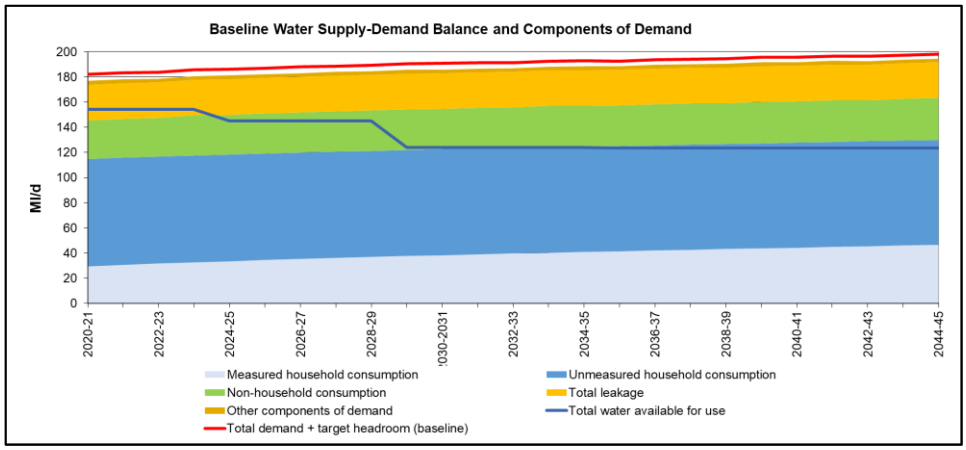

Figure 7: Revised WRMP19 - Components of the baseline demand forecast (1 in 200 year)

	Baseline demand forecast (annual average)	
	Final WRMP19 (Ml/d)	Revised WRMP19 (Ml/d)
2020-21	175.93	176.89
2044-45	185.08	194.69

Table 9: Baseline demand forecast start and end values for Final and Revised WRMP19

The overall baseline demand forecast for our Final WRMP19 rises from 175.93 Ml/d in 2020-21 up to 185.08 Ml/d by 2044-45. Our Revised WRMP19 reflects our latest methodologies and previous outturn values, which results in a starting point of 176.89 Ml/d in 2020-21, rising up to 194.69 Ml/d by 2044-45.

Note the baseline demand forecast for our latest Revised WRMP19 tables has decreased from that presented in our June 2021 Revised WRMP19 report. This is explained further below.

7.1 Baseline Demand scenarios

For our Final WRMP19, we developed forecasts for Normal Year (1 in 2), Dry Year (1 in 20) and Extreme dry year (1 in 200) annual average and critical period drought events. For our June 2021 Revised WRMP19, we also derived demands for the 1 in 80, and 1 in 125 year events so that we can test our ability to meet our agreed levels of service to customers in more granularity.

To derive baseline demand at the different return periods for the June 2021 Revised WRMP19, we utilised both outturn data and stochastically generated DI data. The outturn data was used to produce an estimate of the Normal Year (NY), which is the same approach as for our Final WRMP19. However the stochastic data was then used to characterise rarer events for which there is limited or no experience in our historic record. This was a key difference between the Final and the June 2021 Revised WRMP19 demand forecasts.

The baseline demand forecast for our latest Revised WRMP19 tables has decreased from that presented in our June 2021 Revised WRMP19 report. This reflects an adjustment to ensure compliance with the regulator's water resource planning guideline, which defines the demand forecast as the "forecast dry year annual average demand, before temporary use bans are imposed". Our agreed LoS for temporary use bans is 1 in 20 years and therefore the baseline demand forecast in our 1 in 80 and 1 in 200 year scenarios is now the same as in our 1 in 20 year scenario.

7.2 Properties and population

We generated new forecasts for the June 2021 Revised WRMP19 using the Edge Analytics Bottom-Up approach, which allocates local plan growth according to potential housing development sites, rather than Top-Down which allocated growth according to existing levels of growth. This approach reflects the WRSE methodology and we believe constitutes industry best practice. The methodology is particularly valuable where a local authority is shared between neighbouring water companies. For full details, please refer to the June 2021 Revised WRMP19 report.

7.3 Household consumption as Baseline demand

For our Final WRMP19 we used the 'Variable Flow' (VF) method proposed in the 'WRMP19 Methods – Household Consumption Forecasting' guidance. We retain this methodology for our Revised WRMP19 work, with a number of updated assumptions, including:

- Recognition of the impact of occupancy on consumption i.e. if average occupancy increases, then homes become more efficient and vice versa.
- Climate change impact has been adjusted to the new base year.
- We do not assume any new metering in the baseline scenario as per the revised methodology for WRSE and WRMP24. This differs from our Final WRMP19 where meter optants were included in the baseline. We believe this new approach is more transparent and presents a scenario with no company interventions.

7.4 Non-household consumption as baseline demand

For the Final WRMP19 plan, the Non-household forecast was produced internally at Portsmouth Water. As part of our partnership with WRSE, this forecast has been updated by Artesia. This work, carried out for the whole WRSE region, ensures alignment with the other WRSE companies. Artesia created four core forecasts; Baseline, Low, Central and High. The Central scenario has been adopted for the Revised WRMP19. The Low and High scenario have been used to inform inputs into the headroom analysis (described in section 10).

7.5 Leakage as baseline demand

The latest Environment Agency guidance for WRMP24 states "leakage remaining static from the first year of your plan (2025-26) throughout your whole planning period (unless otherwise agreed by regulators)".

In practice, given no additional company effort, the baseline leakage would rise as assets deteriorated and both the length of the network and the number of supply pipe connections increase with growth (the "natural rate of rise"). In alignment with the guidance, however, we have kept all leakage flat over the entirety of the planning horizon for our Revised WRMP19, starting from 2019-20.

We have adjusted the outturn leakage for the base year of 24.36 Ml/d to the three-year average of 28.36 Ml/d. This 4 Ml/d adjustment has been made to recognise the mild conditions of the preceding winter. Without the adjustment we would be underestimating leakage and total Distribution Input (DI).

8 DEMAND MANAGEMENT OPTIONS

In this section we discuss how we have reviewed our demand options and how that has been used in our Revised WRMP19 work.

8.1 Final WRMP19 options

The demand options selected for our Final WRMP19 for implementation throughout AMP7 and beyond were:

- Household water efficiency programme (partnering approach, home visit)
- Waterwise programme
- Subsidy to customers that purchase water efficient appliances (washing machines and dishwashers, showers and WCs)
- Water saving devices – Retrofitting existing toilets
- Metering on change of occupancy – existing meter pits
- Fixed network of permanent noise loggers connected to telemetry - Tranche 1
- Voids metering
- Water saving devices – spray taps
- Water saving devices – trigger nozzles for hoses
- Smart Meter MNFR Trial
- Voluntary restraint and leakage action
- Mandatory restraint
- Imposition of Drought Direction Restrictions (mandatory commercial restraint)

The demand options selected for implementation in 2025–26 and beyond were as follows:

- Fixed network of permanent noise loggers connected to telemetry - Tranche 2
- Metering on Change of Occupancy – all properties

8.2 Revised WRMP19 options

Our demand options have now been updated to reflect the new basket of options selected by WRSE towards its draft regional resilience plan, and in preparation for our WRMP24.

Our demand management options have been updated in our Revised WRMP19 to reflect our current strategies, which are based on our WRMP19 starting point (2020-21) and best available information going forwards. The options are named as follows for the Revised WRMP19:

- Optant metering
- Change of occupancy metering
- Universal metering

- Household Water Efficiency Programme
- Non-House Hold (NHH) Water Efficiency
- Leakage reduction (AMP7)
- Leakage reduction (Long Term)

The benefit of these options is included within the final supply demand balance of the Revised WRMP19. The options and benefits have not changed since our June 2021 Revised WRMP19, with the exception of the 'Leakage reduction (Long Term)' option, which was found to contain an error. The universal metering option is also now delivered over 10 years instead of 15 years.

9 DISTRIBUTION INPUT

Our distribution input (DI) is the amount of water we put into our network each day and is our headline measure of demand. In this section we detail our Revised WRMP19 final plan forecast demand against our outturn demand for water in 2021-22. We consider distribution input, and its components, including; household demand, water efficiency, non-household demand, PCC and leakage. The impact of Covid on our outturn demand is also considered.

For most outturn years the 'Macro Components' of demand; unmeasured demand and measured demand, do not add up precisely to the measured Distribution Input (DI). The Annual Review process requires any imbalance to be reconciled using the Maximum Likelihood Estimation (MLE) methodology. All outturn data provided in this review are the post MLE values and are provided in the data tables in Appendix A using the new data return guidelines[4].

Outturn results are compared against the Revised WRMP19 dry year (1 in 20 year) forecasts. This is aligned with the EA guidance for the Annual Review which requires comparison against dry year values.

9.1 Outturn distribution input

A summary of how our DI compared to our Revised WRMP19 forecast is shown in Table 10 below.

	Revised WRMP19 Forecast 2021-22		Outturn 2021-22	
	Annual average Ml/d	Critical Period Ml/d	Annual Average Ml/d	Critical Period Ml/d
Distribution Input	174.50	215.79	177.19	207.54

Table 10: Outturn Distribution Input compared to Revised WRMP19 DI

It is clear from the outturn values that our annual average outturn DI has exceeded that planned in 2021-22. The year was not considered a 'dry year', yet the DI is higher than that forecast for a dry year. We believe this is primarily due to the impacts of Covid on customer consumption which is explained in detail below, and in the other relevant sections in this report.

9.2 Impact of the weather and Covid on distribution input

In this section we outline the analysis we have undertaken to investigate how Covid impacted demand and the various components. The 'expected' DI values stated and shown in the figures refer to the expectations from our demand model, rather than the Revised WRMP19 forecast.

[4] Technical guidance for completion of WRMP annual review data return, Environment Agency, March 2022

Figure 8 below looks across the year. We have observed a 2% increase in Distribution Input compared with pre-Covid demand. This is estimated to be fully owing to Covid impacts. Increased household consumption was predominantly offset by a reduction in non-household demand until the autumn. It is also noted that benign weather in 2021-22 reduced the peak demand relative to the previous year.

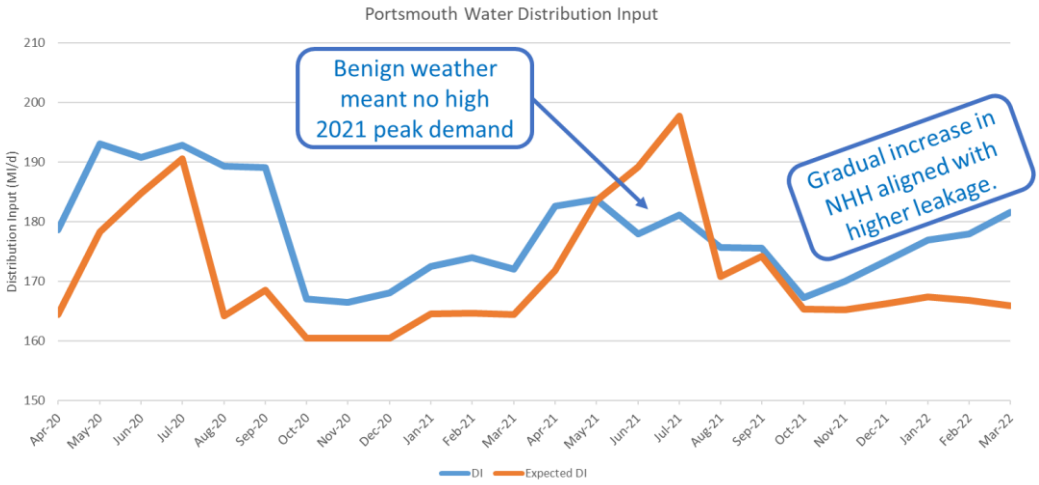

Figure 8: Outturn Distribution Input

9.3 Leakage contributing to distribution input

In this section we cover our leakage performance. Leakage is an element of demand that is mostly in the control of companies, but is also subject to the impact of weather, typically extremes of weather that cause some amount of ground movement.

A summary of how our outturn leakage compared to our Revised WRMP19 forecast is shown in Table 11 below.

	Revised WRMP19 Forecast 2021-22		Outturn 2021-22	
	Annual average Ml/d	Critical Period Ml/d	Annual average Ml/d	Critical Period Ml/d
Leakage	25.34	25.34	26.93	26.93

Table 11: Outturn 2021-22 leakage compared to Revised WRMP19

Despite the increase in outturn leakage compared with the previous year, we remain in a good position to achieve our leakage targets throughout AMP7. A recovery plan is in place to reduce leakage to pre-Covid levels.

Since missing our target in 2017-18, our leakage recovery plan has reduced leakage by over 13Ml/d through improved efficiencies and additional expenditure. We are fully committed to continuing to reduce leakage, and will do so by:

- Expanding our network of acoustic monitors;
- Continuing our innovative work on micro-pressure logging and AI software; and,
- Continuing to enhance our ability to run a calm network through the creation of a company-wide Digital Twin network model.

9.3.1 Impact of the weather and covid on leakage

There have been no impacts on leakage due to covid. However, we did see a 1% overall increase in leakage compared to what we would have expected, due to the cold winter weather. Figure 9 shows the expected and actual levels of leakage throughout the year.

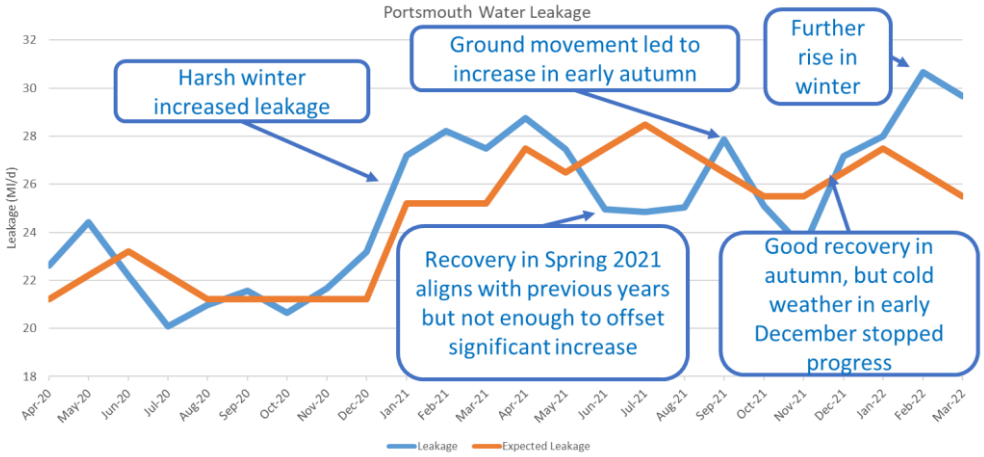

Figure 9: Impacts of weather and covid on leakage

9.4 Household Per Capita Consumption contributing to distribution input

In this section we cover our PCC performance, how it compares to our Revised WRMP19 dry year forecast for 2021-22 and the reasons for variation. Table 12 provides an overview of the figures.

Per capita consumption (l/h/d)	Revised WRMP19 Forecast 2021-22		Outturn 2021-22	
	Annual Average	Critical Period	Annual Average	Critical Period
Measured Household	137.00	175.00	144.61	173.95
Unmeasured Household	163.00	227.00	167.02	213.67
Average Household	**154.31**	**209.60**	**160.30**	**201.70**

Table 12: Outturn PCC compared to Revised WRMP19 dry year

Our average measured and unmeasured PCC is between 4 and 8 l/h/d higher than forecast, leading to an average PCC of 6 l/h/d higher for 2021-22 compared to our Revised WRMP19.

Our critical period measured and unmeasured PCC is between -1 and -13 l/h/d lower than forecast, leading to an average critical period PCC of 8 l/h/d lower for 2021-22 compared to our Revised WRMP19.

Despite missing our annual average targets the outturn values reflect a significant improvement compared to 2020-21, when average household PCC was 15 l/h/d higher than target.

The following sections explain why we have not met PCC targets.

9.4.1 Summary of covid impacts on PCC

In our 2020-21 annual review we identified PCC to be the main performance commitment which has been affected by Covid. In general, our more rural and affluent customers are located in the northern part of our supply area, and their Per Household Consumption (PHC), is typically about 400 litres per property per day, compared to those in more urban and coastal customers with demand often less than 300 litres per day per property.

In 2020-21, we saw general increases in demand, with the largest increases focussed in urban areas, Portsmouth in particular, but also Gosport and Bognor. This reflected the impacts of the Covid lockdown which prompted significant changes to the working patterns of the population. Urban areas tend to have more working aged people living in them and the lockdown saw many staying at home who would normally be at their place of work.

Figure 10 illustrates how the previous reporting year's PHC increased as well as geographical differences throughout our supply area.

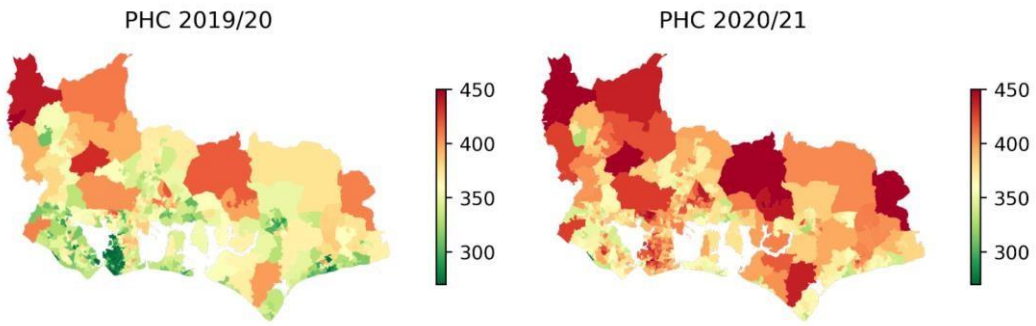

Figure 10: Geographical and volumetric difference in PHC between 2019-20 and 2020-21

In the current reporting year we saw an 8% increase in household demand compared to what we would have expected based on our demand model in 2021-22, and we attributed all of the increase to Covid impacts given the benign weather conditions.

We will continue to closely monitor this issue and engage with Ofwat and other stakeholders to ensure we all understand what the impacts of Covid have been.

Figure 11 illustrates how household demand changed throughout the reporting year.

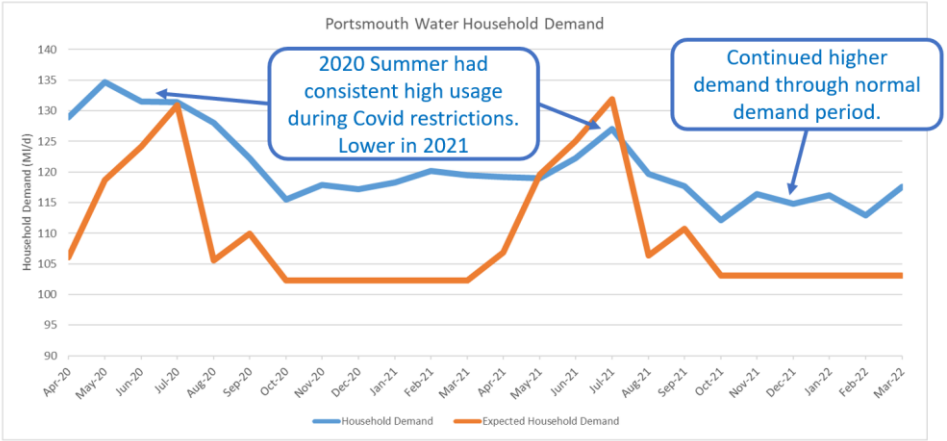

Figure 11: Household demand and the impacts of covid in 2020-21 and 2021-22

9.4.2 Metering and water efficiency

Over 2021-22, the number of metered properties on our network has risen by 2,255. Our plans to install meters were hampered due to several limitations. Firstly, impacts associated with Covid including staff absences and adhering to social distancing rules to protect our customers. Secondly, a lack of uptake from customers to voluntarily ask for meter installation and lastly, limitations within our Change of Occupier scheme where should a customer vacate an unmetered property, they should inform Portsmouth Water allowing us to install a water meter before the new occupier moves in.

In last year's Annual Review 20-21 we reported that we were due to launch a smart meter challenge for around 50 customers in the Portsmouth Water area. We have implemented this scheme however, invitations for the challenge were only accepted by 27 customers. As a result, we have installed 27 "Jellyfish" smart devices to new meters installed for customers. A Jellyfish device is attachment to the meter which reads meters automatically and transfers real time data to an information network. Over the course of the trial customers have not been billed using smart meter readings, but we have used the data to explore ways of talking to customers about their consumption in a 'safe space' and have identified a number of customer side leaks. We have also uncovered lots of learning points through this small scale trial, which will inform the progressing business case for the provision of a universal metering programme in future years.

Across the past year we have had 3,727 new customers sign up for the Get Water Fit scheme. This is a mobile friendly platform run by Save Water Save Money where customers can complete a survey on their household usage, order free water saving devices and complete daily challenges to reduce consumption. Of these 3,727 customers, 657 or 17% took part in water efficiency challenges and found that they saved around 989 litres per day. This equates to around 1.5 l/h/d. Early indications suggest that if all of our domestic customers were to sign up to this scheme, we could reduce demand by as much as 1.1 Ml/d.

Our aim is to get 10,000 customers signed up to the Get Water Fit service by March 2023.

Across 2022-23 we are planning to increase customer engagement within water efficiency schemes. With the assistance of Advizzo we are set to launch a scheme for 20,000 of our customers residing in metered properties. This involves the development of an accessible platform which gives customers insights into their water consumption as well as sharing advice as to where they can change behaviours in order to reduce usage.

9.4.3 Water stress status

Portsmouth Water was previously in an area of 'moderate water stress' and therefore unable to pursue compulsory metering. Due to our relatively low level of meter penetration, since 2005 the Company has encouraged optional metering and required all new properties to be metered.

The Environment Agency has recently reassessed which water companies are under serious water stress, defined in the regulations as where 'the current household demand for water is a high proportion of the current effective rainfall which is available to meet that demand. Or, the future household demand for water is likely to be a high proportion of the effective rainfall which is likely to be available to meet that demand'.

The final classification (1 July 2021) has confirmed that we have now moved from an area of 'moderate' to 'serious' water stress. This will allow us to target water efficiency measures in those areas of greatest need and greatest potential benefit. This would be done in our next

Water Resource Management Plan through compulsory metering, if it is shown to be both supported by customers and cost beneficial.

9.5 Non-Household Consumption contributing to distribution input

We have seen a 13% reduction in non-household demand compared to what we would have expected from our demand models. We have attributed all of this decrease to Covid impacts, with benign weather conditions.

Covid has resulted in a reduction of c.10 Ml/d in demand during periods of enforced restrictions. The 2021 peak period saw an increase in demand again due to added UK based tourism prompted by the wide restrictions on international travel (staycations), although the peak was lower than in 2020 due to the benign weather conditions. We have seen a gradual bounce-back in demand as restrictions eased in 2021-22, with usage almost back to pre-Covid levels. Figure 12 illustrates the variations in non-household demand throughout the year.

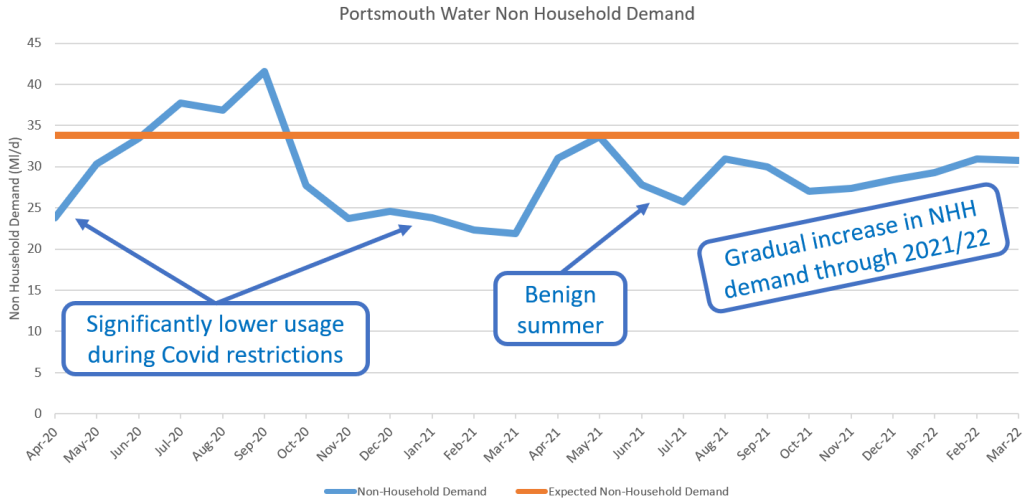

Figure 12: Non-household demand and the impacts of covid

10 HEADROOM ASSESSMENT

In this section we discuss the impact our work on the revised WRMP19 project has had on our understanding of the headroom we need to maintain.

10.1 Target Headroom

In accordance with the Water Resources Planning Guidance, the supply-demand balance includes a margin between supply and demand to allow for uncertainties inherent within the supply and demand forecasts. This margin is known as 'headroom'. The headroom value determined for each year across the planning horizon is termed the target headroom allowance. The aim of calculating a target headroom allowance is to provide a reasonable margin to cover the combined impact of factors leading to uncertainty on the supply-demand balance at a defined level of risk.

The standard methodology used for the Final WRMP19 includes 13 uncertainty factors:

- Vulnerable Surface water licences
- Vulnerable Groundwater licences
- Time Limited Licences
- Bulk Imports

- Gradual Pollution
- Accuracy of Supply-Side Data
- Single Source Dominance
- Impact of Climate Change on Deployable Output
- New Sources
- Accuracy of Sub-Component Demand Data
- Demand Forecast Variation
- Impact of Climate Change on Demand
- Demand Management Measures

We previously updated the target headroom allowance for the June 2021 Revised WRMP19 to take into account the new baseline demand and supply forecasts. This was achieved using the new Python based headroom model, which includes a further three factors to enhance accuracy:

- Demand uplift Uncertainty
- Non-household consumption
- Natural Water Efficiency Variation

We have further updated the target headroom allowance in 2022 to follow a new WRSE methodology, which incorporates the uncertainty associated with future Covid impacts. Our Covid component makes use of information presented within the Artesia collaborative impact of COVID 19 on consumption report for household and non-households.

As a result of this work, we have revised our view on headroom. Table 13 below illustrates the comparison between our Final WRMP19 and latest Revised WRMP19, for the start and end of AMP7 in a dry year for comparative purposes only.

Headroom	WRMP19 final Ml/d		Revised WRMP19 Ml/d	
	2019-20	2024-25	2019-20	2024-25
Dry year annual average (Ml/d)	5.3	5.6	4.89	4.95
Dry year Critical Period (Ml/d)	7.1	7.7	5.66	5.74

Table 13: Target headroom allowance final WRMP19 and Revised WRMP19

The results show that we have now decreased our target headroom for the Revised WRMP19. The methodology and results will be included within our draft WRMP24, which is out for public consultation this autumn.

11 SUPPLY-DEMAND BALANCE – 1 IN 20 DRY YEAR SCENARIO

This section describes the overall summary of the 2021-22 supply-demand balance situation, taking into account our performance for the year and comparing this against our Revised WRMP19 **dry years** (i.e. 1 in 20 year drought) scenario, as per the requirements of the guidance.

11.1 Forecast Revised WRMP19 and outturn supply-demand balance – Dry Year scenario

Using the outturn values described throughout this report, the final dry year supply-demand balance has been calculated for both annual average (Table 14) and critical period (Table 15) scenarios for 2021-22. The outturn supply-demand balance shown here is using the guidance definitions for each of the components (e.g. actual bulk supply figures).

Annual Average	Revised WRMP19 Forecast 2021-22 (Ml/d)	Outturn Values 2021-22 (Ml/d)
Final Plan Deployable Output	229.46	227.56
Outage	6.70	7.80
Treatment works losses and operational use	2.40	6.84
Water Available For Use in a Dry Year	**220.36**	**212.92**
Potable water exported (bulk supplies to SWS)	30.00	4.63
Total Water Available for Use	**190.36**	**208.29**
Distribution Input	174.50	177.19
Target headroom	5.16	5.16
Supply Demand Balance	**10.7**	**25.94**

Table 14: Annual Average supply-demand balance for Revised WRMP19 and Outturn 2021-22

Critical period	Revised WRMP19 Forecast 2021-22 (Ml/d)	Outturn Values 2021-22 (Ml/d)
Final Plan Deployable Output	286.1	283.5
Outage	6.40	9.12
Treatment works losses and operational use	2.40	4.65
Water Available For Use in a Dry Year	**277.3**	**269.73**
Potable water exported (bulk supplies to SWS)	30.00	7.55
Total Water Available for Use	**247.3**	**262.18**
Distribution Input	215.79	207.54
Target headroom	5.89	5.89
Supply Demand Balance	**25.62**	**48.75**

Table 15: Critical period supply-demand balance for Revised WRMP19 and Outturn 2021-22

Table 14 and Table 15 show how our performance in 2021-22 affected our supply-demand balance, and how this compares to our Revised WRMP19.

The conclusion is that we have maintained a positive supply-demand balance, so customers were not at risk in either the annual average, or critical period scenarios. However it is recognised that if Southern Water had taken the full 30 Ml/d bulk supply throughout the year, the outturn annual average supply-demand balance would have been close to zero i.e. finely balanced.

Our Annual Review normally reports on the supply-demand balance index (SDBI), previously known as security of supply index (SOSI). This metric is an indication of whether our customers would have been at risk if 2021-22 was a 'dry year', with a 1 in 20 year return period and is calculated by using the outturn values, with the forecast Revised WRMP19 dry year DI.

The impact of Covid on our annual average DI meant that our outturn DI was in fact larger than our forecast 'dry year' DI in our Revised WRMP19. Therefore, the usual method of calculating SDBI, does not work in this instance.

12 SUPPLY-DEMAND BALANCE – 1 IN 200 YEAR SCENARIO

The Annual Review guidance does not require that we report on our 1 in 200 year supply demand balance in terms of our outturn values. However, it is important that we outline our supply-demand balance position which we have presented in our Revised WRMP19 tables, resulting from the changes to each of the components as described throughout this review. This section provides a summary of the results.

Our previous June 2021 Revised WRMP19 analysis identified that the 1 in 200 year and the 1 in 80 year events represent the most challenging scenarios. In the 1 in 80 year event (which is comparable to the worst historic drought on record) we had a small headroom deficit until our DO resilience schemes are delivered. However, following updates and corrections to our baseline demand forecast, DO, demand and supply side options, and headroom during the previous year, our latest Revised WRMP analysis no longer has a deficit for the 1 in 80 year event.

Nonetheless, the situation is different for the 1 in 200 year scenario. Table 16 below is a snapshot of the Revised WRMP19 average annual final supply-demand balance for the 1 in 200 year scenario (see bottom row). This shows that with the adjustments we have made due to advancements in methodologies and knowledge, we would be in headroom deficit for 2022-23 and 2023-24 if we experienced a 1 in 200 year drought scenario i.e. our risk and uncertainty allowance for the supply demand balance is almost fully used. Whilst of some concern, this is an improved position relative to that estimated within our June 2021 Revised WRMP19.

The orange cell colour refers to a 'headroom' deficit, where we have some available headroom, but not enough to maintain the target. The red cell colour represents deficits where there is no headroom available.

Revised WRMP19 Annual Average (Ml/d)	2020-21	2021-22	2022-23	2023-24	2024-25
Distribution input	175.05	174.50	173.70	174.15	173.50
WAFU (own sources)	204.49	204.46	204.42	204.39	217.65
Total WAFU	174.49	174.46	174.42	174.39	178.65
Target headroom	5.25	5.16	5.05	5.05	4.95
Available Headroom	-0.55	-0.04	0.72	0.24	5.16
Supply demand balance	**-5.80**	**-5.20**	**-4.33**	**-4.81**	**0.21**

Table 16: Revised WRMP19 1 in 200 average supply-demand balance

Table 17 below is the same scenario but in the critical period. Following updates and corrections to our baseline demand forecast, DO, demand and supply side options, and headroom during the previous year, our latest Revised WRMP analysis no longer has a deficit for the critical period 1 in 200 year event.

Revised WRMP19 Critical Period (Ml/d)	2020-21	2021-22	2022-23	2023-24	2024-25
Distribution input	216.16	215.79	215.01	215.34	214.61
WAFU (own sources)	255.70	255.60	255.50	255.40	265.80
Total WAFU	225.70	225.60	225.50	225.40	226.80
Target headroom	6.00	5.89	5.81	5.80	5.74
Available Headroom	9.54	9.81	10.49	10.06	12.19
Supply demand balance	**3.54**	**3.92**	**4.68**	**4.26**	**6.45**

Table 17: Revised WRMP19 1 in 200 critical period supply-demand balance

12.1 Mitigation and monitoring measures

We would like to take this opportunity to reassure our customers, regulators and stakeholders that we are doing everything within our capabilities to safeguard the service to our customers and the regional supplies to Southern Water.

We have been exploring mitigation measures and monitoring with the Environment Agency and Southern Water during 2021 to address the residual risk within our 1 in 200 year scenario. These are outlined below.

12.1.1 Pywr modelling of the AMP7 schemes

We continue to undertake further work to understand and optimise the benefit of our AMP7 schemes through the Pywr model. Pywr allows us to explore the DO benefits at a network and water resource zone level to determine whether we can readily increase the DO benefits, and where in the network this would be most beneficial. It is thought that there may be some 'locked in DO', which could be released with appropriate network solutions. This would allow existing water available in the system to reach areas of the network which currently experience unsatisfied demand within the model– and therefore result in a deficit being recorded in the tables.

This workstream has already led to the identification of a new network option to unlock DO, which is now being considered as a feasible option in the development of our WRMP24.

12.1.2 Explore access to additional supplies of water

We have reviewed the capability of our groundwater sources and improved our understanding of whether they could produce more water through the removal of constraints on abstraction.

We sought the Environment Agency's views on several alternative proposals to ensure that we considered all available options. For example, the transfer of licensed quantities or the implementation of additional drought permits. Our latest Pywr modelling has now demonstrated that the options are unlikely to significantly improve the supply demand balance. This is because there are no options that would help the 'pinch points' within our supply area due to network constraints.

We plan to continue our discussions with the Environment Agency and reconsider this type of mitigation option if new information arises. Should this type of mitigation measure progress, it will need to be tested within the Environment Agency's regional groundwater model to understand the environmental impacts.

12.1.3 Enhanced monitoring of the drought condition

The Revised WRMP19 has demonstrated that we may be slightly more vulnerable to a severe drought than previously understood. Monitoring data presented in Figure 2 demonstrate that we ended the reporting year with groundwater levels below the long term average. There is now a slightly higher risk that a severe drought could develop over the next two years if we do not receive the normal groundwater recharge to our aquifers.

We do not believe the risk of the headroom deficit revealed in the reworked tables is immediate. However, we will continue to monitor groundwater levels to understand the risks to our supply demand balance and provide updates to our environmental regulator on a frequent basis.

12.1.3 PCC recovery plan

Currently our customer PCC is higher than the projections we made in the Final WRMP19 and also above the levels set in our regulatory performance commitment. As described in previous sections, in part this is due to the impact Covid has had on consumption patterns over the last 2 years, but is also a result of slow starts to a number of our planned initiatives.

Both the WRMP and our Ofwat target require us to reduce PCC by 5% in the course if this AMP, with the WRMP requiring us to continue to make savings into the future beyond that. The bullet points below summarise the interventions and initiatives we are undertaking to influence PCC and recover our performance in line with regulatory commitments and the WRMP (see Figure 13). These actions also serve as mitigation measures for the residual headroom deficits within our Revised WRMP19.

Following a cost benefit review of the effectiveness of a number on interventions we have selected a suite of activity we feel represents our most influential mix of activity, whist also providing value for our customers. These solutions are:

- **Intensified promotion of our GetWaterFit platform:** We are seeking to get 25,000 of our customers to sign up to our GetWaterFit platform to encourage water efficiency in their households by the end of the plan period (10,000 by March 2023). The platform provides customers with free access to water saving devices, tailored to their needs, and gameification of personal and household water efficiency challenges. In addition the platform provides incentivisation through community support initiatives.
- **General broadcast messages:** We are looking to engage with more of our customers through re-designing and increasing customer engagement activity around water efficiency, both seasonally and in line with national campaigns. We will widen the number of channels previously used including banners and merchandise at our community events, scheduled posts on our social media pages, advertorials in local publications and **i**ncreased use of video / dynamic content online.
- **Tailored communications: High consumption alerts:** We will seek to engage directly with customers who have increased their water use between billing cycles. We will proactively contact any currently metered customers who have exhibited a rise in historical consumption of over 10%. We will offer water efficiency advice, promote the free gadgets available through GetWaterFit and our leak detection customer support package.
- **Metering**: We will continue to support customers who request to have a water meter fitted to their property and will continue to insist all new houses built in the region are fitted with a water meter. In addition we have introduced a 'Change of Occupier' metering programme that will deliver 27,500 newly metered customers by April 2025.
- **Smart metering trial:** We will conclude our 'Club50' smart metering project that is retrofitting "jellyfish" smart devices onto standard household meters making them smart. Customers sign up to the challenge through the Get Water Fit website and take advantage of the services such as daily water efficiency challenges, order free water efficiency devices and receive advice and support from a water saving expert. Participants will also receive monthly updates from us which will tell them how much they have used month on month as well as any potential savings. We will include water saving tips and important motivational messages focusing on benefits to water efficiency that relate to environment, financial savings and social responsibility. We will work with our customers on the trial to learn which messages drive are most impactful and drive the most change. Each customer will take part in 6 monthly surveys which will help us to review the success of the trial.
- **Future innovations & Technology:** We will look to partner with a provider of one of the household leak detection devices currently commercially available on the market. We would seek to make a number of devices available free of charge to customers we know are using above average volumes of water. We would hope the use of such a device might provide

insight to the customer allowing them to possible adjust their water use habits and provide assurance against household leakage being a factor in their high levels of consumption.

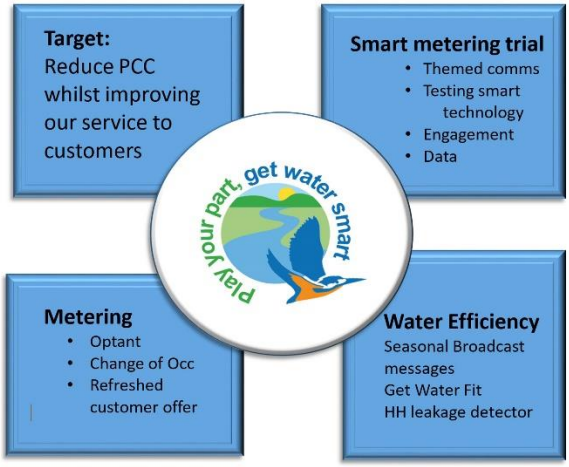

Figure 13: Summary of our PCC recovery strategy

12.2 Next steps

Planning for a 1 in 200 year drought event provides future resilience and, as we have committed to providing a further bulk supply to Southern Water with water available up to a 1 in 200 year event, it is appropriate to undertake planning based on this event.

The Revised WRMP19 final supply demand balances demonstrate that we are no longer meeting our target headroom in the 1 in 200 year annual average scenario (between now and 2023-24).

Whilst the risk of a 1 in 200 year event occurring within the next few years is low, as they take multiple dry winters to evolve to such a severity, we will continue to progress the mitigation measures described above during the rest of AMP7, in parallel with ensuring the development of a robust WRMP24 for 2025 and beyond.

13 FORWARD LOOK

As we look forwards, we have some challenges to resolve around our resilience in extreme dry weather events in the future. We do not perceive there to be a significant risk at this point in time, but we are working hard on the mitigation measures outlined in Section 12 to minimise the risk.

We also recognise the importance of delivering our remaining AMP7 schemes to ensure a healthy starting position for WRMP24. There will be a key decision point this autumn with respect to our Source J scheme (and associated additional bulk supply to Southern Water), because we will have an improved understanding of potential yield from our on-site investigations.

We will continue to work closely alongside the Environment Agency via our on-going fortnightly and quarterly meetings, which provide regular opportunities to discuss our progress, to highlight any risks and concerns. This includes making steps towards addressing the Environment Agency's new licence capping policy, including identification of the associated

environmental investigations and options appraisals that may be required in the AMP8 WINEP (2025 to 2030).

We are also committed to working with Southern Water throughout the planning process to ensure that we do everything we can to best protect the security of supply. As well as ad hoc meetings when necessary, we have regular quarterly meetings set up, where we are able to discuss progress, risks and mitigations that arise as we continue to develop our WRMP24. We also have an on-going project with Southern Water to develop a joint Pywr simulation model for our supply areas in Hampshire to allow improved understanding of risks and potential solutions, which should be available for testing scenarios in the autumn.

Portsmouth Water is committed to continuing full participation with Water Resources South East (WRSE) in the development of the multi-sector regional plan. The emerging plan was consulted upon in January 2022 and we are currently supporting WRSE in the development of a Best Value Plan that will shape our draft WRMP24. Both the draft regional plan and draft WRMP24 will be consulted on this autumn.

14 DATA TABLES

The data tables are based on outturn data which has been adjusted using the MLE process to achieve a water balance. For this Annual Review, the tables have been provided in Appendix A for average and peak conditions.

APPENDIX A

WRMP ANNUAL REVIEW DATA RETURN - WATER BALANCE COMPONENTS

ANNUAL AVERAGE

Water Company: Portsmouth Water
Number of resource zones: 1
Year of data submission: 2021/22
Reporting against WRMP: Revised WRMP19

Row numbering in line with WRMP structure	Component	Derivation and type of data	Units	DP	Data requirement	Water company total data
	SUPPLY					
	Resources					
1_{AR}	Raw water abstracted	Input outturn data	Ml/d	2dp	Required	188.66
2_{AR}	Raw water imported (in the reporting year)	Input outturn data	Ml/d	2dp	Required	0
3_{AR}	Potable water imported (in the reporting year)	Input outturn data	Ml/d	2dp	Required	0
5_{AR}	Raw water exported (in the reporting year)	Input outturn data	Ml/d	2dp	Required	0
5.1_{AR}	Non potable water supplied	Input outturn data	Ml/d	2dp	Required	0
6_{AR}	Potable water exported (in the reporting year)	Input outturn data	Ml/d	2dp	Required	4.63
7_{AR}	Deployable output	Input dry year figure	Ml/d	2dp	Required	227.56
12AR	Water Available For Use (own sources)	(Deployable Output + changes to DO) - (Treatment works losses and operational use + outage experienced).	Ml/d	2dp	Required	212.92
13AR	Total Water Available For Use	WAFU own sources + (total water imported) - (total water exported). Total WAFU is based on maximum contractual volumes as stated in WRMP19.	Ml/d	2dp	Required	182.92
	Process Losses					
9_{AR}	Treatment works losses and operational use	Input outturn data	Ml/d	2dp	Required	6.84
10_{AR}	Outage experienced	Input outturn data	Ml/d	2dp	Required	7.8
	DEMAND					
11_{AR}	Distribution input (in reporting year)	Outturn data for: Total household and non-household consumption + water taken unbilled + distribution system operational losses + total leakage	Ml/d	2dp	Required	177.19
	Consumption					
23_{AR}	Measured non household - consumption	Input outturn data	Ml/d	2dp	Required	29.05
24_{AR}	Unmeasured non household - consumption	Input outturn data	Ml/d	2dp	Required	0.61
25_{AR}	Measured household - consumption	Input outturn data	Ml/d	2dp	Required	31.95
26_{AR}	Unmeasured household - consumption	Input outturn data	Ml/d	2dp	Required	85.50
29_{AR}	Measured household - pcc	Outturn data: (Measured household consumption * 1,000,000) / (measured household population * 1,000)	l/h/d	0dp	Required	144.61
30_{AR}	Unmeasured household - pcc	Outturn data: (Unmeasured household consumption * 1,000,000) / (Unmeasured household population * 1,000)	l/h/d	0dp	Required	167.02
31_{AR}	Average household - pcc	Outturn data: (Measured and unmeasured household consumption * 1,000,000) / (measured and unmeasured household population * 1,000)	l/h/d	0dp	Required	160.3
32_{AR}	Water taken unbilled	Input outturn data	Ml/d	2dp	Required	2.62
33_{AR}	Distribution system operational use	Input outturn data	Ml/d	2dp	Required	0.52
	Leakage					
34_{AR}	Measured non household - uspl	Input outturn data	Ml/d	2dp	Required	0.6
35_{AR}	Unmeasured non-household - uspl	Input outturn data	Ml/d	2dp	Required	0.05
36_{AR}	Measured household - uspl	Input outturn data	Ml/d	2dp	Required	5.07
37_{AR}	Unmeasured household - uspl	Input outturn data	Ml/d	2dp	Required	7.11
38_{AR}	Void properties - uspl	Input outturn data	Ml/d	2dp	Required	0.4
39_{AR}	Distribution Losses	Input outturn data	Ml/d	2dp	Required	13.7
40_{AR}	Total leakage	Outturn data: Total USPL + distribution losses	Ml/d	2dp	Required	26.93
	CUSTOMERS					
	Properties					
42_{AR}	Measured non-household - properties	Input end of reporting year data	000's	3dp	Required	12.054
43_{AR}	Unmeasured non-household - properties	Input end of reporting year data	000's	3dp	Required	1.503
44AR	Void non households - properties	Input end of reporting year data	000's	3dp	Required	2.459
45_{AR}	Measured household - properties	Input end of reporting year data	000's	3dp	Required	102.222
45.7_{AR}	Measured void household - properties	Input end of reporting year data	000's	3dp	Required	2.293
46_{AR}	Unmeasured household - properties	Input end of reporting year data	000's	3dp	Required	198.505
47_{AR}	Unmeasured void household - properties	Input end of reporting year data	000's	3dp	Required	4.712
48_{AR}	Total resource zone properties (inc voids)	End of reporting year data : Total non-household properties + total void non-household properties + total household properties + total void household properties	000's	3dp	Required	323.748
	Population					
49_{AR}	Measured non-household - population	Input end of reporting year data	000's	3dp	Required	12.598
50_{AR}	Unmeasured non-household - population	Input end of reporting year data	000's	3dp	Required	1.571
51_{AR}	Measured household - population	Input end of reporting year data	000's	3dp	Required	220.913
52_{AR}	Unmeasured household population	Input end of reporting year data	000's	3dp	Required	511.948
53_{AR}	Total resource zone population	End of reporting year data: Unmeasured and measured household population + Unmeasured and measured non-household population	000's	3dp	Required	747.03
	Metering					
57_{AR}	Total measured household metering penetration (incl. voids)	Outturn data: Measured household properties exc. voids / (measured household properties exc. voids + unmeasured household properties exc. voids) + measured and unmeasured household void properties)	%	2dp	Required	33.22
57.1	Total households with a meter installed	Input outturn data (See technical annex for guidance)	%	2dp	Optional	
	Total numbers of household meters installed	Input outturn data	000's	3dp	Required	2.255
	SUPPLY-DEMAND BALANCE					
16AR	Target headroom	Input adjusted reporting year figure or dry year WRMP	Ml/d	2dp	Required	5.16
18AR	Observed supply-demand balance (in reporting year)	(Total WAFU - DI) - target headroom	Ml/d	2dp	Required	0.57

WRMP ANNUAL REVIEW DATA RETURN - WATER BALANCE COMPONENTS

CRITICAL PERIOD

Water Company: Portsmouth Water
Number of resource zones: 1
Year of data submission: 2021/22
Reporting against WRMP: Revised WRMP19

Row numbering in line with WRMP structure	Component	Derivation and type of data	Units	DP	Data requirement	Water company total data
	SUPPLY					
	Resources					
1_{AR}	Raw water abstracted	Input outturn data	Ml/d	2dp	Required	219.74
2_{AR}	Raw water imported (in the reporting year)	Input outturn data	Ml/d	2dp	Required	0
3_{AR}	Potable water imported (in the reporting year)	Input outturn data	Ml/d	2dp	Required	0
5_{AR}	Raw water exported (in the reporting year)	Input outturn data	Ml/d	2dp	Required	0
5.1_{AR}	Non potable water supplied	Input outturn data	Ml/d	2dp	Required	0
6_{AR}	Potable water exported (in the reporting year)	Input outturn data	Ml/d	2dp	Required	7.55
7_{AR}	Deployable output	Input dry year figure	Ml/d	2dp	Required	283.5
12AR	Water Available For Use (own sources)	(Deployable Output + changes to DO) - (Treatment works losses and operational use + outage experienced).	Ml/d	2dp	Required	269.73
13AR	Total Water Available For Use	WAFU own sources + (total water imported) - (total water exported). Total WAFU is based on maximum contractual volumes as stated in WRMP19.	Ml/d	2dp	Required	239.73
	Process Losses					
9_{AR}	Treatment works losses and operational use	Input outturn data	Ml/d	2dp	Required	4.65
10_{AR}	Outage experienced	Input outturn data	Ml/d	2dp	Required	9.12
	DEMAND					
11_{AR}	Distribution input (in reporting year)	Outturn data for: Total household and non-household consumption + water taken unbilled + distribution system operational losses + total leakage	Ml/d	2dp	Required	207.54
	Consumption					
23_{AR}	Measured non household - consumption	Input outturn data	Ml/d	2dp	Required	29.05
24_{AR}	Unmeasured non household - consumption	Input outturn data	Ml/d	2dp	Required	0.61
25_{AR}	Measured household - consumption	Input outturn data	Ml/d	2dp	Required	38.43
26_{AR}	Unmeasured household - consumption	Input outturn data	Ml/d	2dp	Required	109.39
29_{AR}	Measured household - pcc	Outturn data: (Measured household consumption * 1,000,000) / (measured household population * 1,000)	l/h/d	0dp	Required	173.95
30_{AR}	Unmeasured household - pcc	Outturn data: (Unmeasured household consumption * 1,000,000) / (Unmeasured household population * 1,000)	l/h/d	0dp	Required	213.67
31_{AR}	Average household - pcc	Outturn data: (Measured and unmeasured household consumption * 1,000,000) / (measured and unmeasured household population * 1,000)	l/h/d	0dp	Required	201.7
32_{AR}	Water taken unbilled	Input outturn data	Ml/d	2dp	Required	2.62
33_{AR}	Distribution system operational use	Input outturn data	Ml/d	2dp	Required	0.52
	Leakage					
34_{AR}	Measured non household - uspl	Input outturn data	Ml/d	2dp	Required	0.6
35_{AR}	Unmeasured non-household - uspl	Input outturn data	Ml/d	2dp	Required	0.05
36_{AR}	Measured household - uspl	Input outturn data	Ml/d	2dp	Required	5.07
37_{AR}	Unmeasured household - uspl	Input outturn data	Ml/d	2dp	Required	7.11
38_{AR}	Void properties - uspl	Input outturn data	Ml/d	2dp	Required	0.38
39_{AR}	Distribution Losses	Input outturn data	Ml/d	2dp	Required	13.7
40_{AR}	Total leakage	Outturn data: Total USPL + distribution losses	Ml/d	2dp	Required	26.91
	CUSTOMERS					
	Properties					
42_{AR}	Measured non-household - properties	Input end of reporting year data	000's	3dp	Required	12.054
43_{AR}	Unmeasured non-household - properties	Input end of reporting year data	000's	3dp	Required	1.503
44AR	Void non households - properties	Input end of reporting year data	000's	3dp	Required	2.459
45_{AR}	Measured household - properties	Input end of reporting year data	000's	3dp	Required	102
45.7_{AR}	Measured void household - properties	Input end of reporting year data	000's	3dp	Required	2.293
46_{AR}	Unmeasured household - properties	Input end of reporting year data	000's	3dp	Required	198.505
47_{AR}	Unmeasured void household - properties	Input end of reporting year data	000's	3dp	Required	4.712
48_{AR}	Total resource zone properties (inc voids)	End of reporting year data : Total non-household properties + total void non-household properties + total household properties + total void household properties	000's	3dp	Required	323.748
	Population					
49_{AR}	Measured non-household - population	Input end of reporting year data	000's	3dp	Required	12.598
50_{AR}	Unmeasured non-household - population	Input end of reporting year data	000's	3dp	Required	1.571
51_{AR}	Measured household - population	Input end of reporting year data	000's	3dp	Required	220.913
52_{AR}	Unmeasured household population	Input end of reporting year data	000's	3dp	Required	511.948
53_{AR}	Total resource zone population	End of reporting year data: Unmeasured and measured household population + Unmeasured and measured non-household population	000's	3dp	Required	747.03
	Metering					
57_{AR}	Total measured household metering penetration (incl. voids)	Outturn data: Measured household properties exc. voids / (measured household properties exc. voids + unmeasured household properties exc. voids) + measured and unmeasured household void properties)	%	2dp	Required	33.2178649
57.1	Total households with a meter installed	Input outturn data (See technical annex for guidance)	%	2dp	Optional	
	Total numbers of household meters installed	Input outturn data	000's	3dp	Required	2255
	SUPPLY-DEMAND BALANCE					
16AR	Target headroom	Input adjusted reporting year figure or dry year WRMP	Ml/d	2dp	Required	5.89
18AR	Observed supply-demand balance (in reporting year)	(Total WAFU - DI) - target headroom	Ml/d	2dp	Required	26.3