Draft Water Resources Management Plan 2024

Draft Water Resources Management Plan 2024 Compliance Statement:

In accordance with Section 37B(3) of the Water Industry Act 1991 Portsmouth Water have published a Draft Water Resources Management Plan for consultation. This plan does not contain any commercially confidential material and there have been no redactions as a result.

The original plan did contain information that the Secretary of State may consider to be contrary to the interests of national security and this has been redacted. This information related to abstraction licence and asset names, which have been replaced by generic titles, and locations which have been removed.

Any person may make representations to the Secretary of State before the end of the representation period.

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GLOSSARY

Acronym or term		Definition
1-in-200		Refers to a drought with a 1-in-200 chance of happening in any single year.
1-in-500		Refers to a drought with a 1-in-500 chance of happening in any single year.
Abstraction		The removal of water from the environment, either permanently or temporarily.
Abstraction licence		The authorisation granted by the Environment Agency to allow the removal of water from a source.
Adaptive plan		A framework which allows water companies to consider multiple preferred programmes or options. An adaptive plan should set out how decisions will be made within the framework.
ADO	Average deployable output	The annual average daily deployable output of a source/treatment works or a group of sources/treatment works (the average daily DO, in million litres a day, or Ml/d, over a year).
AR	Annual return	The annual return of data submitted to the Environment Agency by all water companies in England.
AIC	Average Incremental Cost	A financial term used to calculate the cost benefit of an option over the life of the planning period. An AIC value has been calculated for each option considered so that options of different scales, lifetimes and type can be objectively compared to inform decision making about what is the most cost-effective water to balance supply and demand for water over the long term.
Available headroom		The difference (in Ml/d or percent) between water available for use (including imported water) and demand at any given point in time.
Base year		A selected year before the beginning of the planning horizon which forms the basis for the water demand and supply forecasting of subsequent years. The base year should be based on actual data, adjusted to the relevant planning scenario as appropriate (e.g. Dry Year Annual Average).
Baseline forecast/scenario		A forecast which reflects a company's supply and demand situation without any further interventions from the company.
BAU	Business as usual	The system currently in place for a company prior to implementing changes to increase efficiency.
BVP	Best value plan	A best value plan is one that considers factors alongside economic cost and seeks to achieve an outcome that increases the overall benefit to customers, the wider environment and overall society.
BNG	Biodiversity net gain	Measurable improvements for biodiversity by creating or enhancing habitats in association with development. An approach used to improve a sites biodiversity value, with the application of biodiversity net gain leaving a positive ecological impact and delivering environmental enhancements/mitigation.
CAPEX	Capital expenditure	Capex is a contraction of the term capital expenditure. The term refers to investment in long term physical or fixed assets.
CCW	Consumer Council for Water	The Consumer Council for Water is the independent representative of household and business water consumers in England and Wales.
CO_2	Carbon dioxide	A heat trapping greenhouse gas.
Demand management		The implementation of policies or measures which serve to control or influence the consumption or waste of water (this definition can be applied at any point along the chain of supply).

Acronym or term		Definition
Design event		The drought event on which the supply assumptions in a plan are based on.
DI	Distribution input	The amount of water entering the distribution system at the point of production. This is usually measured by a flow meter on a pipe as water leaves a water treatment works.
Distribution losses		Made up of losses on trunk mains, service reservoirs, distribution mains and communication pipes. Distribution losses are distribution input less water taken.
DO	Deployable output	The output of a commissioned source or group of sources or of bulk supply as constrained by hydrological yield, licensed quantities, environment (represented through licence constraints), pumping plant and well/aquifer properties, raw water mains and aqueducts, transfer and output main, treatment and water quality.
Drought order		An authorisation granted by the Secretary of State under drought conditions, which imposes restrictions upon the use of water and/or allows for abstraction/impoundment outside the schedule of existing licences on a temporary basis.
Drought permit		An authorisation granted by the Environment Agency under drought conditions, which allows for abstraction/impoundment outside the schedule of existing licences on a temporary basis.
Dry year annual average unrestricted daily demand		The level of demand, which is just equal to the maximum annual average, which can be met at any time during the year without the introduction of demand restrictions. This should be based on a continuation of current demand management policies. The dry year demand should be expressed as the total demand in the year divided by the number of days in the year.
DSOU	Distribution system operational use	Water knowingly used by a company to meet its statutory obligations particularly those relating to water quality. Examples include mains flushing and air scouring. For example, water run to waste such as that used for the purpose of mains flushing.
DWI	Drinking Water Inspectorate	The government body that regulates the quality of drinking water.
dWRMP	draft Water Resource management plan	A draft statutory 25-year plan that all water companies in England & Wales are required to update, publish and consult on every five years. The plans show how companies intend to secure water supplies for current and future customers, at least cost to customers, society and the environment, while meeting all other environmental obligations.
DWSP	Drinking Water Safety Plan	A plan to verify that the World Health Organisation and drinking water safety plan process has been followed and is in line with regulations to ensure drinking water safety.
DYAA	Dry year annual average	The annual average value of water demand, deployable output or some other quantity over the course of a dry year.
DYCP	Dry year critical period	Typically, the time in a dry year when demand is greatest, often termed the peak week. Also commonly known as the summer peak period.
EFI	Environmental flow indicators	Percentage deviation from the natural river flow represented by a flow duration curve, which determines the ecological sensitivity to changes in river flow.
Feasible option		An option that is considered suitable to assess for inclusion in the preferred programme of options. I.e. it should have no unacceptable planning or environmental constraints.

Acronym or term		Definition
Final planning forecast		A forecast, which reflects a company's preferred policy for managing demand and resources through the planning period, after taking account of all options through full economic analysis.
Final planning forecast/scenario		A forecast which reflects a company's supply and demand situation with its preferred options in place.
GCM	Global climate models	Complex mathematical representation of the major climate system components (atmosphere, land surface, ocean, and sea ice), and their interactions. Earth's energy balance between the four components is the key to long-term climate prediction.
GHG	Greenhouse gas	Greenhouse gas is a gas that absorbs and emits radiant energy within the thermal infrared range, causing the greenhouse effect. This contributes to global warming.
GIS	Geographical information system	System that creates, manages, analyses, and maps all types of data. GIS connects data to a map, integrating location data (where things are) with all types of descriptive information (what things are like there).
h-plan/ housing plan	Housing Plan	Housing Plan based projections. These housing plan forecasts take account of areas or sites where housing is identified for delivery in the future, not just where it currently exists.
HRA	Habitat Regulations Assessment	An assessment of the potential impacts on designated sites of the measures or interventions we are proposing in our plan; it also assesses how effective any mitigation measures are in reducing the impact on designated sites.
HSE	Hampshire Southampton East zone	This is a water resources zone in Southern Water's supply area.
INNS	Invasive non-native species	A non-native species is one that did not originate in the given habitat, with the potential to have a positive or negative effect on the ecosystem.
l/h/d	Litres per head per day	The average amount of water used per person each day.
l/prop/d	Litres per property per day	The average amount of water used per property each day.
LHN	Local housing need	Housing need is described as when a household whose housing falls below at least one of the standards of Affordability, Suitability and Adequacy.
LoS	Levels of Service	The frequency with which we can impose different types of water restrictions during water shortages (and which are supported by our customers).
Meter optants		Properties in which a meter is voluntarily installed at the request of its occupants.
mg/l	Milligrams per litre	Metric to measure water quality.
Micro-component analysis		The process of deriving estimates of future consumption based on expected changes in the individual components of customer use.
Ml/d	Megalitres per day	Metric to measure water volume.
MLR	Multi-linear regression	Multiple linear regression (MLR), also known as multiple regression, is a statistical technique that uses several explanatory variables to predict the outcome of a response variable.

Acronym or term		Definition
NAV	New appointments and variation companies	New appointments and variations (NAVs) are limited companies which provide a water and/or sewerage service to customers in an area which was previously provided by the incumbent monopoly provider. A new appointment is made when a limited company is appointed by Ofwat to provide water and/or sewerage services for a specific geographic area.
NC	Natural capital	The elements of nature that either directly or indirectly provide value to people e.g. soil provides the means for growing crops.
NPV	Net Present Value	The difference between the discounted sum of all the benefits arising from a project and the discounted sum of all the costs arising from the project.
NEUBs	Non-essential use bans	A restriction placed on water usage during drought conditions, which has more impact on the businesses in the local area.
NHH	Non-household	Properties receiving potable supplies that are not occupied as domestic premises, for example, factories, offices and commercial premises. They also include properties containing multiple households, which receive a single bill (for example, blocks of flats).
NIC	National infrastructure commission	The UK National Infrastructure Commission is the executive agency responsible for providing expert advice to the UK Government on infrastructure challenges facing the UK.
Non-households		Properties receiving potable supplies that are not occupied as domestic premises, for example, factories, offices and commercial premises. They also include properties containing multiple households, which receive a single bill (for example, blocks of flats).
Normal year annual average daily demand		The total demand in a year with normal or average weather patterns, divided by the number of days in the year.
NPP	National population projection	Projections of the future size and age structure of the population of the UK and its constituent countries. Based on mid-year population estimates and assumptions of future fertility, mortality and migration.
NRW	Natural Resources Wales	Welsh government sponsored body ensuring the environment and natural resources of Wales are sustainably maintained and used, now and in the future.
NY	Normal year	A year in which temperature and rainfall values are at or close to their long-term average.
NYAA	Normal year annual average	The annual average daily value of water demand, deployable output or some other quantity over the course of a normal year.
OAHN	Objectively Assessed housing need	Total demand or housing, from all types of household and for both affordable and market housing.
OFWAT	Office of Water Services	The independent economic regulator for the water industry.
OMT	Outage modelling tool	A tool to model the temporary loss of reliable water (see deployable output) due to planned or unplanned events. Examples of planned events include where we need to carry out maintenance of our water sources; an example of unplanned events are where there are power cuts or failures in our treatment processes.
ONS	Office for National Statistics	The UK's largest independent producer of official statistics and the recognised national statistical institute of the UK.
OPEX	Operating costs	Our day-to-day operating costs.

Acronym or term		Definition
Option		A scheme which can provide water to a company either through reduction in customer or business demand, or increasing supply, or transferring water from outside the resource zone. An option should increase water availability in some part of the supply-demand balance.
Outage		A temporary and unplanned loss of deployable output. Common reasons for outages include assets failing, and power cuts.
OxCAM	The Oxford–Cambridge Arc	The Oxford to Cambridge (OxCam) Arc is the name given to a cross-government initiative that supports planning for the future of the five ceremonial counties of Oxfordshire, Bedfordshire, Buckinghamshire, Cambridgeshire and Northamptonshire up until 2050. The area covers 26 Local Authority Districts extending between Oxford, Milton Keynes and Cambridge.
PCC	Per capita consumption	The water used by a measured or unmeasured property over a given period (litres per property per day, l/prop/d).
PDO	Peak demand deployable output	The average daily deployable output, measured in million litres per day (Ml/d), at the time of peak demand, whether over a period of a week (the peak week), a month (the peak month) or some longer period.
PET	Potential evaporation and transpiration	Potential evapotranspiration or PE is a measure of the ability of the atmosphere to remove water from the surface through the processes of evaporation and transpiration assuming no control on water supply. Actual evapotranspiration or AE is the quantity of water that is removed from a surface due to the processes of evaporation and transpiration.
PHC	Per household consumption	Water consumption per household property to feed into baseline water usage.
Plan		Water resources management plan.
Planning horizon		The period over which the plan is based (e.g. 2025–26 to 2074–75).
Potable water exported		Potable water exports from within a defined geographical area to an area outside the defined geographical area.
Potable water imported		Potable water imports from outside a defined geographical area to the defined geographical area.
Potable water produced		Raw water treatment less treatment works operational use and treatment work losses.
Preferred plan		The preferred set of options and actions set out by a company in its water resources management plan.
Programme appraisal		A comparison of different programmes of options against each other to inform and justify the preferred programme.
PyWR	Python for water resources	A flexible and fast processing model used for water resource stochastic data.
RAG	Red, amber, green	An assessment approach for environmental screening with red being negative and green being a more positive outcome.
RAPID	Regulators' Alliance for Progressing Infrastructure Development'	RAPID has been formed to help accelerate the development of new water infrastructure and design future regulatory frameworks. The joint team is made up of the three water regulators Ofwat, Environment Agency and Drinking Water Inspectorate. It will provide a seamless regulatory interface, working with the industry to promote the development of national water resources infrastructure that is in the best interests of water users and the environment.

Acronym or term		Definition
Raw water losses		The net loss of water to the resource system, comprised of mains/aqueduct (pressure system) losses, open channel/very low pressure system losses, and losses from break-pressure tanks and small reservoirs.
Raw water operational use		Regular washing-out of mains due to sediment build-up and poor quality of source water.
RCM	Regional climate models	Numerical climate prediction model.
Regional plan		A regional plan is similar to a WRMP, but at a regional level and includes the needs of other sectors including water customers, business, industry, navigation and agriculture will be managed in the region.
Resource zone		The largest possible area in which all resources, including external transfers, can be shared and hence the area in which all customers experience the same risk of supply failure from a resource shortfall.
RSS	Regional system simulator	Model developed using a python-based water resource modelling platform called 'Pywr'. Pywr was selected as the platform for the RSS following a detailed review of available options conducted for WRSE.
Scheme		Used interchangeably with option.
SEA	Strategic Environmental Assessment	An SEA is the process by which we demonstrate how we have incorporated environmental considerations into our policies, plans and programmes of work.
SNPP	Principle sub-national population projection	Based on a five-year history (2013–2018) to derive local fertility and mortality assumptions and a long-term UK net international migration assumption and a two-year history (2016–2018) of internal migration assumptions.
Source		A named source of water, where the water is an input to a water resource zone. A multiple well/spring source is a named place where water is abstracted from more than one operational well/spring.
SRO	Strategic Resource Options	SRO's are large infrastructure schemes, that are developed between water companies and with RAPID to ensure water supplies across the network, often in the form of reservoirs and bulk water transfers.
Supply pipe losses		The sum of underground supply pipe losses and above ground supply pipe losses.
Supply-demand balance		The difference between water available for use (including imported water) and demand at any given point in time (c.f. available headroom).
Sustainability reduction		Reductions in deployable output required by the Environment Agency to meet statutory and/or environmental requirements.
SWS	Southern Water Services	Southern Water is the private utility company responsible for the public wastewater collection and treatment in Hampshire, the Isle of Wight, West Sussex, East Sussex and Kent, and for the public water supply and distribution in approximately half of this area.
Target headroom		The threshold of minimum acceptable headroom, which would trigger the need for water management options to increase water available for use or decrease demand.
Total leakage		The sum of distribution losses and underground supply pipe losses.
Treatment work losses		The sum of structural water loss and both continuous and intermittent over-flows.
Treatment work operational use		Treatment process water i.e. net loss, which excludes water returned to source water.

Acronym or term		Definition
TUBs	Temporary Use Bans	A restriction implemented on water usage during drought/dry weather conditions. This is also known as a 'hosepipe ban'.
UKWIR	United Kingdom Water Industry Research	The collaborative research body of the water companies of England & Wales.
Unconstrained option		An option that could technically be implemented to address the water resources planning problem. It may be subject to unalterable planning or environmental constraints.
Underground supply pipe losses		Losses between the point of delivery and the point of consumption.
Unrestricted demand		The demand for water when there are no restrictions in place (this definition can be applied at any point along the chain of supply).
USPL	Underground supply pipe leakage	Losses on the section of pipework between our distribution system and where water enters a customer's property.
VF	Variable flow	The term 'variable flow' refers to how factors modify fixed future assumptions on 'flows' of water into supply.
Void property		An empty property that is connected to the distribution network but not charged because it has no occupants.
WAFU	Water available for use	The overall amount of water that is available to use. This takes account of the water we lose through planned and unplanned events (see outage) sustainability reductions (see sustainability reduction); but also water we transfer out of our supply area to other companies (exports) and water we receive from other companies (imports). The value is calculated by deducting allowable outages and planning allowances from deployable output in a resource zone.
Water delivered		Water delivered to a defined address for people to use. This can be in people's homes but also in non-household properties.
Water delivered billed		Water delivered less water taken unbilled. It can be split into unmeasured household, measured household, unmeasured non-household and measured non-households water delivered.
Water taken		The quantity of water remaining from the water that is put into our supply pipes from water treatment works after 'distribution losses' (such as leakage from pipes) have been subtracted.
WFD	Water Framework Directive	European directive which aims to protect and improve the water environment.
WINEP	Water Industry Environmental Improvement Programme	The programme of environmental measures agreed for action between Government, the Environment Agency, Natural England, Ofwat and the water companies.
WRMP	Water Resource Management Plan	The statutory 25-year plans that all water companies in England & Wales are required to update, publish and consult on every five years. The plans show how companies intend to secure water supplies for current and future customers, at least cost to customers, society and the environment, while meeting all other environmental obligations.
WRP tables		Water resources plan tables used for presenting key quantitative data associated with a water resources plan.
WRPG	Water Resource Planning Guideline	The guidance document published by the Environment Agency, Ofwat, Defra and the Welsh Government to provide advice to water companies on what they should include in their WRMPs.

Acronym or term		Definition
WRSE	Water Resources in the South East	An alliance made up of the six water companies that cover the South East region of England, with an aim to secure the water supply for future generations though a collaborative, regional approach to managing water resources.
WRZ	Water resource zone	The largest possible area in which all resources, including external transfers, can be shared and hence the area in which all customers experience the same risk of supply failure from a resource shortfall.

EXECUTIVE SUMMARY

About this document

This draft Water Resources Management Plan 2024 (dWRMP) is part of a statutory process. A Water Resource Management Plan (WRMP) sets out how a water company intends to achieve a secure supply of water for customers and a protected and enhanced environment. The duty to prepare and maintain a WRMP is set out in sections 37A to 37D of the Water Industry Act 1991. We must prepare a plan at least every 5 years and review it annually.

This draft document has been published to enable a meaningful public consultation with our customers and stakeholders about our plans and to help us finalise the WRMP before formal submission to the Secretary of State in Summer 2023.

This consultation is more important than ever, as we face the challenges of an increasing population as well as increasingly frequent and extreme weather events as our climate changes.

The draft plan is built on our proud history of serving the wider Portsmouth and Chichester areas with water for the last 165 years and is the continuation of a well-established planning process. However, there have been several improvements in the way we have created this plan, enabled by the development of new modelling approaches and data sets.

This is our most ambitious and most collaborative plan yet. Through this draft plan will become more resilient to increasingly severe drought events, at the same time as reducing our reliance and impact upon the precious chalk-based environment that characterises our supply area. To achieve this, we have worked in alliance with the other water companies across the South East of England, listened to the views of customers and engaged with regulators and stakeholders.

This draft Plan presents the supply-demand balance throughout the next 50-year planning period (2025–26 to 2074–75). It demonstrates the need for investment to maintain the balance between supply and demand over that period. It shows how we derived feasible options to either reduce demand for water or increase the supply of water. It lays out the programme of actions we are proposing to ensure a reliable and resilient water supply for customers, our environment and to contribute to the resilience of water resources for the wider South East of England.

This is the main statutory document for the dWRMP24. It is accompanied by a non-technical summary which contains more details about the public consultation process for this draft plan including how to respond to the consultation. It is also supported by Water Resources Planning Tables and detailed technical appendices.

Our Company

At Portsmouth Water we are proud of our long tradition of serving Portsmouth and the wider surrounding area with high quality drinking water since the Company was established in 1857. Through amalgamation, the Company's supply area has expanded beyond Portsmouth to supply the towns of Gosport, Fareham, Havant, Chichester and Bognor Regis, in the counties of Hampshire and West Sussex.

Figure 1: The Portsmouth Water supply area

On average, we distribute around 175 million litres of water each day to over 740,000 customers in around 320,000 properties. We also provide water to neighbouring water companies in the Southeast.

We are a "water only" company. That means we only supply drinking water to customers. Southern Water provide the wastewater service to our customers.

Key facts about our supply area

- 100 per cent of our water comes from chalk-based sources – 62 per cent of our water comes from boreholes and wells, 27 per cent from groundwater springs and 11 per cent from the River Itchen.
- Our abstractions influence the Itchen, Meon, Ems and Lavant chalk streams and rivers.
- Our customers each use an average of around 160 litres per day. This is 10 per cent higher than the national average of 145 litres.
- Almost a third of our 3,400 km of pipes were laid or refurbished before 1960 – with around 700 km before 1940.
- The area we serve has significant differences in population density, with a contrast from central Portsmouth to the South Downs villages.
- We generate 10 per cent of our energy from solar panels and are trialling electric and zero emissions vehicles.
- Our average bill is £109 a year. This is the lowest in the industry and significantly below the UK average of £200.[1] We've been identified as one of the most efficient water companies in the UK.
- Our area consists of the South Downs National Park, protected marine harbours and Sites of Special Scientific Interest. The chalk geology across our supply area supports us in providing excellent quality drinking water as well as the important and beautiful habitat we enjoy.

[1] DiscoverWater (en-GB)

Our Vision

Excellence in Water. Always. Our Vision reflected in our planning for water resources

Water resources are fundamental to our business. As such, the dWRMP24 is core to our wider Business Plan, with both plans being developed in parallel with shared governance.

Our vision statement '*Excellence in Water. Always.'*[2] currently out for consultation with our customers, sets out our ambitious vision for the next 25 years, operating against the backdrop of climate change, population growth and a changing world. It outlines our commitment to provide an affordable, reliable, and sustainable supply of high-quality water for our customers. By being smart in our approach, we will work with our local communities to meet our goals while protecting and enhancing the environment for future generations.

Our vision identifies four priorities for us as a business, shown in Figure 2. In some cases, our ambition in the vision is greater than that incorporated in this dWRMP – specifically when it comes to reducing leakage from our network. This reflects our desire to challenge ourselves and the ambitions of our customers. We are totally committed to delivering a halving of leakage by 2050, but if supported by customers and found to be affordable and feasible, we want to commit to a delivery target of 2040.

The following four principles are central to how we'll realise our vision:

- **We are smart about water:** Being smart about water means embracing innovation, the digital revolution and new ways of working. This is most clearly demonstrated in this dWRMP by our preferred option to deliver universal household smart metering to help our customers manage their water use. By reducing unnecessary water waste, providing customers with information about their water use, and helping leaks to be identified and fixed more quickly, this is essential for providing excellent high-quality services, fit for future generations.
- **Our plans are adaptable to future challenges:** We know the future contains challenges and there is a lot of uncertainty around how these will impact us. We also know unexpected events can have dramatic impacts. The adaptive planning approach we have used to develop this dWRMP24 helps us choose options now that will prepare us for a range of possible futures. It means we understand when and what the key decision points are to ensure we can adapt to whatever the future holds – developing flexible, long-term plans so we can change course if we need to.
- **We focus on customers' priorities:** We put our customers first – pushing the boundaries of our performance with the environment at the heart of our decision making. As a company rooted in our communities, we are committed to increasing our customers' voice in our planning and delivering their priorities.
- **We run our Company responsibly**: We're accountable to our customers, stakeholders and colleagues and take responsibility for our decisions. We're honest, transparent, and fair in everything we do. We uphold the highest standards of leadership, transparency and governance and maintain a resilient financial position.

[2] Our Business Plan 2025 to 2030 | Portsmouth Water

SECURE SUSTAINABLE WATER SUPPLIES FOR OUR CUSTOMERS, WHICH PROTECT AND ENHANCE OUR ENVIRONMENT IN A CHANGING WORLD

- Provide enhanced regional drought resilience by bringing Havant Thicket Reservoir into service on schedule by 2029
- Reduce leakage by 50% by 2040, 10 years ahead of government's expectation
- Support customers to reduce personal water usage by 25%
- Deliver universal domestic smart metering by 2040
- No customers will experience restrictions on their water use, even in a severe drought
- Enhance biodiversity on all the sites we own

BE AT THE FRONTIER OF DELIVERING HIGH-QUALITY, RESILIENT, NET ZERO SERVICES – FOR OUR CUSTOMERS, ENVIRONMENT AND REGION

- Become fully carbon neutral
- Maintain our leadership position in network management: lowest burst numbers, best interruption performance, low leakage and a genuine SMART network supported by a Digital Twin
- Collaborate with communities and stakeholders to ensure all chalk streams in our area are classified as being in good health

CO-CREATE SOLUTIONS WHICH DELIVER OUR CUSTOMERS', COMMUNITIES', AND STAKEHOLDERS' PRIORITIES

- 100% of our customers will know where their water comes from and their impact on the environment
- Work with all non-household customers and their retailers to reduce water use and achieve universal smart metering
- Co-create new markets for water resources, supporting crucial local industries to become more sustainable

AFFORDABLE WATER FOR ALL. ALWAYS.

- Our bills will continue to be the lowest in the UK
- Water poverty will be eliminated by 2030 and we will share our success with the rest of the industry as part of a UK-wide strategy
- Always strive to be the most efficient water company in England and Wales to keep customers' bills as low as we can

Figure 2: Our priorities as a business, and the specific commitments that are embedded in both our business planning and this WRMP

Drivers for change since WRMP19

Our operating environment

This dWRMP24 is our most ambitious yet.

This ambition reflects the scale and complexity of the water resources challenge facing us, directly resulting in Defra's acceptance of the Environment Agency's July 2021 recommendation that our area should be reclassified by the Environment Agency as being '**seriously water stressed for metering**'. This classification formally acknowledges that without appropriate investment, there is a risk that the service customers receive for their water supplies could be significantly affected. As a result of this we have proposed an option to implement universal metering across our household customers. Other companies across the South East who were already designated as areas of serious water stress have implemented, or are in the process of implementing, metering to their domestic customers, and have shared evidence of domestic demand savings of between 13 and 18 per cent.

The challenges we face in our supply area are characterised by anticipated growth in population and property numbers, coupled with the effects of climate change and the need to reduce our reliance on the water resources of the iconic and precious chalk-based environment.

Key challenges we face as we plan for sustainable and resilient water resources

- Climate change and changes to land use could put sensitive environments, such as chalk streams, at risk.
- We're predicting we'll need to secure up to 76 million litres of additional water per day by 2050, due to increased demand and to replace water currently being taken from sensitive chalk streams.
- Our infrastructure is getting older and wasn't designed to meet the more frequent extreme weather events we're facing.
- We need to reduce our emissions to meet net zero and help slow climate change.
- We need to ensure our services remain affordable for all – especially considering the cost-of-living crisis and for those in vulnerable circumstances.

Our draft plan is still based on a single Water Resource Zone (WRZ) that covers our supply area. This means all households in our supply area experience comparable levels of service. Our planned levels of service and use of drought options are consistent between the dWRMP and our 2022 Drought Plan over the planning period. These being:

- >1-in-20 years for Hosepipe Bans, representing an annual risk of 5 per cent.
- >1-in-80 years for Non-Essential Use Bans, representing an annual risk of 1.25 per cent.
- >1-in-200 years for Emergency Drought Orders, representing an annual risk of 0.5 per cent.

Planning Guidelines and Government Advice

Building on the previous WRMP19, the dWRMP24 has been developed in compliance with regulatory requirements and Government advice. It adopts new data sets and methodologies, and accounts for the recent social and economic shifts we have experienced since the last planning cycle. Additionally, it reflects the latest thinking around key considerations such as climate change mitigation and adaptation, working towards Net Zero carbon, and protecting the water environment.

Since our last plan was published, there have been both significant shifts in the planning landscape, as well as the continuing evolution of data, methods, and our understanding of the natural environment.

A significant influence on this Plan has been the Environment Agency's National Framework for Water Resources (launched in March 2020). The Framework sets out a national aspiration to leave the environment in a better condition than we found it, while improving resilience to drought and minimising interruptions to water supplies. The Framework took on board many of the recommendations from the 2018 National Infrastructure Commission (NIC) 'Preparing for a Drier Future' report such as the need for improved drought resilience and strengthened regional planning.

The National Framework for Water Resources established a requirement for the delivery of regional plans and for those plans to explicitly inform individual company WRMPs. They also set out some core planning objectives for all company plans. These objectives included:

- To reduce the amount of water individuals use to 110 litres of water per person per day by 2050,
- To facilitate a reduction in water use across all sectors,
- To halve leakage rates by 2050 (based on a baseline of 2017–18) and
- To reduce the use of drought measures that have an impact on the environment.

Furthermore the water resources planning guideline needs us to:

- Ensure that water supplies move from being resilient to an event we might expect to see once in every 200 years (i.e. a 0.5 per cent chance of happening each year) to being prepared to provide a reliable supply in a drought event we might expect to see once in every 500 years (i.e. a 0.2 per cent of happening each year).
- Present an environmental ambition with potential short, mid and long-term reductions in supplies to protect our environmentally important chalk sources and therefore associated investment for new interventions to enable us to continue to meet customer demands in future.
- Incorporate the uncertainty associated with the impact of Covid on demand in the future.

All these objectives and requirements are reflected within our draft Plan.

Collaboration through the regional plan

Water Resources in the South East (WRSE) is an alliance of the six water companies that cover the South East of England – Affinity Water, Portsmouth Water, SES Water, Southern Water, South East Water and Thames Water (see Figure 3). WRSE was formed several planning cycles ago to help us optimise the use of water resources across the South East in previous plans. But with the requirement to produce a regional plan explicit in the Environment Agency guidance, the role of WRSE has significantly grown this planning round.

Through WRSE, the companies of the Southeast have developed common methodologies, shared data sets and a regional adaptive planning approach to meet future water resource challenges. This ambitious multi-sector regional plan uses new, sophisticated modelling and forecasting methods which are then reflected in our own individual company plan, to align with the wider region.

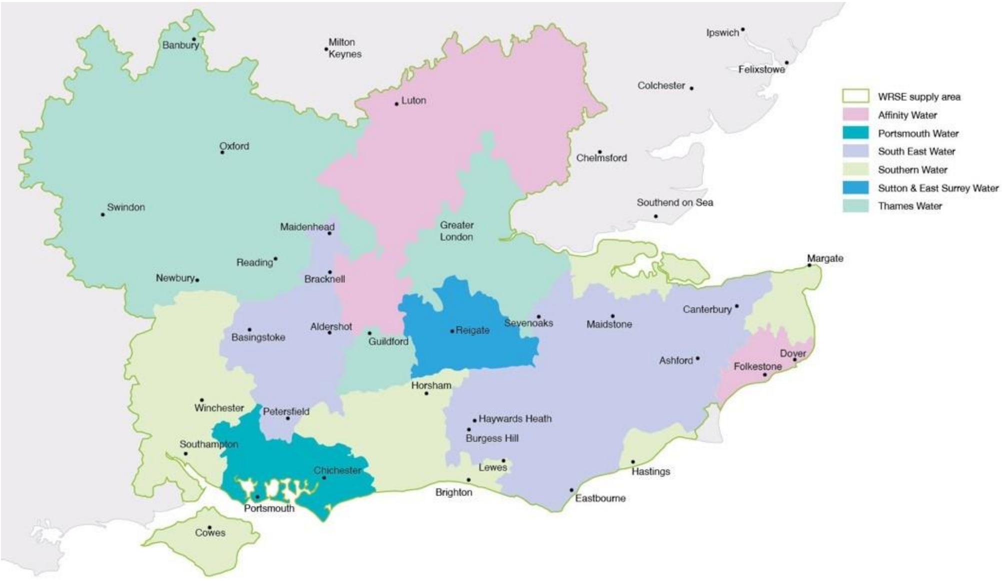


Figure 3: The supply areas of the six water companies who form the Water Resources South East (WRSE) alliance

WRSE commissioned the development of a regional investment model. Using agreed metrics, the model helps us to identify the investment options that enables the provision of water in the right place at the right time, while addressing legal and regulatory requirements and policy expectations. To enable the use of this model it was necessary to carry out detailed assessments of our options and to consider wider benefits beyond cost. This approach enabled us to identify whether we can deliver additional value through our plan that will further improve the region's environment, resilience and benefit wider society. This could mean some options are chosen because they deliver greater value to the region, not just on their cost.

By aligning with the South East regional multi-sector resilience plan for water resources, our draft WRMP24 aims to balance national, regional, and local interests - reflecting the best value for our customers as well as the best value regional plan and the investment and environmental ambitions of our regulators, customers and stakeholders.

We are fully committed to the WRSE approach. As such, where appropriate we are referencing WRSE's method statements and other published documents. Our draft Plan (in Section 10) has been informed by the draft regional plan, with modifications for local considerations.

Havant Thicket Reservoir

A key legacy from WRMP19, that has formed a cornerstone of our ongoing planning process, is the development of Havant Thicket Reservoir. By enabling us to store winter spring flows for use in the Summer, we can increase the quantity of water we supply to Southern Water, which in turn allows them to make environmental improvements by reducing their reliance on sensitive chalk sources in Hampshire. In addition to supporting reduced abstraction on chalk rivers, the scheme has an overall biodiversity net gain and will offer a new community leisure facility for our area.

The reservoir scheme, as proposed in WRMP19, is unchanged and has been included in the baseline assumptions for this plan. It was supported by customers and regulators and is being developed in partnership with Southern Water. This will be the first new reservoir to be built in the South East since the 1970s. Havant Thicket Reservoir has received planning permission and work onsite is ongoing.

The approval for the development of Havant Thicket Reservoir within WRMP19 enabled us to make a major contribution to long-term resilient water resources in the South East.

This asset is something we have built upon and taken further in this draft Plan. Completing Havant Thicket Reservoir unlocks new local and regional options for future water security that would supplement this scheme, such as water recycling. These types of options are needed to meet some of the new challenges, such as significant reductions in our abstractions from Chalk catchments and improved resilience to droughts occurring once every 500 years.

The building blocks of our Plan

Introduction

The full collaborative nature of the development of our dWRMP24 is shown in Figure 4. This 'Plan on a Page' shows each building block that has contributed to the plan's development, along with where in this document you can find more information.

The green elements show items that were developed and assured by Portsmouth Water. The red elements show the areas that have been commissioned and assured in regional collaboration.

Many of the steps that we have delivered directly (shown in green) have followed the regionally agreed methods and approaches ensuring the input data to the regional planning process was consistent and comparable across each of the six water companies.

Some of the WRSE approaches are new, while others are based on established methods which have been widely used by water companies in preparing past water resources management plans. Where methods and approaches have been agreed regionally and are published on the internet, we have referenced these but not duplicated them. For this reason, because so much of the rationale and methods used in developing this dWRMP are already publicly available and published, this dWRMP24 has fewer appendices than previous plans. WRSE documents can be located in the WRSE library: https://www.wrse.org.uk/library

Working through WRSE, we ensured that all processes follow and are compliant with the Water Resources Planning Guidelines (WRPG) and the National Framework.

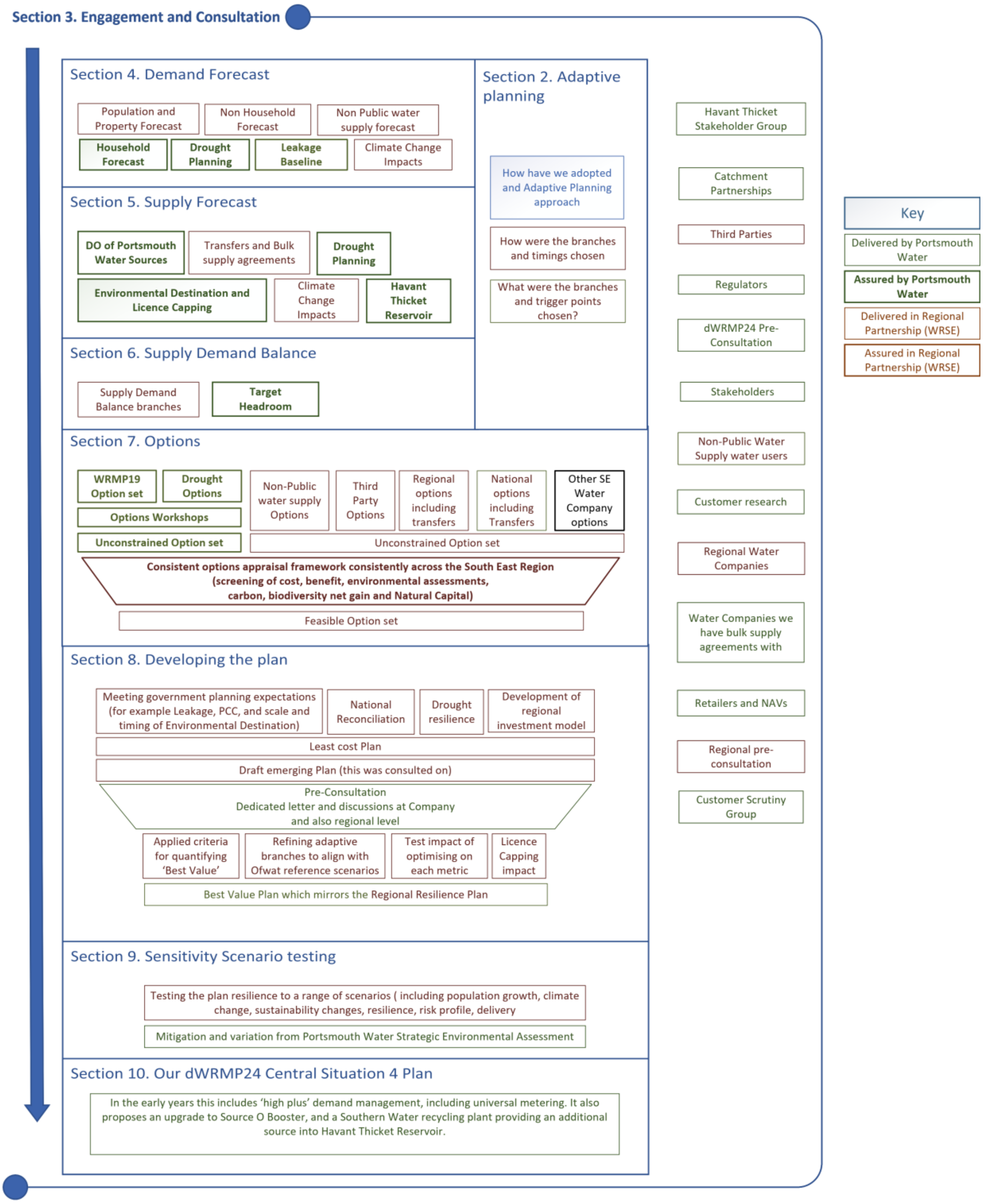


Figure 4: Components of this dWRMP24, illustrating both the process and the extent to which this Plan has been developed in collaboration

Baseline demand forecast

The baseline demand forecast is the amount of water that would be required by customers in the future **should no interventions be made** and is a key component of our plan. The forecast was developed and assured by us, using an agreed regional methodology (WRSE Method Statement: Demand Forecast, August 2021) as provided in the WRSE library, with certain sub-components prepared by WRSE to ensure consistent planning scenarios.

This section in our draft Plan defines and explains the basis of the different demand scenarios we have used. As part of our adaptive planning approach, and to account for uncertainty, different demand scenarios have been generated for high, medium and low growth in population and new property numbers. The scenarios include a forecast of future demand for water from households, businesses, industry and other sectors, whilst accounting for climate change, leakage, population and property growth.

Since 1995, when a standard method for leakage reporting was introduced, we have reduced leakage by 30.9 per cent. Leakage in 2021–22 was 13 per cent of the total water we put into supply. When normalised across the water industry by the number of properties we supply, we have the second lowest leakage rate of water companies in England and Wales. For generating a baseline demand forecast, the planning guidelines require us to model leakage as a single value throughout the duration of the plan.

Under dry year annual average conditions for our "reported core pathway" (which is our preferred planning scenario for the purposes of this draft plan) demand is forecast to **grow** over the planning period from **174.5 Ml/d in 2025–26 to 201.4 Ml/d by 2074–75**. This rise is driven by increasing water use by household and non-household customers as detailed in Table 1.

Table 1: Baseline demand for our reported core pathway in dry year annual average (DYAA) conditions

Baseline demand (without intervention)	2025–26	2049–50	2074–75
Total demand (Ml/d)	174.5	189.8	201.4
Household demand (Ml/d)	126.2	139.8	147.9
Non-Household demand (Ml/d)	32.3	34.0	37.5

Baseline supply forecast

The baseline supply forecast is the amount of water that is available for us to put into supply in the future **should no interventions be made** and is the second key component of our plan. It was developed and assured by us, but to an agreed regional methodology.

Our supply forecast is reported as "water available for use" (WAFU) within our water resources planning tables that accompany this draft Plan. This is the water available from our own sources (referred to as "Deployable Output" (DO)), with adjustment reductions due to climate change, process losses or operational constraints, plus water exported to other companies.

Havant Thicket Reservoir is now part of our baseline supply forecast and therefore included in the WAFU calculation. The reservoir has received planning permission and is in construction phase.

Figure 5 shows an illustrative and indicative example of how we calculate WAFU.

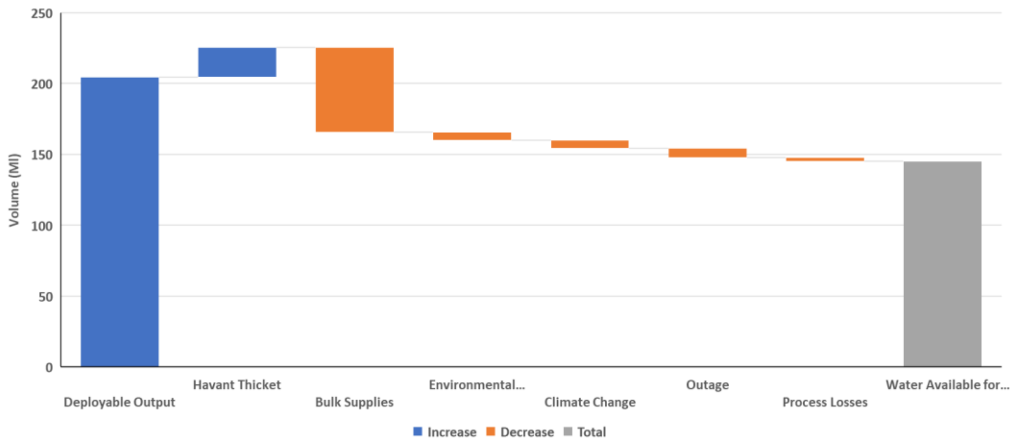


Figure 5: An example of how we calculate Water Available for Use (WAFU)

Our first step when developing the baseline supply forecast was to review WRMP19 supply forecast and, where still relevant, build on instead of duplicating this. The key assumptions included in the supply side forecast are outlined briefly below with more detail provided in Section 5:

- **Deployable Output Assessment**: This has been informed by the development of a new modelling tool called 'Pywr' which can account for large synthetic, but plausible, climatic, and hydrological data sets.

    - The model has led to an improved understanding of the way individual sources of water work conjunctively together as part of the overall supply system and the resilience this provides in a greater variety of drought events. This understanding has prompted development of a network improvement option that can add to our ability to supply reliably during drought conditions by removing current network constraints.
    - We have planned in line with the Government's National Water Resources Framework and the Water Resources Planning Guidelines so that our system becomes resilient to a 1-in-500 chance of implementing an emergency drought order by 2039. This can also be described as '1-in-500 year' level of drought resilience.
    - Increasing our level of resilience from a 1-in-200 to a 1-in-500 year drought has had the overall impact of reducing the water we can rely upon from our existing sources of water by 2.3 Ml/d (from 206.8 Ml/d before 2039 to 204.5 Ml/d after 2039).

- **Bulk Supplies**: We provide bulk supplies to our neighbouring water company, Southern Water. The supply forecast assumes that bulk supplies cease at the end of existing contracts, after which point they become options within the WRSE investment model. Therefore bulk supplies in the baseline supply forecast are zero beyond 2029–30.
- **Sustainability Abstraction Reductions** associated with our proposed Environmental Destination in 2050 (incorporating the latest "Licence Capping" policy) are a significant impact on our supply forecast. The scale of these reductions is one of the main areas of uncertainty in our plan, with the potential to reach 107 Ml/d by the 2050s in our reported core pathway for the dry year annual average scenario. Leaving more water in the environment reduces how much water we can take from some of our existing sources.
- **Climate Change**: Our previous assessment for WRMP19 was based upon the UKCP09 data set. This data set has since been replaced with the UKCP18 projections. Data from UKCP18 provides the most up to date climate change projections available for the UK, using the best climate models from the UK and around the world. Climate change

impacts rise from 3.85 Ml/d in 2025–26 to 9.48 Ml/d by 2074–75 in our reported core pathway.

- **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. The WRMP19 assumptions have been reviewed and updated which has reduced our assumed reduction due to outage.
- **Process Losses** occur between the point of abstraction and the point at which water enters the supply network and account for the loss of water during the treatment process. The WRMP19 assumptions have been reviewed and maintained as the assumptions remain valid.

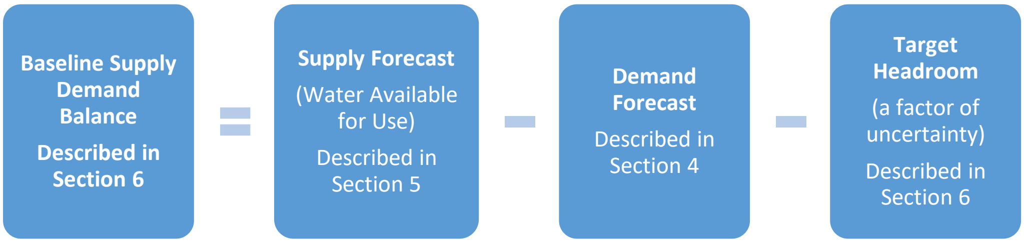
The WAFU **reduces** from around 155 Ml/d in 2025–26, to 115 Ml/d by 2049–50 and then 91 Ml/d by 2074–75, largely driven by environmental considerations. This is a substantial decrease of **41 per cent** and drives much of the investment proposed in this draft plan.

Baseline supply demand balance

The supply demand balance is a forecast of what would happen to our levels of service to customers if we did not take any new supply or demand actions and did not implement any changes in Company policy or existing operations. Section 6 of this draft plan provides details of our baseline supply demand position.

Our baseline supply demand forecast has been calculated by the WRSE investment model based on baseline supply, demand and headroom forecast information we provided for our water resource zone. It has been calculated using consistent assumptions across the South East regional planning area.

The Baseline Supply Demand Balance compares our baseline supply forecast (defined as Water Available for Use) with the baseline demand. The baseline position is based on the dry year annual average (DYAA) for demand and a design drought for supply. Our existing contracts with Southern Water to provide bulk supplies are included as part of our forecast baseline demand.



The supply demand balance for our reported core pathway (also known as “Situation 4” within the WRSE investment model) is presented in Table 2.

Table 2: Baseline supply demand balance for our reported core pathway for dry year annual average (DYAA) conditions

	2025–26	2029–30	2034–35	2039–40	2044–45	2049–50	2059–60	2074–75
Total Water Available for use in Ml/d	154.6	194.1	193.6	145.1	137.0	115.0	92.5	90.8
Distribution Input in Ml/d	174.5	177.8	180.6	183.8	186.7	189.8	194.6	201.4
Target Headroom in Ml/d	4.1	4.8	4.3	3.2	2.5	2.4	2.4	2.2
Supply Demand Balance in Ml/d	-23.9	11.5	8.7	-41.9	-52.3	-77.3	-104.5	-112.8

The negative values in the supply demand row of this table show that without interventions we would have insufficient water to meet the service requirements for our customers for the majority of our plan.

Factoring in uncertainty

Target headroom is an allowance in the planning guidelines to consider the inherent uncertainties in modelling the future. It acts as a 'shock absorber' in the calculations to absorb any risk. Through the Target Headroom allowance, risk and uncertainty is translated into an appropriate water resource planning margin.

The evolving methods and data used to plan water resources across the sector mean that some of the risk that has historically been accounted for in Target Headroom is now accounted for across several other parts of the Plan, such as in the adaptive planning situations and the application of 1-in-500 year supply forecast. In practical terms this means that the application of past approaches to calculating Target Headroom could lead to double counting of uncertainty in the context of this dWRMP24. This risk is addressed by adopting a regionally consistent adaption of the UKWIR 2002 methodology to prevent double counting of uncertainty within the adaptive planning approach.

We recognise that this is an area for future development and a refinement of our approach to Target Headroom is expected between our draft and final WRMP24.

Options

Options appraisal process

From the baseline calculations it can be seen that without interventions we would not be able to deliver the service to customers expected of us. We therefore undertook a significant options identification and appraisal process to identify potential interventions we could make to increase supply or reduce demand (the 'twin-track' approach). In Section 7, we explain our process of determining feasible options

Initially, we reviewed existing planning assumptions within our WRMP19 and where these remain relevant and reasonable, we have continued their use (as published in our final WRMP from 2019, and subsequent revisions).

Our twin-track approach has considered options to increase the amount of water available for supply, as well as options to reduce the amount of water our customers require. We have looked wider than our own supply area, to work with neighbouring water companies, third parties and non-public water users at the potential for water trading and sharing.

Options were generated both internally from Portsmouth Water participants and externally through workshops, surveys and a WRMP19 gap analysis. External options were screened and generated in cohorts alongside WRSE, third parties and other water companies. Potential new options were identified to increase supply and reduce demand.

From this work we identified an 'unconstrained options' list of possible interventions as shown in Figure 6.

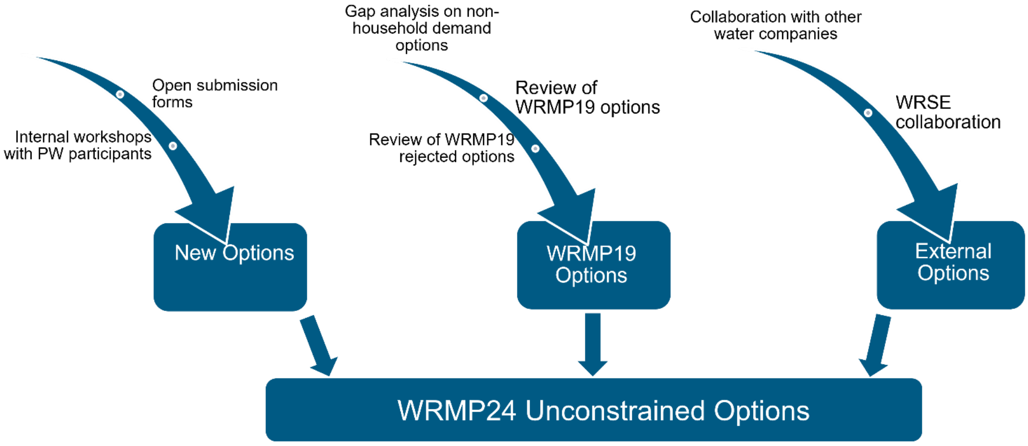


Figure 6: Overview of the WRMP24 Options process.

To determine if our potential options were feasible, we followed an agreed common WRSE methodology. This consistent method was also followed by the other water companies in the region and used by WRSE to consider transfer and non-public water supply options. By following a common and shared method across the region, the regional investment model has fairly selected options from across the region to best resolve any water resources deficits and optimise on the options appraisal metrics.

Primary screening reviewed the options on a pass or fail basis, that determined which options were to be carried forward to the secondary screening or placed on the rejection log. This initial screening focused on questions around feasibility, legal and planning constraints, costs and customer acceptability.

Secondary screening was split into two phases, with '2a' assessing environmentally based objectives, and '2b' assessing adaptability, resilience to climate change, water pressures and deliverability. Environmental objectives surrounding climate change were tackled through the reduction of greenhouse gas emissions and embodied carbon within the options. Strategies to achieve this include embodied carbon meters, and decarbonised construction and vehicle transport.

It should be noted that our WRMP is a statutory plan that sets a framework for future infrastructure development. This infrastructure has the potential to have significant impacts on the environment, including European and internationally protected nature conservation sites. As such, the final plan requires both a Strategic Environmental Assessment (SEA) and a

Habitats Regulations Assessment (HRA). Several options were screened out at this stage, in the knowledge that they would not pass this test at the end of the process.

Costing was based on WRSE best practices, and the WRMP24 options were fed into the WRSE investment model to produce the least cost plan for the options based on construction costs, assets and risks.

The overall summarised process can be seen in Figure 7.

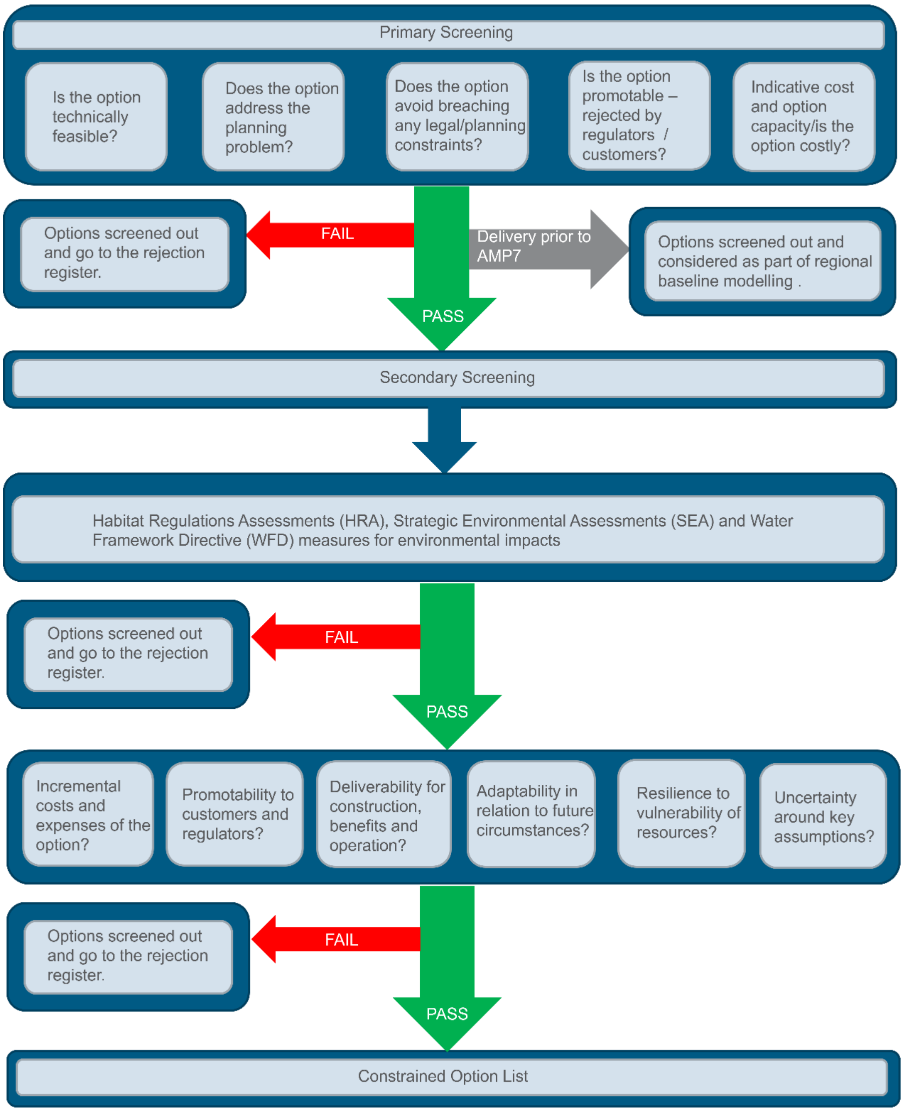


Figure 7: Summary of the Options screening process.

Screening reduced our **258** unconstrained option set to a final feasible option list of **18** options. The feasible options included sub-options to increase supply, reduce demand, and optimise the network.

Summary of Feasible options

Demand options

Four of the feasible options are “demand reduction baskets” comprising increasing volumes of leakage and water efficiency activities. These baskets contain several interlinked interventions that will collectively deliver a demand reduction benefit. The baskets were developed through the review and grouping of 59 constrained feasible demand options:

- Low
- Medium
- High
- High plus (includes universal metering)

Supply options

No new abstractions of water from our environment have been included in our feasible options list. The water catchments in our supply area are designated as 'over-abstracted' within the Environment Agency's Catchment Abstraction Management Strategy and there is no scope for increased abstraction.

As set out in our baseline supply forecast, we are forecasting a reduction in the amount of water we take from the environment to protect the precious chalk landscape and habitat we operate in.

The 12 feasible supply options identified in the options process are to improve supply through:

- maintaining our existing drought plan option of continuing to rely upon an existing drought permit until 2039.
- an option to improve network connectivity so we can move water resources around our supply area, freeing up water resources where we need them.
- ten remaining options to transfer and treat water across our supply area to utilise the water most effectively from Havant Thicket Reservoir.

We identified water recycling and desalination options in conjunction with storage provided by Havant Thicket Reservoir in tandem with Southern Water (the wastewater company serving our area). Most of these options have been taken on by Southern Water in their unconstrained list. Some elements have been included in their Strategic Resource Options (SRO) submissions to Ofwat via the RAPID gateway process.

Section 8: Developing the Plan

In conjunction with WRSE and the regional investment model, our dWRMP24 represents what we consider to be a 'best value' plan and not a 'least cost' plan. A best value plan is one that considers factors alongside economic cost and seeks to achieve an outcome that increases the overall benefit to customers, the wider environment and overall society.

The process of how we moved from a feasible list of options to a best value plan is described in the WRSE graphic presented as Figure 8 below.

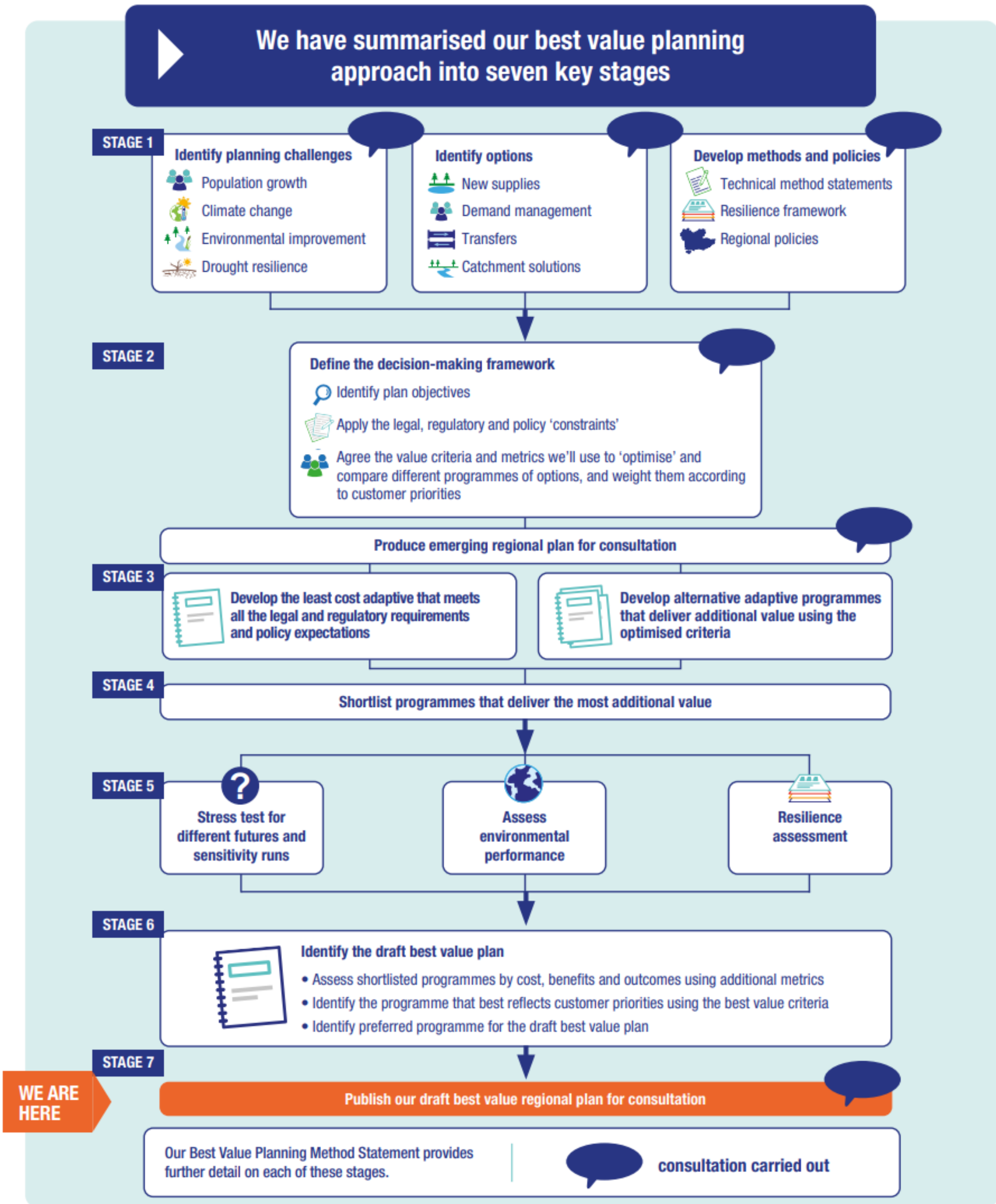


Figure 8 The regional approach to best value planning (from WRSE Draft Plan Annex 1, 2022)

Section 9: Testing the Plan

We have tested the draft Plan through a series of different sensitivity scenarios considered to represent the main areas of uncertainty concerning risk to supply and demand.

Section 9 of our draft plan describes the scenario and sensitivity analysis undertaken to ensure it is robust in the face of future uncertainties. Through this performance testing analysis, we are typically examining 'what if' questions such as:

- **What if a key scheme cannot be delivered**: A particular area of focus in the scenario testing is to explore the robustness of the plan to risks that key schemes cannot be delivered. The purpose is to identify the alternative schemes that are or may be needed.
- **What if a key scheme is significantly more costly or does not deliver the expected benefits:** the purpose again is to identify the alternative schemes. This may also include

assumptions around demand management e.g. what if the leakage reduction target is not achieved.

We can understand the implications of this testing primarily through the adaptive planning process described in the following section. Possible future scenarios relate to uncertainties in forecasting supply and demand components – such as population growth, customer behaviour, impacts of climate change, impacts of environmental destination on the available sources.

The sensitivity testing can help to identify and finalise triggers and timing for the final adaptive pathways used for the draft Plan. In this way, the whole process is iterative, involving multiple reviews and feedback mechanisms.

The sensitivity testing has demonstrated that our draft plan is robust, with the same options being selected in the near future and with consistent implementation timescales.

Adaptive planning

In previous planning rounds, WRMPs have published a single forecast future which is used as the basis to identify options to balance a single future's supply and demand. Uncertainty in that future was identified through scenario and sensitivity testing of a plan.

Due to the significant range and scale of potential futures and the challenges that we face, a refined approach has been identified for WRMP24. In line with planning guidelines and in collaboration with WRSE, we have adopted 'adaptive planning' to develop a regional plan to secure water supplies for the South East to the year 2075, and our company dWRMP is integral to that regional plan.

Section 2 of this dWRMP24 introduces the concept of adaptive planning and explains why it is needed. It provides an overview of the adaptive pathways we have used within our plan.

Adaptive planning is an approach to developing and articulating long-term delivery strategies by setting out decisions against a range of plausible future scenarios in an uncertain future.

To develop our adaptive plan, working with WRSE we identified 580 different potential futures based upon 5 different population growth scenarios, 29 climate change scenarios and 4 differing environmental scenarios. Through a process of optimisation, 9 scenarios comprising of combinations of these factors were taken forward to reflect the range of plausible futures

These 9 scenarios span from low challenge benign futures to high challenge adverse futures and can be represented as a tree of alternative pathways or branches. They start from a central core forecast founded upon the most likely scenario in the immediate short-term reflecting key current or expected policies. This then branches into 3 pathways by 2035 associated with futures surrounding forecasted population and property growth. Each of these 3 pathways then branch again into a further 3 pathways (9 in total) in 2040 to account for uncertainty in DO reductions surrounding environmental ambition and to recognise long-term climate uncertainty.

These scenarios have been produced in accordance with the Environment Agency's and Ofwat's guidance to plan for future uncertainties.

By tracking key metrics associated with the decision points, the pathway diagrams can be used to understand when key decisions must be taken to deliver our ambitions. Investment can be scheduled, and options implemented in response to new information that indicates the triggering of an adaptive pathway.

We have used the WRSE pathways in our dWRMP. For the first five years the adaptive pathways in our draft Plan start with local authority housing plans, moderate climate change impacts and low impact environmental sustainability reductions on existing supplies. In 2030, for the second five years of the plan, three scenarios are identified which explore the impact of alternative housing forecasts. From 2035 onwards the full range of alternative futures are shown through higher and lower climate change and environmental impact scenarios as shown in Figure 9 below.

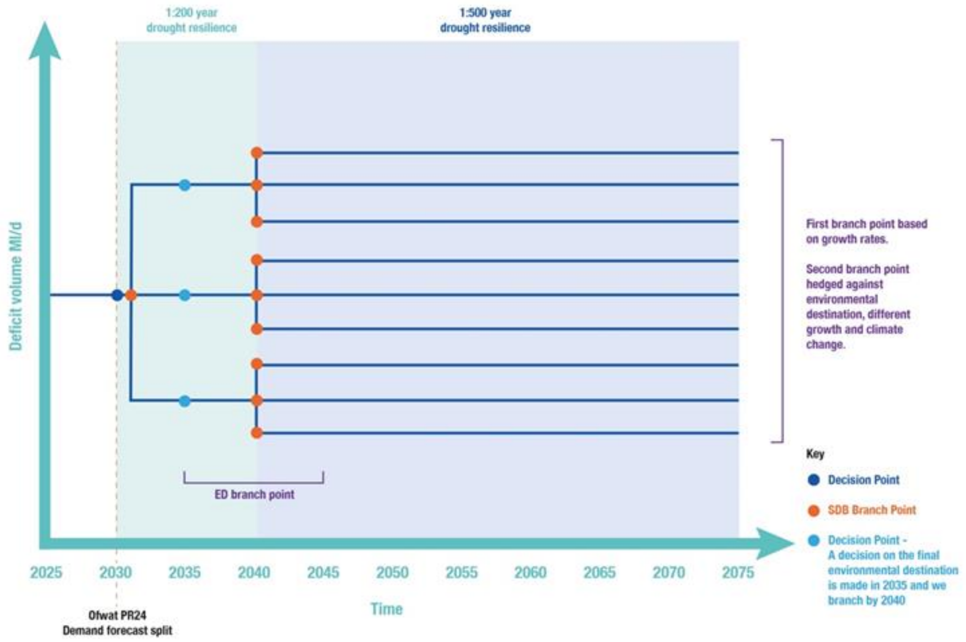


Figure 9: Adaptive planning branches used to develop our dWRMP24.

In all nine adaptive situations (pathways), our supply demand balance starts in deficit and remains in deficit until 2028–29 as shown in Figure 10 for the dry year annual average (DYAA) scenario and Figure 11 for the dry year critical period (DYCP) scenario. In 2029–30 the supply demand balance improves significantly when the Havant Thicket Reservoir becomes operational and as existing bulk supply contracts end.

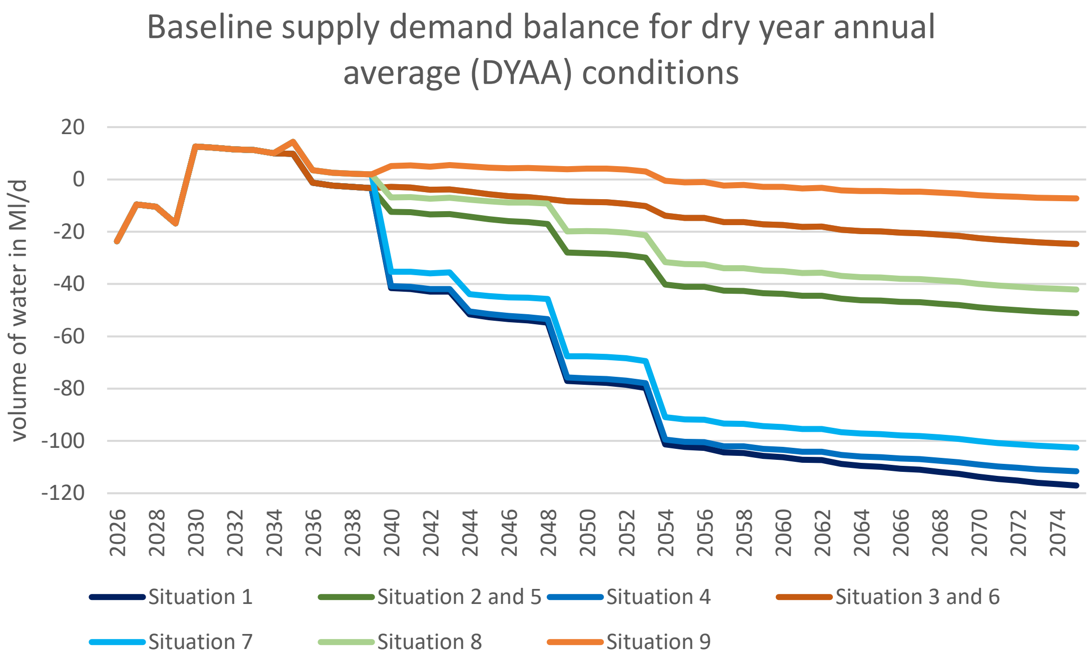


Figure 10: Baseline Supply Demand Balance (shown in Ml/d) for each of the nine adaptive planning Situations (in dry year annual average conditions)

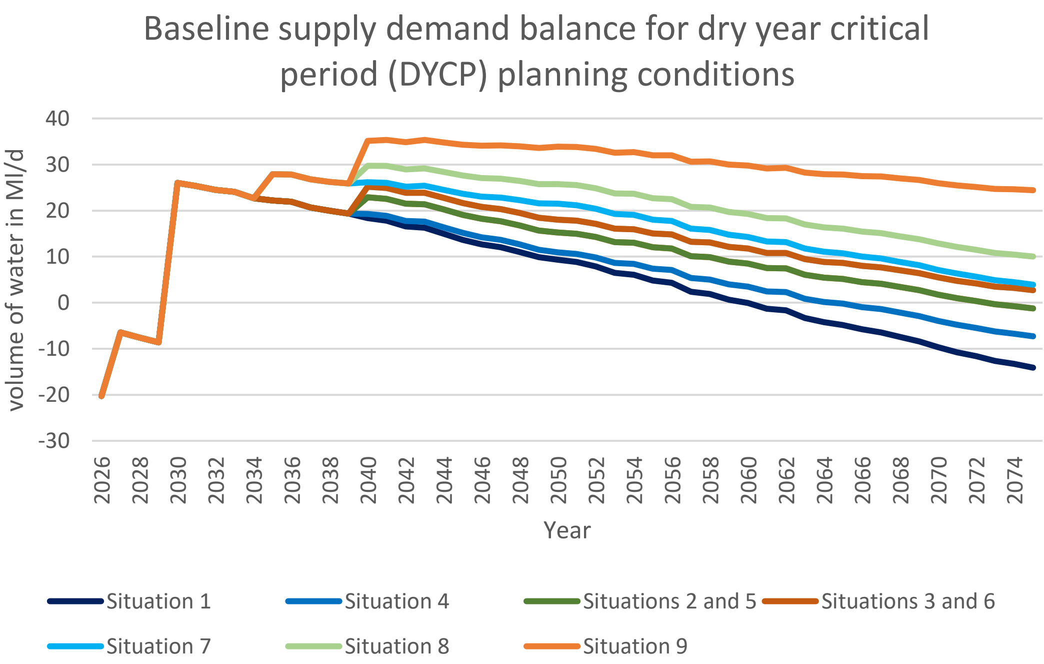


Figure 11: Baseline Supply Demand Balance (shown in Ml/d) for each of the nine adaptive planning Situations (in dry year critical period conditions)

Note that although nine scenarios and therefore nine supply demand balances have been produced by the regional investment modelling, two are not differentiated for Portsmouth Water. This is because two of the situations apply directly to the delivery of the Oxford to Cambridge (Ox-Cam) Arc. This is a cross-Government initiative to support development across the five counties of Oxfordshire, Bedfordshire, Buckinghamshire, Cambridgeshire and Northamptonshire up until 2050. It drives significant demand for some companies in WRSE but does not affect us directly. It is possible that water scarcity driven by this development might impact our options indirectly.

During a dry year, the supply demand balance is more challenging under the annual average scenario (DYAA) rather than under critical peak (DYCP) conditions. Therefore, it is the dry year annual average planning condition that drives our investment need and has been used as the basis for modelling the best value plan. This is standard industry practice.

If we experience a different future scenario from one we are planning for in our draft plan reported core pathway, we will need to move to an alternative pathway. We have included decision points where we will decide if we need to change course. If we do there will then be a branching point at which we'll move to the appropriate pathway.

There are three main factors that would require us to change pathway.

- **Population growth** - This will impact future demand for water. We have included a decision point in 2030 where we will assess whether the growth in population and the updated population forecasts are in line with our draft plan reported core pathway. If it is above what we assumed and we need extra water, we'll move to an alternative pathway with additional investment. If it's less, we will move to a pathway where less future investment is required.
- **Environmental improvement** - The level of abstraction reduction will impact how much water is available to supply. We have included a decision point in 2035 following the completion of the environmental investigations that will take place from 2025 via the WINEP. These will determine how much water companies will need to reduce their abstractions by, to deliver environmental improvement by 2050. If this differs to our draft plan reported pathway, we will move to the appropriate alternative pathway in 2040.
- **Climate change** - The impact of climate change will also affect how much water is available to supply. Again, we may need to move to an appropriate alternative pathway in 2040.

The regional plan will be updated every five years to inform the water companies' future WRMPs. The trigger points we have included align with the completion of the five-year business plans that should include the investment needed for the pathway we are following.

For planning purposes, we have had to nominate a single 'reported core pathway' as our preferred scenario. This pathway, a single path through these branches of possible futures, represents a scenario that satisfies regulatory requirements. We have used this reported core pathway to complete the data tables associated with our dWRMP24.

However, that's not to say there is a larger probability of the reported core pathway future becoming reality than the probability of other branches in the adaptive plan. Therefore, we have costed and are aware of the interventions necessary to deliver our service to customers should any of the possible planned futures occur.

Our reported core pathway is known as 'Situation 4' within the WRSE investment model and is the common pathway selected across the whole of WRSE.

Engagement and consultation

Introduction

We pride ourselves in being a community focused water company. Understanding the needs of our customers and stakeholders is important to us, especially when thinking about decisions for the future. We take an evidence-based approach to put the views of our customers and stakeholders at the heart of shaping our business and the way we operate.

Engaging with our customers, regulators, and other stakeholders has enabled us to incorporate their expectations and priorities right at the start of this planning process. Our engagement activities have been designed to inform both the WRMP and our Business Plan (PR24).

Some strands of our customer and stakeholder engagement continue and build on our previous initiatives, whereas other aspects are new. The dWRMP24 is collaborative to its core, with many fundamental building blocks of this draft Plan having shared methodologies. We have actively participated in the new and wider engagement activities of the regional plan through WRSE and with the National Framework through RAPID and the Strategic Resource Options (SROs).

This open and iterative process will continue with the public consultation of this dWRMP24, and we welcome your thoughts and comments as we continue this journey.

Customer research

We commissioned research into customer priorities for water resources, long term supply-demand choices, and investment decisions. This research has guided our options selection, has acted as a check on the modelling outputs of the WRSE regional investment modelling and is also informing our PR24 Business Plan.

To build on existing knowledge and evidence and to determine where customer research would be most useful, we first analysed over 30 existing reports for common themes and existing evidence.

Customers participated in focus groups and surveys to investigate specific topics, such as customer views on metering and future developments to Havant Thicket Reservoir.

Our customers have told us they strongly support the fixing and reduction of leaks and there was also good support for encouraging customers to use a bit less water. Furthermore, of the 700 self-selected panellists in a March 2022 online panel survey, 45 per cent 'strongly support' and 28 per cent 'tend to support' universal metering. Whilst there was good support for construction of Havant Thicket reservoir, there was less support for increasing supplies through desalination, recycling treated wastewater and water transfers.

The views of customers about the challenges we face are included in Section 1. Customer preferences on specific options are included in Section 7 and have informed a metric which has been used to develop the Plan as described in Section 8.

WRMP Pre-consultation

Some parts of this plan have been developed at company level, and others at regional level. It has been appropriate that the engagement that has informed development of this plan has happened both directly with our customers, as well as part of the regional WRSE group.

As part of the formal dWRMP24 pre-consultation, we wrote to regulators and stakeholders to inform them about our process, approach, and draft emerging results. We also consulted on an SEA scoping report.

Our pre-consultation letter was sent to the Statutory consultees named in the WRPG, and also to individuals and organisations who had previously engaged with our Drought and/or Water Resources Management Plans, or the development of the Havant Thicket Reservoir. We also invited all Retailers and New Appointments and Variations (NAVs) to participate in our pre-consultation.

Generally stakeholders were supportive of the approach. Section 4 of our draft plan includes further details on their feedback.

Ofwat wanted to reiterate their expectations for the planning process, while Environment Agency comments were focussed on the detail around specific options. We subsequently carried out an enhanced pre-consultation with both Ofwat and the Environment Agency discussing how each of their comments had been considered and had shaped the development of this Plan. For example, the adjustment of the adaptive planning branch points and inclusion of an additional growth scenario to reflect new Ofwat guidance, and the selection of a reported core pathway that assumes a high level of environmental protection by 2050 to meet Environment Agency expectations.

We also had dedicated pre-consultation discussions with Natural England, where Local Nature Recovery Strategies were discussed, and a separate pre-consultation meeting with the Drinking Water Inspectorate (DWI) to identify our key options.

We have also incorporated discussions about the approach we are taking to develop the dWRMP24 and our emerging draft plan into our existing conversations with other stakeholders. Examples of this include in our participation with the Arun and Western Streams catchment partnership group, in discussions with Friends of the Ems and in stakeholder groups interested in the development of the Havant Thicket Reservoir.

Regional collaboration and shared pre-consultation activities

Engagement with our neighbouring water companies, and more widely across the region, has been fundamental to development of this Plan. We have developed regional options, collectively consulted on an emerging regional plan, and co-created shared approaches and methodologies.

Through the WRSE group, we engaged in regular dialogue with regulators and stakeholders as well as consulting widely on method statements as they were developed and adopted as well as pre-consultation on the emerging regional plan.

We have actively encouraged our stakeholders to engage with the development of the regional plan through webinars, presentations, and consultation documents on the development of the policies, technical methods, solutions and programme appraisal.

WRSE has produced a Stakeholder Engagement Report which summarised the extensive engagement and consultation activity that has taken place to date. The report was published alongside the emerging plan in January 2022 and contains further details of the 40-plus engagements held to date, including sessions with Local Authorities, Retailers, ‘Blueprint for Water’, National Infrastructure Commission, National Farmers Union (NFU) and the Horticultural Traders Association.

This regional engagement has been particularly successful in understanding views on topics that affect several water companies, for example the Southern Water options that interact with Havant Thicket Reservoir.

An example of where pre-consultation has directly influenced this dWRMP24 has been the introduction of earlier risk-based variations triggered by population growth, environmental destination and climate change forecasts compared to the WRSE emerging plan consulted on in Spring 2022. The selection of adaptive planning Situation 4 as the draft plan reported pathway across the South East region is another example of how regulatory engagement has contributed to key decisions taken during this process.

What is in our Best Value Plan

Our preferred best value plan

Our plan resolves the supply demand deficit identified in our baseline supply demand deficit using a selection of the feasible options we identified. We consider the plan to represent a best value plan and not solely a least cost plan. We have a solution for all 9 branches of the adaptive pathways but have completed our data tables using our reported core pathway (also known as 'Situation 4').

This pathway is based on local authority housing plans, CC06 climate change forecasts and prepares for a high level of impact on our existing supplies to deliver environmental ambition and cap existing abstraction licences at recent actual levels.

Our draft preferred best value plan consists of the following components:

- **Starting in 2025–26**: Implementation of the 'high plus' basket of demand management measures which aims to reduce leakage by 50 per cent and overall customer demand for water by around 16 per cent by 2050 compared to 2017–18 levels. This basket of measures includes universal household 'smart' metering over 10 years starting in 2025–26. Existing 'dumb' meters will also be replaced with smart meters, ensuring by 2040 every household meter will be smart. By 2034–35 we expect that 94 per cent of the households we serve will have a meter, compared with 37 per cent in 2021–22. Installing 'smart' meters will deliver added benefits to reducing water demand, the data from the meters will help reduce leakage inside and outside properties and improve the quality of our customer engagement.
- **From 2025–26 until 2039–40**: When required in extreme events, the continued use of existing drought schemes in accordance with our drought plan (Temporary use bans, Non-essential use bans and our supply-side Source S drought permit). Beyond 2039-40 the Source S drought permit is no longer used, although the implementation of Temporary use bans and Non-essential use bans is continued.
- **From 2025–26**: Continued provision of existing and planned bulk supplies to Southern Water, including the Havant Thicket and Source J bulk supplies from WRMP19. This involves providing up to a 15 Ml/d transfer to Southern water at our eastern border and providing up to a 24 Ml/d transfer to Southern Water at our western boundary from 2025, rising to a 45 Ml/d capacity transfer by 2030. The actual transfer rates vary throughout the planning horizon depending on the amount of water we have available for transfer and the needs of Southern Water. The delivery of the bulk supply linked to our Source J is also reliant upon the success of on-going borehole investigations.
- **Starting in 2026–27**: To optimise the effectiveness of our own water efficiency efforts, our best value plan assumes that the Government will introduce mandatory water labelling for white goods and strengthen water regulations standards to improve water efficiency in homes. This assumption has been applied consistently across the WRSE regional planning area and discussed with regulators.
- **By 2030**: A network enhancement to improve the way we can move water resources around our supply area.
- **By 2049**: Bulk import of potable water from Southern Water to the west of our supply area. This represents a reversal of flow in the existing and planned bulk supplies to Southern Water. Once Southern Water has more water in Hampshire through the delivery of a supply development detailed within the WRSE draft regional plan and Southern Water's dWRMP24, we would be able to start receiving supplies from Southern Water to support our own supplies in future.

In addition to the above components, a WINEP programme will take place in two phases over the first 10 years of our WRMP24, including environmental assessments for all the river catchments in our supply area, to ascertain the extent of any capping of our abstraction licenses necessary to deliver improvements for the environment (our environmental destination). Developing the evidence base will determine what reductions are required to our current sources of supply to achieve good environmental status of the water bodies in our area. There is a possibility that less demanding abstraction reductions could be required following these no deterioration studies and would inform future WRMPs. The scale of future sustainability reductions (our environmental destination) is a key driver of the level of investment needed to meet potential future deficits.

This dWRMP24 fully aligns with the outcomes of the WRSE draft regional plan. It is consistent with our previous plan (WRMP19) and aligns with the stated preferences of our customers in engagement work we have undertaken to date both through the WRSE and directly.

Regional context

Our draft best value plan not only supports our own future challenges, but also supports a resilient reliable water resources solution for the South East region.

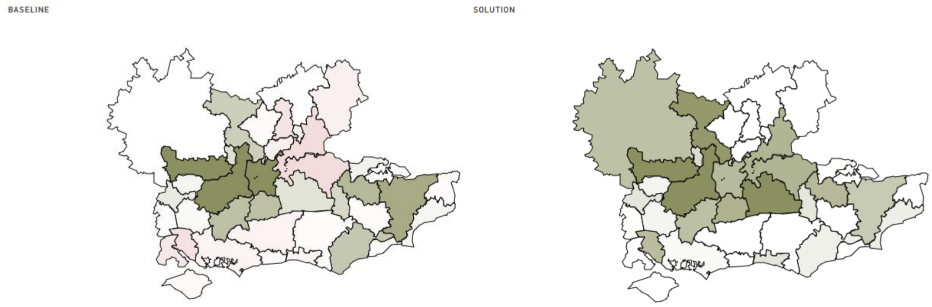
The following regional maps show the scale of the supply demand balance in Megalitres per day (Ml/d) before and after the draft best value plan options have been implemented. Red shades indicate a deficit in the supply demand balance and green shades represent a surplus.

The maps show no residual deficit remaining in the Portsmouth Water supply zone following the implementation of the interventions outlined in our proposed draft best value plan.

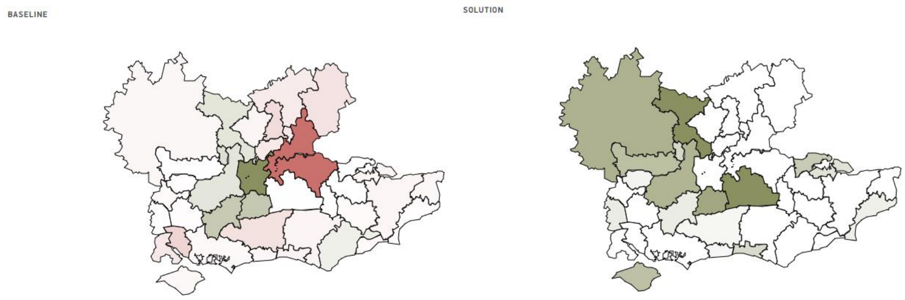
Key to the regional supply demand balance, by water resource zone in Ml/d.

-350	-300	-250	-200	-150	-100	-75	-50	-25	-10	-5	0	5	10	25
-350	-300	-250	-200	-150	-100	-75	-50	-25	-10	-5	0	5	10	25

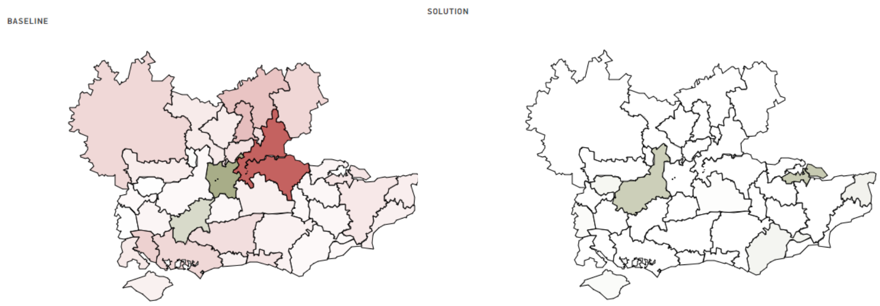
Baseline & final supply demand balance for all pathways (DYAA) for 2025–26



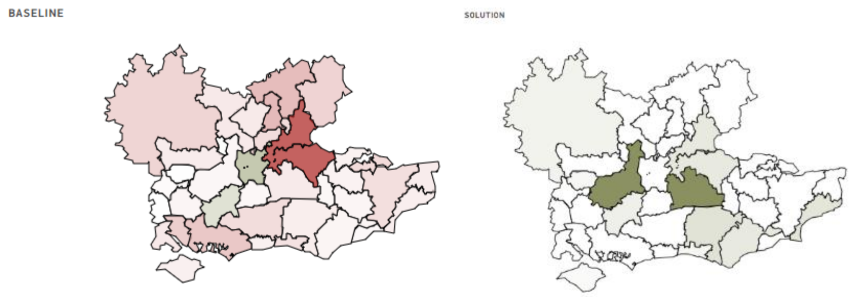
Baseline & final supply demand balance for the reported core pathway (DYAA) in 2035–36



Baseline & final supply demand balance for the reported core pathway (DYAA) in 2049–50



Baseline & final supply demand balance for the reported core pathway (DYAA) in 2074–75



Adaptive planning and strategic alternatives in our draft best value plan

Through the process of adaptive planning and considering strategic alternatives to our draft plan, we considered the modelling outputs of all nine adaptive planning pathways, and a variety of optimisations to consider both what plans would look like if it was optimised on Least Cost, or on producing the best environmental and social metrics.

Comparing outputs for all nine adaptive pathways, our draft Plan is resilient and largely unchanged across the variety of adaptive planning situations considered.

The implementation dates of interventions and options we need to deliver under the 9 adaptive planning branches are shown in Table 3. The lack of variation of dates shows that for us the branches do not make a significant difference to our investment needs.

Table 3: A comparison of when options are triggered to resolve each of the nine adaptive planning situations

	WRSE adaptive planning situations (DYAA)								
	S1	S1	S3	S4	S5	S6	S7	S8	S9
Portsmouth Water Demand Basket High Plus	2026	2026	2026	2026	2026	2026	2026	2026	2026
Network upgrade	2030	2030	2030	2030	2030	2030	2030	2030	2030
Bulk import of potable water from Southern Water	2054	-	-	2049	-	-	2049	-	-
Continuing drought measures until 2040									
Drought Permit: Source S	2026	2026	2026	2026	2026	2026	2026	2026	2026
Non-Essential Use Ban (NEUB)	2026	2026	2026	2026	2026	2026	2026	2026	2026
Temporary Use Ban (TUB)	2026	2026	2026	2026	2026	2026	2026	2026	2026

Cost

Figure 12 shows the total expenditure of the Regional best Value Plan driven by each of the nine adaptive planning branches. The more costly situations to resolve are defined by high climate change impact and high impact of sustainability reductions and licence capping to meet environmental destination.

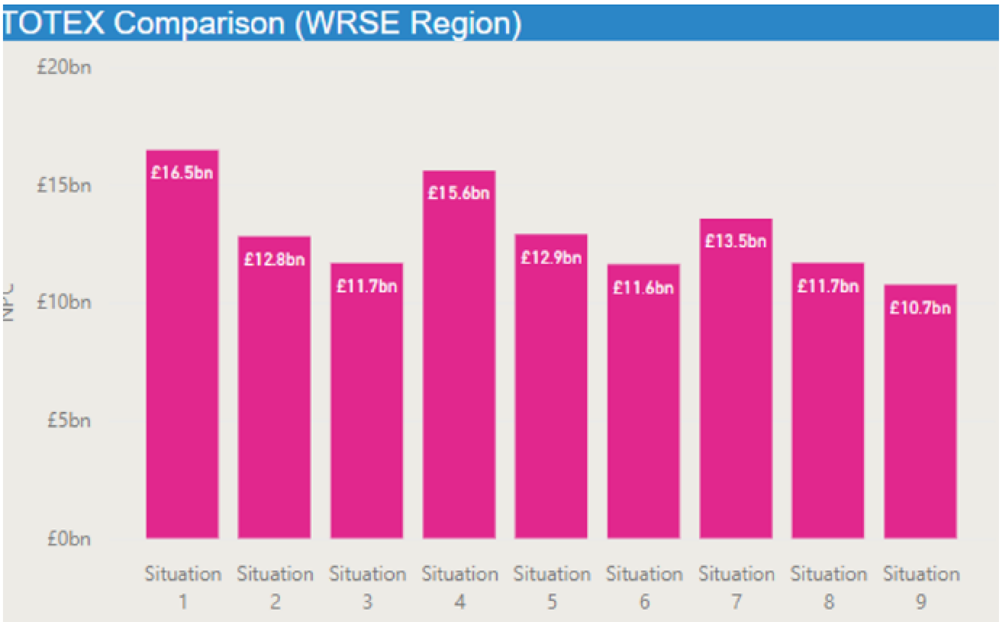


Figure 12: Total Expenditure (Totex measured in Net Price Calculation) for Best Value Plan modelling for DYAA conditions of all nine adaptive planning situations

The total expenditure for our preferred Best Value Plan reported core pathway ('situation 4') is £243m Net Present Value (NPV), and the total expenditure for the other adaptive planning branches ranges between £227m and £249m NPV.

The total expenditure for the Least Cost Plan (and 'situation 4') is £243m NPV i.e. the same as the Best Value Plan. Further information on the cost of alternative plans is provided in the supporting WRMP tables.

We have estimated that our 50-year preferred Best Value Plan will add around £5 on average to bills from 2025 to 2030, increasing to £14 from 2046 to 2051.

Quality Assurance and Board Approval

We developed elements of our dWRMP24 in-house. The Board also approved the appointment of expert third parties to undertake preparation of certain parts of the WRMP and approved the development of other parts of the WRMP to be carried out in regional collaboration.

The data input into the WRMP was checked and reviewed internally with additional peer reviews and assurance points at key points to ensure the quality of work produced and its compliance with the WRPG.

The Board considered an assurance report from Jacobs, the Company's Technical Assurance provider on the draft Water Resource Management Plan. The report checked:

- that we have met our obligations in developing our plan.
- that our draft plan incorporated the long-term government requirements for leakage and demand reduction.
- that our draft plan aligns with the WSE regional plan and that it has been developed in accordance with the national framework and relevant guidance and policy.
- that the WRMP and PR24 business planning assumptions are consistent.

Board Assurance Statement

In preparing this statement, the Board have considered its overall vision for the company and the strategy for Water Resources. It has reviewed the views of Customers and Regulators as well as reports from third parties, conducting elements of the work and reviewing aspect of it. It has also considered the work of WRSE of which we are a key member.

The Board agreed the Core Strategy for the Business Plan and the Water Resource Management Plan which set the tone for this draft plan.

Board Approval

At its meeting in September 2022, the Board reviewed the draft Plan including the least cost assessment and how the draft best value plan was chosen, and confirmation that it reflected accurately policy decisions taken by the Board. It also considered reports from third parties as described above. As a result of this process of review and challenge, the Board is satisfied that the draft plan being presented aligns with customer priorities, represents the most cost-effective and sustainable long-term solution, and will make a major contribution to resilient water supplies in the South East in the future.

1 OVERVIEW

1.1 Introduction

It is a statutory requirement under the Water Industry Act 1991 for water companies to produce a Water Resources Management Plan (WRMP) every five years to help ensure customers and communities have adequate water supplies available. Our WRMP sets out in detail how we will provide and develop an affordable and efficient water supply for our customers, improving the resilience of water supplies to droughts and other future challenges, whilst also protecting the environment.

For this draft Water Resources Management Plan 2024 (dWRMP24) we have planned for the 50-year period from 2025–26 to 2074–75. The steps of the statutory process that must be followed in preparing a WRMP are set out in Figure 13.

Engagement and consultation have contributed to the development of this draft WRMP24. A draft emerging plan, along with method statements, was shared and discussed with our regulators and interested stakeholders. We also advertised for suggestions of options to help increase supply or decrease demand and wrote a 'pre-consultation' letter to regulators and stakeholders providing information about the process and inviting comments.

This dWRMP24 is a continuation of the collaborative process of developing our final WRMP24. It is published in line with Step 8 of Figure 13 below, with the permission of the Secretary of State (SoS).

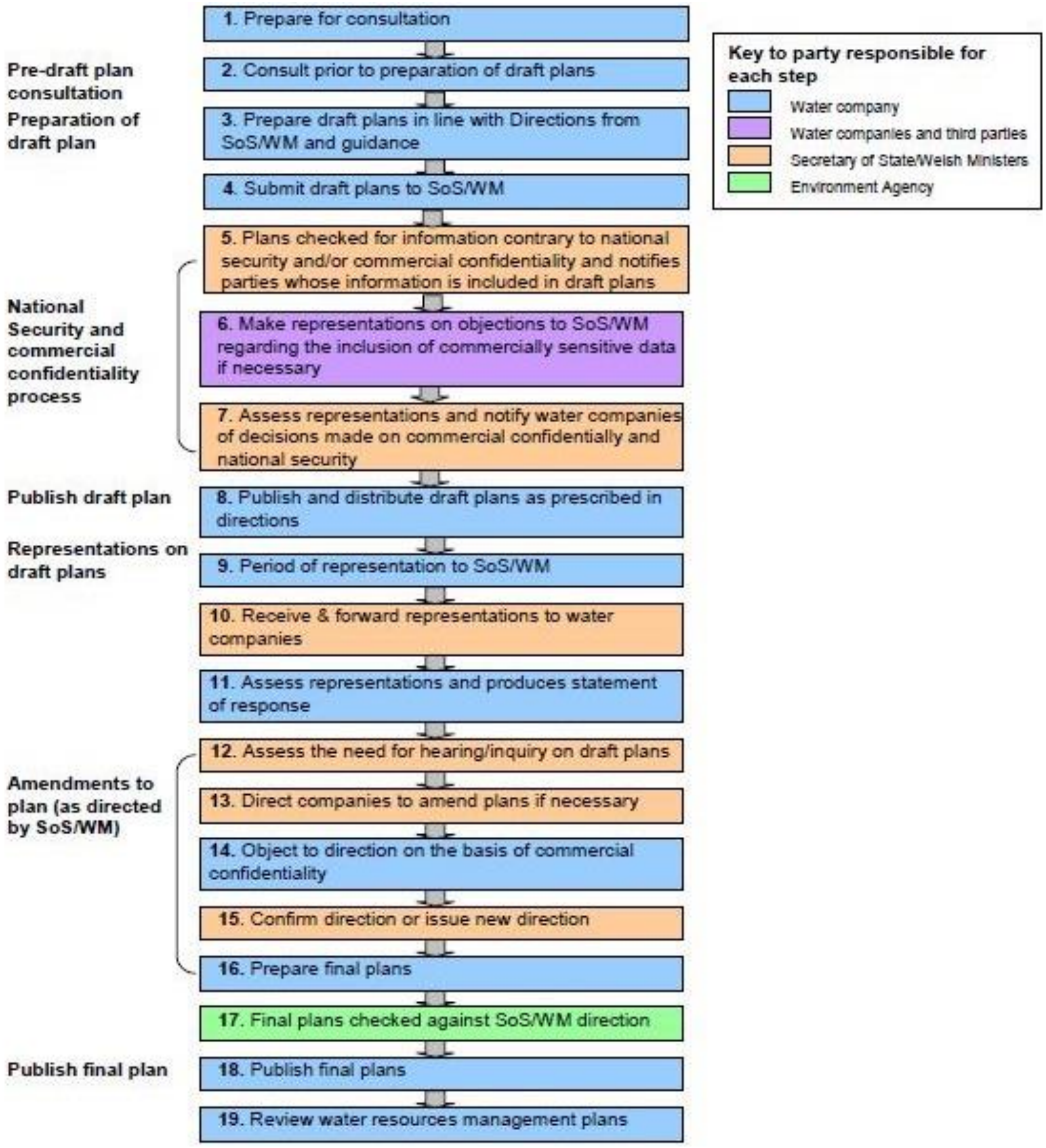


Figure 13: Process for developing a WRMP (Source: WRPG, EA, NRW, Ofwat, Defra and Welsh Government, 2018)

This dWRMP24 is our most ambitious yet.

This ambition reflects the scale and complexity of the water resources challenge facing us. This challenge directly resulted in Defra's acceptance of the Environment Agency's July 2021 recommendation that our supply area should be reclassified by the Environment Agency as being 'seriously water stressed for metering'. This classification formally acknowledges that without appropriate investment, there is a risk that the service customers receive for their water supplies could be significantly affected. This classification has allowed us to consider the option of implementing a universal metering programme across our household customers. Other companies across the South East who were already designated as areas of serious water stress have implemented, or are in the process of implementing, metering to their domestic customers, and have shared evidence of domestic demand savings of between 13 and 18 per cent.

Building on our previous water resources management plan, WRMP19, this dWRMP24 has been developed in compliance with regulatory guidelines and government preferences. It adopts new data sets and methodologies, and accounts for the recent social and economic shifts we have experienced since the last planning cycle. Additionally, it reflects the latest thinking around key considerations such as climate change mitigation and adaptation, working towards Net Zero carbon, and protecting the water environment by delivering against a stated environmental destination for 2050.

In March 2020 the Environment Agency launched the National Framework for Water Resources, aspiring to leave the environment in a better state than we found it while improving the nation's resilience to drought, and minimising interruptions to water supplies. This took on board many of the recommendations from the 2018 National Infrastructure Commission (NIC) 'Preparing for a Drier Future' report such as improved drought resilience and strengthened regional planning.

The National Framework for Water Resources sets out the need for regional water resources planning – captured in Regional Water Resilience Plans - to overcome the national challenges of securing public water supplies, population growth, food security, climate change, protecting the environment, and power generation.

We are members of the Water Resources South East group.

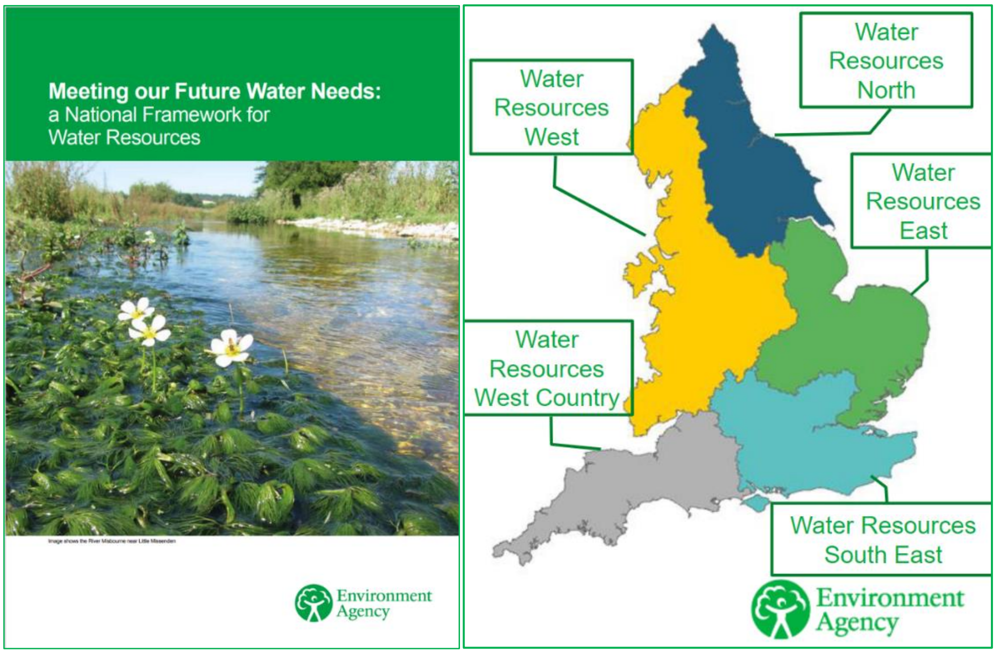


Figure 14: The National Framework for Water Resources has been a major influence for this dWRMP24. This Framework sets out a case for regional water resources groups developing regional multi-sector resilience plans to inform WRMPs.

In addition to establishing a requirement for regional plans to inform WRMPs, the National Framework for Water Resources sets out some core objectives. These included;

- Reducing the amount of water people use to 110 litres of water per person per day by 2050,
- Driving down water use across all sectors, halving leakage rates by 2050 (based on a baseline of 2017–18) and
- Reducing the use of drought measures that have an impact on the environment.

Another core ambition within the National Framework for Water Resources was to "move water to where it's needed through more transfers of different scales and lengths". The Regulators' Alliance for Progressing Infrastructure Development (RAPID) was set up to progress this ambition in parallel with the new regional planning initiative and to feed into the statutory WRMP planning process.

RAPID is an alliance of Ofwat, the Environment Agency and the Drinking Water Inspectorate (DWI). It was established in 2019 to engage with the regional planning process to support work to develop and select the best solutions and prepare their path for delivery starting in the next price review period (2025–2030). It specifically aimed to facilitate nationally significant strategic infrastructure schemes, such as solutions that improve interconnectivity between company and regional supply areas.

The RAPID 2021–22 programme is supporting the development of 18 solutions through a gated review and challenge process. At the end of each gate, if an option is no longer considered to merit further investigation, then the investigation of that option is stopped. One of these is a direct transfer from Havant Thicket Reservoir, in our area, to Southern Water's supply area. To find out more about these strategic schemes and the regulatory process they are following, visit [The RAPID gated process - Ofwat.][3]

Figure 15: Map of strategic region water resources solutions supported by the RAPID gated process[4]

We collaborated regionally through the Water Resources in the South East (WRSE) alliance to develop a shared approach to adaptive planning and have delivered elements of the supply and demand forecasts through group projects, following shared methodologies.

WRSE is an alliance of the six water companies which cover the South East of England - Affinity Water, Portsmouth Water, SES Water, Southern Water, South East Water and Thames Water (see Figure 16).

[3] www.ofwat.gov.uk/regulated-companies/rapid/the-rapid-gated-process/
[4] Source, RAPID, Forward programme 2022–23, March 2022, www.ofwat.gov.uk/wp-content/uploads/2022/04/RAPID-forward-prog-2022.pdf

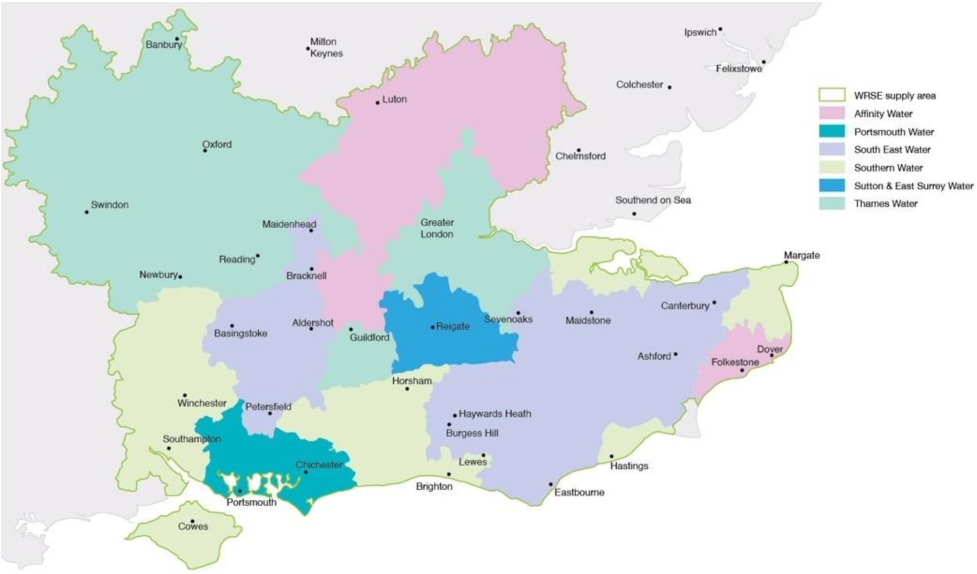


Figure 16: The supply areas of the six water companies who form the Water Resources South East (WRSE) alliance

Working as a regional alliance, WRSE commissioned the development of a regional investment model. Using agreed metrics, the model helps us to identify the options that provide water in the right place at the right time across the whole region, while addressing legal and regulatory requirements and policy expectations initially at the most efficient cost.

The next step was to carry out further assessments of our options and consider wider benefits beyond cost. This enabled us to identify whether we can deliver additional value through our plan that will further improve the region's environment, resilience and benefit wider society. This could mean some options are chosen as they deliver best value to the region, albeit at a higher cost.

By aligning with the WRSE regional plan, our dWRMP24 aims to balance national, regional and local interests - reflecting both the best value regional plan but also the service level and environmental ambitions of our regulators, customers, and stakeholders.

This document is the main statutory document for the dWRMP24. It is accompanied by a non-technical summary which contains more details about the public consultation process for this draft plan including how to respond to the consultation. It is also supported by water resources planning tables and detailed technical appendices.

1.2 Strategic Environmental assessment (SEA)

Due to the potential for the WRMP to lead to schemes which will require an Environmental Impact Assessment (EIA), it is a statutory requirement that a SEA is undertaken under the European Directive 2001/42/EC for "the assessment of certain plans and programmes on the environment" (the 'SEA Directive'). The SEA Directive came into force in the UK through the Environmental Assessment of Plans and Programmes Regulations 2004 (the "SEA Regulations"). While the United Kingdom has now left the EU, the SEA Regulations still apply to a wide range of plans and programmes, including water resource management plans, and modifications to them.

The SEA Regulations reflect the overarching objective of the SEA Directive which is:

"To provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans…

with a view to promoting sustainable development, by ensuring that, in accordance with this Directive, an environmental assessment is carried out of certain plans… which are likely to have significant effects on the environment." (Article 1)

The main requirements introduced by the SEA Regulations are that:

- the findings of the SEA are published in an Environmental Report (ER), which sets out the significant effects of the draft WRMP24;
  - consultation is undertaken on the plan and the ER;
  - the results of consultation are taken into account in decision-making relating to the adoption of the WRMP24; and
  - information on how the results of the SEA have been considered is made available to the public.

As such, it is a key element of the SEA to act iteratively with the development of the WRMP24 to ensure that environmental and some economic and social considerations are made at the earliest stages. This is important because whilst the WRMP includes interventions developed both within our supply area, and those shared with neighbouring water companies, there is a potential that some of these solutions may cause adverse effects on the environment or the people of the area, particularly during their construction but also through operation.

As mentioned previously, we are also working through WRSE to produce a regional resilience plan for the whole of the Southeast Region. For the same reasons described above, the regional plan also requires an SEA to be undertaken. The SEA for our plan complements that done for the regional plan but allows for ‘local’ scrutiny of environmental issues and opportunities.

The issues considered in the two SEAs are those set out under the SEA Regulations, namely of biodiversity, soils, the water environment, air and climate, cultural heritage, and landscape, as well as people-based topics of health and material assets.

A bespoke assessment framework, compatible with that developed for WRSE as part of the regional SEA but specific to the Portsmouth Water area, was developed through a review of relevant plans and policies, as well as local baseline information. This ensured that relevant local issues would be addressed as part of the assessment process and would allow for mitigation to be developed to help reduce any adverse effects identified, or to allow for opportunities for environmental improvement to form part of the WRMP development.

The robustness of this local assessment framework was verified through consultation on the SEA Scoping Report with key stakeholders and regulators and comments received formed an important component of refining the assessment process. This consultation process, and how it impacted our approach is documented in Section 3.5 and the SEA that accompanies this WRMP24.

1.2.1 Other environmental assessments that helped inform the SEA

Alongside the SEA process and helping to inform it, a series of other environmental assessments have been undertaken of water and biodiversity aspects that are relevant to water resource management planning. These include Natural Capital Assessment (NCA), Water Framework Directive (WFD) assessment, Biodiversity Net Gain (BNG) assessment and Invasive Non-Native Species (INNS) assessment.

The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 require all natural water bodies in the UK to achieve both Good Chemical Status (GCS) and Good Ecological Status (GES) which, collectively, result in a water body classification of “good” status. River Basin Management Plans (RBMP), published by the Environment

Agency, identify actions considered necessary to enable natural water bodies to achieve good status. Any new activities or schemes in a WRMP that might, without mitigation, negatively affect the water environment require careful consideration. Assessments have been made of options within the WRMP, to determine their possible effects on waterbodies.

Biodiversity Net Gain (BNG) is an approach applied during the consenting of any new schemes or developments that requires them to leave the natural environment in a measurably better state than beforehand. Natural England have produced a biodiversity metric that provides a way of measuring and accounting for biodiversity losses and gains resulting from development or land management change.

Natural capital is defined in the 25 Year Environment Plan (England) as “the elements of nature that either directly or indirectly provide value to people”. As a new and emerging approach, natural capital incorporates methodologies and approaches (such as ecosystem services) to understand the value that natural assets provide. For the water industry, these can be substantial. The Water Resource Planning Guidelines (WRPG) (England and Wales) states that WRMPs should “use natural capital in decision-making”, “use a proportionate natural capital approach”, “deliver environmental net gain”, and provide cost information on monetised ecosystem service costs and benefits where monetisation is used. WRSE have conducted these BNG and Natural Capital assessments in full, but the findings have been used to inform our dWRMP24.

An Invasive Non-Native Species (INNS) assessment of our options has also been carried out to determine the threat of inadvertently spreading INNS. The results of these INNS assessments have formed part of the SEA process for the biodiversity and water objectives. INNS dispersal can occur through a range of recreational and operational (water company) ‘pathways’, which may include water or land-based recreation and sports, and water company operations, such as ground maintenance and the operation of Raw Water Transfers (RWTs).

1.3 Habitats Regulations Assessment

Within our supply area there are a series of areas that are of vital importance to nature conservation, such as ephemeral and perennial chalk streams. Therefore, in addition to SEA and the specific environmental assessments outlined above, another specialist assessment has been made of the WRMP.

This assessment, known as a Habitats Regulations Assessment (HRA), is required by Regulation 105 of the Conservation (Natural Habitats, and species) Regulations 2017 (as amended by The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019) and is required where a land use plan is likely to have a significant effect on such sites designated for nature conservation and is not directly connected with or necessary to the management of that site.

Such sites include Special Areas of Conservation (SAC) and Special Protection Areas (SPA). An HRA is also required, as a matter of UK Government policy, for other designations, including; Potential SPAs (pSPA), Possible SACs (pSAC), listed and proposed wetlands of international importance (Ramsar sites and proposed Ramsar sites), sites identified as compensatory measures for adverse effects on habitats sites, pSPA, pSAC.

In short, an HRA determines whether there will be any ‘likely significant effects’ on a designated sites because of the implementation of the WRMP (either on its own or ‘in combination’ with other plans or projects) and, if so, whether these effects will result in any adverse effects on the site’s integrity. Designated areas protected under the Habitats Regulations are shown in Figure 17 below.

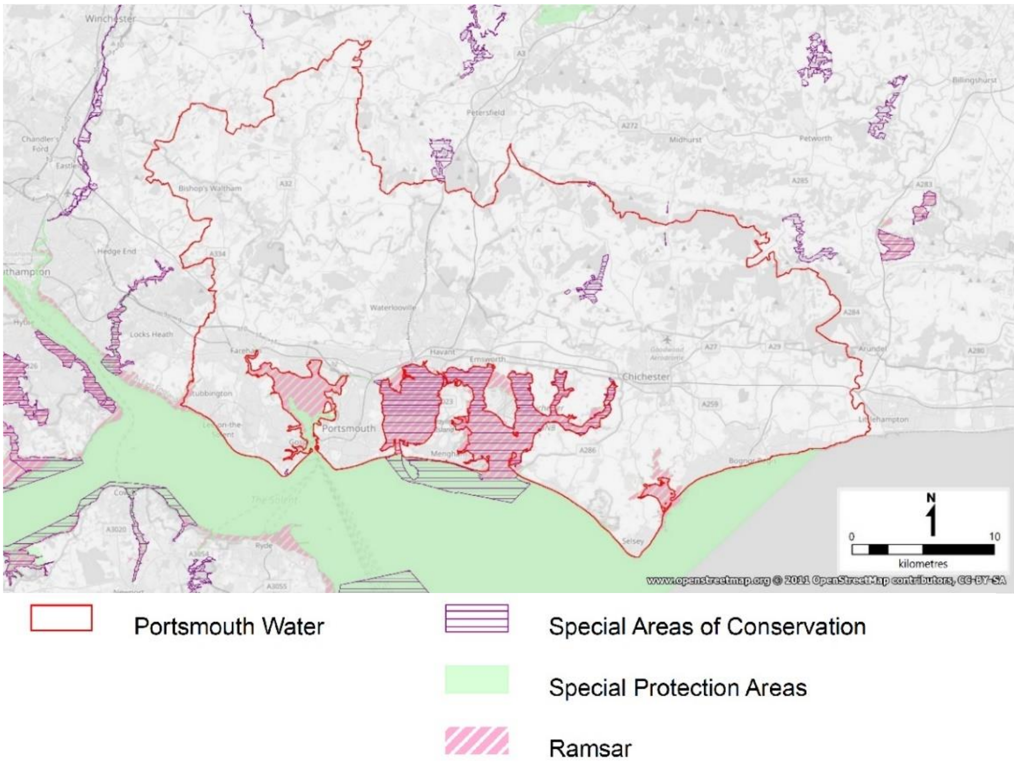


Figure 17: Map of the Special Areas of Conservation, Special Protection Areas and RAMSAR areas that have the potential to be impacted by this Plan

1.4 Consultation and engagement

Engagement with customers, regulators, stakeholders, employees and other Water Companies across the South East has been fundamental to the development of the dWRMP24.

The public consultation for this dWRMP24 continues the collaboration already undertaken for its development. Regionally we have worked with customers, other WRSE member water companies, the water industry regulators, other regional water planning groups and a range of stakeholders to develop our dWRMP24.

Consultation on the regional and dWRMP24 plans included the following:

- At a regional level the WRSE Emerging plan consultation was launched in January 2022. Well attended consultation webinars were held, with several of our local stakeholders, such as “Friends of the Ems” actively participating.
- At a company level, we have been undertaking our own consultation and engagement activities. We have identified “future water supply” and “demand management” as two of the five ‘big conversation’ topics we are having with customers through the current WRMP and business planning round. We commissioned several research activities, as well as systematically capturing existing consumer data and insight from over 32 reports relating to these. The views and preferences of our customers have directly influenced the development of this draft Plan.
- In January 2022 we wrote to 169 individual representatives of regulators, Non-Governmental Organisations (NGOs), Councils and interested groups with details of our emerging dWRMP24, to ask for feedback and invite them to comment on our approaches.

- Dedicated pre-consultation discussions were held with Ofwat, the Environment Agency, the Consumer Council for Water (CCW), The Drinking Water Inspectorate (DWI), and Natural England.

Our dWRMP24 Strategic Environmental Assessment (SEA) scoping report was circulated to key stakeholders and regulators on the 14 March 2022 for consultation. Comments were received from the Environment Agency, Natural England, and Historic England.

Section 3 provides more information about how engagement has contributed to the development of this dWRMP24.

1.5 WRMP as part of a wider planning landscape

Water resources planning, and the dWRMP24 specifically, does not operate in isolation. It has interdependencies with other plans and processes both within Portsmouth Water and more widely with regional and national plans and ambitions.

Within Portsmouth Water, we have ensured alignment across each of the different planning processes through a WRMP24 steering group which has met each month during the development of this plan.

In the table below we summarise how we have ensured this dWRMP has taken specific elements of the wider planning landscape into consideration.

Aspect of Planning	Consideration.
The previous WRMP (Revised WRMP19 tables submitted June 2022)	WRMP19 data was used as starting place for dWRMP (WRSE) modelling. Where there has been no change, WRMP19 work has been referenced rather than being repeated, for example for WRZ Integrity where we continue to operate as a single zone supply area. Conversely, where we have revised the WRMP19 in response to regulatory queries and challenges, we have incorporated new WRMP24 methodologies and approaches to incorporate the latest analytic techniques. This effectively provided a bridge between WRMP19 and WRMP24. We've achieved a lot since our last water resources plan was published in 2019, significantly reducing leakage and progressing our plans to build Havant Thicket Reservoir. However, the restrictions of the Covid pandemic slowed our metering programme and other schemes could not progress as planned. At present we have less of a buffer in our supply demand balance (referred to as 'headroom') compared with that planned for in our original WRMP19. **This means there's currently a slightly higher risk we'd need to introduce emergency restrictions in a very severe drought, so we've resolving this in this latest WRMP24.**
The PR24 business planning process	The water resources planning process runs in parallel to the periodic review business planning process, run by Ofwat. The Business Plan and WRMP are inherently linked, with WRMP investment requirements being put forward as part of the company's overall Business Plan. Alignment has been achieved through shared governance within the company. Our 25-year vision statement "*Excellence in Water. Always*." sets out our company vision, against the backdrop of climate change and population

	growth, to provide an affordable, reliable, and sustainable supply of high-quality water for our customers. By being smart in our approach we will work with our local communities to meet our goals while protecting and enhancing the environment for future generations. This vision is currently out for consultation with our customers to understand if they have the same vision for their local water company. Our number one priority within our 25-year vision statement is to, 'secure sustainable water supplies for our customers, which protect and enhance our environment in a changing world'. Some of the proposals we are testing with customers include the following: • Provide enhanced regional drought resilience by bringing Havant Thicket reservoir into service on schedule by 2029. • Reduce leakage by 50 per cent by 2040, 10 years ahead of government's expectation. • Support customers to reduce personal water usage by 25 per cent. • Deliver universal domestic smart metering by 2040. • No customers will experience restrictions on their water use, even in a severe drought. • Enhance biodiversity on all the sites we own. Our second business priority is to, 'be at the frontier of delivering high-quality, resilient, net zero services – for our customers, environment and region'. Third is to, 'co-create solutions which deliver our customers', communities', and stakeholders' priorities', and fourth is, 'affordable water for all. Always'. In some cases, our ambition in the vision statement is greater than that incorporated in this dWRMP24 – specifically when it comes to reducing leakage from our network. This reflects our desire to challenge ourselves and the ambitions of our customers. We are totally committed to delivering a halving of leakage by 2050 as stated by this plan, but if supported by customers and found to be affordable and feasible, we want to commit to a delivery target of 2040.
The Drinking Water Safety Plan	Working with both the Water UK Water Quality Group, and through WRSE, we have developed a screening process for Drinking Water Safety Plan (DWSP) risks identified as part of the source to tap assessment. This is documented in Appendix 1B. This work has also been shared with our neighbouring companies where relevant, to ensure a consistent approach is taken for schemes that are common to both companies. More information is found in section 7.5.
The Drought Plan	We published our drought plan on 29 April 2022. This is an operational plan that sets out the actions we will take during drought periods (including the lead up to droughts) to ensure continuity of supply whilst at the same time continuing to protect the environment. The drought plan is linked to the WRMP, as the modelling of droughts of different severities and the groundwater levels that trigger timely actions are reflected in the WRMP process. Drought options, such as temporary use bans, drought permits and orders, also form part of the feasible set of options that are available to meet future deficits, alongside demand management and development of new supplies or transfers.

	There have been no changes to our previously agreed Levels of Service (LoS) or supply side drought permit options. We have on-going programmes of work that were agreed with the Environment Agency and Natural England as part our permission to publish our drought plan. We continue to liaise with Southern Water about their drought triggers on the Itchen. Southern Water submitted a technical note on drought triggers to the Environment Agency in Summer 2022. This included a joint position statement with ourselves, which will form an addendum to our drought plan. We also have on-going environmental assessment work taking place alongside the development of our dWRMP24, which will be used to update our drought plan appendices once finalised.
WINEP	The Environment Agency, Natural England and Ofwat use the Water Industry National Environment Programme (WINEP) process to define the scope of environmental activities. Previously the WINEP focused on a 5-year funding programme but has increasingly moved to a long-term view and approach. The WINEP and dWRMP24 both feed into the PR24 process by proposing investment programmes for investigations and schemes to be delivered over the course of the next 5-year funding period and the longer term 25-year Defra Environment Planning period. The dWRMP24 is having a strong influence on the WINEP programme due to the requirement to investigate a significant number of abstraction sources to confirm the need and scale for sustainability reductions to meet our 'Environmental Destination' (including 'Licence Capping'). Further information is provided within Section 5.4. WRSE have scored all the catchments we operate in as high priority for meeting the proposed environmental destination and therefore significant sustainability reductions are modelled within the baseline supply demand balance. As a result, a range of supply and demand schemes are needed to meet a supply demand balance deficit. These potential sustainability reductions will be refined via detailed investigations and options appraisals via the WINEP. The influence of the WINEP on future WRMPs includes: • No deterioration studies to review the effects of increasing abstraction beyond recent actual. • Abstraction licence capping where certain abstraction sources are capped at recent actual rates if this is considered appropriate as part of a best value environmental solution. • Catchment management to manage raw water quality and to meet Drinking Water Safety Plan (DWSP) obligations.
The Plan for delivering Net Zero	We currently generate 10 per cent of our energy from solar panels and are trialling electric and zero emissions vehicles. One of the four priorities identified in our 25-year vision statement is to 'be at the frontier of delivering high-quality, resilient, net zero services – for our customers, environment and region'. It is our vision that we will be totally net zero by 2050 – both in our operations and our embedded carbon. We'll generate more energy than we need from our

<table>
<tr><td></td><td>operations and assets, and export this to our local communities. All our vehicles will be zero emissions – embracing the latest technology.

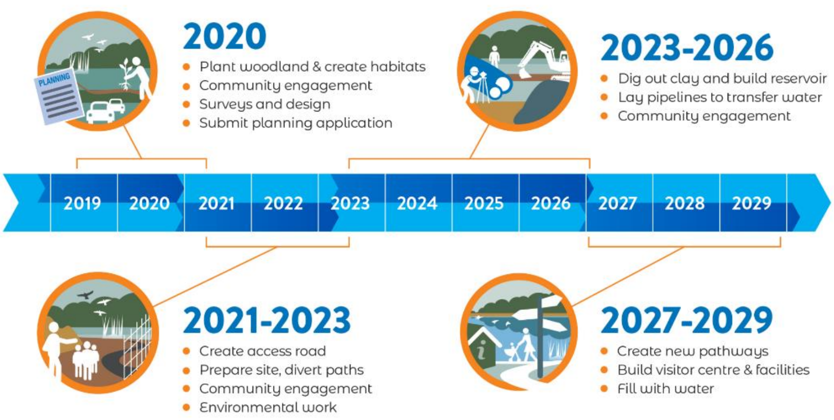
Within the dWRMP24 options that we have considered, we have included the assumption that they will be supplied by renewable energy sources. The carbon of each option has been accounted for within the option dossiers (please see Section 7.4.1), and this was one of the metrics that was used to develop our preferred best value plan (please see Section Figure 32).</td></tr>
<tr><td>The existing development of the Havant Thicket Reservoir</td><td>We're working in partnership with Southern Water to deliver Havant Thicket Reservoir. This scheme was approved as part of our WRMP19 and PR19 Business Plan.

Havant Borough Council's Planning Committee resolved to grant planning permission for both the reservoir and the pipeline between it and Bedhampton Springs on 3 June 2021.

The reservoir will secure more reliable water supplies for the South East region and protect the environment. By using the reservoir to supply our own customers, we can share supplies from our other water sources with Southern Water. This will mean that Southern Water can reduce the amount of water that they take from the Chalk Rivers Test and Itchen in Hampshire. These rare and sensitive chalk streams are home to many species. It will also help cater for a growth in the population and housing and increasingly severe droughts that are predicted due to climate change.

The reservoir will take another seven years before the current plans and designs are realised in 2029 with the completed reservoir full of water and open to the public.

The diagram below sets out our timescales, with construction taking place in phases.



Please note that the current approved plan for the reservoir, included in the baseline of this dWRMP24, has no associated element of recycled water. Together with Southern Water, we are exploring options for the future, which include adding recycled water to the reservoir and taking a pipeline from the reservoir directly to Southern Water's supply area. But these options are in a relatively early feasibility stage. More information about these options can be found in Section 7.8.</td></tr>
</table>

1.5.1 Regional planning

Regionally, this is our most collaborative water resources planning process yet; We share common methods and approaches across the Southeast, have undertaken regional engagement with regulators and stakeholders and use a single regional investment planning model used to inform our dWRMP24.

The WRSE draft regional plan sets out how we, as a region, plan to achieve a secure, resilient, and sustainable supply of water for our customers and other sectors, across a challenging range of potential futures for the next 50 years. This will ensure that water is used in the most sustainable way in the years to come. The plan will ensure we improve the environment, and that we will be able to adapt to climate change, whilst providing the water needed as the population grows. It will deliver a step-change in how we use water so that we reduce how much is wasted and use what we need as efficiently as possible. It will make the region's water supplies more resilient to drought and other shocks – providing 21st century solutions so that society always has the water it needs.

We have looked to local authority development plans to inform the regional demand forecast. We have also invited third parties to suggest possible options and we have considered non-public water supplies for the first time.

We are fully committed to the WRSE approach. As such, where appropriate we are referencing WRSE method statements and other published documents within this dWRMP24.

Our preferred best value plan (in Section 10) has been informed by the draft regional plan, with modifications for local considerations where necessary.

WRSE are consulting on the draft regional plan at the same time as our dWRMP24 consultation, and the dWRMP24 consultations of the other five water companies across the region. These are separate consultations and therefore please try to direct your response to the appropriate consultation.

This statutory dWRMP24 document is accompanied by a non-technical summary, which contains more details about the public consultation process for our dWRMP24 including how to respond to the consultation.

Figure 18 shows the high-level alignment and key interactions in the timetables of the WRSE regional plan with our own WRMP24.

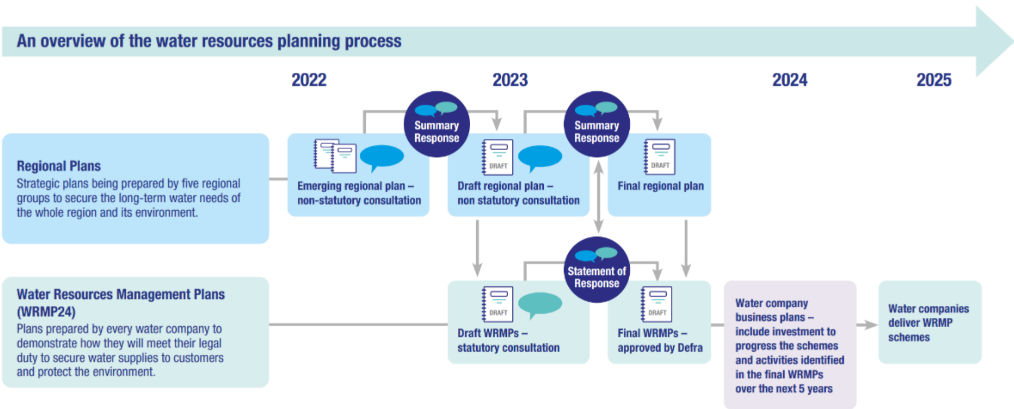


Figure 18: Alignment of regional plan and WRMPs

1.5.2 River basin catchment planning

We have looked to engage with and align with the objectives of River Basin Management Plans (RBMPs) and planning catchment groups to meet WFD obligations. We have achieved this through engagement with individual catchment partnerships.

We work collaboratively to develop catchment and nature-based strategies and work delivery plans. For example, we are part of the Arun and Western Streams Catchment partnership on the River Ems to create and develop the River Ems Chalk Restoration Scheme. After completing baseline environmental assessments, a series of stakeholder task and finish groups will co-create a sustainable river restoration plan to be delivered over the next 25 years.

1.5.3 National plans

More widely we have considered the National Framework for Water Resources as well as other national planning frameworks, such as:

- PR24 and beyond: Long-term delivery strategies and common reference scenarios, Ofwat, November 2021
- A Green Future: Our 25 Year Plan to Improve the Environment, DEFRA, 2018
- National Infrastructure Strategy, HM Treasury, November 2020
- Environment Agency's 2027 Abstraction Plan – ref Section 5.4
- The draft Environment Bill, and Local Nature Recovery Strategies.
- National Infrastructure Commission's resilience document – Anticipate, React, Recover published in May 2020

Table 4 shows where the influences and interconnections are in this plan with other Portsmouth Water, regional and national plans. These links have been made in technical work and stakeholder engagement.

Key:

- ● Ongoing interdependency
- ◊ New regional or national driven interdependency
- ○ New Portsmouth Water driven interdependency
- ♦ New Portsmouth Water and Regional/National interdependency

		Portsmouth Water Plans						WRMP24 Chapter								
		WRMP24	Revised WRMP19	2021 Drought Plan and future 2026 Drought Plan	Drinking Water Safety Plan	Portsmouth Water's Net Zero Plan	PR24	2. Adaptive Planning	3. Engagement and Consultation	4. Demand Forecast	5. Supply Forecast	6. Supply Demand Balance	7. Options	8. Developing the Plan	9. Scenario Sensitivity Testing	10. Best Value Plan
Portsmouth Water Plans	Revised WRMP19	●		●	●		●		●	●	●	●	●	●	●	●
	2021 Drought Plan and future 2026 Drought Plan	●	●				●		●	●	●	●	●			
	Drinking Water Safety Plan	●	●				●						●			
	Portsmouth Water's Net Zero Plan	○					○						○	○		○
	PR24	●	●	●	●	○							●	●	●	●
Regional Plans	WRSE Regional Plan (including RAPID SROs and National Reconciliation with other regional plans)	♦	◊	◊	◊	♦	◊	♦	♦	♦	♦	♦	♦	♦	♦	♦
	Natural England Nature Recovery List	●					●				●		●			
	River basin Management Plan and Planning catchment groups (WFD obligation)	●	●				●				●		●			
	Local authority housing growth plans	●	●	●			●	♦		●		●				
	Abstraction Licence capping	◊	◊	◊			◊	♦			●	●	●			
	Environmental Destination	♦		◊			♦	♦		◊	◊	◊	◊			
National Plans	National Framework for Water Resources	♦	◊				◊	♦	◊	◊	◊	◊	◊	◊	◊	◊
	Government's 25- year Environment Plan	♦					◊	♦			◊	◊	◊			◊
	Ofwat's common reference scenarios	♦					◊	♦		♦	♦	♦			♦	
	Water Industry Natural Environment Plan	●	●				●				●		●			

Table 4: Ongoing and new interdependencies between Portsmouth Water Plans, Regional Plans, and National Plans.

1.6 Portsmouth Water operating area

At Portsmouth Water we are proud of our long tradition of serving Portsmouth and the surrounding area with high quality drinking water since the Company was established in 1857. Through amalgamation, the Company's supply area has expanded beyond Portsmouth to supply the towns and cities of Gosport, Fareham, Havant, Chichester and Bognor Regis, in the counties of Hampshire and West Sussex.

On average, we distribute around 175 million litres of water each day to over 740,000 customers in around 320,000 properties. Some customers on new housing estates are also supplied by New Appointments and Variation companies (NAVs).

Figure 19: Portsmouth Water's supply area

We are a community-focused 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 treated water so that, in part, 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.

The area of supply includes a large expanse of coastline with numerous important habitats that have been designated under European Directives (including the South Downs National Park). As a statutory undertaker, we have due regard to the purposes of the national park.

1.6.1 A single Water Resources Zone supply area

Our supply area is made up of a single Water Resource Zone (WRZ). These zones are a key building block for water company WRMPs. They are defined as:

> *The largest possible zone in which all resources, including external transfers, can be shared and hence the zone in which all customers will experience the same risk of supply failure from a resource shortfall.*

Our distribution system includes significant strategic treated water storage spread across a series of large, treated water storage reservoirs and is based around a spine main that runs East to West across our Region. This system ensures that all our customers in the supply area experience the same level of service and the same overall risk of supply failure. This applies under normal, dry year and drought conditions.

There have been no changes to the company area or WRZ configurations since WRMP19. As there have been no significant zonal configurations to the water supply network, the results of the WRMP19 Water Resource Zone Integrity Study are still relevant and have continued to be used to inform this finding. This report is set out in Appendix 1A.

We anticipate a revised Water Resource Zone Integrity Study for WRMP29. This will be informed by python-based water resource modelling we have carried out for this dWRMP24, which has provided greater insight into how our sources operate conjunctively, as a system.

1.6.2 Sources of water

We have 21 water sources, abstracting an average of around 170 megalitres per day (Ml/d) from one group of springs, one river and 19 borehole sites. Our system currently has no significant raw water storage, so we are reliant on the recharge of groundwater over the winter period.

The triangles in the map below (Figure 20) provide an overview of where our water comes from across our supply area. These are known as abstraction sources and the amount of water we take, and the timing of when we take it, is governed by the Environment Agency through their Abstraction Licencing system.

Most of our sources are subject to ‘group licences’ where the abstraction licence conditions span more than one specified site. Just six of our abstraction sites have individual licences.

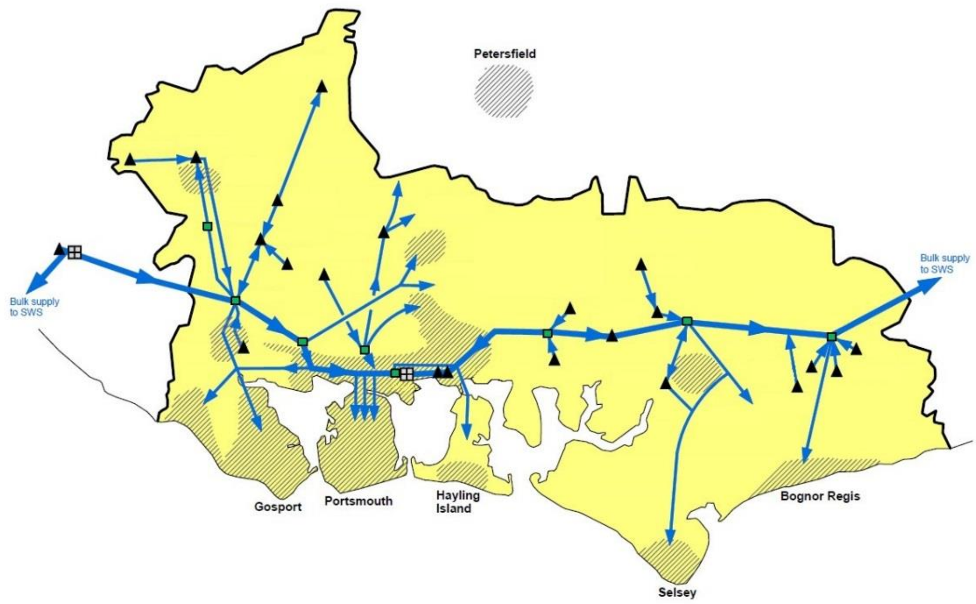


Figure 20: Map of Portsmouth Water Area of Supply

1.6.3 Sharing water with Southern Water

We supply two bulk transfers of water to our neighbour Southern Water. One flows East into their Sussex Zone, with a capacity of 15 Ml/d which is available on a ‘best endeavours’ basis, with a sweetening flow of 1 Ml/d required at all times. The second sends water West into their Hampshire Zone. It is also up to 15 Ml/d with water volumes guaranteed through a reservation basis.

In addition to these existing bulk supplies, we are also planning to provide Southern Water with additional future bulk supplies to support their Hampshire zone as they continue to reduce abstraction from chalk rivers. One of these additional bulk supplies is due to commence in 2024 at a rate of 9 Ml/d, although its delivery is reliant upon the success of on-going borehole investigations at our Source J. The other will be in association with the development of Havant Thicket Reservoir, increasing bulk supplies by up to a further 21 Ml/d in 2029.

We have worked closely with Southern Water in the development of this plan to ensure our dWRMP24s are aligned. As well as sharing water resources, Southern Water are the sewerage provider to our customers.

1.6.4 Havant Thicket winter storage reservoir

Havant Thicket Winter Storage Reservoir is a significant construction project being developed in collaboration between ourselves 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.

Havant Thicket Reservoir was approved in WRMP19 and has been included within the baseline of this dWRMP24.

Figure 21: Artist's impression Havant Thicket Reservoir when completed and filled in 2029

1.7 Challenges and opportunities

1.7.1 Introduction

There are emerging challenges and opportunities for both future water supplies and customer demand. Our planning approach has been developed in response to the scale and nature of the challenges we face through the problem characterisation framework shown in Section 1.7.10. A summary of challenges and opportunities is provided in the sections below.

1.7.2 We operate in an area of serious water stress

In July 2021, Environment Agency reassessed which water companies are under serious water stress. This is defined as being 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'.*

In our last plan, WRMP19, our area was classified as being an area of 'moderate' water stress, but this reassessment has reclassified our area to being in 'serious' water stress.

This classification allows us to target water efficiency measures in those areas of greatest need and to achieve the greatest potential benefit through universal, compulsory, metering of household customers if it is shown to be beneficial.

1.7.3 The challenge to reduce our reliance on chalk aquifers

To ensure the water we take from the environment is sustainable, we have worked with the Environment Agency to define our proposed environmental destination for planning purposes. In some cases, this means needing to reduce our use of existing water sources.

The likely impacts of capping or reducing our existing supplies to deliver environmental benefits is explored in Section 5.4. The scale and timing of the implementation of our proposed environmental destination (including abstraction licence capping) is a significant driver of new options and investment being required within our dWRMP24.

1.7.4 An opportunity to contribute to a protected and enhanced environment

As well as an opportunity to increase our resilience and improve the sustainability of our existing supplies and biodiversity within our operating area, we are actively looking at ways to protect and enhance our environment. We are doing this through the WINEP as part of our business planning processes. However, we have also evaluated the environmental impacts of the options we have considered in this dWRMP24, working through the SEA process when developing our preferred best value plan, and considered how to contribute to achieving Net Zero.

1.7.5 Uncertainty around population increase and the 'new normal' for water use

For demand forecasting, we have uncertainty around how long the changes in demand that started during the covid pandemic will continue, and although our customer population is forecast to grow, there is additional uncertainty around the impact of Brexit and global politics on population forecasts.

This variation our baseline demand forecast is large. When including the latest forecasts produced by the Office of National Statistics (ONS) and local authority housing plans, our customer population could grow by between 6.8 per cent and 33.6 per cent over the next 50 years, compared with our baseline year of 2019–20. This is a wide range and is illustrated in Section 4.3.1.

1.7.6 A changing climate and our planning scenarios

Climate change is leading to hotter drier summers, milder wetter winters and more frequent extreme weather events. As the climate continues to change this could mean increasing demand for water or reduced ability to supply water from our existing sources.

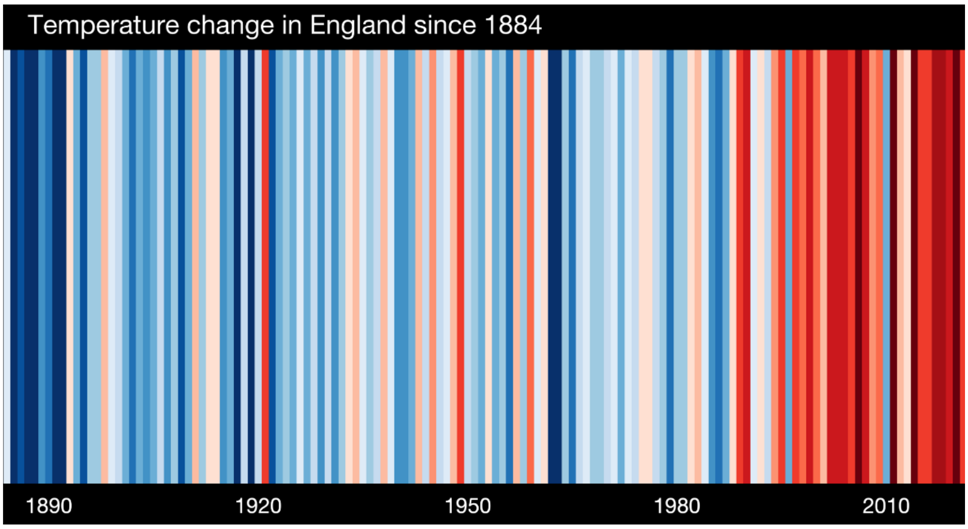


Figure 22: Average temperature for each year in England since 1884, shown using Reading University's 'Show Your Stripes[5]' Each stripe represents the average temperature for a single year, relative to the average temperature over the period. Shades of blue indicate cooler-than-average years, while red shows years that were hotter than average. The stark band of deep red stripes on the right-hand side of the graphic show the rapid heating of our planet in recent decades.

Summer 2022 has been a poignant reminder of this challenge with record temperatures across the UK, which led to soaring demand for water and tested our ability to supply the necessary water to meet this demand.

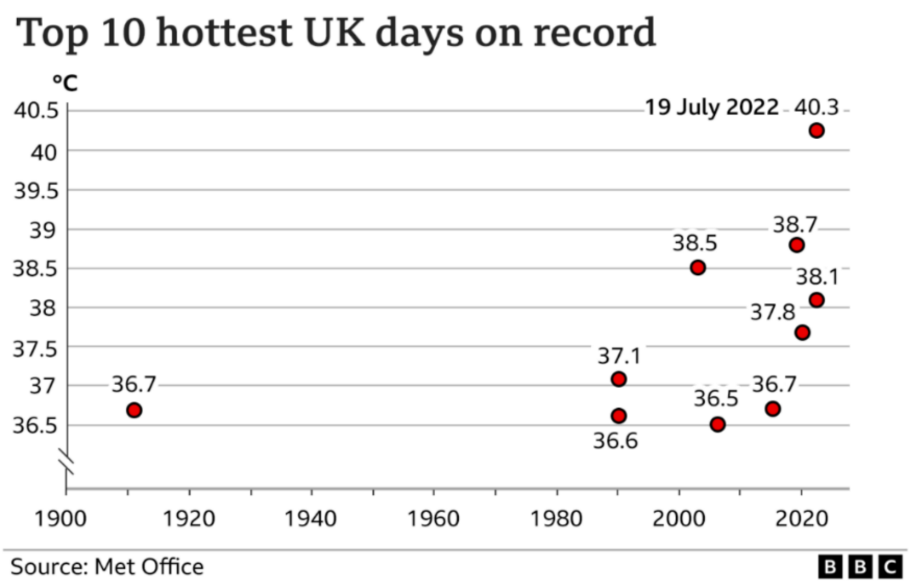


Figure 23: A graph showing nine of the ten hottest UK days on record have happened since 1990[6]

Although both Figure 22 and Figure 23 above show climate change, there is an important distinction between them. Whilst Reading University's climate stripes show the average temperature across a single year, the graph below it shows single hottest days.

5 https://showyourstripes.info/l/europe/unitedkingdom/england/
6 Source Met office, via BBC downloaded July 2022, https://www.bbc.co.uk/news/world-europe-62224157

We need to plan to ensure reliable water supplies both over the whole of a dry year, as well as being prepared for shorter critical periods that can put strain on our systems. These critical periods can be in the form of summer heatwaves when demand for water is high and available water is low, or freeze-thaw events when frozen ground leads to broken underground pipes and a sudden increase in leakage. Our supply network proved resilient to the 2018 freeze-thaw event and the 2018 and 2022 summer heatwaves.

In this dWRMP24, we plan for both an average normal year (NYAA), as well as for a dry year (DYAA), and during a dry year the critical period (DYCP). We recognise that the climate is changing within these planning scenarios. With the expectation of more frequent warmer drier summers and warmer wetter winters, we need to prepare for conditions more challenging and more extreme than those previously experienced.

The modelling in this plan provides the strategic basis for investment needed. It is supported by our drought plan which is an operational plan of actions we would take in dry conditions.

1.7.7 The opportunity to increase our resilience

Our WRMP19 supply forecast was based on a design drought of 1-in-200 years. In deciding on this design drought, the company followed the 'UKWIR Risk based planning guidance' (UKWIR, 2016b) and opted to develop a resilience tested plan (risk composition 2) that considered a challenging, but plausible range of droughts.

We moved to this 1-in-200 year level of resilience for WRMP19 from a position in WRMP14 where we planned to the worst historic drought on record. This move was enabled by the development of synthetic rainfall and climate data and driven by the recognition that our future is likely to see more extreme events than we have historically recorded. For WRMP19, this aligned with our commitment to providing a bulk supply to Southern Water with water available up to a 1-in-200 year event.

For this dWRMP24 we are planning to deliver the government expectation of increased resilience to a 1-in-500 year drought event by 2039. To achieve this, our baseline supply forecast shifts from a 1-in-200 year condition to a 1-in-500 year condition in 2038–39, and the default for all proposed options/interventions in this dWRMP24 is that they provide a benefit associated with the 1-in-500 year condition. This includes drought actions such as demand-side Temporary Use Bans (TUBS) and Non-Essential Use Bans (NEUBs), starting from 2025–26.

Furthermore, supply-side drought permits are not available for selection beyond 2040–41. This aims to decrease our reliance on options that could impact the environment when it is already stressed by drought.

1.7.8 Adaptive planning provides an opportunity to develop a plan able to accommodate uncertainty

The challenge of planning for an uncertain future is not a new one, but the range of uncertainty has grown with respect to changing climate, population and housing forecasts and environmental destination.

To meet this challenge, in collaboration with WRSE we have developed an adaptive planning approach to ensure we are prepared for a wide variety of future scenarios.

Our intention is that by applying an adaptive approach to our modelling, we ensure the decisions we take today are effective in ensuring a reliable source of water and a sustainable future.

1.7.9 What our customers told us they think our biggest challenge will be over the next 25 years

In June 2022 we surveyed 574 of our bill-paying customers. This was the second wave of our 'Consumer Panel Barometer' which is described in more detail in Section 3. A summary of our customer research is provided in Appendix 3C.

The first question we asked was, "What do you think the biggest challenge will be for Portsmouth Water over the next 25 years?" The answers showed that our customers are aware of a variety of possible future challenges for Portsmouth Water. Customers mention challenges relating both to the supply of and demand for water and consider both population and environmental factors. Many refer to properties/developments being built in their region.

When prompted, 9 in 10 expect population growth will mean higher demand for water. The majority also firmly believe climate change will have an impact on local environments. Meanwhile panellists are much less convinced that in future people will adjust their behaviours to reduce water usage – underlining the challenge faced.

Figure 24: Word cluster showing the frequently used words customers used when describing our future challenges

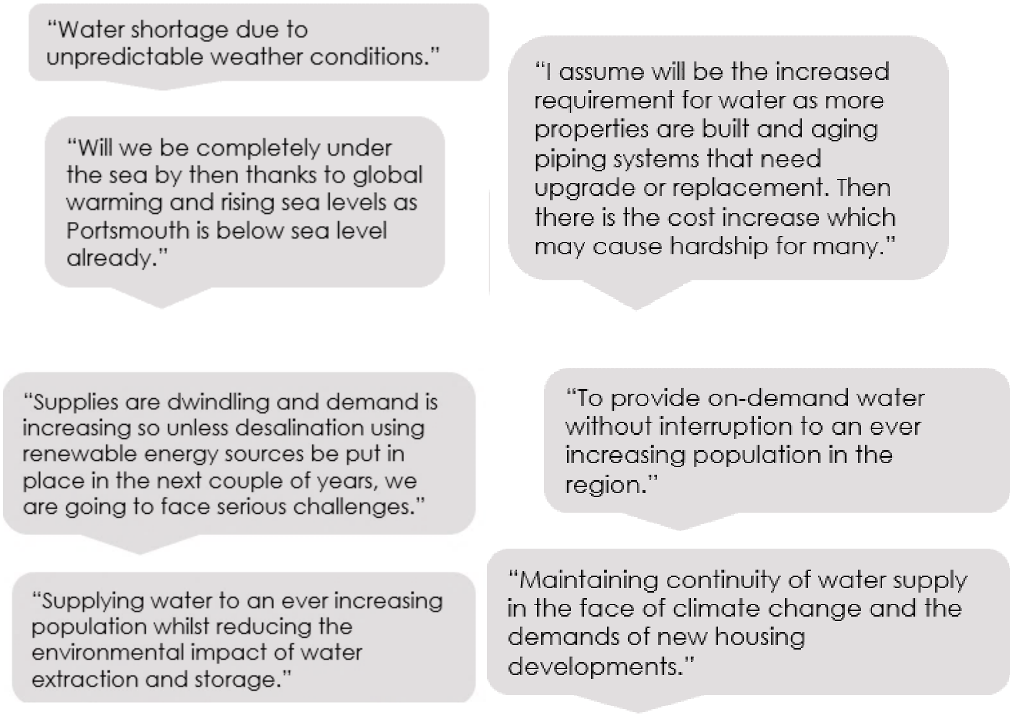


Figure 25: Quotes from customers describing challenges we face

The second question asked was, "To what extent, if at all, do you expect each of the following will happen over the next 25 years?"

Over eighty-five per cent of the people asked said that they expected population growth to lead to higher demand for water, and that climate change will affect local river habitats and wildlife.

Of concern is that over eighty per cent of respondents thought it probable or definite that long-term increases in living costs will mean that more people struggle to afford their water bill. With the cost-of-living crisis and threat of recession, affordability is increasingly a challenge.

Another challenge to address is that only thirty-seven per cent of respondents thought households in the regions would probably or definitely change their habits to use less water.

1.7.10 Problem characterisation

Problem Characterisation assessment is "a tool for assessing a company's vulnerability to various strategic issues, risks, and uncertainties".[7]

By assessing the scale of water resources challenge a company faces and the complexity of the options available to solve the challenge, a risk-based recommendation is made around the most appropriate risk-based methods to support development of the Water Resources Management Plan 2024 (WRMP24).

The result of the dWRMP24 problem characterisation assessment, documented in Appendix 1E, is that the Portsmouth Water supply area has a high level of concern. This indicates that

[7] UKWIR, 2016 'WRMP 2019 Methods – Decision Making Process: Guidance, p40

several of the extended methods and even use of the 'complex approaches' may be appropriate for developing the WRMP24.

This conclusion informs and aligns with those of the WRSE regional Problem Characterisation assessment. The 'high level of concern' status is reflected in the complex approaches and methods adopted in development of the regional plan which is, in turn, informing our WRMP24. The approaches adopted for forecasting our supply capability and selecting an appropriate decision-making approach can be seen in Section 5.2.4.1 and Section 8.2 respectively.

		Strategic Needs Score ("How big is the problem?")			
		0–1	**2 to 3**	**4 to 5**	**6**
		(None)	**(Small)**	**(Medium)**	**(Large)**
Complexity Factors Score ("How difficult is it to solve?")	**Low (<7)**				
	Medium (7–11)				
	High (11+)			Portsmouth Water	

Key

Green	low level of concern means WRMP14 methods and EBSD decision making is appropriate
Yellow	moderate level of concern means some 'extended' methods may be appropriate
Orange	High level of concern means several of the extended methods and even use of the 'complex approaches may be appropriate.

Figure 26: Matrix using the results of the problem characterisation assessment to identify 'modelling complexity' of the decision-making approach for WRMP24

1.8 Levels of service

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) that may start to impact businesses in the local area. These are also referred to as ordinary drought orders.

In more extreme circumstances, water companies may also ask for emergency drought orders 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 (a 5 per cent chance of happening in any given year).
- Non-Essential Use Bans to be implemented no more frequently than in a 1-in-80 year drought event (a 1.25 per cent chance of happening in any given year).
- Emergency Drought Orders to be implemented no more frequently than in a 1-in-200 year drought event (a 0.5 per cent chance of happening in any given year).

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 the performance commitment in our business plan.

Our levels of service are not planned to change in the future other than for emergency drought orders, which are proposed to change to 1-in-500 years in 2038–39 to meet the requirements of the Water Resources Planning Guideline (WRPG).

1.9 Our approach to dWRMP24

1.9.1 Compliance

This dWRMP24 has been developed to comply with the Water Resources Planning Guideline (December 2021) developed by the Environment Agency, Natural Resources Wales (NRW) and Ofwat, and Defra's Water Resource Management Plan (England) Direction 2022.

In producing our dWRMP24 we have followed the relevant government's policy expectations and specified outcomes. Table 5 sets out where in this dWRMP24 each of these expectations is addressed.

Table 5: Location of the text in the draft WRMP 2024 where we have addressed the Water Resources Management Plan (England) Directions 2022

Planning period for water resources management plan		
Water Resource Management Plan (England) Direction 2022	**Location in Portsmouth Water's draft WRMP 2024**	**WRP Table**
2.(1) Other than Southern Water Services a water undertaker must prepare a water resources management plan for a period of at least 25 years commencing on 1 April 2025.	This relates to the whole document. The draft WRMP covers the period from 1 April 2025 to 31 March 2075.	WRP Tables template covers the period 2019–20 to 2074–75
Matters to be addressed in a water resource management plan		
Water Resource Management Plan (England) Direction 2022	**Location in Portsmouth Water's draft WRMP 2024**	**WRP Table**
3.(a) the appraisal methodologies which it used in choosing the measures which it has identified in accordance with section 37A(3)(b) and its reasons for choosing those measures	We have followed the approaches specified in the WRPG (December 2021). The draft WRMP has used outputs from various technical and consultation strands of the collaborative work undertaken for the WRSE regional plan.	Not referred to in WRP Tables
(b) for the first 25 years of the planning period, its estimate of the average annual risk, expressed as a percentage, that it may need to impose prohibitions or restrictions on its customers in relation to the use of water under each of the following— **(i) section 76(b);** **(ii) section 74(2)(b) of the Water Resources Act 1991(c); and** **(iii) section 75 of the Water Resources Act 1991, and how it expects the annual risk that it may need to impose prohibitions or restrictions on its customers under each of those provisions to change over the course of the planning period as a result of the measures which it has identified in accordance with section 37A(3)(b);**	Our planned levels of service have been agreed with our customers and are set out in section 1.6. The relationship between levels of service and deployable output is set out in section 5.2.4. It is not anticipated that there will be any change regarding the annual level of service risk over the course of the planning period other than for emergency drought orders (1-in-200 year to 1-in-500 year).	Table 2f: WC Level DYAA -Levels of Service - Final Planning

(c) the assumptions it has made to determine the estimates of risks under sub-paragraph (b), including but not limited to drought severity;	The annual risk of restrictions is set by the level of service agreed with customers. It has been assumed that the level of risk will not vary with time (other than for emergency drought orders). A full stochastic risk assessment of supply capability has been undertaken and is described in section 5.2. Section 9 describes how the plan has been tested.	Not referred to in WRP Tables
(d) in respect of greenhouse gas emissions – **(i) the emissions of greenhouse gases which are likely to arise as a result of each measure which it has identified in accordance with section 37A(3)(b), unless that information has been reported and published elsewhere and the water resources management plan states where that information is available;** **(ii) how those greenhouse gas emissions will contribute individually and collectively to its greenhouse gas emissions overall;** **(iii) any steps it intends to take to reduce those greenhouse gas emissions;** **(iv) how these steps will support delivery of any net zero greenhouse gas emissions made by it; and** **(v) how these steps will support delivery of the UK government's net zero greenhouse emissions targets and commitments**	We have evaluated carbon emissions for all feasible options in this draft WRMP. The methodology is described in section 7.4.1, with information presented in the options costing report (shared with the regulators) and in the SEA. The assessment of the likely emissions associated with the final planning scenario is set out in the SEA.	Table 4 WC Level Options: Appraisal Summary: Separate columns for: • Embodied carbon emissions (tCO_2 equivalent) • Operational carbon emissions under maximum utilisation scenario (tCO_2 equivalent per annum) • Average operational carbon emissions (tCO_2 equivalent per annum) • Total Carbon Cost (£M)
(e) the assumptions it has made as part of the supply and demand forecasts contained in the water resources management plan in respect of—		
(i) the implications of climate change, including in relation to the impact on supply and demand of each measure	(i) We have assessed the impact of climate change on supply (section 5.5), demand (Table 19 in Section 4.3) and headroom	Table 3a: DYAA – Baseline Table 3b: DYAA – Final plan options

which it has identified in accordance with section 37A(3)(b);	(section 6.3). We have considered the impact of climate change on each of its options in section 7.4.1.	Table 3c: DYAA – Final Plan Table 3d: DYCP – Baseline Table 3e: DYCP – Final Plan Options Table 3f: DYCP – Final Plan • Change in DO due to climate change • Percentage of consumption driven by climate change • Volume of consumption driven by climate change • Target headroom (climate change component)
(ii) household demand in its area, including in relation to population and housing numbers, except where it does not supply, and will continue not to supply, water to domestic premises; and	(ii) Our approach to estimating current and future household demand follows the methods in the WRPG and is presented in section 4.3. Population and housing numbers are derived from Local Authority estimates. We have used the plan-based forecasts without adjustment.	Table 3a: DYAA – Baseline Table 3b: DYAA – Final plan options Table 3c: DYAA – Final Plan Table 3d: DYCP – Baseline Table 3e: DYCP – Final Plan Options Table 3f: DYCP – Final Plan
iii) non-household demand in its area, except where it does not supply, and will continue not to supply, water to non-domestic premises or to an acquiring licensee;	(iii) Our approach to estimating current and future non-household demand follows the methods in the WRPG and is described in section 4.4.	Table 3a: DYAA – Baseline Table 3b: DYAA – Final plan options Table 3c: DYAA – Final Plan Table 3d: DYCP – Baseline Table 3e: DYCP – Final Plan Options Table 3f: DYCP – Final Plan
(f) its intended programme for the implementation of domestic metering and its estimate of the cost of that programme, including the costs of installation and operation of meters; **(i) the proportion of smart meters to other meters;**	Section 4.3.2 sets out the assumptions we have made regarding metering in our baseline supply-demand balance (i.e. new properties and optant metering), whilst section 10.4.2 sets out our preferred final planning approach to additional	See lines below for details of where number of meters are recorded

(ii) if it does not intend to install smart meters, the reasons for this; **(iii) its estimate of the cost of that programme, including the costs of installation and operation of meters;**	metering over the planning period (change of occupancy and void household metering, plus a smart meter trial). The costs of the metering programme are presented in the options costing report (shared with the regulators). Summary costs are also included in WRMP Table 5.	
(g) its estimate of the total number of meters installed to record water supplied to domestic premises at the commencement of the relevant planning period and include a breakdown of— **(i) the number of smart meters** **(ii) the number of meters that are not charged by reference to volume;** **(iii) the number of meters that are charged by reference to volume including-** **(aa)optant metering;** **(bb) change of occupancy metering;** **(cc) new build metering;** **(dd) compulsory metering; and** **(ee) selective metering,** **and its estimate of the impact on demand for water in its area of any increase in the number of premises subject to domestic metering;**		Base year numbers given in Table 2c: WC Level DYAA - Meter Installations (including meter upgrades) - Final Planning
h) its estimate of the total number of domestic premises which will become subject to domestic metering during the planning period and including a breakdown of— **(i) the number of domestic premises with smart meters;** **(ii) the number of meters that will not be charged by reference to volume;** **(iii) the number of meters that will be charged by reference to volume including-** **(aa)optant metering;**	The number of premises which will become subject to domestic metering during the planning period as a result of the different types of metering in the baseline and the final plan are shown in sections 4.3.2, 7.2.5.1, and 10.4.2, and in the WRMP Tables. The expected volumetric savings to result from the final planning metering options are presented in Table 44 and in the WRMP Tables.	Annual programme for changes in meter numbers from Base Yea given in Table 2c: WC Level DYAA - Meter Installations (including meter upgrades) - Final Planning

(bb) change of occupancy metering; **(cc) new build metering;** **(dd) compulsory metering; and** **(ee) selective metering, and its estimate of the impact on demand for water in its area of any increase in the number of premises subject to domestic metering;**		
(j) its assessment of the cost-effectiveness of domestic metering as a mechanism for reducing demand for water by comparison with other measures which it might take to meet its obligations under Part III of the Act;	We have assessed the cost-effectiveness of metering options available to us (change of occupancy metering, void household metering and smart metering) against other options that could be used to balance supply and demand in the economic appraisal of options, section 7.6 of this plan. Optant metering is already included in the baseline demand forecast, as is new property metering. Costs for these do not therefore form part of the WRMP cost effectiveness assessment in accordance with the Water Resources Planning Guideline (Environment Agency and Natural Resources Wales, 2018).	
(k) its intended programme to manage and reduce leakage, including anticipated leakage levels and how those levels have been determined;	Our intended programme to manage and reduce leakage is set out in section 7.2.5.2.	Table 2a: WC Level Normal Year planning scenario Table 2d: WC Level DYAA - Key Components – Baseline Table 2e: WC Level DYAA - Key Components - Final planning
(l) if leakage levels are expected to increase at any time during the planning period, why any increase is expected;	Our leakage levels are not expected to rise during the planning period.	
(m) how its intended programme to manage and reduce leakage will contribute to –	In some cases, our ambition in the vision, as referenced in Section 1.5, is greater than that incorporated in this dWRMP – specifically when it comes to reducing leakage from our	Table 2a: WC Level Normal Year planning scenario

(i) a reduction in leakage by 50 per cent from 2017/2018 levels by 2050; and **(ii) any leakage reduction commitment it has made in respect of its appointment area;**	network. This reflects our desire to challenge ourselves and the ambitions of our customers. We are totally committed to delivering a halving of leakage by 2050, but if supported by customers and found to be affordable and feasible, we want to commit to a delivery target of 2040.	Table 2d: WC Level DYAA - Key Components – Baseline Table 2e: WC Level DYAA - Key Components - Final planning
(n) In respect of any relevant regional water resources plan – **(i) how this plan has been considered and reflected in its water resource management plan; or** **(ii) where the plan has not been considered and reflected in its water resources management plan, the reasons for this.**	This dWRMP24 fully reflects the WRSE regional water resources plan, as set out in Section 1.5.1	

1.9.2 Process

In the broadest terms, the components of this dWRMP24 can be grouped into three of the following purposes:

Defining the scale of the water resources challenge: we have assessed the balance between supply and demand during both average annual conditions, over a year, and for shorter-term critical period conditions such as during heat waves and high seasonal demand.

We used our Drought Vulnerability Assessment (Appendix 1F) to choose the drought events for our plan. This assessment is based on WRMP19 baseline supply forecast and will be updated between draft and final WRMP24, following the completion of a combined water resources system model that includes shared resources between our own and Southern Water's supply areas.

Determine what feasible options are available to help resolve this challenge: We generated a long list of as many potential options as possible. A screening process filtered out unsuitable and unviable options to ensure the options that have been put forward for modelling are feasible. The screening considered environmental, social, economic and practical aspects of each option, along with the practical benefit it could provide for water resources. We have taken a conscious twin track approach and actively generated and considered options that reduce demand as well as options which would increase our ability to supply.

Take steps to develop our preferred best value plan: Though modelling and optimisation we put forward the best combination and timing of options that ensure compliance with the WRPG. They deliver a reliable supply of water, at an affordable price using means acceptable to customers and stakeholders while protecting and if possible, enhancing our environment.

Each of these three stages of planning are shown below in Figure 27.

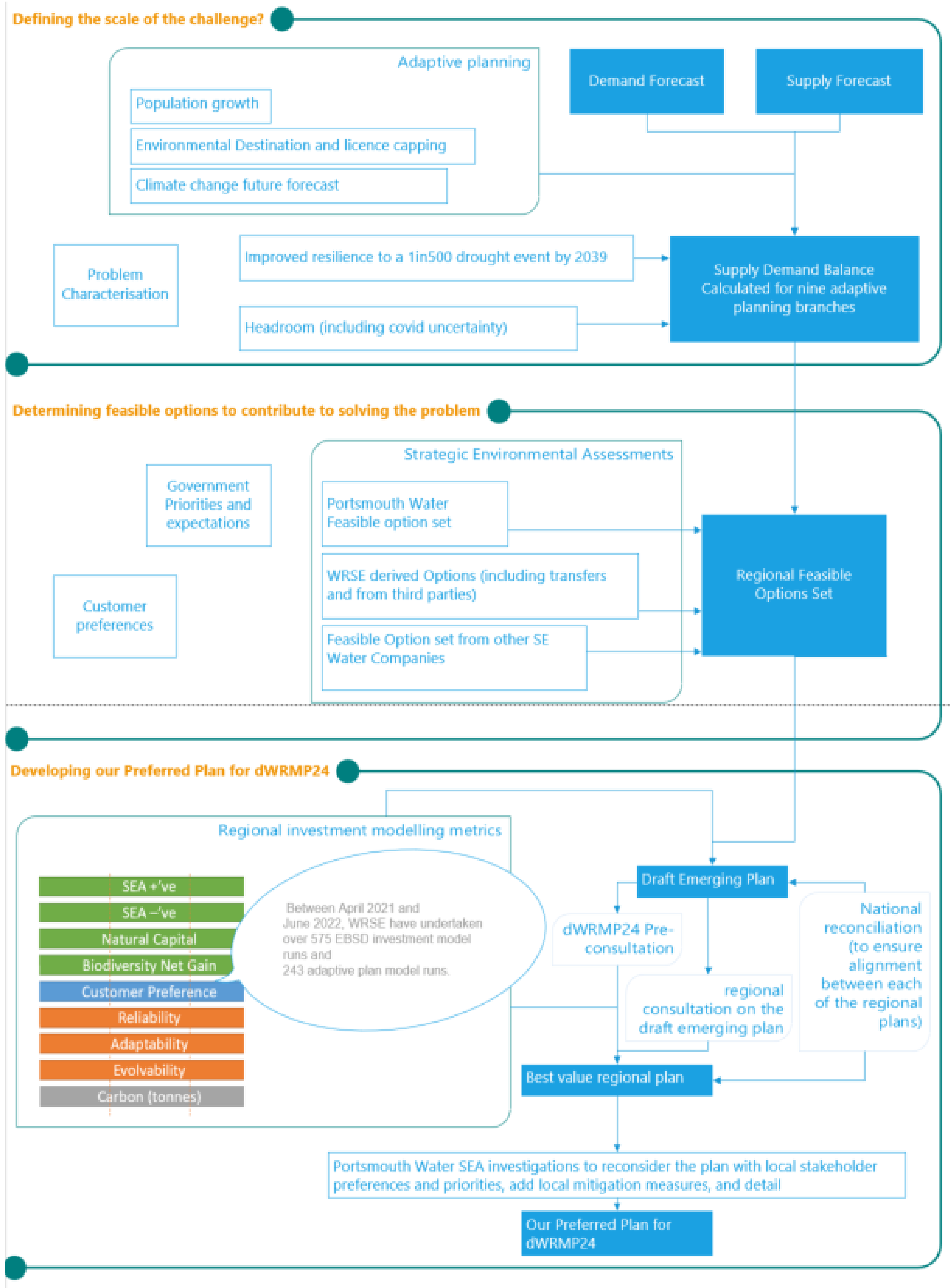


Figure 27: The high-level process of developing this plan

1.9.3 Approach to delivery

The 'Plan on a Page' in Figure 28 shows each of the larger building blocks that have contributed to the development of the dWRMP24, along with where in this document you can find more information.

Supporting and informing every step has been engagement and consultation within Portsmouth Water, with customers, across the regional planning group, and with stakeholders and regulators.

The colour scheme of the diagram differentiates between steps predominantly led and delivered by us, and those that have been delivered in regional partnership through the WRSE alliance. Many of the steps we undertook ourselves were done to regionally consistent methodologies and approaches.

To aid this work, WRSE produced a series of method statements that set out the processes and procedures followed when preparing the technical elements for our regional plan, which in turn have informed this dWRMP24. These method statements were shared with stakeholders, consulted on in 2021 to ensure transparency of approach, and then updated to reflect feedback received and as methods have evolved. The method statements and all of the other WRSE published reports are available in the WRSE online library: https://www.wrse.org.uk/library

Some of the WRSE approaches are new, while others are based on established methods which have been widely used by water companies in preparing past water resources management plans.

Through WRSE it was ensured that all processes follow and are compliant with the WRPG and the National Framework.

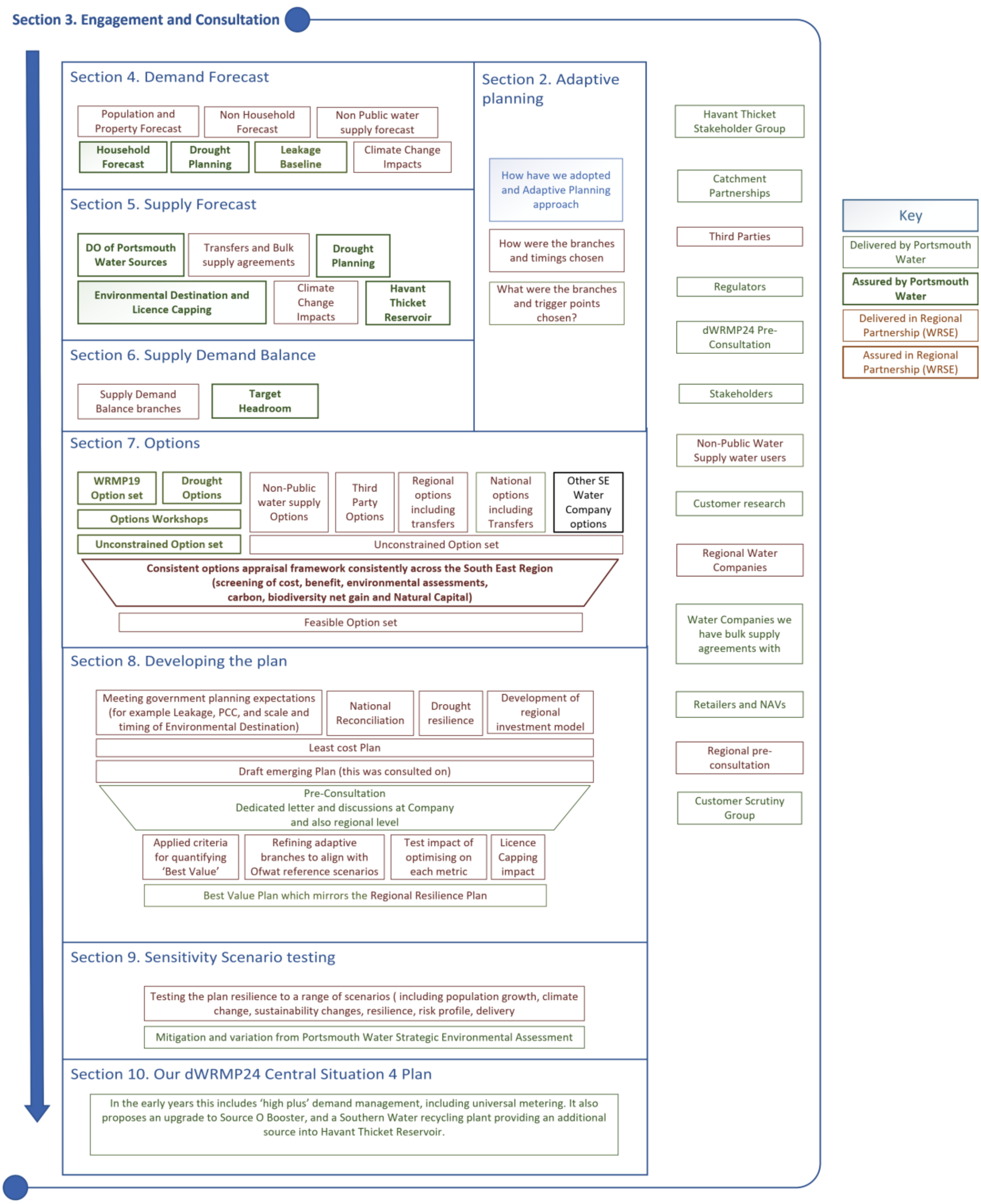


Figure 28: The building blocks of our planning process, showing which have been delivered directly, and which we have delivered collaboratively through the WRSE alliance

2 ADAPTIVE PLANNING

2.1 Introduction

This section of the dWRMP24:

- Introduces the concept of adaptive planning and explains why it is needed.
- Provides an overview of the adaptive pathways developed by WRSE and the alliance of companies including Portsmouth Water.
- Summarises how adaptive pathways are used within our dWRMP24.

Subsequent relevant chapters of this dWRMP24 will then report against the adaptive pathways and associated plausible future scenarios detailed here. Within these chapters, components of the plan (i.e. demand, supply) will assess and report against relevant variables driving uncertainty in the assessments. Once combined in the supply-demand balance chapter and building the plan chapter, these then build a full picture of the adaptive planning scenarios.

2.1.1 What is adaptive planning?

Adaptive planning is an approach to developing flexible long-term delivery strategies in an uncertain future, by setting out investment options against a wide range of plausible future scenarios (Figure 29). Its purpose is to identify flexible low-regret options based on the comparison of optimal solutions for each plausible pathway.

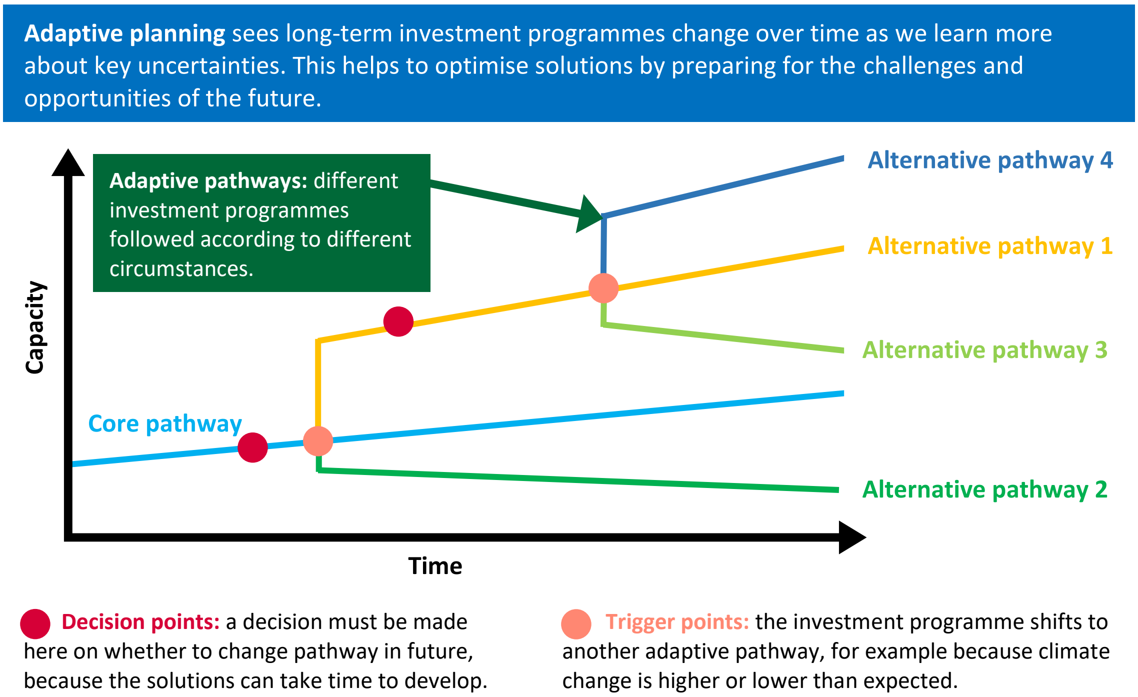


Figure 29: Conceptual diagram demonstrating the approach to adaptive planning and definitions for key concepts of adaptive pathways, decision points and trigger points. Adapted from sources: [Ofwat, May 2022]; [Ofwat, April 2022].

Our long-term adaptive planning strategy consists of a core pathway which is consistent with best practice techniques and encompasses the ‘low regrets’ investments that are identified as necessary in all plausible future scenarios. We then seek to define other pathways, which represent lower challenge 'benign' scenarios and higher challenge 'adverse' scenarios. Understanding what causes these other pathways allows to identify the sensitivity of our planning to other factors such as population or climate change. This in turn allows us to understand trigger points for these factors that would point to the need for us to move from our core pathway, to an alternative one.

This process accounts for how a water company's long-term strategy is likely to change in the future, in addition to reducing risk of over or under investment. Implementation of modular or flexible solutions provides adaptive capacity to closer reflect required capacity, rather than building traditional large infrastructure solutions now based on future uncertainty (Figure 30).

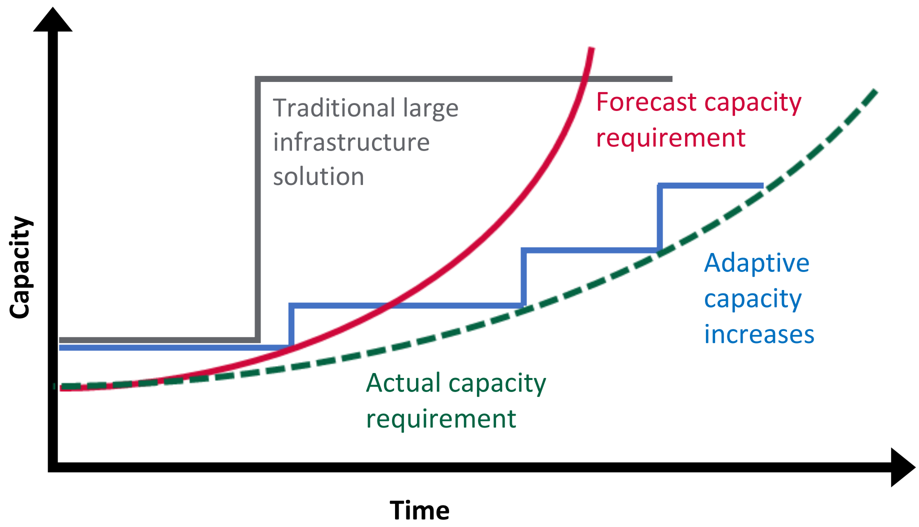


Figure 30. Conceptual diagram for building adaptive capacity. Adapted from Ofwat, April 2022.

2.1.2 Expectations of water companies: an uncertain future

The regulator's WRPG Water resources planning guideline - GOV.UK (www.gov.uk) (December 2021) states that an adaptive planning solution should be considered if there is:

- significant uncertainty, particularly in the first 5 years of your plan.
- a strategic decision in the plan's medium term, which has a long lead-in time.
- large long-term uncertainty which might lead you to consider different preferred solutions.

They stipulate that the adaptive plan should:

- set out at what point each decision will be taken.
- how each decision will be made.
- how the plan will be monitored.
- consider how headroom will be affected.
- ensure that uncertainty is not double-counted.
- clearly report the costs and solution differences between the adaptive pathways.

In November 2021, Ofwat set out their expectations for strategic planning frameworks at PR24. Their letter stipulates a requirement for water companies to employ an adaptive pathways approach within their long-term strategies in order to:

- support decisions using common scenarios representing known issues and future uncertainties.
- Link long-term ambition to shorter term deliverables.
- identify low regret interventions to meet needs, allowing for future flexibility
- make decisions based on robust costs and benefits valuation and scenarios-based testing.
- prepare an investment approach to support timely delivery of plans.

> ***"Adaptive planning should be at the heart of the long-term delivery strategy"***
> **–** *Ofwat, April 2022*

Ofwat have set out common reference scenarios to capture future uncertainties (Figure 31). They specify benign and adverse scenarios in climate, technology development, demand (e.g. population and property growth, building regulations and standards), environmental destination or ambition (e.g. abstraction reductions) and other wider uncertainties (e.g. localised or company specific). These scenarios provide a spectrum of plausible extremes upon which to deliver strategies.

	Climate change	Technology	Demand	Abstraction reductions	Wider scenarios
'Adverse' scenarios	**High:** RCP8.5	**Slower:** slower development than expected	**High:** higher growth forecasts	**High:** 'Enhanced' scenario (in England)	Material **local or company-specific factors**, as appropriate
'Benign' scenarios	**Low:** RCP2.6	**Faster:** faster development than expected	**Low:** lower growth forecasts and legislation on building regulations and product standards	**Low:** Current legal requirements (in England and Wales)	Parameters **between the reference scenarios**, e.g. a 'medium' scenario, as appropriate
	Mandatory Impacts presented separately				**Discretionary** Can be combined if plausible

Figure 31: Expectation for scenario testing. Source: Ofwat, April 2022

Our dWRMP, in common with the regional resilience plan, is presented in this document as a core pathway, with the investment needed to deliver in that context. Alongside that core pathway we illustrate alternative benign and adverse futures, that are equally plausible. We articulate the triggers we would use to test our planning assumptions and the necessary changes to our investment plans, should we need to adapt to an alternative pathway.

2.2 Regional multi-sector planning approach

WRMPs have traditionally published a single forecast future used as the basis to identify options to balance future supply and demand. They have considered uncertain futures through scenario and sensitivity testing of the plan. However, due to the significant range of potential futures and challenges that we face, a refined approach has been identified for dWRMP24.

WRSE has collaborated regionally to develop an adaptive planning approach to meet the future water resources challenges in the South East of England. This approach employs a branching approach from the single core pathway. WRSE identified three pathways which branch from the core at a trigger point in 2035, and a further three pathways branch from each of these pathways from a trigger point in 2040 and stretch out over a 50-year planning horizon from 2025–2075 (see Figure 32). The timing of trigger points was identified following a review of risk-based triggers for variations of population growth, environmental destination and climate change forecasts.

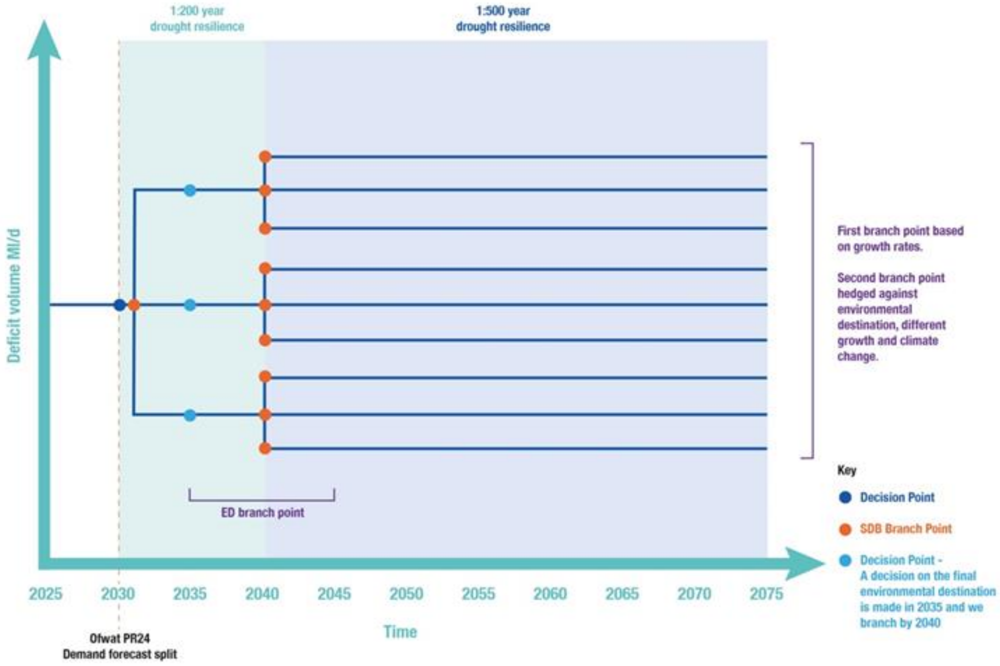


Figure 32: WRSE's adaptive planning pathways.

2.2.1 WRSE adaptive planning scenario factors.

2.2.1.1 Population growth

Uncertainty within the predictions of future economic and demographic futures presents a challenge for water resource management.

The UK government has stated aspirations to accelerate the rate of house building to 300,000 new homes per year. However, the UK's exit of the European Union and the global restrictions on migration presented by the Coronavirus pandemic means that the UK is facing a unique period of uncertainty politically, economically and demographically. The need for robust evidence on future housing growth and demographic change are key requirement to the dWRMP.

The population and property forecast used in our dWRMP have been developed by WRSE (Edge Analytics, July 2020). Several scenario forecasts were generated including trend projections (Office of National Statistics and Greater London Authority), housing-led forecasts (Local Plan, Greater London Authority (GLA), Oxford Cambridge Arc (OxCam)) and employment-led forecasts, founded upon fertility, mortality and migration assumptions.

For the WRSE region, the Low and High population growth averages for the full 2025 – 2075 horizon range from 21% to 42%. Each company within WRSE had its own forecast which was used in our adaptive planning approach. We have accounted for population uncertainty using different housing and population scenarios within our demand forecasting.

2.2.1.2 Environmental destination

Sustainably abstracted water bodies are more resilient to climate change and drought (EA, March 2020). There is rising awareness that the water bodies in our supply area are under increasing pressure with the assumption that the abstraction of water for public water supply is a component of that pressure. In close consultation with the Environment Agency, we have sought to understand the possible range of reductions in abstraction we might foresee in the future to raise the resilience of water bodies in our area.

Exact site by site reduction levels have yet to be established, but to allow this plan to account for this significant pressure, we have modelled the possible impact of reductions as 'environmental destinations'. This approach, endorsed by the Environment Agency in the National Framework, gives the scale of possible reductions a value at our full water resource zone level.

Collectively, the companies in WRSE considered seven environmental destination scenarios in total (BAU, BAU+, Enhance, Adapt, Combine, Central and Alternative). Following collaboration with Environment Agency, four scenarios were initially taken forward for inclusion in investment modelling for the emerging regional plan. Following a series of workshops held with catchment partnerships and other local stakeholders (WRSE, January 2022) these were deemed to reflect the range of environmental ambition for the region.

However, recent investment modelling and adaptive planning towards the development of the draft regional plan, the 4 options were reduced to three environmental destinations, consolidated into 'High', 'Medium' and 'Low' values. Further detail is provided in Section 5.4.

The range of values expressed in these environmental destinations have significant effects on regional plan.

2.2.1.3 Climate change

Under future climate, we are facing hotter, drier summers, and warmer wetter winters, bringing new challenges to delivering and securing resilience of water resources. Since our last plan, new climate projections have been produced (UK Climate Projections (UKCP) - Met Office; known as the UK Climate Projects 2018, UKCP18) using the most up to date and best climate models from the UK and around the world.

WRSE have carried out water resources system modelling to determine a deployable output (DO) impact for 28 'equally likely' climate change scenarios for the highest emissions scenario RCP8.5 (Global Climate Models, (GCMs) and Regional Climate Models (RCMs))[8], which represent the range of uncertainty present in the UKCP18 products. Results are then scaled between different emissions scenarios to provide supply forecasts for high, medium and low climate change future scenarios.

2.2.2 Scenario selection for adaptive pathways

As part of the WRSE, we initially identified 580 different potential futures based upon 5 different population growth scenarios, 29 climate change scenarios and 4 different environmental destination scenarios. These futures encompass different planning scenarios of Normal Year Annual Average (NYAA), Dry Year Annual Average (DYAA), Dry Year Critical Period (DYCP) and different drought conditions (e.g., 1-in-100 year, 1-in-500 year). This results in a significant range of forecasts across the South East region. It is this range in potential future challenge that drives different investment choices. To select the most

[8] RCP is the representative concentration pathway, indicating the level of emissions. RCP8.5 is equivalent to ~4 ◦C of warming by the end of the century, compared with ~2 ◦C by the end of the century for RCP2.6.

appropriate pathways, WRSE has undertaken investment model runs using various iterations of these possible futures (pathways), which have then been tested and assessed by Portsmouth Water and the other water companies. Analysis of these pathways have led to two key time periods:

2025–2035 Priority 'least regrets' plan: This period includes the schemes that water companies must progress. These schemes are required in all the future pathways and are considered 'least regret' options. This period will also include preparatory work necessary to assess the feasibility and effectiveness of options that could be needed in future years. Uncertainty in our assessments is accounted for within a target headroom allowance during this period.

2035–2075 The adaptive plan: This period is more uncertain and so includes a strategy to deal with different futures through nine representative alternative pathways. Each pathway represents a different combined population growth, environmental destination and climate change scenario and includes the schemes needed under each. Collectively the 9 pathways encompass the full range of impact form the 580 possible futures identified initially. The plan will adapt depending on which future scenario occurs.

Additional details on population growth, climate change and environment scenarios are provided in the following section "our adaptive planning scenarios", which adopts WRSE's scenarios.

2.2.3 Our adaptive planning scenarios

We have adopted the adaptive planning pathways and scenarios developed by WRSE. These have been produced in accordance with Ofwat's guidance to plan for future uncertainties and to comply with the WRPG. Our adaptive planning pathways are outlined in Figure *33* and the definition and source of individual scenario components are detailed in Table 6.

Several the WRSE pathways are heavily impact by the possible 'Oxcam' and 'hplan' developments, which significantly increase population scenarios. Because our area will not be directly impacted by these developments these pathways do not impact our demand and supply assumptions. However, due to the interconnectivity of supply systems planned, it is possible these developments might affect the options selected for our supply area.

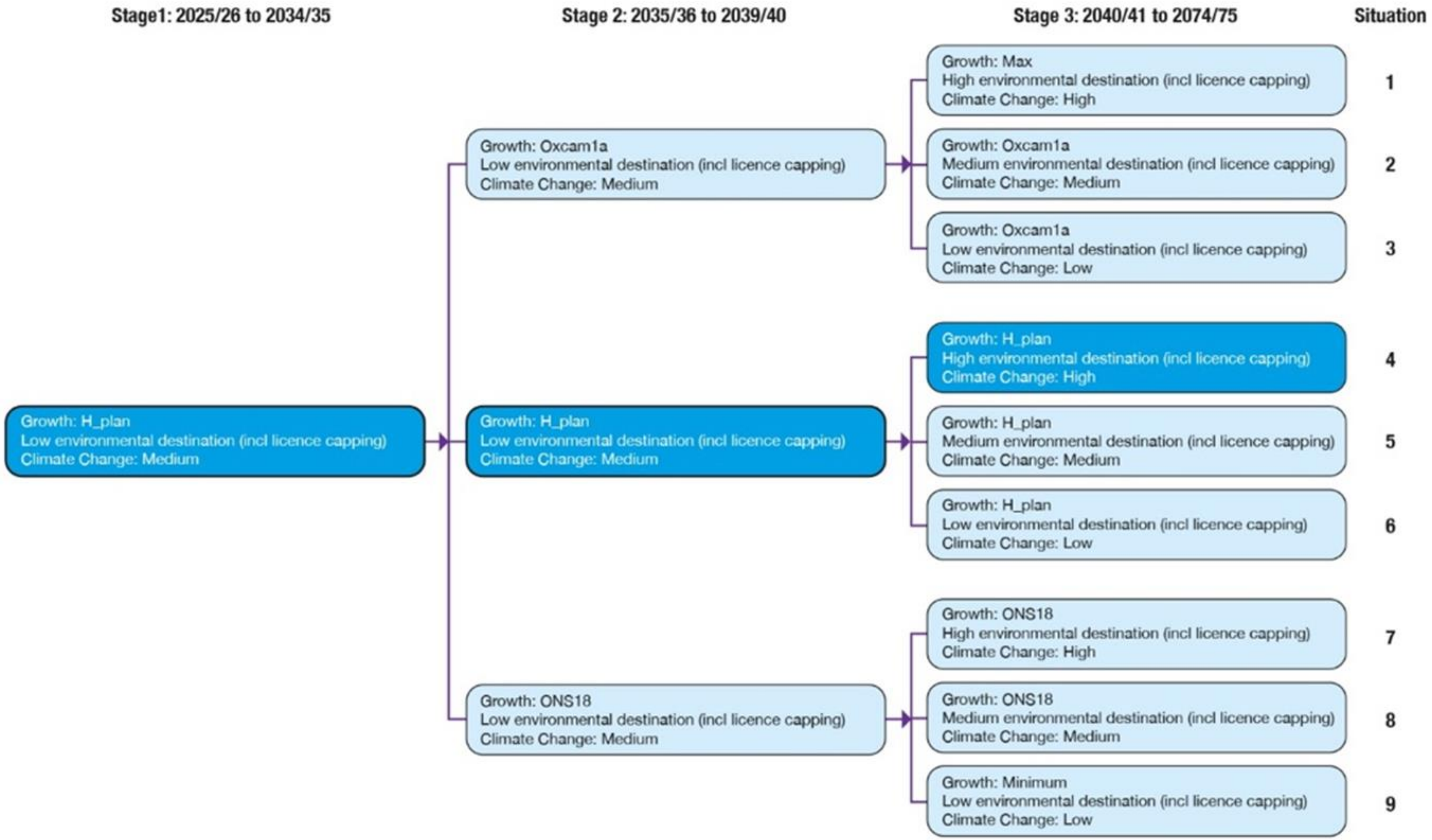


Figure 33: Portsmouth Water's Adaptive Planning branches with the core pathway highlighted.

Table 6 Definitions of adaptive pathway components

Component	Scenario	Definition and source
Housing and population growth (Growth)	hmax	Housing-led forecast (Housing-need; 2020–2050)*. A Housing-led scenario, with population growth underpinned by the trajectory of housing growth associated with each local authority's Local Housing Need (LHN) or Objectively Assessed Housing Need (OAHN). Following the final year of data, projected housing growth returns to the ONS-14 and ONS-16 long-term annual growth average by 2050. (Edge Analytics, July 2020)
	Oxcam1a	Housing-led forecast (2020–2050)*. 'New Settlement' 23k dpa scenario, with circa 4,200 dwellings per annum (dpa) above Housing Plan. Household representative rates for young adults returning to (higher) 2001 levels by 2039, remaining fixed thereafter. (Edge Analytics, July 2020). Due to insignificant differences in outputs between Oxcam1a and hplan, hplan is used in place of Oxcam1a for our plan.
	hplan	Housing-led forecast (2020–2050)*, with population growth underpinned by each local authority's Local Plan housing growth trajectory. Following the final year of data, projected housing growth returns to the ONS-14 and ONS-16 long-term annual growth average by 2050. (Edge Analytics, July 2020)
	ONS18	Trend forecast. ONS 2018-based Principal sub-national population projection (SNPP), using a five-year history (2013–2018) to derive local fertility and mortality assumptions and a long-term UK net international migration assumption of +190,000 and a two-year history (2016–2018) of internal migration assumptions. In line with the ONS 2018-based national population projection (NPP), this round of projections includes a reduced UK fertility outlook compared to ONS-16 and a dampened rate of improvement in life expectancy compared to ONS-16. (Edge Analytics, July 2020)
	hmin10	Trend forecast. ONS 2018-based Low International Migration sub-national population projection (SNPP), incorporating a Low long-term UK net international migration assumption of +90,000 per annum, with all other assumptions consistent with ONS-18. (Edge Analytics, July 2020)
Environmental destination (Env. destination)	High	The 'High' scenario reflects the Environment Agency's Enhance and BAU+ (locally verified) scenarios. This high abstraction reduction scenario meets the current expected level of abstraction reduction set by the Environment Agency.
	Medium	The 'Medium' scenario was proposed by us and refined with the Environment Agency; it assumes licence reductions that, at a water resource zone level, are representative of the Environment Agency's BAU scenario.
	Low	The 'Low' scenario represents our best estimate of potential licence capping impacts to address WFD no deterioration risks.
Climate Change (CC)	CC06	Upper quartile of 28 UKCP18 climate change scenarios. These will be the 12 regional projections, the 3 global projections from the Hadley Model which were not run through the regional climate model, and the 13 global projections from the CMIP5 ensemble.
	Medium	Median of 28 UKCP18 climate change scenarios, as described above for CC06.
	CC07	Lower quartile of 28 UKCP18 climate change scenarios, as described above for CC06.

Key: benign scenarios; moderate scenarios; adverse scenarios.

*Growth scenarios for 2050–2075 are underpinned by fertility, mortality and migration assumptions from the ONS 2018-based NPP, configuring a principal, low and high growth outcome

2.3 Implementing our adaptive planning scenarios within our dWRMP24

To develop our dWRMP24, we have produced supply-demand balances for each of the nine adaptive pathways. Below we stipulate how the components of each pathway are considered for our demand forecast, supply forecast and subsequently the supply-demand balance.

2.3.1 Demand forecasting

Within the short term (2025–2030), demand forecasts (see Chapter 4) are conducted for the core pathway, which utilises the hplan housing plan, a low environmental destination and the medium climate change projections. Beyond 2030, our demand forecasts then explore uncertainty in growth by utilising different housing plan forecasts e.g. ONS18. Demand forecasts have been produced for the NYAA, NYCP, DYAA and DYCP planning scenarios for all pathways, where demand for the Dry Year scenarios represents the 1-in-20 year condition.

2.3.2 Supply forecasting

Within supply forecasting, the high, medium, and low environmental destinations were considered to reflect a suitable range of uncertainty in plausible abstraction reductions (see Section 5.4). This included the development of stepped profiles for sustainability reductions, with initial reductions commencing in 2028 and final reductions occurring around 2050.

The low environmental destination was selected for the short to medium term period (2025–2040) considering regulatory drivers for the range of adaptive planning branches. This includes the Ofwat low regret approach to adaptive planning, including sustainability reductions already included in WINEP and the full range of environmental destinations by the end of the plan. Beyond 2040, our supply forecasts explore uncertainty in our environmental destination i.e. the low, medium and high environmental destinations.

Three sets of climate change impacts were also applied to the supply forecast reflecting high, median and low DO impacts (see Section 5.5). The medium scenario is used in the short to medium term period (2025–2040) and beyond this the supply forecasts explore all three scenarios (low, medium and high).

2.3.3 Uncertainty

A 'Target Headroom' factor is included in our calculation of the supply demand balance to account for the uncertainties within both the supply and demand forecasts. In determining target headroom, we considered the appropriate level of risk for our plan. If target headroom is too large it may drive unnecessary expenditure. If it is too small, the risk is that we may not be able to meet our planned level of service.

Collaboratively as part of the WRSE group our approach to Target Headroom has been revised for this plan. The new approach seeks to avoid the potential of doubling counting uncertainties that are already explored and accounted for within the adaptive planning branches.

For more information about our calculation of target headroom can be found in Section 6.3 and Appendix 6A.

2.3.4 Supply-demand forecast and options selection

Once the supply and demand forecasts were produced for each pathway, the WRSE model tested the range of options for all pathways and scenarios to identify a set of low-regret options that can solve all pathways and scenarios. Based upon this root and branch adaptive pathway tree, the plan can ensure options are chosen at the beginning of the plan that remain effective for future challenges. The preferred best value plan then includes further options that are considered to provide best value, limiting wasted investment weighed across the initial and future periods, under all situations (Figure 34).

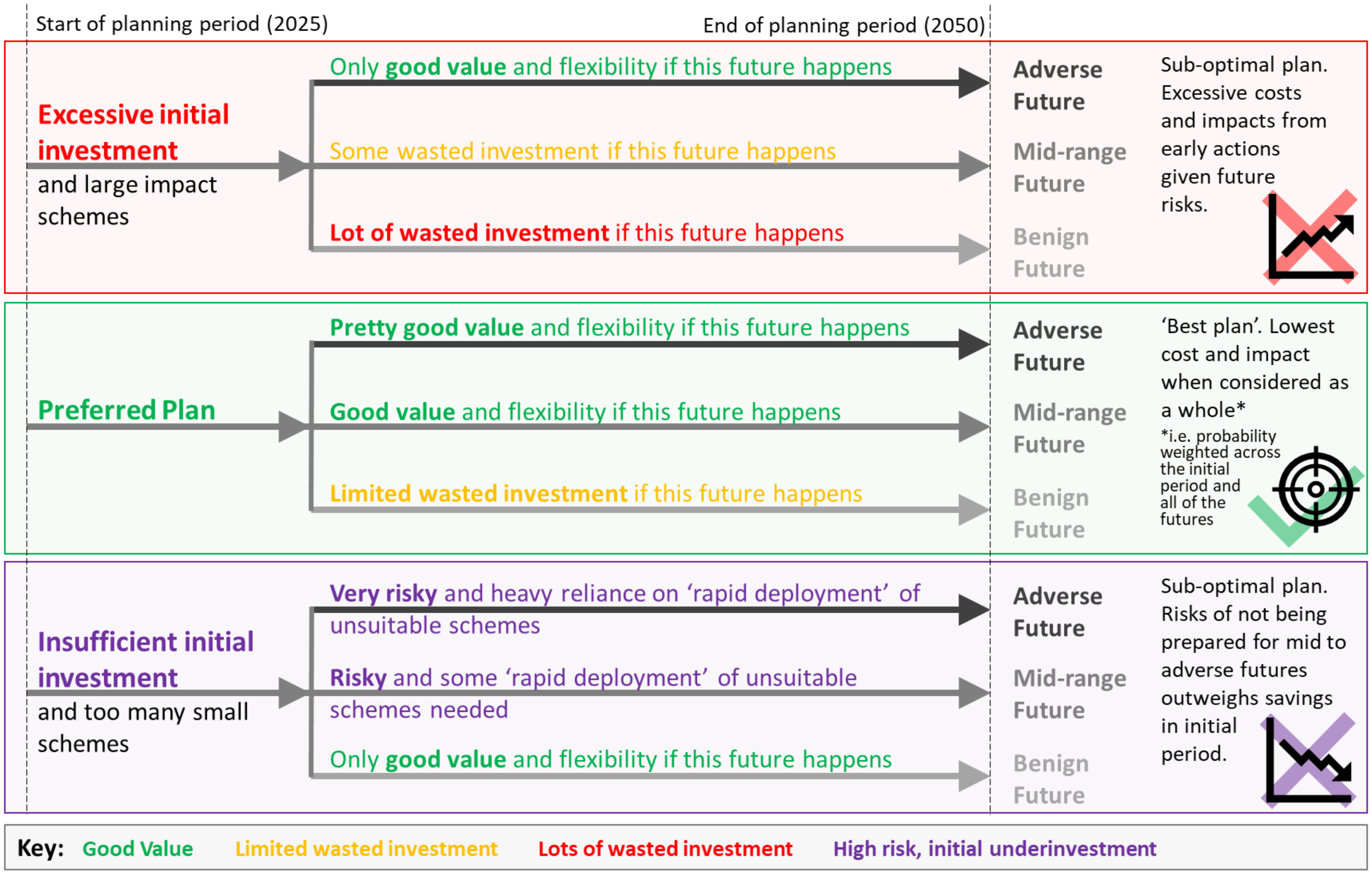


Figure 34: WRSE's approach to the preferred plan using adaptive planning.

3 ENGAGEMENT AND CONSULTATION

3.1 Overview

We pride ourselves in being a community focused water company. Engaging with our stakeholders is important to us, especially when thinking about decisions for the future. We take an evidence-based approach to put the views of our customers and stakeholders at the heart of shaping our business and the way we operate.

Engaging with our customers, regulators, and other stakeholders has enabled us to incorporate their expectations and priorities right at the start of this planning process. Our engagement activities have been designed to inform both the WRMP24 and our Business Plan (PR24).

Some strands of our customer and stakeholder engagement continue and build on our previous initiatives, whereas other aspects are new. The dWRMP24 is collaborative to its core, with many fundamental building blocks of the plan having shared methodologies. We have actively participated in the new and wider engagement activities of the regional plan through WRSE and with the National Framework through RAPID and the Strategic Resource Options (SRO).

This open and iterative process will continue with the public consultation of this dWRMP24, and we welcome your thoughts and comments as we continue this journey. The non-technical summary for our dWRMP24 provides information on how to respond to the consultation.

3.1.1 Customer research

We commissioned research into customer priorities for water resources, long term supply-demand choices, and investment decisions. This research has acted as a check on the modelling outputs of the WRSE regional investment modelling and is also informing our PR24 Business Plan.

To build on existing knowledge and evidence and to determine where customer research would be most useful, we first analysed over 30 existing reports for common themes and existing evidence.

Customers participated in focus groups and surveys to validate these findings and investigate specific topics, such as customer views on metering and future developments to Havant Thicket Reservoir.

The views of customers about the challenges we face are included in Section 1. Customer's preferences on specific options are included in Section 7 and have informed a metric which has been used to develop the preferred best value plan as described in Section 8.

3.1.2 WRMP Pre-consultation

As part of the formal dWRMP24 pre-consultation, we wrote to regulators and stakeholders to inform them about our process, approach, and draft emerging results. We also consulted on a SEA scoping report.

Our pre-consultation letter was sent to the Statutory consultees named in the WRPG, but also to individuals and organisations who had previously engaged with our Drought and/or Water Resources Plans, or the development of the Havant Thicket Reservoir. We also invited all Retailers and New appointments and variations (NAVs) to participate in our pre-consultation.

We have incorporated discussions around our approach to WRMP24 into our existing conversations with stakeholders and regulators. Examples of this include our participation with the Arun and Western Streams catchment partnership group, discussions with Friends of the Ems, and in discussions around the development of the Havant Thicket Reservoir.

3.1.3 Regional collaboration and shared pre-consultation activities

Engagement with our neighbouring water companies, and more widely across the region has been fundamental to the development of this dWRMP24. We have developed regional options, collectively consulted on an emerging regional plan, and co-created shared approaches and methodologies.

Through the WRSE Alliance, we engaged in regular dialogue with regulators and stakeholders as well as consulting widely on method statements and pre-consulted on the emerging regional plan.

We have encouraged our stakeholders to engage with the development of the regional plan through webinars, presentations, and consultation documents on the development of the policies, technical methods, solutions, and programme appraisal.

WRSE has produced a Stakeholder Engagement Report which summarised the extensive engagement and consultation activity that has taken place to date[9]. The report was published alongside the emerging plan in January 2022 and contains further details of the 40-plus engagements held to date, including sessions with Local Authorities, Retailers, 'Blueprint for Water', National Infrastructure Commission, National Farmers Union (NFU) and the Horticultural Traders Association.

This regional engagement has been particularly successful in understanding views on topics that affect several water companies, for example the Southern Water options that interact with Havant Thicket Reservoir.

An example of where pre-consultation has directly influenced this dWRMP24 has been the introduction of earlier branching on population growth, environmental destination and climate change forecasts within the adaptive planning compared to the WRSE emerging plan consulted on during January to March 2022. The selection of adaptive planning pathway 4 (also referred to as 'situation 4' within the WRSE investment model) as the reported core pathway for our dWRMP24 is another example of how regulatory engagement has contributed to key decisions taken during this process.

3.2 Board engagement and how our employees have helped shape this plan.

Employees from across our business have helped to inform this dWRMP24. A key area for employee engagement was during the identification of unconstrained options at workshops held with operational staff. More detail on this is presented in Section 7.2.1 and Appendix 7A.

Our Board engaged with and contributed to the development of this dWRMP24. It has the same overarching overall governance and delivery structure as our other planning processes, such as the PR24 Business Plan, the Drinking Water Safety Plan and our Plan for Net Zero. The structure is designed to ensure we understand and address the interdependencies so that the plans align and that common datasets are used.

[9] stakeholder-engagement-report-january-2022.pdf (wrse.org.uk) - https://www.wrse.org.uk/media/0f5l4ug4/stakeholder-engagement-report-january-2022.pdf

The Board signed off this dWRMP24 in September 2022. In the two years running up to this point, they reviewed the monthly updates on programme progress and key developments. Board papers were presented and discussed in Spring 2021, November 2021, May 2022 and July 2022 on proposed approaches and initial results.

Specifically the Board gave active support to the continued development of options surrounding Havant Thicket Reservoir with Southern Water, with a cautionary note that securing customer acceptance of recycled water was vital before the physical development of the option could take place. Similarly, challenge was made on our delivery profile for metering, with the Board challenging if we might deliver swifter than the 15 year programme initially considered. This challenge resulted in the 10 year programme that features in this dWRMP24.

At a more tactical level, a dedicated WRMP Steering Group of key internal stakeholders from across our company has met monthly to:

1. Ensure the visibility and buy-in of the dWRMP24 development and decision-making process with key representatives in Portsmouth Water.
2. Provide the linkages between the WRMP24 process and wider business functions, including Business Planning for PR24 and Net Zero, so that the relevant outputs from WRMP24 are taken forward into the Business Plan for the 2025 to 2030 period.
3. Promote quality assurance by facilitating an internal check and review function.

The Steering Group Terms of Reference are provided within Appendix 11B.

3.3 How regional collaboration has shaped our plan

Our dWRMP24 has been co-created with other water companies who operate in the Southeast of England as part of the WRSE Alliance. In collaboration with the other companies we agreed the appropriate level of collaboration, namely, on shared approaches and methodologies, the commissioning of regional data sets, a common shared investment model, regionally-focused engagement to support the development of the regional plan and therefore this dWRMP24.

We actively collaborate with Southern Water and ensure the two companies' WRMPs are aligned regarding volumes of transfers and operational agreements especially during drought situations and regarding options for which Havant Thicket Reservoir is a component. We have worked particularly closely on several fronts:

- Southern Water is the wastewater provider to our supply area. Our demand forecast influences their anticipated wastewater flows in their Drainage and Wastewater Management Plan (DWMP). This consideration of the whole water cycle has led to the development of water recycling options.
- We have existing bulk supplies with Southern Water. We have agreed a common set of assumptions for the baseline supply forecasts of both plans. These are documented in two letters to Southern Water in Appendix 1C.
- Our Drought Plans are closely aligned and during periods of dry weather, such as Summer 2022, we have weekly joint operational meetings and discuss drought monitoring triggers.
- Our baseline supply forecast, set out in Section 5, contains details of the Havant Thicket Reservoir scheme currently under development. This is a joint scheme within our supply area but funded by Southern Water.
- As set out in Section 7.8, we have worked together with Southern Water to develop shared options for the WRSE regional plan and our dWRMP24s.

3.3.1 Engagement carried out with Southern Water specifically to explore potential future uses of Havant Thicket Reservoir

In the last year, extensive stakeholder engagement has been carried out by both Portsmouth Water and Southern Water in relation to possible further development of Havant Thicket Reservoir to allow for recycled water from Southern Water's Budds Farm wastewater treatment works to be used as a source of raw water for the reservoir.

Stakeholders including MPs, councillors, members of local community groups, representatives from statutory bodies and environmental groups, have been given detailed briefings. There have also been organised visits to Budds Farm wastewater treatment works, which is the proposed source of the recycled water, and the Havant Thicket Reservoir stakeholder site, to see and hear more about the proposals.

This was followed by Southern Water's six-week consultation, which ran from 5 July to 16 August 2022. The consultation and related events were publicised via a variety of different channels including local newspaper advertising, social media, the Havant Thicket Reservoir E-Newsletter and website, posters at community venues including Staunton Country Park and flyers.

Over the six weeks, almost 900 people attended six drop-in sessions held in community venues and shopping centres. Southern Water also held three webinars where customers could find out more about the plans. A virtual room was also set up online where people could view the consultation brochure, search maps, and give their feedback on the plans.

Southern Water is now considering all the feedback received, alongside further technical and environmental work, as it works to develop a more detailed design for the 'Hampshire Water Transfer and Water Recycling Project'. Southern Water will present this more detailed design, alongside information from its preliminary environmental work, at another consultation in 2023, during which people will have an opportunity to provide further feedback.

Because this proposal is for the benefit of the demand supply balance in Southern Water's Hampshire supply zone, the detail of these schemes feature in Southern Water's dWRMP24.

3.4 How pre-consultation with regulators, retailers, NAVs and other stakeholders has shaped our plan

In January 2022 we wrote to representatives of regulators and stakeholders to formally invite them to share their thoughts with us as we developed this dWRMP24. This included all Retailers and NAVs operational in our supply area.

The letter we sent contained an overview of the following:

- the resource zones on which our dWRMP24 will be based.
- our indicative supply-demand balance at a water resource zone level.
- our approach to adaptive planning.
- problem characterisation assessment.
- how our plan will reflect the relevant regional plans.
- our planned approach to assessing climate change.
- progress with WRMP19 delivery, significant changes and how this will affect our dWRMP24.
- our provisional preferred schemes.
- the wider benefits and outcomes we plan to deliver beyond a least-cost plan.
- and any risks and issues we identify in our dWRMP24.

In response to the dWRMP24 pre-consultation letter, we received 39 comments from two respondents, Ofwat and the Environment Agency. The 31 items of feedback from Ofwat reiterated their expectations for the planning process, while the 8 comments from the Environment Agency were on the detail around specific options. We subsequently carried out an enhanced pre-consultation with both Ofwat and the Environment Agency discussing how each of their comments had been considered and had shaped the development of this dWRMP24. For example, the adjustment of the adaptive planning branch points and inclusion of an additional growth scenario to reflect new Ofwat guidance, and the selection of a reported core pathway that assumes a high level of environmental protection by 2050 to meet Environment Agency expectations.

We also had dedicated pre-consultation discussions with Natural England, where Local Nature Recovery Strategies were discussed, and with the Consumer Council for Water (CCW) and the Drinking Water Inspectorate (DWI) to identify our key options.

The agendas and dates of these discussions are included in Appendix 3B.

This engagement has shaped our dWRMP24 by maintaining focus upon regulatory requirements and expectations and enabling early discussions around specific approaches and methodologies as they were being developed.

Alongside the formal pre-consultations letter, we have actively engaged with stakeholder groups in our area about our approach to dWRMP24, inviting their views and observations to help shape our plans.

With respect to retailers, we are seeking views on our dWRMP24 whilst also engaging with retailers on our 25 Year Vision and emerging PR24 Business Plan.

3.5 SEA scoping report consultation

Our Strategic Environmental Assessment (SEA) scoping report, which forms part of the dWRMP24, was circulated to key stakeholders and regulators on 14 March 2022.

The statutory consultee bodies required under the Environmental Assessment of Plans and Programmes Regulations 2004 are Natural England, Historic England and the Environment Agency, as well as Local Authorities in the Plan area.

Consultation was aimed at ensuring that the SEA would be comprehensive and robust in supporting the dWRMP24 by gathering early views on how the plan should be developed. Comments were sought on how the evidence-gathering and proposed approaches could be improved or clarified. In addition, the Scoping Report also aimed to seek views on the assessment approaches. The helpful responses we received have been incorporated into the development of our assessment and subsequently our dWRMP24.

3.6 How regional stakeholder engagement has shaped our dWRMP24

A continuous thread of engagement throughout the development of the WRSE regional plan has involved a wide range of stakeholders to understand their priorities and preferences, and to take these into account in decisions leading to the best value regional plan. Our dWRMP24 reflects the best value regional plan and has therefore also been influenced by this regional stakeholder engagement.

WRSE has established stakeholder groups to help guide the development of the regional plan. The groups are the stakeholder advisory board, environmental stakeholder group and the multi-sector stakeholder group. Our CEO, Bob Taylor, represents Portsmouth Water on the WRSE Senior Leadership Team which is advised by the Stakeholder Advisory Panel while approving key decisions and programme milestones.

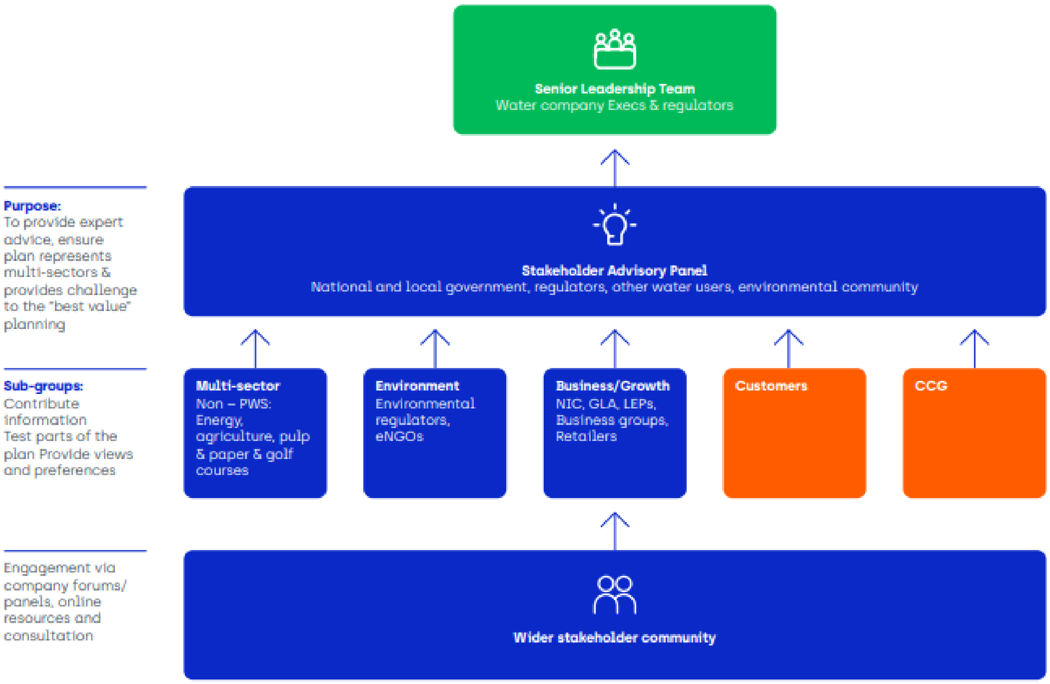


Figure 35: Stakeholder groups for WRSE

In addition to those specific groups, WRSE has proactively engaged with the wider stakeholder community via meetings, webinars and consultations throughout the development of the regional plan.

WRSE has established strong links with other regional groups to ensure the opportunities to share resources effectively are understood and fully investigated and to provide a coordinated national water resources picture.

The WRSE engagement and consultation programme has three main phases:

- **Plan and prepare – up to 2020**, focus was on the 'building blocks' of the regional plan. This included the technical methods, approaches and tools that would be applied in the development phase, for example, the forecasts for future growth and demand for water; the environmental assessments; and the regional policies. WRSE ran a programme of webinars and held topic-specific consultations to give stakeholders the opportunity to engage and input to the process.
- **Develop – during 2021,** the focus broadened and set out the planning challenge for the region, sharing information on feasible solutions, including the SROs, and formulating the approach to determine the best value regional plan.
- **Consult and update – during 2022**, the focus moved to the plan itself. WRSE held an 8-week period of engagement and consultation on the 'emerging' regional plan in January 2022. This led to the creation of the best value regional plan. In Autumn 2022, a further round of consultation will be undertaken on the best value plan, alongside the statutory consultation on the draft WRMP24s. A final regional plan will then be produced.

WRSE has produced a Stakeholder Engagement Report which summarised the extensive engagement and consultation activity that has taken place to date[10].

3.7 Incorporation of customer preferences in optimisation modelling

In 2021, a survey was undertaken across the Southeast region to see what customers thought a good plan should cover and how much weight they put behind certain criteria. The survey results are shown in Figure 36.

By combining the output from the best value plan metrics with the customer preferences at a regional level, we have been able to develop a customer weighted approach to appraising the regional plan, which has in turn informed our own draft Plan.

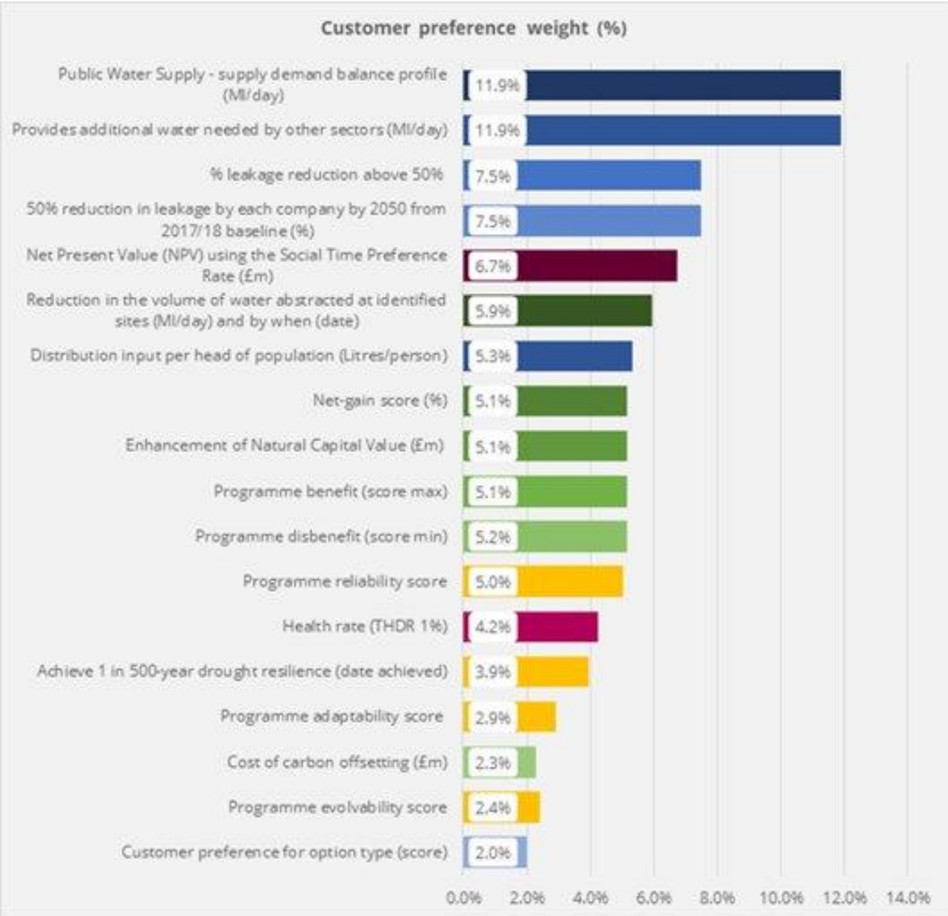


Figure 36: Customer preferences for options to improve the balance between supply and demand

As part of our collaborative regional plan engagement activity, we are testing the affordability and acceptability of the regional plan with our customers. This research is currently underway and we will report on its findings in time for the publication of our Statement of Response document, as part of this consultation.

[10] [stakeholder-engagement-report-january-2022.pdf (wrse.org.uk)](https://www.wrse.org.uk/media/0f5l4ug4/stakeholder-engagement-report-january-2022.pdf)
https://www.wrse.org.uk/media/0f5l4ug4/stakeholder-engagement-report-january-2022.pdf

3.8 Customer research to validate regional modelling outcomes

Alongside work carried out at a regional level we completed our own validation exercise to ensure that the regional approach and outcomes are right for our customers and communities within our supply area. This research informed our decision-making process about whether to accept and fully adopt the outputs of the regional plan, or if there were areas where it would be appropriate to challenge.

3.8.1 Existing evidence

We first reviewed the existing evidence base of over 30 published reports across the sector to see what could be learnt and where different research came to similar and supporting conclusions.

Our review of existing evidence reaffirmed our understanding that customer's top two priorities for their water supply are ensuring a reliable water supply and fixing leaks. When presented with more information about water resources and options to improve the balance between supply and demand, customers tell us their top three option types to achieve these are, in order of preference, reducing and fixing leaks, using less water, and increasing supply.

Existing research told us that customers support us making long term supply-demand choices that prioritise demand management over new supply options and demonstrate cost efficiency. Customers want to see sustainable long-term solutions that protect and conserve the environment and promote energy efficiency (and reduce our carbon footprint).

3.8.2 New research to inform our decision-making process

We then investigated specific topics with customers to find out more:

- Quantitative research has been carried out over two waves with our Customer Panel. This provided a larger-scale snapshot of uninformed views across our household customer base.
- Qualitative research generated more considered and informed views through a deliberative process and represented the views of a wider range of audiences including non-bill payers and non-household water users.
- 'Water Talk', our Customer Advisory Panel (CAP) discussions explored key areas in more detail and depth, such as the challenges we face. Our engagement with this group has helped to define our demand management options.

    - In March 2022, 700 Water Talk panellists took part in the first wave of engagement. In June 2022, 574 Water Talk panellists took part in a second wave of engagement.
    - The Customer Advisory Panel[11] (CAP) is designed to be an increasingly 'expert' citizen sample of Portsmouth Water's current customers and future customers. For these surveys, Portsmouth Water customers were selected to match the known demographic profile for age and gender although otherwise the Panel was self-selecting rather than purposively sampled to be representative.
    - We engaged with the Panel during the pre-consultation phase of this dWRMP24 to consider the long-term vision for WRMP24 and the PR24 Business Plan.

[11] Customer Advisory Panel, Report 1 Response to Portsmouth Water's long term vision (13th June 2022).

Deliberative Qualitative Research January 2022

- Online community plus 8 online focus groups
- 36 participants incl. 20 household bill payers, 5 future bill payers, 5 non-household customers
- Including customers with range of vulnerabilities

Portsmouth Water Online Panel Survey March 2022

- **Self-selecting sample** from randomised email send
- **700** panellists took part - household **bill payers**
- Including customers with range of vulnerabilities
- Data **weighted** to match known age & gender

- We commissioned Community Research to undertake a survey of support organisations at the beginning of 2022 to uncover how satisfied they were with the way we manage services for vulnerable customers.

  - 70 per cent of respondents reported that they were 'satisfied' or 'very satisfied' with the services that Portsmouth Water provides to customers living in vulnerable circumstances. That said, the cost-of-living crisis is top of mind for support organisations.
  - Respondents warned that metering could be a source of anxiety for many vulnerable clients and that they could only address this anxiety, and any misinformation from other sources, if they were well informed. Respondents were keen to understand how customers in the most vulnerable circumstances would be protected against bill increases. This is helping to define our approach to delivering universal metering.
  - We presented to our Customer Scrutiny Panel who provide overview over all aspect of our engagement with customers. They were keen for us to continue to explore the acceptability to customers of using recycled water and to exchange our research with Southern Water in the development of the new Havant Thicket related options. They also asked us to specifically consider the impact of the proposed meter programme on vulnerable customers and how the metering process could enhance our support for those customers rather than be perceived by them as a potential threat.

There was an iterative process through the research, building on customer feedback. For example, some of the material presented to members of our Customer Scrutiny Panel had been refined based on feedback received from consumers in the first round of the qualitative Customer Advisory Panel (CAP).

Looking at evidence from these differing approaches to engagement has enabled us to validate and understand a broader view of customer priorities.

For instance, although universal metering with smart meters is seen as a lower initial priority (as shown in the quantitative customer wave research results), support increases when customers are informed of the range of benefits (as evidenced in the qualitative research results).

Universal metering is broadly supported and is preferred to desalination, water recycling or water transfers. In response to detailed descriptions of local schemes, seven out of 10 respondents support universal smart metering with only 14 per cent actively against it based on concerns over water affordability and negative perceptions of smart energy meters. There's a similar level of support for water recycling at Havant Thicket Reservoir, with only 9 per cent actively against it.

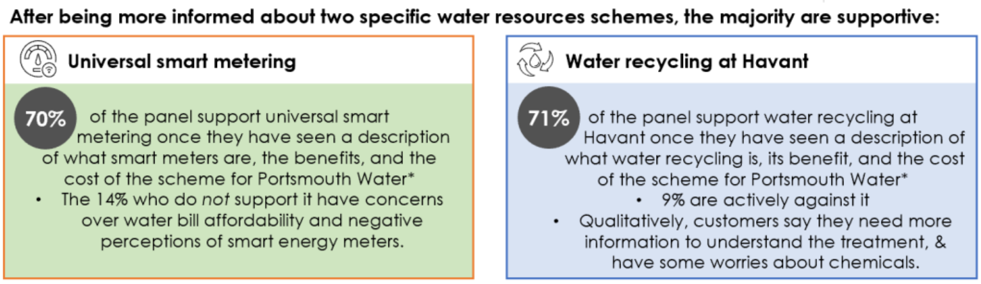


Figure 37: customer views on universal smart metering and water recycling at Havant Thicket.

Considering the longer-term picture, and after being informed about the region's water resources status, the large majority want to prioritise both ensuring a reliable long-term supply and avoiding damage to the local environment over keeping bills as low as possible.

Research indicates that most are prepared to pay more for long-term sustainable water supplies. In terms of initial response to ideas to ensure enough water in the future, nearly everyone wanted to see further investment into reducing leaks. There is also strong support for both demand management and Havant Thicket Reservoir.

4 BASELINE DEMAND

4.1 Introduction

This section details our current and forecasted future demand for water. It defines and explains the basis of the different demand scenarios used in water resources planning, including base year and forecast household demand, water efficiency, non-household demand and leakage. By presenting baseline demand this section is forecasting what we think will happen without options/interventions being applied. Details of what interventions we have considered and are proposing to implement, including achieving the National Framework's 110 litres per head per day (l/h/d) target, are provided in section 10.4.

As part of our adaptive planning approach different demand scenarios have been assessed for high, medium and low growth in population and properties and for the impact of climate change.

We developed our household demand forecast and additional information using the methodology is detailed in Appendix 4A.

The demand forecast figures in this Section report our baseline in a 1-in-20 year drought event which is unconstrained demand at the point we would introduce Temporary Use Ban drought restrictions. This reflects our supporting WRMP Tables, which also report an unconstrained baseline demand for the 1-in-20 year drought event. This is in accordance with the regulator's Water Resources Planning Guideline.

Please note that the WRSE investment model applied consistent 1-in-10 year demands for all companies and therefore we subsequently adjusted our tables to reflect 1-in-20 year demands. This does not have any implications with respect to option selection. The adaptive planning approach for the regional plan and this WRMP24 has demonstrated that the selection of options is consistent across a wide range of scenarios. To accommodate the small 1 Ml/d difference between 1-in-10 year and 1-in-20 year demand forecasts in this draft WRMP24 we have assumed that the benefit of our drought permit will reflect a 1-in-200 year level of resilience during 2025-26 to 2029-30 (in line with our existing drought plan) and we have also adjusted the headroom allowance as described in Section 6.3. We will work with WRSE to ensure that the additional 1 Ml/d of demand is modelled within the investment model for the Revised WRMP24. This will result in a slight uplift in the contribution from options already selected within the model e.g. Havant Thicket reservoir.

A number of components of the wider baseline demand forecast have been developed by WRSE to ensure consistent planning scenarios regionally (WRSE Method Statement: Demand Forecast, August 2021). This has been detailed in Table 7. To determine the demand forecast under each of the adaptive pathways, uncertainties in housing and population forecasts, climate scenarios, water efficiencies and markets have been assessed. To understand demand under uncertain futures, all selected adaptive planning pathways have been reported against, which is a step change from only reporting a core scenario in WRMP19.

Table 7: Summary of baseline demand forecast components, their definition, and their delivery/assurance

Component	Definition/ Description
Baseline demand forecast	A forecast of the future demand for water from households, businesses, industry and other sectors, accounting for climate change, leakage, population and property growth and minor components.
=	
Population and property forecast	Forecasts of population growth and new property growth, accounting for uncertainty with Min, Max, ONS-18-P and BL_H_Plan forecasts.
+	
Non-household forecast	Non-household demand determined from a range of other forecasts including population and properties, climate and the economy.
+	
Non-public water supply forecast	Used to determine water abstracted by private licence holders for agricultural and industrial purposes
+	
Household forecast	Uses population and property forecasts and a range of other forecasts including climate to determine household demand with Per Capita Consumption (PCC) and Per Household Consumption (PHC).
+	
Leakage Baseline	Used to determine demand due to leakage through distribution network losses and customer-side supply pipe leaks.
+	
Climate change impacts	Demand forecasts are modelled against varying climate scenarios and different drought severities.

Key:	Delivered by Portsmouth Water	**Assured by Portsmouth Water**	Delivered in Regional Partnership (WRSE)	**Assured in Regional Partnership (WRSE)**

4.1.1 Historic and current demand

Figure 38 shows our historic Distribution Input (DI) from 1995–96 to 2019–20. There has been a steady long-term decline in DI since 1995–96. This is attributable to a combination of leakage management, declining non-household demand and greater household water efficiency. Since 2010, there has been a steady fall in DI from 181 Ml/d to a minimum of 167 Ml/d in 2015–16 (the base year for the previous WRMP). This decline is attributed to a fall in commercial demand of 7 Ml/d since 2010, in addition to increased active leakage control, pressure management and improvements in household water efficiency. Since the last WRMP, DI briefly increased to 175 Ml/d in 2017–18 and 2018–19, before declining to 170 Ml/d in 2019–20 (the base year for the dWRMP24).

The latest complete financial year for which we have out-turn data, 2019–20, has been chosen as the base year for the dWRMP24 to provide as up-to-date a view of demand as possible. Moreover, 2019–20 has been selected as the base year since 2020–21 was impacted by both Covid-19 and a hot dry summer.

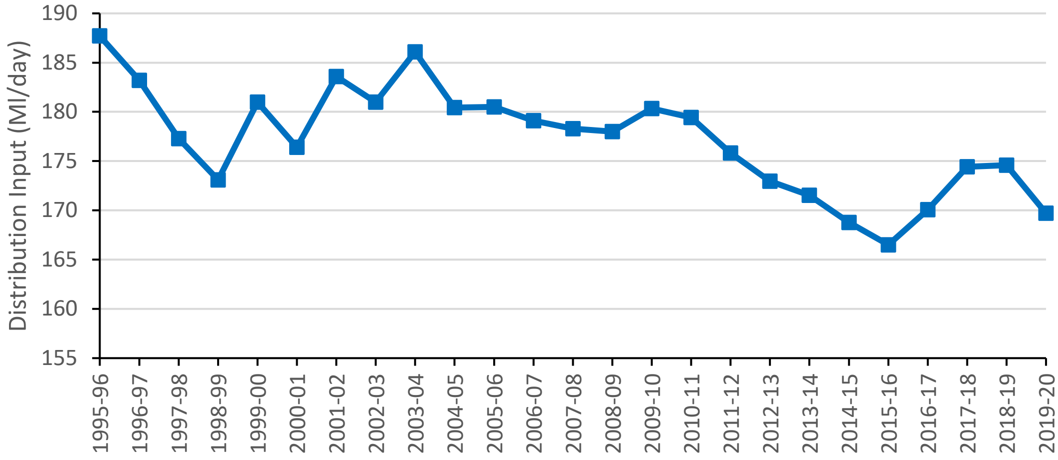


Figure 38: Historic annual average distribution input (Ml/d).

4.1.2 Demand scenarios

The WRPG (Environment Agency, Ofwat and Natural Resources Wales, July 2022) requires demand forecasts to be produced for the three planning scenarios defined below:

- *Normal Year Annual Average Demand (NYAA):* The annual average daily value of demand under 'normal' weather conditions. The base year must be assessed as to whether it is a normal year, and if it is found not to be, its demand must be normalised to take account of factors such as weather.
- *Dry Year Annual Average Demand (DYAA):* The annual average value of demand under dry conditions without any drought demand restrictions in place. This demand is presented against the Average Demand Deployable Output (ADO) supply forecast.
- *Dry Year Critical Period Demand (DYCP):* The rolling 7-day average peak week that occurs during the dry year. This demand scenario is presented against the Peak Deployable Output (PDO) supply forecast.

The Normal Year Critical Period (NYCP), the 7-day average peak week that occurs during 'normal' weather conditions has also been reported for completeness. The agreed WRSE Dry Year definition is that "dry year" scenarios are classed as 1-in-10 year events.

The method by which demands for these different scenarios have been derived is set out in section 4.2 below.

4.2 The base year

4.2.1 Normalisation of distribution input

The level of demand for water is not fully controlled by factors under the influence of a water company. Demand does vary year to year because of ongoing trends, leakage reduction, water efficiency, metering and changes to properties and population. But the levels of demand experienced is dominated by the weather, with hot dry weather causing the demand for water to rise significantly.

Demand normalisation seeks to separate the effects of our ongoing interventions on leakage etc. from the effects of weather, so that an estimate can be made of the demand that would have occurred in the base year had 'normal' or 'dry' conditions been experienced.

In order to achieve this, a weather demand model (Dynamic Demand Modelling for WRSE, WRc, 2020) consistent with WRMP19 Methods – Household Consumption Forecasting (UKWIR, 2016) guidance was developed. It allows historical and stochastically generated weather data to be run through the base year to determine how base year demand (both annual average and critical period) would change if the weather in year 'X' occurred again in 2019–20.

Historical data is used to produce an estimate of the normal year, which is well understood, as this type of year occurs most frequently. To get a best view of NYAA and NYCP demand in 2019–20, DI was de-trended using a Seasonal and Trend Loss decomposition. The data was then annualised and ranked and the 50th percentile is used to represent the Normal Year. Figure 39 shows the normalised result from the weather demand model. The blue line represents historic outturn DI, whilst the orange line represents the normalised DI data simulated by the regression model. The simulated DI data provides an estimate of what DI would be if that year's weather happened again with the current customer base and behaviours.

The stochastic DI data is then used to explore rarer events, which are limited in the historic 20 year record. Raw simulated DI is first normalised to the median DI across all years and stochastic runs to convert to factors. These factors can then be used as multipliers to the already derived NYAA and NYCP to generate annual DI annual averages (AA) and annual weekly maximums (CP) for different return periods, including the 1-in-10 year DYAA and DYCP. Further information is presented within Appendix 4A.

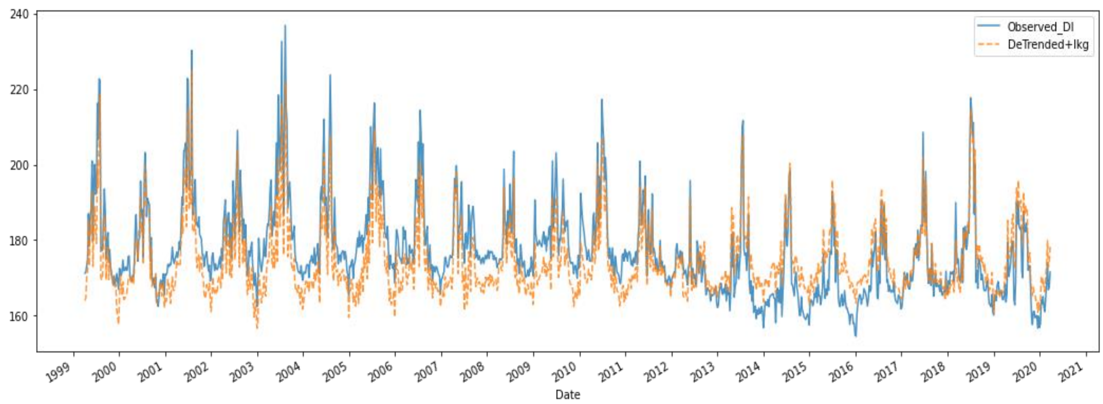


Figure 39 Normalised (simulated) distribution input time series

4.2.2 Base year population, property and occupancy

4.2.2.1 Base year household population

Population and property numbers for the dWRMP24 were provided by Edge Analytics as part of regional forecasting with WRSE (Edge Analytics, July 2020), which ensured consistency across the region. Table 8 indicates that there has been a 4.2 per cent increase in the company's household population since WRMP19 (2017–18). For dWRMP24, the base year (2019–20) household population is 731,052, comprised of 209,865 measured and 521,187 unmeasured households.

Table 8 WRMP19/WRMP24 Base Year Household Population Estimate Comparison

	WRMP19 (2017–18)	WRMP24 (2019–20)	Difference
2019–20 Total Household Population	701,651	731,052	+29,401

4.2.2.2 Base year household properties

The base year number of household properties is taken from our billing system. For the dWRMP24, the total number of household properties in the base year (2019–20) is 296,612 (Table 9).

Table 9 Base Year Household Properties

	Measured	Unmeasured	Total
2019–20 Total Household Properties (Excluding voids)	96,362	200,250	296,612

4.2.2.3 Base year household occupancy

Household occupancy is calculated using the Edge Analytics 2019–20 population estimate divided by the number of properties in the company billing system for measured and unmeasured classifications (Table 10). The company average occupancy in the base year (2019–20) is 2.46 persons per property.

Table 10 Aggregated 2019/20 Occupancy by Measured/Unmeasured Status

	Measured	Unmeasured	Company Average
2019–20 Household Occupancy (Excluding voids)	2.17	2.60	2.46

4.2.2.4 Base year non-household population

Non-household/communal population refers to residential accommodation such as sheltered accommodation units, student halls of residence, large hostels, hospitals and prisons. Table 11 summarises non-household population estimates for the year 2019–20 for comparison with WRMP19. Comparison between the WRMP19 figures and the revised Edge Analytics WRMP19 estimate indicates there is a marginal difference (+1.4 per cent overall). For the dWRMP24, the base year (2019–20) non-household population is 14,140.

Table 11 WRMP19/WRMP24 Base Year Non-Household Population Estimate Comparison

	WRMP19 (2017–18)	WRMP24 (2019–20)	Difference
Measured Non-Household Population	12,574	12,606	+32 (+0.2%)
Unmeasured Non-Household Population	1,376	1,534	+158 (+11.5%)
Total Non-Household Population	13,950	14,140	+190 (+1.4%)

4.2.2.5 *Base year non-household properties*

Prior to the final WRMP19, historical non-household property data was cleansed to align our billing system with the Ofwat guidance on eligibility for the opening of the non-household retail market. Figure 40 shows the trend in measured and unmeasured non-household properties since 2010. There has been a steady decline in the number of measured non-household properties. The drop in measured properties in 2013–14 is a result of a change in our billing system when significant data cleansing occurred. Both groups show a further a drop in measured properties in 2019–20.

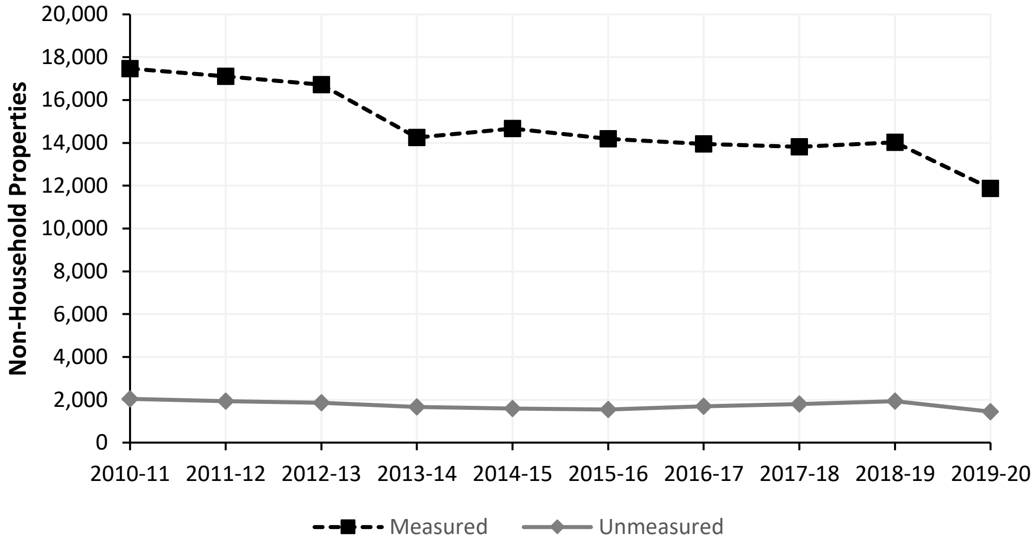


Figure 40 Historic Outturn Non-Household Properties

4.2.3 Base year per capita consumption (PCC)

One of the important components of household demand is per capita consumption (PCC). Understanding customer usage is crucial to designing demand management options that may help customers save water and help to reduce any supply-demand deficit (feasible customer options are discussed in the options appraisal, Chapter 7).

Firstly, base year PCC must be estimated for both unmeasured and measured customers. We use a water balance approach to estimate outturn unmeasured PCC, while outturn measured PCC is more readily calculable from meter readings.

Figure 41 displays the trends in unmeasured and measured PCC, with the values being reported in Table 12.Unmeasured PCC showed a steady decrease since 2009–10 through to 2016–17, although it has increased again over the following years. Measured PCC has fluctuated between 112 l/h/d (in 2013–14) and 132 l/h/d (observed in 2007–08 and 2019–20). It should be noted that these values are not the historically reported PCCs for previous years, but revised PCCs which take account of the change in the water balance because of the Consistency of Reporting Performance Measures (UKWIR, 2017) industry wide leakage convergence project.

To calculate the base year PCCs for the scenarios required by the WRPG, a water balance approach is again taken. The normalised DI produced by the weather-demand model is balanced with the bottom-up regression model of the sub-components of DI. The outputs of the model provide a good balance with an error of just one per cent.

Measured and unmeasured PCC values are broken down into their constituent micro-components for illustrative purposes. PCC has been apportioned into the different micro-components based on the Water Research Centre (WRc) Compendium of Micro-Components (WRc, 2012). The apportionment for all scenarios is shown in Figure 42. Personal washing and toilet flushing accounts for the greatest proportions of PCC. All components exhibit higher values in a critical period relative to the annual average, and for a dry year relative to the annual average, although external use exhibits the greatest proportional increase relative to NYAA under both average and critical period conditions.

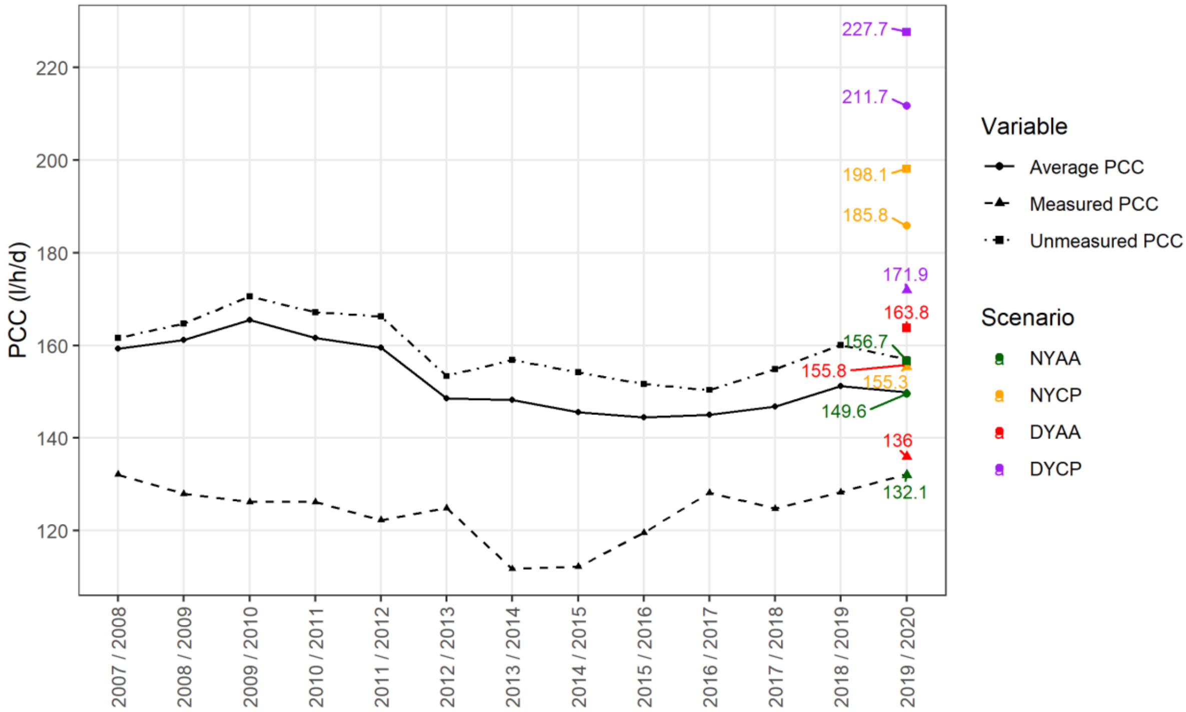


Figure 41 Per Capita Consumption (PCC) graph (DY = 1-in-20 year)

Table 12 Per Capita Consumption (PCC) (l/h/d)

	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17	2017–18	2018–19	2019–20
Outturn Measured	132	128	126	126	122	125	112	112	120	128	125	128	132
Outturn Unmeasured	162	165	171	167	166	153	157	154	152	150	155	160	157
NYAA measured													132
NYAA unmeasured													157
NYCP measured													155
NYCP unmeasured													198
DYAA measured*													136
DYAA unmeasured*													164
DYCP measured*													172
DYCP unmeasured*													228

***** DY = 1-in-20 year

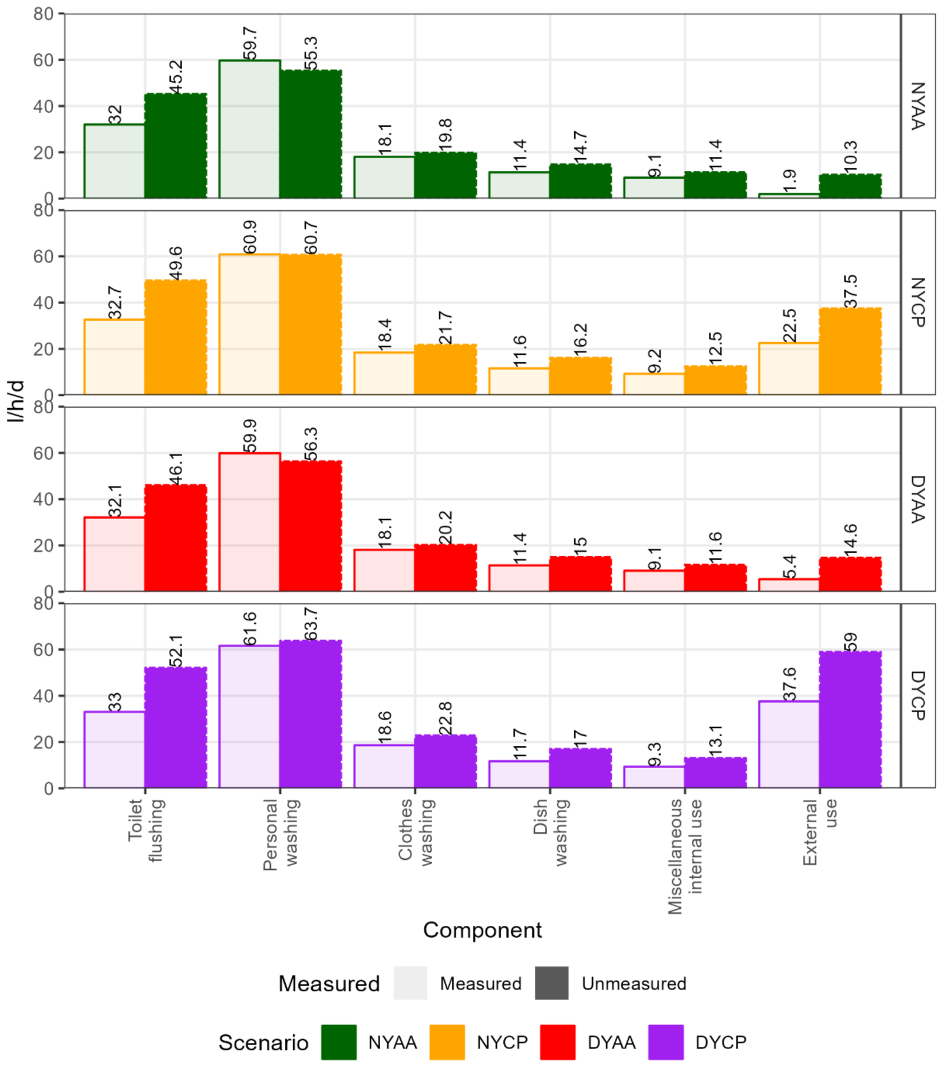


Figure 42 Breakdown of Base Year Per Capita Consumption (PCC) by micro-component (DY = 1-in-20)

4.3 Baseline household demand forecast

The baseline household demand forecast projects future customer water consumption based upon household property and population forecasts and climate projections to determine household demand with PCC and Per Household Consumption (PHC). The baseline forecasts consider the impact of the baseline metering policy and water efficiency activity we undertake but indicate customer consumption without any further intervention beyond the base period (2020–2025) and do not include the impacts from any drought measures.

4.3.1 Household property and population forecast

Uncertainty within the predictions of future economic and demographic futures presents a challenge for water resource management. Thus, robust evidence on future housing growth and demographic change is a key component of the WRPG. Population and property numbers for WRMP24 were provided by Edge Analytics, July 2020 as part of regional forecasting for the WRSE, which ensured consistency across the region.

For WRMP24 Edge Analytics produced a range of scenarios, for the 2020–2050 WRMP plan-period and the long-term 2020–2075 outlook. Each scenario has a growth trajectory for 2020–2050, coupled with three alternative growth scenarios for 2050–2075. The range of outcomes is necessary to enable consideration of the uncertainty associated with the demographic components of population change, the effects of different scales and phasing of future housing growth, plus the impact of alternative data inputs and assumptions applied by ONS and GLA.

The 2020–2050 scenarios can be broadly classified into three groups: trend projections; housing-led forecasts; and employment-led forecasts. Growth scenarios for 2050–2075 are underpinned by fertility, mortality and migration assumptions from the ONS 2018-based NPP, configuring a principal, low and high growth outcome. All scenarios produce statistics on population, households, population not-in-households and properties and occupancy[12].

WRSE have selected scenarios to be applied in an adaptive planning approach (see Section 2) to represent low, high and central population and property projections (ONS18 also provides a lower central scenario and Oxcam1a provides a higher central scenario; see Table 13). Figure 43, Figure 44, Figure 45 and Figure 46 show the baseline forecasted number of new household properties, total number of household properties, household population and household occupancy figures for this dWRMP24 for all housing scenarios.

New properties per year are projected to decline across the period 2020 to 2050 in all scenarios, with two scenarios forecasting higher than historical averages and two scenarios forecasting lower than historical averages. Forecasts then indicate new properties to stabilise from 2050 to 2075, although significant differences between scenarios remain. Only the Max scenario maintains new property development at a rate higher than current day under the longer term forecast out to 2075. Subsequently, total new houses by 2075 range between 54,000 and 146,000 across the scenarios. Figure 43 summarises average new properties per year under each scenario.

Population is set to increase by between 6.8 per cent and 33.6 per cent by 2075 compared to the base year (Table 15). New housing is expected to outstrip new population growth in the region resulting in occupancy rates falling from 2.46 in 2019–20 to 2.19–2.22 by 2075 (Table 16).

Table 13. High (red), low (green) and central (yellow) population and property growth scenario components of adaptive planning situations.

Stage1: 2025–26 to 2034–35	Stage 2: 2035–36 to 2039–40	Stage 3: 2040–41 to 2074–75	Pathway / Situation	
hplan	Oxcam1a*	hmax	1	More challenging future ↑
		Oxcam1a*	2	
		Oxcam1a*	3	
	hplan	hplan	**4**	
		hplan	5	
		hplan	6	
	ONS18	ONS18	7	↓ Less challenging future
		ONS18	8	
		hmin10	9	

Pathway / Situation 4 is regarded as the reported core pathway for this dWRMP24. See Chapter 2 for further information on adaptive planning situations and Edge Analytics, July 2020 for the population and property projections. *Due to insignificant differences between Oxcam1 and hplan, hplan is used for central and higher central scenarios.

[12] wrse_file_1346_wrse-population-property-forecast-methodology-draft-report.pdf (all WRSE documents can be located in the WRSE library: https://www.wrse.org.uk/library)

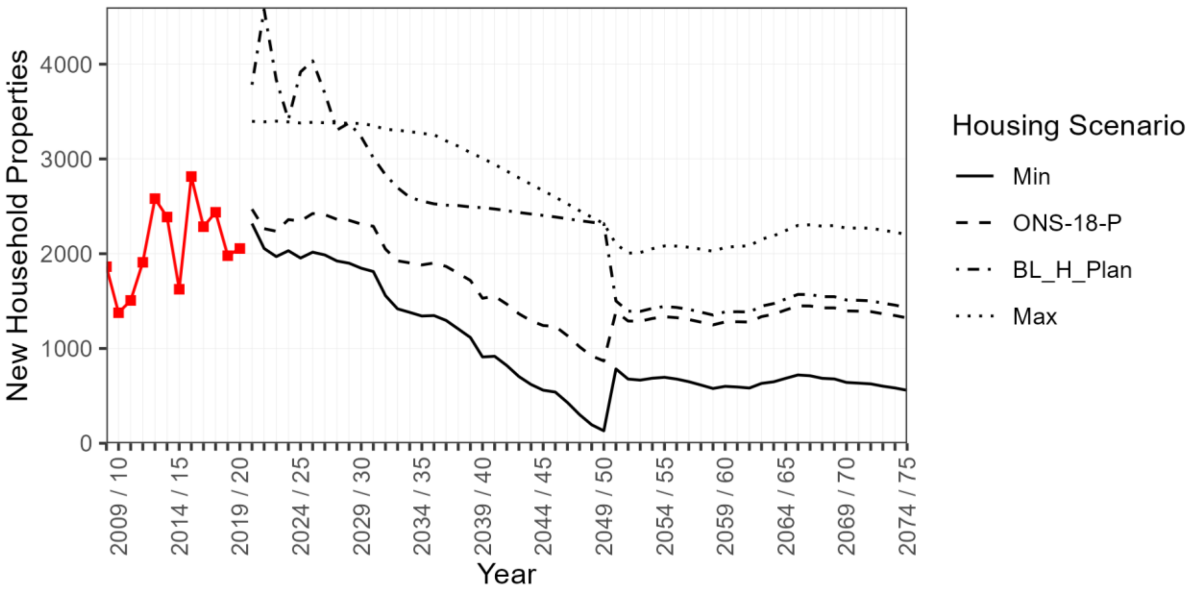


Figure 43. New Household Connections

Table 14 New property forecasts (average per year per scenario)

	Outturn	Min	ONS-18	BL_H_Plan	Max
2008–2020 Historic Average New Properties Per Year	2,068				
2020–2050 Average New Properties Per Year (projections driven by trend/ housing)		1,287	1,816	2,911	3,077
2051–2075 Average New Properties Per Year (projections driven by ONS-18 fertility, mortality and migration assumptions)		649	1,348	1,458	2,159
2020–2075 Average Per Year		997	1,603	2,251	2,660
2019–20 Base Year Number of Properties	296,612				
Total New Properties by 2050		38,611	54,491	87,330	92,324
Total New Properties by 2075		54,827	88,181	123,789	146,295
Property Increase by 2075 (%) compared to 2019–20 base year		18.5%	29.7%	41.7%	49.3%

Table 15 Population forecast per scenario

	Outturn	Min	ONS-18	BL_H_Plan	Max
2019/20 Base Year Household Population	731,052				
2075 Projected Household Population		780,490	852,824	930,012	976,870
Population Increase by 2075 (%) compared to 2019/20 base year		6.8%	16.7%	27.2%	33.6%

Table 16 Occupancy forecast per scenario

	Outturn	Min	ONS-18	BL_H_Plan	Max
2019–20 Base Year Household Occupancy	2.46				
2075 Projected Household Occupancy		2.22	2.21	2.2	2.19
Occupancy Decrease by 2075 (%) compared to 2019–20 base year		-9.8%	-10.2%	-10.6%	-11.0%

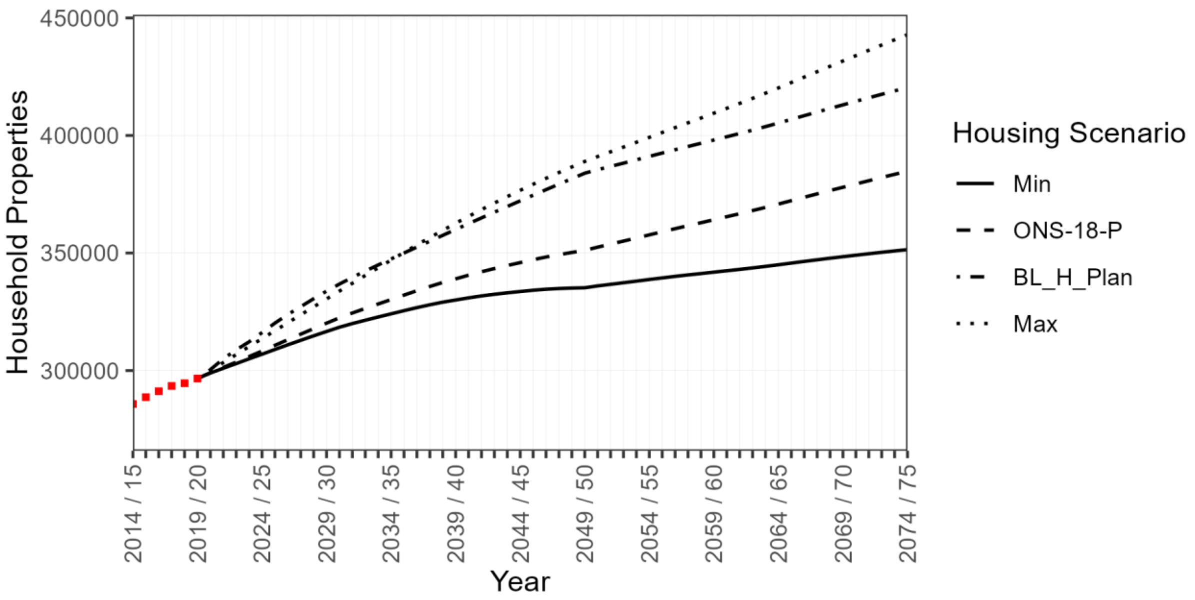


Figure 44. Baseline Household Property Forecast

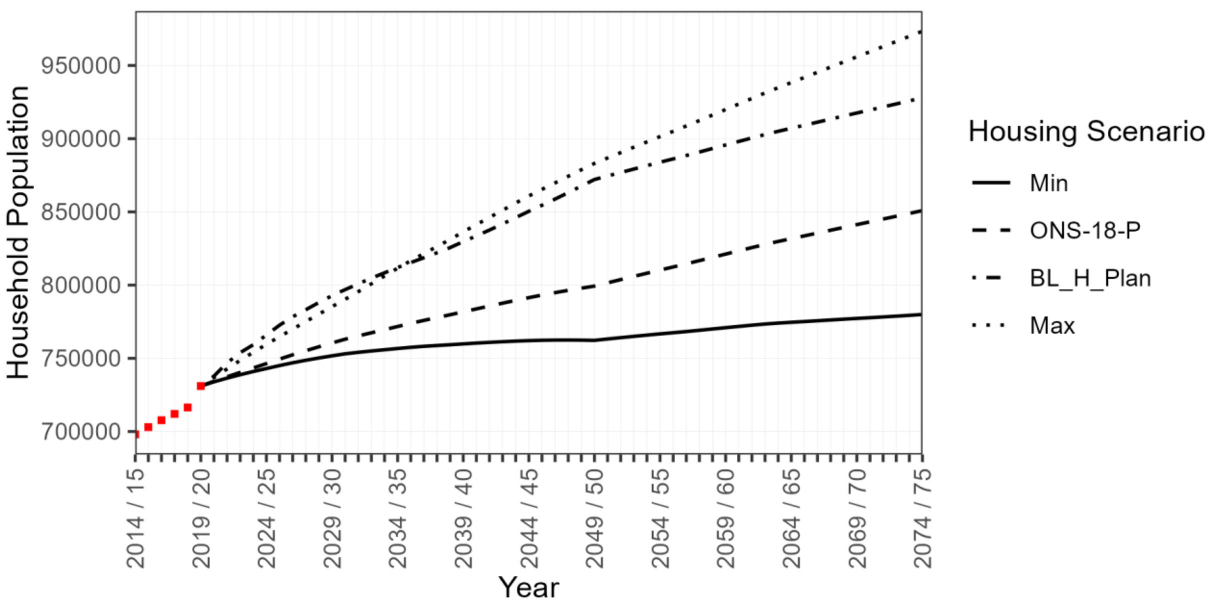


Figure 45. Baseline Household Population Forecast.

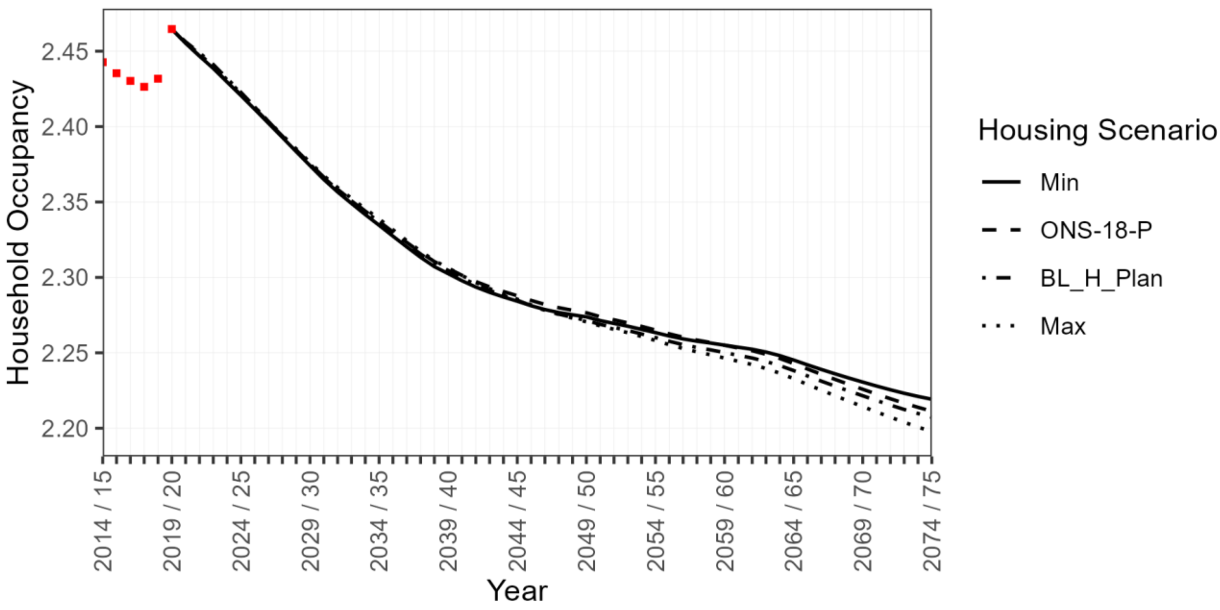


Figure 46. Baseline Household Occupancy Forecast

4.3.2 Baseline metering policy

Our current metering programme contains two elements; an optional metering element where unmeasured customers are encouraged to switch to a meter using promotional activities, and a change of occupier metering element where we install a meter at suitable properties when we are notified of an occupancy change.

In the early years of the current plan period, these programmes were hampered by access restrictions arising from Covid and the need to adhere to social distancing rules to protect our customers. Over 2021–22 the number of metered properties on our network rose by 2,255. However, in 2022–23 a metering recovery programme has been initiated with a trajectory to install the 27,500 meters specified in WRMP19 by December 2024.

For this dWRMP24, our baseline assumption is that optant levels remain consistent with recent levels (Figure 47).

In light of our new designation as an area of serious water stress, we are able to propose universal metering as a demand management option to allow us to manage the water balance.

Our WRSE investment model has indicated that universal metering is a cost efficient way of reducing demand and therefore we are proposing it as an option to be delivered in our dWRMP24.

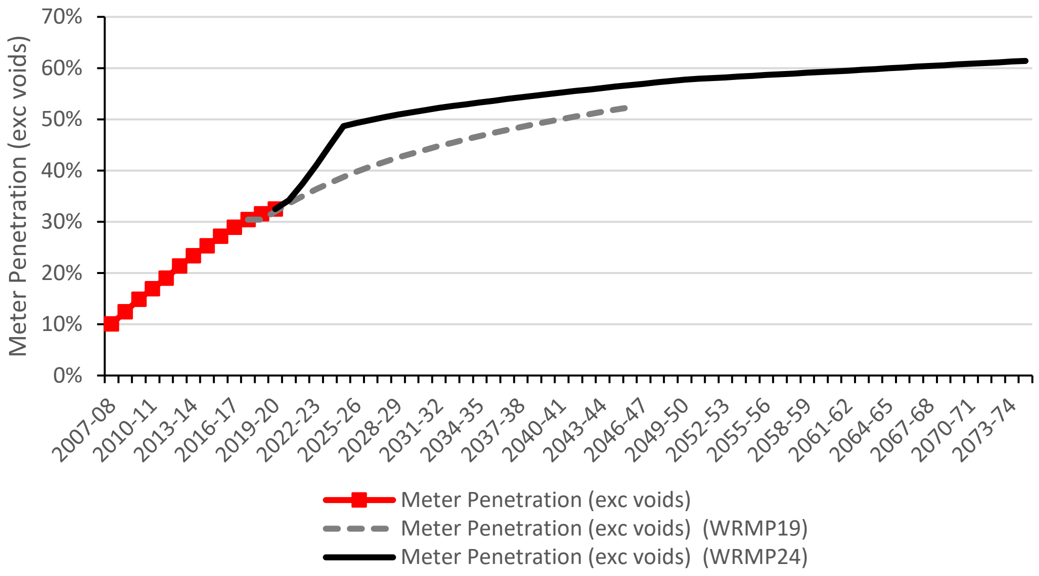


Figure 47. Baseline Meter Penetration Forecast.

Table 17 presents the percentage of household metering for WRSE companies as per their annual WRMP review.

Unlike other water companies in the Southeast, we did not meet the regulatory water-stressed requirements until 2021. As a result this plan is the first opportunity to propose a universal metering programme.

Table 17: Metering penetration figures across the Southeast region

Company	Percentage metering as of 2021	Water stressed status in 2013	Water stressed status in 2019	Water stressed status in 2022
Affinity Water*	**59.2%***	**Yes**	**Yes**	**Yes**
Portsmouth Water	**32.5%**	**No**	**No**	**Yes**
Southern Water	**87.4%**	**Yes**	**Yes**	**Yes**
South East Water	**90.0%**	**Yes**	**Yes**	**Yes**
Sutton and Surrey Water	**61.8%**	**Yes**	**Yes**	**Yes**
Thames Water	**52.0%**	**Yes**	**Yes**	**Yes**

*2020 figure used for Affinity

4.3.3 Per household consumption (PHC) /per capita consumption (PCC) Forecast

The dWRMP24 has used a 'Variable Flow' (VF) method proposed in the 'WRMP19 Methods – Household Consumption Forecasting' guidance. This was a new approach used for the final WRMP19. The VF method explicit exploration of the factors impacting demand and the uncertainty surrounding the model assumptions. The variable flow method uses historical data to define variables, but also requires expert judgement and the application of assumptions. The term 'variable flow' refers to how factors modify fixed future assumptions on 'flows' of water into supply. For this dWRMP24, the method is applied again with updated assumptions.

The core drivers of volume in the VF model are population, properties and climate change. The model also includes impacts for baseline options implemented for metering, leakage and water efficiency for the period leading up to 2024–25. These are consistent with the medium scenario provided as part of regional planning for the WRSE options submission.

The household demand splits the household customer base into three groups: unmeasured properties, new properties and meter optants. New properties are those customers with properties built after 2004 while meter optants are properties that have historically opted for a meter. Typically, in water resource planning, new volumes associated with growth are assigned to either new properties or new persons. One weakness of this approach is that it does not fully recognise the impact of occupancy on consumption, i.e. if average occupancy increases, then homes become more efficient and vice versa. The VF model attempts to capture occupancy impacts by assigning volumes to both properties and persons. Customer movements can then drive volume factors according to the outputs of the properties and population model. To derive the volume factors, a linear regression model was developed using company-specific data. The model uses customer type and occupancy to predict PHC volumes. The result is coefficients that split the PHC volume impacts for persons and households (Table 12).

Table 18 Aggregated coefficients for population and property movements.

Population & Property group	Properties (l/hh/d)	Population (l/h/d)	PHC (l/hh/d) Formula
New Property	91.2	72.4	PHC = (average occupancy × 72.4) + 91.2
Measured (Meter Optant)	N/A	85.9	PHC = average occupancy × 85.9
Unmeasured	N/A	94.4	PHC=average occupancy × 94.4

The impact of climate change in our model is based on the outputs of the UKWIR 'Impact of Climate Change on Water Demand Project' (2013, Appendix 6 look-up factors). We have used the factors used for the South East derived from the 'Thames' outputs. The factors cover a range of scenarios from 10th to 90th percentile, with 50th percentile used as the central scenario. The Excel ETS forecast function has been used to extrapolate raw factors beyond 2040. The raw factors also use a 2012 base; to adjust to the dWRMP24 base, the net difference is taken from 2019–20 onwards. The factors applied differ according to the planning scenario (i.e., Annual Average and Critical Period). To convert the factors to Ml/d impacts, the factors are multiplied by the base year total household consumption, which also varies according to the relevant planning scenario. The total Ml/d impact of climate change in each year is then split between the unmeasured and measured groups proportionally, according to the split of households for a given year.

A reduction in PHC is expected without company intervention, driven by the natural replacement of old, less efficient, water-using devices. However, in practice, we have seen a continual increase in PHC in recent years, which may suggest that natural water efficiency through device replacement is being offset by other factors, for example, changes in customer behaviour. As these impacts cannot be robustly estimated, no reduction for natural water efficiency is assumed for the central scenario.

The change in the key components of total household consumption over the planning period resulting from this forecasting exercise are shown in Figure 48. The impact of new properties and population has the greatest influence on baseline demand; however, the proportion of impact varies significantly between housing scenarios, ranging from 3–22 Ml/d additional demand for population and 5–17 Ml/d additional demand for properties by 2075 (Table 19).

The impact of climate change also acts to increase demand, but to a far lesser extent, except for the Min housing scenarios under critical periods. Some reductions in baseline demand are observed over time resulting from our current meter optant policy and more significantly from the assumed increase in company-led installation of water efficient devices.

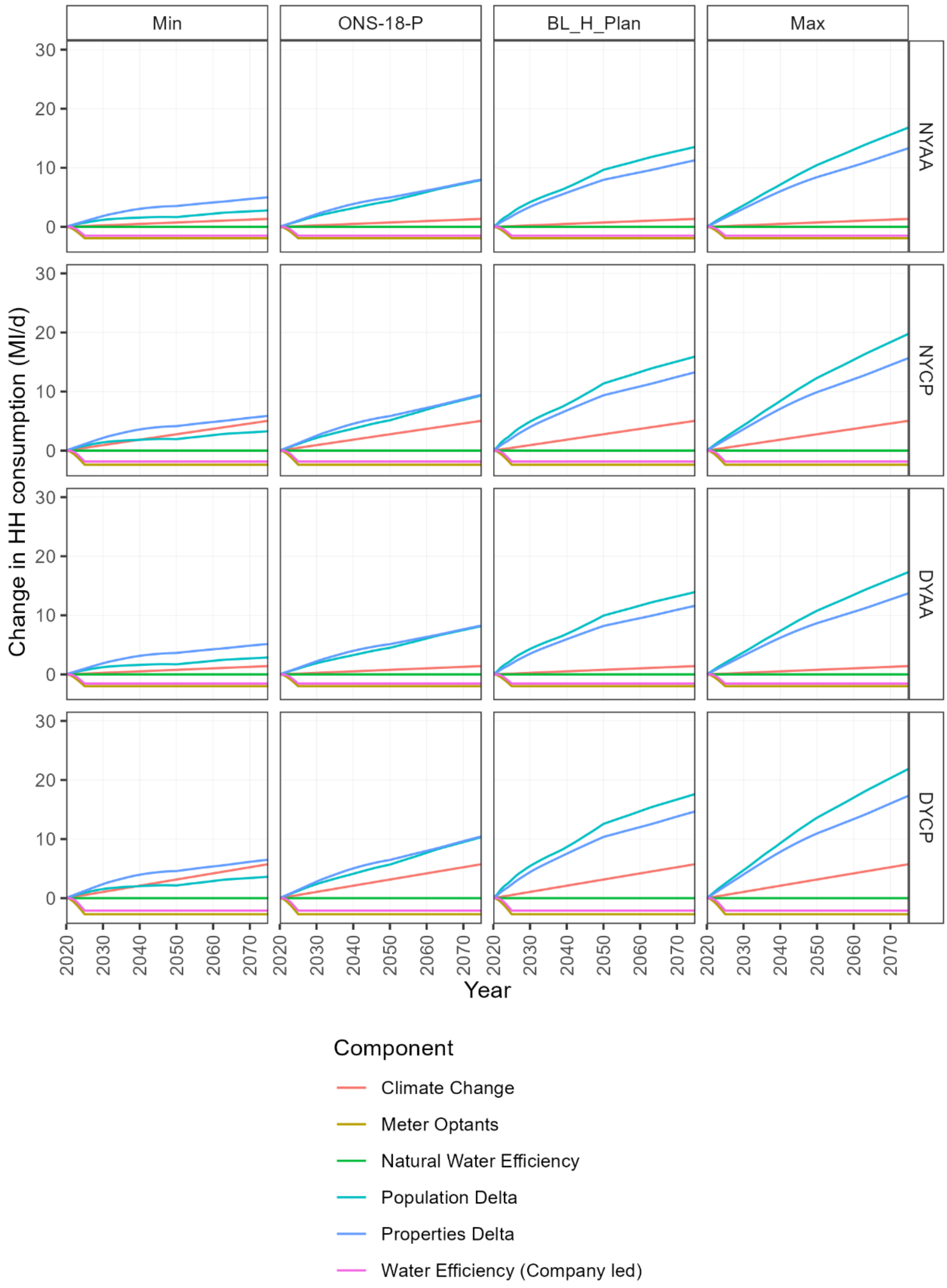


Figure 48: Cumulative change in total household consumption (DY = 1-in-20 year)

Table 19 Cumulative change in total household consumption by 2075 relative to base year (Ml/d)

Climate Scenario	Housing Scenario	Climate Change	Meter Optants	Natural Water Efficiency	Population Delta	Properties Delta	Water Efficiency (Company led)	Total Impact
NYAA	Min	1.3	−1.9	0.0	2.8	5.0	−1.5	5.7
	ONS−18−P	1.3	−1.9	0.0	7.9	8.0	−1.5	13.9
	BL_H_Plan	1.3	−1.9	0.0	13.5	11.3	−1.5	22.7
	Max	1.3	−1.9	0.0	16.8	13.3	−1.5	28.1
NYCP	Min	5.0	−2.4	0.0	3.3	5.9	−1.9	9.9
	ONS−18−P	5.0	−2.4	0.0	9.3	9.4	−1.9	19.6
	BL_H_Plan	5.0	−2.4	0.0	15.9	13.3	−1.9	30.0
	Max	5.0	−2.4	0.0	19.8	15.7	−1.9	36.3
DYAA (1-in-20)	Min	1.4	−2.0	0.0	2.9	5.1	−1.6	5.9
	ONS−18−P	1.4	−2.0	0.0	8.2	8.3	−1.6	14.3
	BL_H_Plan	1.4	−2.0	0.0	13.9	11.6	−1.6	23.4
	Max	1.4	−2.0	0.0	17.3	13.7	−1.6	28.9
DYCP (1-in-20)	Min	5.7	−2.7	0.0	3.6	6.5	−2.1	11.0
	ONS−18−P	5.7	−2.7	0.0	10.3	10.5	−2.1	21.7
	BL_H_Plan	5.7	−2.7	0.0	17.6	14.7	−2.1	33.2
	Max	5.7	−2.7	0.0	21.9	17.3	−2.1	40.2

Colour shading indicates the scale of impact (blue = decrease, red = increase, white = no impact).

The baseline forecast of PCC for all climate and housing scenarios (resulting from changes in the customer base, device replacement and climate change adjustments) is presented in Figure 49 and Table 20.

For NYAA, unmeasured PCC is expected to decrease from 157 l/h/d in 2019–20 by up to 0.8 (0.5 per cent) by 2075. Measured PCC is expected to show a decline from 132 l/h/d in 2019–20 by 0.9 per cent for the Max housing scenario but increase by 4.5 per cent for the Min scenarios. Measured critical period PCC indicates the greatest increases by 2075 (up to 10.4 per cent for DYCP).

Table 20 PCC 2074–2075 comparisons with base year

Climate scenario	Measured/ Unmeasured	Unit	Base Year 2019–20	Housing Scenario (2074–75) Min	ONS-18-P	BL_H_Plan	Max
NYAA	**Measured**	l/h/d	132	137.9	134.6	131.9	130.8
		%	-	4.5%	2.0%	-0.1%	-0.9%
	Unmeasured	l/h/d	157	157.0	156.6	156.4	156.2
		%	--	0.0%	-0.3%	-0.4%	-0.5%
NYCP	**Measured**	l/h/d	155	169.8	165.1	161.1	159.5
		%		9.5%	6.5%	3.9%	2.9%
	Unmeasured	l/h/d	198	203.9	203.0	202.3	202.0
		%	-	3.0%	2.5%	2.2%	2.0%
DYAA*	**Measured**	l/h/d	136	142.6	139.2	136.3	135.1
		%	-	4.9%	2.3%	0.2%	-0.7%
	Unmeasured	l/h/d	164	164.2	163.9	163.6	163.5
		%	-	0.1%	-0.1%	-0.2%	-0.3%
DYCP*	**Measured**	l/h/d	172	190.0	184.4	179.8	177.9
		%	-	10.4%	7.2%	4.6%	3.4%
	Unmeasured	l/h/d	228	234.8	233.7	233.0	232.6
		%	-	3.0%	2.5%	2.2%	2.0%

*DY = 1-in-20 year

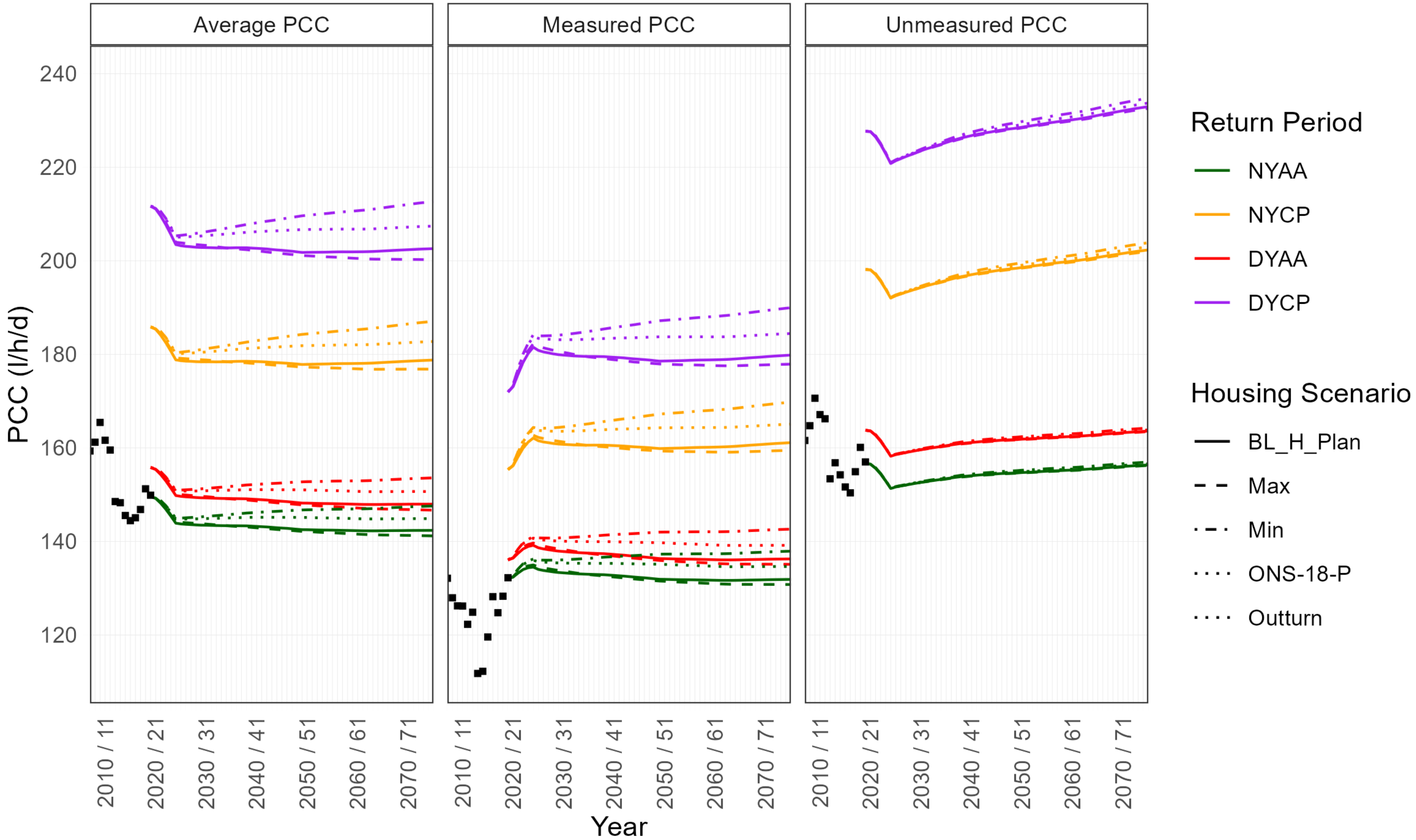


Figure 49. Baseline Forecast PCC for all housing and climate scenarios (DY = 1-in-20 year)

4.3.4 Water efficiency

Our approach to water efficiency has been multi-faceted. Following a cost benefit review of the effectiveness of several 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 interventions we are making for our current WRMP19 are described below:

4.3.4.1 Intensified promotion of our GetWaterFit platform (www.getwaterfit.co.uk/#/)

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. The platform provides:

- Customers free access to water saving devices, tailored to their needs.
- Gamification of personal and household water efficiency challenges.
- Incentivisation through community support initiatives.

Across the past year we have had 3,727 new customers sign up for the GetWaterFit scheme. Of these 3,727 customers, 657 (17 per cent) took part in water efficiency challenges, resulting in savings of around 989 litres per day in total. This equates to around 1.5 l/h/d. Early indications suggest that if all 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 through our water efficiency schemes. With the assistance of Advizzo we are set to launch a scheme for 20,000 of our customers who live 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 to reduce usage

4.3.4.2 General broadcast messages

We are looking to engage with more of our customers about water efficiency through re-designing and increasing customer engagement activity, 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,
- Increased use of video / dynamic content online.

4.3.4.3 Tailored communications: High consumption alerts.

We are engaging directly with customers who have increased their water use between billing cycles.

We are proactively contacting any currently metered customers who have exhibited a rise in historical consumption of over 10 per cent. We will offer water efficiency advice, promote the free gadgets available through GetWaterFit and our leak detection customer support package.

4.3.4.4 Customer engagement portal

We are working with a specialist consultancy, Advizzo, who design customer engagement solutions for water and energy companies, to sign some customers up to a water usage dashboard designed to motivate water efficiency behaviours.

4.3.4.5 Leakbot: Household water use / leakage detector (https://leakbot.io/)

We are giving away 1000 'Leakbots' to our high consuming customers using above average volumes of water. We expect the use of such a device to 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.

4.4 Baseline non-household demand forecast

For the non-household demand forecast, we commissioned Artesia to assess current and modelled future non-public water supply demands from 2025 to 2075. Non-household customers were segmented based on Ovarro report recommendations. This included five sectors grouped in terms of the main factor(s) that drives growth:

- Agriculture and other weather-dependant industries
- Non-service industries (excluding Agriculture)
- Service industries – population driven
- Service industries – economy driven
- Unclassified

To generate future projections a multi-linear regression (MLR) model was developed based on past aggregated consumption data, considering Oxford Economic variables and other factors. The model is calibrated for the base year of 2019–20, first by industry sector using the property consumption data, then by WRZ using the Annual Return (AR) consumption. The MLR model and the calibration are then applied to future explanatory variables to estimate future non-household (NHH) consumption. Forecasts are then extended from 2040–41 to 2074–75 using the total company trend between 2031–32 and 2040–41.

Given its uncertainty and less significant proportion (unmeasured non-household demand makes up less than one per cent of demand), the unmeasured sector is forecasted to remain unchanged from the base year value. The baseline forecast does not include any impact from drought measures, or from further water company intervention beyond the baseline period 2020–2025.

Artesia have produced 729 scenarios exploring uncertainty in gross value added (GVA; ±30 per cent to ±50 per cent), employment (±1.5 per cent to ±3 per cent), population (±6 per cent to ±12 per cent, selected from the Edge Analytics population forecasts) and modelled uncertainties in climate change (UKCP18 10^{th}-90^{th} percentile from 12 regional climate models). They have also considered uncertainty in the development of the retail market and water efficiency scenarios (water consumption reduced by 2–16 per cent by 2050–51). Artesia have then derived four core forecasts with associated uncertainty scenarios:

- Upper: 90th percentile of all the scenarios each year
- Central: 50th percentile of all the scenarios each year
- Lower: 10th percentile of all the scenarios each year
- Baseline: based on assumptions surrounding policy and historical trends

This is a step change from Bottom-Up and Top-Down linear regression forecasts completed for WRMP19. Uncertainty in climate change is also included within dWRMP24 for non-household demand forecasts. Previously, the UKWIR Impact of Climate Change on Water Demand (UKWIR, 2013) guidance suggested that there was little evidence to suggest that climate change will have an influence on non-household water demand. This was therefore not considered in WRMP19.

The resulting estimates of future non-household demand are presented in Figure 50 and Table 21. The four forecasts provide differing projections for non-household demand. The lower forecast shows demand declining from 32.3 Ml/d in 2019–20 to 27.4 in 2049–50, then steadily increasing from 2049–50 to 28.0 Ml/d in 2074–75. The upper forecast shows non-household demand rapidly increasing from 32.3 Ml/d in 2019–20 to 45.0 Ml/d by 2074–75. The baseline scenario demand increases over that of the 'High' scenario in the initial years of the planning horizon. As a result, to provide a range for the WRSE investment model, the Central scenario has been adopted for the core scenario.

Table 21 Baseline forecast non-household demand

Scenario	Outturn 2019–20	Lower 2074–75	Baseline 2074–75	Central 2074–75	Upper 2074–75
NHH total demand (Ml/d)	32.3	28.0	38.7	36.9	45.0
2074/75 NHH total demand increase from base year (%)	-	−13.3%	+19.8%	+14.2%	+39.3%

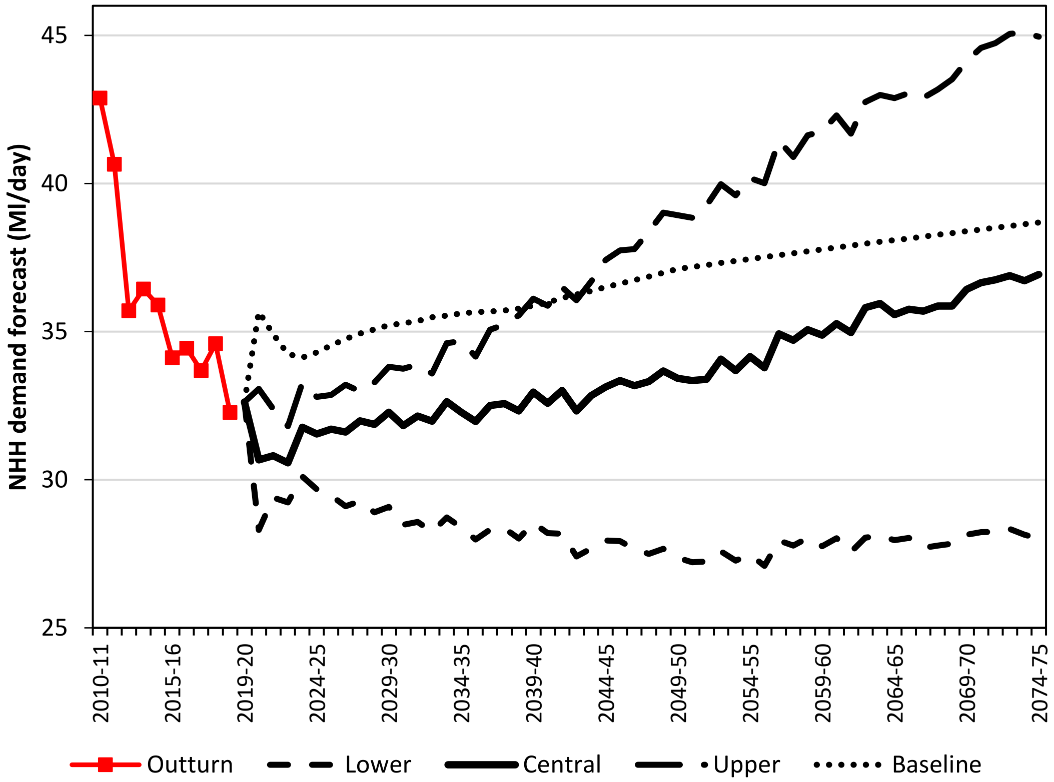


Figure 50. Baseline forecast non-household demand

4.5 Baseline leakage forecast

Leakage, which is defined as water abstracted and treated but not delivered to customers' taps, is of significant concern to us and our customers.

Most of the water lost through leakage is because of leaks that occur on underground pipes without the water rising to the surface. The leaks that do result in water being visible on the surface are easy to identify and consequently are repaired quickly and are not a significant proportion of the leakage we report.

Since 1995, when a standard method for leakage reporting was introduced, we have reduced leakage by 30.9 per cent. Leakage in 2020–21 was thirteen per cent of the total water we put into supply. When normalised across the water industry by the number of properties we supply, we have the second lowest leakage of water companies in England and Wales.

4.5.1 Leakage assessment

The WRPG suggests that leakage in the baseline forecast should remain static from the start of companies' plans to the end of the planning period. In practice, given no additional company effort the baseline would rise as the length of the network, and as the number of supply pipe connections increase with housing growth, and assets deteriorate with age.

In alignment with the guidance, however, all leakage is kept flat over the entirety of the period (Figure 51). Baseline leakage options are included in the forecast for the period leading up to the start of the dWRMP24 planning horizon in 2024–25. These are consistent with the medium scenario provided as part of the WRSE options submission.

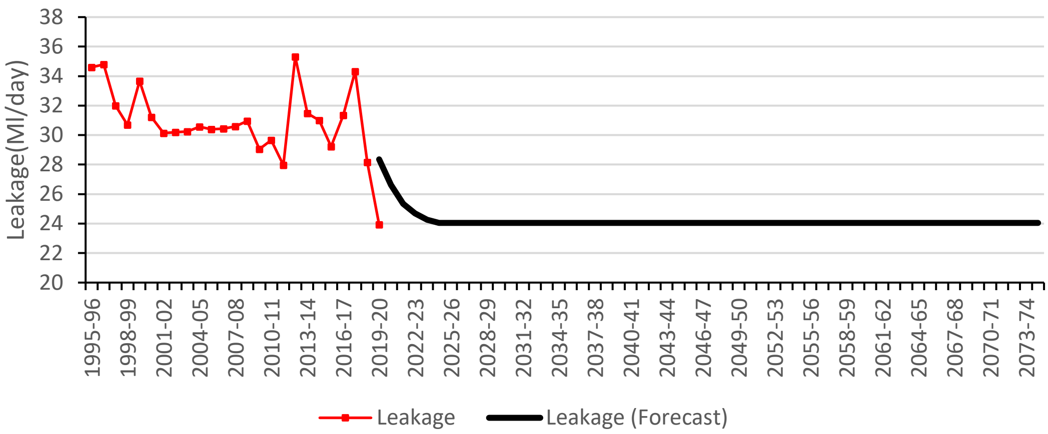


Figure 51 Leakage in Ml/d

4.5.2 Supply pipe leakage

The leakage figure we report includes unmeasured water that is lost through leaks in customer supply pipes and/or internally within customer properties. We undertake leakage detection activity to identify these leaks or customers sometimes become aware of the leaks themselves. We continue to offer up to two free supply pipe repairs or a subsidised replacement of the supply pipe.

Supply pipe leakage tends to be lower on measured properties than on unmeasured properties. If a leak occurs on a measured property, customers will notice the step change in the volume consumed. In addition, when a customer opts for a meter, a check is undertaken on the customer's supply pipe. Consequently, the leakage forecast falls over the period to take account of the reduction in supply pipe leakage because of the number of customers opting for a meter.

4.6 Other components of demand

Other components of demand include:

- Distribution System Operational Use (DSOU) – water run to waste such as that used for the purpose of mains flushing.

- Water Taken Unbilled – this includes water legally and illegally unbilled. Legally unbilled water includes water used for firefighting purposes whilst water illegally unbilled includes void properties which are actually occupied.

Water taken unbilled and DSOU are assumed to stay at the same rate over the period at 2.45 Ml/d and 0.48 Ml/d respectively. Water taken unbilled and DSOU are kept constant over the entirety of the planning period, held at 2019/20 levels.

4.7 Demand summary

The total demand for all scenarios and summary of demand for adaptive planning pathway 4 (also referred to as 'situation 4' in the WRSE investment model) are summarised in Figure 52 and Table 22.

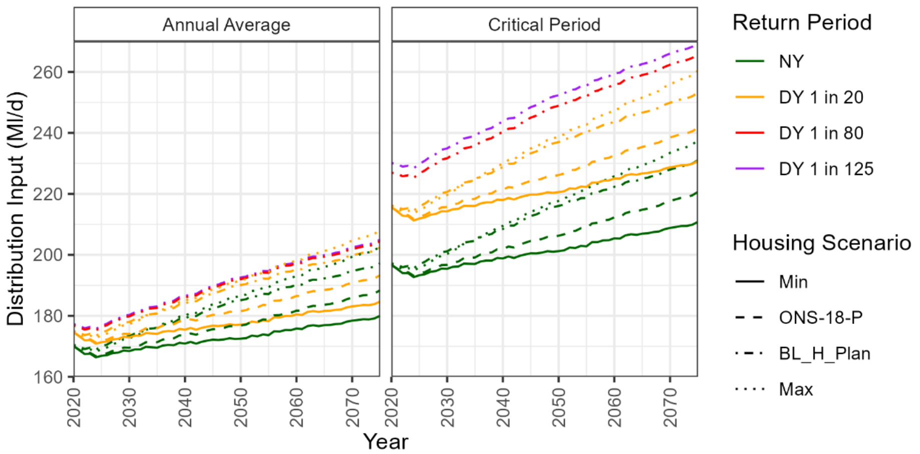


Figure 52. Distribution input (Ml/d) for all situations.

Table 22. Demand summary table for adaptive planning pathway 4 for a 1-in-20 year dry year under DYAA conditions (Ml/d)

	2025–26	2029–30	2034–35	2039–40	2044–45	2049–50	2059–60	2074–75
Household	126.2	129.0	131.7	134.2	137.0	139.8	143.1	147.9
Non-household	32.3	32.9	32.9	33.5	33.7	34.0	35.5	37.5
Void properties	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Distribution Losses	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7
Distribution System Operational Use	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Water Taken Unbilled	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Total Distribution Input	174.5	177.8	180.6	183.8	186.7	189.8	194.6	201.4
Leakage	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1

5 SUPPLY FORECAST

5.1 Introduction

The majority (89 per cent) of the water supplied by us to customers is derived from the local Chalk aquifer. It is either taken from boreholes directly from the Chalk aquifer or captured as it emerges from the Chalk aquifer via springs. In addition, the company has one surface water abstraction from the River Itchen.

This section of the dWRMP24 describes how much water we estimate is available to us to put into supply. It presents the latest supply calculations, referred to as Deployable Output (DO) assessments. These assessments consider factors that could affect DO, such as: bulk supplies to neighbouring water companies, processes losses, potential source outage and the potential impact of climate change. The estimates of available DO are presented at the whole water resource zone level and have been revised for this dWRMP24.

The key assumptions included in this supply side forecast are outlined briefly below with more detail in the following sections. It covers:

- Deployable Output Assessment
- Bulk Supplies
- Sustainability Reductions and longer-term environmental destination
- Climate Change
- Outage Assessment
- Process Losses

How these components of supply relate to each other to generate an overall "water available for use" is presented in Figure 53. This specific illustration represents a single scenario. The relative contributions of some elements of the supply forecast (for example, climate change or environmental destination) will change in other scenarios.

Because Havant thicket Reservoir has received planning permission and is in construction phase, it is included as part of our baseline plan.

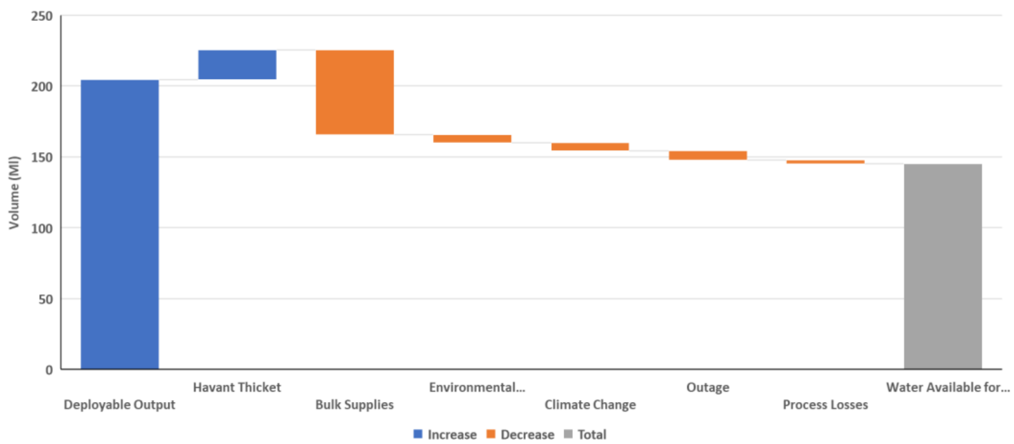


Figure 53 Illustrative plot showing the impacts of components of supply forecast on the amount of water available for Situation 4, DYAA, year 2039–40.

5.2 Deployable output assessment

We review and update our DO values, and submit these to the Environment Agency and Ofwat, every five years as part of our WRMP submission. For this plan, WRSE have developed a regional system simulation model to inform and support our dWRMP24 submission. WRSE have produced a method statement for the assessment of DO (WRSE.org.uk, 2022)[13]. The method statement defines DO as:

"*the supply capability for a water resources system under specified conditions, as constrained by: hydrological yield; licensed quantities; the environment (via licence constraints); abstraction assets; raw water assets; transfer and/or output assets; treatment capability; water quality; and levels of service, as defined by the Water Resources Planning Guideline*."

The regional system simulator was further improved and modified to better represent our supply area and then used to assess DO at a WRZ scale. This section summarises the work undertaken and the DO results relevant to our supply area across the planning period.

5.2.1 Critical period and planning scenarios

Historically, our reliance on groundwater supplies and our low level of raw water storage has meant critical period scenarios have been our most challenging. The critical period for us is associated with peak summer demand. For this reason, a critical period scenario (peak-week summer demand) has been included within the dWRMP24 DO assessment.

The links between planning scenarios and the DO estimates within our dWRMP24 are as follows:

- The assessment of Average Demand Deployable Output (ADO) is linked to the dry year annual average (DYAA) planning scenario.
- The assessment of the Peak Demand Deployable Output (PDO) is linked to the critical period (DYCP) (peak-week summer demand) planning scenario. Based on analysis of the demand profiles used in the regional system simulator, the Peak week occurs in mid-August.

5.2.2 Move to 1-in-500 year drought resilience

Previous iterations of WRMPs have focused on assessing water companies' supply capability against droughts that have happened historically. The use of the historical record provides datasets that allow robust comparison of capability to actual events but does not allow for the analysis of the impacts of droughts which could plausibly happen in the future. Consequently, the use of 'stochastic' climate datasets is growing within water resources planning, driven by a need to consider the impact of droughts that are more extreme than those previously observed in the historic record. Stochastic data is described as having a random probability distribution or pattern that may be analysed statistically but may not be predicted precisely.

The need for water companies to consider droughts beyond those in the historical record has been specified by WRPG requirements that water companies demonstrate how they would make their water supply systems resilient to a 1-in-200 year drought as part of WRMP19. A new WRPG requirement for WRMP24 is that companies' water supply systems are resilient to a 1-in-500 year drought by 2039.

WRSE has generated 400 replicates of a 48-year baseline sequence cumulating in a stochastic dataset that represents 19,200 years of daily data. The method statement produced by WRSE[14] provides a summary of the data as well as highlighting its key features and

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[13] method-statement-depolyable-output-aug-21.pdf (wrse.org.uk). All WRSE documents can be located in the WRSE library: https://www.wrse.org.uk/library
[14] Microsoft Word - WRSE_File_1332_WRSE MS Stochastic Datasets.docx. All WRSE documents can be located in the WRSE library: https://www.wrse.org.uk/library

differences to WRMP19. This stochastic dataset, primarily composed of rainfall and potential evaporation (PET) data, has been post-processed to provide groundwater level data that have been utilised in our dWRMP24 DO assessment. The DO assessment is presented in the sections below, including 1-in-200 year DOs that apply to the Dry Year scenarios up to 2038–39 and 1-in-500 year DOs that apply to the Dry Year scenarios in 2039–40 and beyond.

5.2.3 Previous deployable output assessments

AECOM undertook the DO assessment for our WRMP19 submission. The assessment was undertaken in line with the WRPG (April 2017). AECOM assessed DO through the development of source models to calculate individual source DO values for the worst historic drought on record and through a WRZ assessment to determine DO values for group licences for the worst historic drought and a range of stochastic droughts (see Table 23).

Table 23: Summary of WRMP19 DO values by return period

Return Period	PDO (Ml/d)	MDO (Ml/d)	ADO (Ml/d)
1-in-20 year	280	252	227
1-in-40 year	270	237	217
1-in-80 year	263	233	212
1-in-125 year	252	235	203
1-in-200 year	236	222	191
1-in-500 year	238	217	185

5.2.4 Reassessment of deployable output for the dWRMP24

5.2.4.1 Development of the regional system simulator

The regional system simulator (RSS) has been developed using a python-based water resource modelling platform called 'Pywr'[15]. Pywr was selected as the platform for the RSS following a detailed review of available options conducted for WRSE[16].

Pywr allows the representation of our supply zone than has previously been achieved with a better representation of network connections and constraints as well as the bulk supplies to Southern Water's Hampshire and Sussex North regions.

Our Pywr model has been developed to operate as both an independent model of our supply area and as a component of the larger RSS. In each case the model has been developed to allow utilisation of the 19,200 years of stochastic data developed by WRSE. This dWRMP24 follows the current WRPG, utilising the stochastic sequences to assess DO across a range of return periods up to a 1-in-500 year event.

5.2.4.2 Further development of the Pywr model

The Pywr water resources model built as part of WRSE has been further developed to support our DO assessment. The model used for this dWRMP24 is the same as that used for

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[15] Tomlinson, J.E., Arnott, J.H. and Harou, J.J., 2020. A water resource simulator in Python. Environmental Modelling & Software. https://doi.org/10.1016/j.envsoft.2020.104635
[16] wrse_file_1331_wrse-regional-simulation-model-scoping-report.pdf (all WRSE documents can be located in the WRSE library: https://www.wrse.org.uk/library)

our revised WRMP19. As well as contributing to the DO assessment the updated Pywr model has been utilised in options and network enhancement assessments including identification of the Source O Booster supply-side option.

The Pywr modelling has been undertaken using the same stochastic inputs that were created for WRSE, however a number of network and supply options were created in the model that could be included or excluded from model runs appropriate to the required assessment. Details of these features are outlined below and options such as the Source O Booster enhancement are discussed in the options section of this dWRMP24. As well as the DO assessment presented hereafter the outputs of this modelling have been used in the supply forecasts provided to WRSE.

5.2.4.3 WRMP19 assumptions

Updates and enhancements to sources within our WRZ are being undertaken in advance of the start of the dWRMP24 planning horizon in 2025–26. These updates have been reflected in the latest DO modelling and are described below. 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-in-20 year drought 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-in-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-in-20 and 1-in-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-in-20 and 1-in-200 drought conditions.

Source J: This scheme is to provide resilience to supplies once the bulk transfer to Southern Water from Source A increases from 15 Ml/d to 24 Ml/d in 2024–25. Currently the source DO is limited by the Deepest Advisable Pumped Water Level (DAPWL) in borehole 3, to around 8.5 Ml/d under severe drought conditions.

5.2.4.4 Revised assumptions for dWRMP24

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 DO 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.

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 provided 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 (Table 24).

The DYCP scenario benefits are lower than originally anticipated because water from the schemes cannot be fully transferred to the parts of our WRZ where this water is most needed.

The Pywr modelled benefits were used within the latest Revised WRMP19 tables, and they have also formed part of our upload to the regional modelling towards our dWRMP24 tables.

Table 24: Summary of revised DO of WRMP24 groundwater enhancements

Source	1-in-200 Average Benefit (Ml/d)	1-in-200 Peak Benefit (Ml/d)	Implementation Date
GW Schemes total benefit (maximising DO at Source O, C, H & J)	13.3	10.5	Source H recently implemented. Source O and C to be implemented in 2023–24 and Source J in 2024–25.

5.2.4.5 *DO assessment methodology*

We have followed the WRSE method statement for the assessment of DO using our Pywr model as part of the broader RSS and utilising the newly developed stochastic datasets from WRSE.

The WRSE method statement discusses recording a count of the number of events requiring imposition of drought orders as the describing metric for DO. However, because demand restrictions within our WRZ are based on the groundwater level at Well 'X' and not on the residual volume of a given water-storage or collection of storage location, this approach is unsuitable for us. To better assess the supply-system DO, we counted the number of events which cause demand deficits to occur at each level of demand. The return period of demand deficits (and therefore DO) was determined from this figure.

The focus of the WRSE modelling and the inputs required to feed into the investment models is at a WRZ level, which for us means the whole of our supply area. Therefore, source level DOs were not required for regional planning purposes and were not explicitly re-assessed (although source licence and other constraints are included in the water resource model to derive the overall WRZ level DO).

For the attached planning tables, we have provided a summary of source level DOs based on disaggregating the supply area DO figure based on the previous WRMP19 source DO values. Values have then been cross checked against known constraints, e.g. licence or pumping constraints to assure the values calculated.

The calculated source DOs are described in section 5.2.8.

5.2.5 Levels of service and drought plan links

When drought conditions begin, we implement our drought plan. This results in a steady escalation of restrictions on the demand for water. The first step is through appeals to our customers for voluntary restraint, but then escalates through temporary use bans (TUBs) such as bans on the use of hosepipes, and Non-essential use bans (NEUBs) that may start to impact businesses in the local area.

As a last resort, water companies may also ask for emergency drought orders (e.g. use of standpipes and rota cuts to reduce the demand for water), although these 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) as defined in our current Drought Plan are as follows:

- Temporary Use Bans: No more frequently than 1-in-20 years
- Non-Essential Use Bans: No more frequently than 1-in-80 years
- Emergency Drought Orders: No more frequently than 1-in-200 years

The DO assessment undertaken for this dWRMP24 has estimated the DO for a range of plausible droughts that are more severe than those we have experienced in the past. The introduction of a demand profile (considering the critical period) has enabled the results from the DO assessment to be mapped relative to our planned LoS. This provides a link between the WRMP and the drought plan.

Following the requirements of the WRPG, baseline DO figures are calculated without the benefit of demand saving measures (media campaigns, TUBs and NEUBs). However, the DO benefit of these reductions can be determined using the same DO assessment methodology with the reductions implemented. The demand reduction factors associated with each formal intervention for demand reduction are:

- TUBs: 7.2 per cent reduction (92.8 per cent of demand remains)
- NEUBs: 11.9 per cent reduction, inclusive of the TUBs reduction (88.1 per cent of demand remains)

The DO assessment results are used within the WRMP process to understand the impact of drought conditions on the supply-demand balance. It also allows the calculation of any required investment costs should demand restrictions and supply-side drought permits not be permissible.

5.2.6 Havant Thicket Winter Storage Reservoir

The WRPG states that:

> *"Your baseline scenarios should include benefits of schemes that have met one and, or more of the following conditions: have planning permission to go ahead; a funding allowance made by Ofwat in a business plan for delivery of the scheme; or other necessary permissions such as abstraction licences or environmental permits."*

Havant Thicket Reservoir has received planning permission and is therefore included as part of our supply baseline from 2029–30 onwards, when it is programmed to have been constructed and filled. Havant Thicket Reservoir has also been "pre-selected" in the WRSE regional investment model to account for this. The reservoir is currently in the construction phase and will be filled and topped up using chalk spring water from Source B in winter.

Havant Thicket Reservoir provides a drought resilient resource which maintains its output during low flows and droughts, when we need it the most. It means we can provide Southern Water with a bulk supply of water, allowing them to reduce abstractions in the River Itchen catchment and protect and conserve chalk stream environments. This bulk supply is treated as an option within the WRSE investment model.

The DO benefit of the Havant Thicket Reservoir was most recently reported within the revised (June 2022) WRMP19 planning tables, which state the ADO benefit of Havant Thicket as 21.1 Ml/d for the 1-in-200 year scenario. Table 25 below presents the DO at each return period for the baseline position. Appendix 1C provides a more detailed report.

Table 25: DO Benefit of Havant Thicket Reservoir in the baseline scenario

Return Period	DO Benefit of Havant Thicket Reservoir for use in WRSE (Ml/d)
1-in-2 average	19.9
1-in-2 peak	18.7
1-in-100 average	19.1
1-in-100 peak	18.7
1-in-200 average	21.1
1-in-200 peak	21.3
1-in-500 average	12
1-in-500 peak	12

We have worked alongside Southern Water to develop a joint Pywr water resources model of the Hampshire region, modelling our two networks. The model will be utilised in future water resources modelling studies for both companies, including the assessment of Southern Water's Hampshire Water Transfer and Water Recycling options. The model will allow for a more detailed assessment of the conjunctive use benefit of Havant Thicket Reservoir for both companies across a range of configurations and scenarios.

5.2.7 WRZ deployable output assessment

As described previously, the WRZ DO assessment used the Python for Water Resources (Pywr) WRZ model, which was developed for WRSE. The Pywr model uses individual source constraints, group licence constraints, resource availability (based on Well 'X' groundwater levels) and a profile of demand to develop DO for a range of drought return periods.

Simulated demand, distributed through the year according to the demand profile, is increased within the model to generate supply failures. The return period of our WRZ DO therefore relates to the return period of these modelled supply-demand failures, rather than the return period of rainfall, groundwater levels or water-storage health as discussed in section 5.2.4.5.

At each step of simulated demand the frequency of observed demand deficits, that is the volume of demand not met by available supply, is recorded. Simulated demand was increased until failures occurred at the required frequency to define the DYAA and DYCP DO at a range of return periods of interest; 1-in-500, 200, 100 and 2 years. This is known as the 'Scottish' method of DO assessment and is in line with the WRSE method statement.

The DYAA DO is the annual average level of demand that could be sustained at each return period when failures were considered. The DYCP DO is the peak level of demand that could be met during the peak week of demand, and that caused failure at the specified frequency. The DYCP DO was also assessed using the Scottish DO method in which demand was increased until the frequency of failure reached the required return period; 1-in-500, 200, 100 and 2 years. The critical period is associated with peak-week summer demand.

The values provided in Table 26 are amount of water supplied from our sources in these conditions.

Table 26: Summary of DO assessment outputs – DYAA and DYCP

Return Period	DYAA DO (Ml/d)	DYAA DO (Ml/d) with Havant Thicket	DYCP DO (Ml/d)	DYCP DO (Ml/d) with Havant Thicket
2	240.7	260.6	295.3	314
100	220.3	239.4	266.6	285.3
200	206.8	227.9	249.3	270.6
500	204.50	216.5	250.4	262.4

5.2.8 Source deployable output assessment

As described previously in section 5.2.4.5, we have developed source DO values by apportionment of the WRZ level DO values that were calculated using the Pywr model. Table 27 and Table 28 below provide a summary of the ADO and PDO for each source for a selection of return periods.

Table 27: Average deployable output by source in our water resource zone

Source works	1-in-2	1-in-100	1-in-200	1-in-500
Source A	39.7	33.5	22.0	21.6
Source B	56.3	48.4	46.5	46.0
Source C	18.4	18.0	17.7	17.5
Source D	1.2	0.8	0.9	0.9
Source E	0.4	0.4	0.4	0.4
Source F	7.2	7.2	7.2	7.2
Source G	1.6	1.6	1.6	1.6
Source H	8.2	7.9	7.8	7.7
Source I	1.5	1.5	1.5	1.5
Source J	9.7	8.9	9.0	8.9
Source K	10.2	10.0	9.8	9.7
Source L	15.0	14.4	14.2	14.0
Source M	4.8	3.4	4.1	4.1
Source N	25.9	25.1	24.6	24.2
Source O	4.0	2.4	3.0	3.0
Source P	8.9	8.8	8.6	8.5
Source Q	9.3	9.5	9.4	9.3

Source works	1-in-2	1-in-100	1-in-200	1-in-500
Source R	10.0	10.0	10.0	10.0
Source S	2.0	2.1	2.1	2.0
Source T	6.4	6.4	6.4	6.4
Total	240.7	220.3	206.8	204.5

Table 28: Peak Deployable output by source in our water resource zone

Source works	1-in-2	1-in-100	1-in-200	1-in-500
Source A	45.5	40.1	38.5	40.3
Source B	63.5	51.4	46.1	43.8
Source C	23.7	22.2	21.4	22.3
Source D	2.5	2.1	1.8	1.7
Source E	0.46	0.46	0.46	0.46
Source F	12.4	11.7	11.5	11.8
Source G	2.6	3.1	2.8	2.6
Source H	9.1	9.0	8.6	9.0
Source I	2.0	2.0	1.8	1.9
Source J	10.2	10.1	9.7	7.8
Source K	12.3	12.0	11.6	12.1
Source L	16.0	14.8	14.0	14.2
Source M	6.3	4.7	3.7	2.8
Source N	36.4	34.7	33.4	33.7
Source O	4.0	2.7	1.6	1.3
Source P	10.0	9.9	9.5	9.9
Source Q	13.0	11.9	11.0	11.6
Source R	14.0	12.9	11.9	12.5
Source S	2.5	2.5	2.3	2.5
Source T	8.8	8.3	7.6	8.1
Total	295.3	266.6	249.3	250.4

5.3 Existing bulk supplies

We provide several bulk supplies to our neighbouring water company, Southern Water. This section describes each of those existing bulk supplies in more detail. Other options to provide additional bulk supply are discussed later in Section 7 of this dWRMP24.

5.3.1 Southern Water - Sussex North

We have an existing bulk supply agreement with Southern Water to supply their Sussex North WRZ. The infrastructure necessary for this bulk supply was constructed in 2004.

The maximum transfer rate is 15 Ml/d and only allows water to flow from Portsmouth Water to Southern water.

There is a cross connection between the bulk supply to Sussex North and an existing Southern Water main to its Sussex Worthing WRZ. This connection provides operational flexibility for Southern Water but does not increase the total transfer capacity. Therefore, it was not considered material within our dWRMP24, but is a consideration in Southern Water's dWRMP.

Within the WRSE investment model the existing 15 Ml/d bulk supply to Sussex North is treated as part of the baseline until 2025–26, beyond which point it becomes an option that can be selected if required.

5.3.2 Southern Water - Hampshire Southampton East

We have an existing bulk supply agreement with Southern Water to supply their Hampshire Southampton East (HSE) zone. The bulk supply exports up to 15 Ml/d from us to Southern Water's HSE WRZ. Flow is abstracted from the River Itchen at Source A, treated at Source A treatment works and then transferred to Southern Water.

Following the planned completion of the Source J enhancement in 2024–25 the bulk supply capacity is expected to increase by 9 Ml/d. However, as clearly articulated previously in WRMP19 before and reiterated here, our ability to provide this additional bulk supply remains dependent upon the success of on-going borehole investigations at Source J and our subsequent ability to license the assets required.

We have clearly articulated this risk to Southern Water.

Within the WRSE investment model the 15 Ml/d and 9 Ml/d bulk supplies to the HSE WRZ are treated as part of the baseline until 2028–29, beyond which point they become options that can be selected.

Additionally, once Havant Thicket Reservoir is constructed and commissioned, an additional bulk transfer of up to 21 Ml/d can be made to the HSE WRZ via a new bulk supply. The WRSE investment model does not include this additional bulk supply within the baseline supply forecast. Instead, it is treated as an option that can be selected in 2029–30.

5.3.3 Third Party Supplies

No third-party suppliers responded to Portsmouth Water with an offer of supplies.

There are several housing developments in our supply zone where a third party delivers the water to the end user. In these cases, we are retained as the bulk supplier and there is no net reduction in the amount of water we need to supply. It would be possible for a developer to install effluent re-use and therefore create a nominal surplus for us to use elsewhere. This has not happened so far.

5.3.4 Imports

We do not currently have any bulk supply imports.

5.4 Sustainability Reductions (Environmental Destination)

5.4.1 Introduction and WRSE approach to developing environmental destination for the emerging regional plan

Our traditional approach to protecting the environment has been focused on what asset improvements are required in the next 5 to 15 years to deliver the improvements specified by the Environment Agency in the Water Industry National Environment Program (WINEP). Typically, this programme delivered schemes or sought to investigate potential issues with a view to feeding that information into our next WRMP and business plan round.

The WINEP provided the actions required in the short-term to be compliant with environmental legislation. This process did not lend itself to considering a more collective longer-term approach for the WRSE region, because it does not account for potential future scenarios including the impact that climate change might have on the availability of water in the longer term.

For this reason, WRSE developed an environmental ambition method to establish a series of alternative longer-term ‘futures’ which can be used to derive an adaptive regional plan and hence identify a series of pathways through which these different outcomes might be delivered in practice. These futures represent different anticipated levels of environmental protection, which will help to move towards planning for proactive protection rather than retrospective remediation. The WRSE approach allows the issues to be mapped out and schemes to be identified to deliver water resource benefits that can be put forward by water companies to improve the resilience of the environment against future scenarios. This is a step change in approach from previous plans.

The Environment Agency (EA) has recently completed a longer-term environmental water needs assessment as part of the Water Resources National Framework. This work established a view on the potential licence reductions required by 2050 for rivers to meet their Environmental Flow Indicators (EFI). Unless proven to the contrary by local data driven evidence, the EA consider meeting EFI to be a requirement for a river achieving or maintaining “good ecological status”. WRSE used this work to inform the plausible environmental scenarios in the emerging regional plan, which was released for consultation in January 2022 (read more about the emerging plan here).

The EFI is defined by an Abstraction Sensitivity Band (ASB) allocated to each waterbody. Four scenarios were analysed during the development of the WRSE emerging regional plan:

- **Business as usual (BAU):** the same percentage of natural flows continues for the future. Uneconomic waterbodies, where reducing abstraction would imply a significant investment, were initially discarded. However, an additional scenario (BAU+) including them has been subsequently incorporated following local verification by the Environment Agency. For companies in other regions, local verification has sometimes reduced sustainability reduction figures. However, for Portsmouth Water the local verification resulted in higher levels of sustainability reductions. This has been discussed further with the Environment Agency, and we have been advised this is valid, as it reflects the high pressures on water resources in the Southeast of England and the presence of sensitive Chalk catchments.
- **Enhance:** a greater environmental protection for protected areas and Sites of Special Scientific Interest (SSSI) rivers and wetlands, and principal salmon and chalk rivers is achieved by applying the most restrictive ASB.
- **Adapt:** same ASB as BAU but a recovery to a lower standard is assumed in some heavily modified waterbodies.
- **Combine:** balances a greater environmental protection for protected areas, SSSI rivers and wetlands and principal salmon and chalk rivers with a view that good status (as

defined under the Water Framework Directive) cannot be achieved everywhere in a shifting climate. Hence, adopts the Enhance ASB with a lower recovery to the EFI in some heavily modified waterbodies.

WRSE analysed the impact of these scenarios on the supply-demand balance of our region's water resource zones by establishing the potential changes to licensed quantities and therefore abstraction quantities. For Portsmouth Water, the reductions in abstraction ranged between 12 and 48 Ml/d, which were then used as a proxy for reductions in deployable output.

For the purpose of investment modelling and adaptive planning towards the development of the emerging regional plan, four environmental destinations were taken forward. This included the BAU+ (locally verified) and Enhance scenarios described above, but also two additional scenarios named 'Central' and 'Alternative'. Together, these were considered to reflect a suitable range of uncertainty in environmental destination. For Portsmouth Water, the plausible abstraction reductions used in the investment model and within the adaptive planning branches ranged between 6.1 Ml/d and 48.3 Ml/d.

Further detail on the assessments described above for the WRSE emerging regional plan is published here.

5.4.2 Approach to developing environmental destination for the WRSE draft regional plan and our dWRMP24

For the WRSE draft regional plan and our dWRMP24, we have further developed the 2050 environmental destination scenarios using our Pywr water resources model and discussions with the Environment Agency. The scenarios also consider Environment Agency April 2022 guidance to water companies on its licence capping approach, which aims to prevent deterioration of water bodies under the WFD through licence reductions by the early 2030s. A summary of our activities is provided below:

- October 2021: A meeting with the local Environment Agency team to discuss abstraction growth factors, WRSE environmental destination assumptions and a plan to develop agreed scenarios for testing within our new Pywr water resources model.
- November 2021: A meeting with the local Environment Agency team to discuss proposed 'High' and 'Medium' environmental destination scenarios for testing within Pywr. This included refinement of indicative licence reductions on an abstraction source basis for use within the model. The 'High' scenario was based on the ambitious Enhance and BAU+ (locally verified) scenarios. The 'Medium' scenario was proposed by us and refined with the Environment Agency; it assumes licence reductions that, at a water resource zone level, are representative of the BAU scenario described earlier.
- December 2021: We reviewed outputs from the Pywr model with the local Environment Agency team.
- January 2022: Through consultation with local Environment Agency and the WRSE Environment Agency representative, we agreed 'High', 'Medium' and 'Low' environmental destinations for use within the WRSE adaptive planning and investment model. This included the development of stepped profiles for sustainability reductions, with initial reductions commencing in the early 2030s and final reductions occurring around 2050.
- February 2022: We uploaded our environmental destination profiles to WRSE for modelling.
- April 2022: We reviewed new guidance from the Environment Agency on its approach to licence capping and completed an in-house assessment of how our abstraction licences might be impacted, including identification of priority catchments for action.
- May 2022: Our Pywr model was used to understand the impact of the early 2030s licence capping relative to the 2050 environmental destination. We presented the

results of the modelling and our initial catchment prioritisation work to the local Environment Agency. We also provided WRSE with new environmental destination profiles (incorporating licence capping) for use within the adaptive planning and investment model.
- June 2022: Following additional Pywr modelling and discussions with the local Environment Agency and the WRSE Environment Agency representative, we submitted final environmental destination profiles (incorporating licence capping) to WRSE.

The final environmental destination profiles used within the WRSE adaptive planning and investment model assume the following:

- Initial deployable output reductions of around 5.5 Ml/d occur in 2028–29, rising to 11 Ml/d by the early 2030s and 22 Ml/d by the late 2030s (for a 1-in-500 year drought condition). This represents our best estimate of licence capping impacts to prevent deterioration of water body status and the 'low' environmental destination pathway.
- The adaptive planning then assumes a decision is made in 2035 on the long-term environmental destination and branches to allow us to follow either a 'low', 'medium' or 'high' destination. By the 2050s, the deployable output reduction could range between 33 Ml/d ('low' scenario) and 107 Ml/d ('high' scenario).

WRSE and Portsmouth Water have been ambitious, selecting as our core, a pathway to the 'high' environmental destination scenario, consistent with the Environment Agency's BAU+ (locally verified) and enhanced scenarios. However, the environmental destination is very uncertain and the WRSE adaptive planning approach allows for this. We have still considered different levels of long term environmental destination ('high', 'medium' and 'low'), so that we can better adapt to a changing timetable for implementation and / or changing depth of deployable output sustainability reductions in the future to ensure protection for the environment.

Through the inclusion of the environmental destination scenarios within our process, we will deliver improved protection for the environment. This includes achieving and maintaining sustainable abstraction to 2050 (and beyond), taking account of climate change impacts and future demand for water.

5.4.3 Short, medium and long term actions to realise the environmental destination

We recognise the need to protect the environment by investigating changes to our licences to better reflect water availability in catchments and reduce any impact from abstraction. However, reducing abstraction from rivers and aquifers can only be achieved at a rate that is matched by cost-efficient investment to reduce demand or develop alternative sources of water. We have set out our proposed short, medium and long term actions below.

In the short term (up to 2025):

- We do not have any immediate actions that are required to meet current regulatory requirements (i.e. confirmed and likely sustainability changes to licences to be implemented in Asset Management Plan Period (AMP7)). However, we will review the sustainability of our abstractions when applying for new licences or licence variations associated with our funded AMP7 and AMP8 schemes at sources J and B.
- Through discussions with regulators and stakeholders, we will continue to develop and refine the proposed AMP8 WINEP investigation and option appraisal programme for inclusion within our PR24 business plan. We will continue working with the Environment Agency, Natural England and WRSE to prioritise catchments for investigation. WRSE-led catchment prioritisation work to date has identified that the WFD operational catchments within our area (East Hampshire Rivers and Western Streams) are some of the highest priorities. This assessment was based on:

- Maximising benefits of abstraction reduction (focus on upstream catchments first to extend benefits to down-stream catchments). This sub-assessment was completed by the Environment Agency.
- Certainty of benefit to flow and ecology from implementing sustainability reductions. This sub-assessment was completed by the Environment Agency.
- Scale of the issue with respect to the gap between existing flows and the EFI target flow. This sub-assessment was completed by the Environment Agency.
- Highest ecological potential (inclusion of protected areas within the catchment).
- Benefit to people (population and access to blue spaces).
- Natural England's Nature Recovery List.
- The amount of Chalk streams within a catchment.

- As an example, our own prioritisation work has identified the River Ems catchment as the highest priority for investigation and option appraisal within the AMP8 WINEP.
- We will continue discussions with the Environment Agency regarding opportunities for any flexibility in meeting future licence capping related reductions to support optimal solution development and reduce the risk to our supply demand balance.

In the medium term (2025–2033):

- We do not have any time limited licences, although we do have time limited conditions on some of our permanent licences that expire in 2028 (sources C, F and the QRST Group). Therefore, we will review the sustainability of these licences with the Environment Agency during AMP8.
- We will investigate the sustainability of our permanent licensed abstractions and undertake options appraisals during AMP8 for higher priority catchments, with all catchments being completed by the end of AMP9. We believe that a catchment-wide approach needs to be taken alongside water resource zone level considerations to ensure that a best value strategy is identified and progressed in AMP8 and beyond.
- We expect the AMP8 and AMP9 WINEP investigations and option appraisals to include:

    - Use of our Pywr water resources model to investigate the impact of potential sustainability reductions on the integrity of our WRZ and the need for local network improvements to overcome any restrictions. It is anticipated these improvements will be introduced as options within WRMP29 and WRMP34 and our associated business plans.
    - Use of the Environment Agency East Hants and Chichester groundwater model, which encompasses our company supply zone. This model currently being updated and will be the best available tool for optimising the benefit of sustainability reductions within a groundwater catchment.
    - Appraisal of options to identify an optimal environmental solution per catchment. We expect that a catchment solution will involve a combination of staged licence reductions in parallel with improvement works (e.g. removal of barriers to fish passage), supply network improvements and demand management measures, to provide best value for the environment and society. With respect to demand management, we have already responded to the new 2021 'serious water stress' classification for our supply area by including universal metering within our list of feasible options for this dWRMP24.

In the longer term (2034 to 2050 and beyond):

- We will determine the environmental destination path that is required to achieve the best value for the environment and society based on the evidence from AMP8 and AMP9 work.

- We will continue to consult with customers, regulators and stakeholders on a regular basis to help guide our journey to the environmental destination, including via the WRMP and Business Plan cycles.

The approach and actions described above will ensure that our proposed actions (now and in the future) are cost-effective and affordable, provide overall environmental improvement, and provide good value to the environment and our customers. They will help us to fulfil our WFD regulations obligations and support the achievement of environmental objectives for water resources in River Basin Management Plans by supporting the journey to good ecological status.

5.5 Climate Change

The WRPG requires companies to assess the risk and possible impact of climate change on their supply systems and report the likely implications for deployable output.

Our previous assessment for WRMP19 was based upon the UKCP09 dataset. This dataset has since been replaced with the UKCP18 projections. Data from UKCP18 provides the most up to date climate change projections available for the UK, using the best climate models from the UK and around the world. It provides several datasets which can be used by the water industry to determine the range of outcomes that climate change may result in. WRSE produced a method statement detailing how the impact of climate change on DO has been assessed using this UKCP18 dataset through the regional water resource model[17].

The WRSE method statement on assessing the potential impact of climate change follows the Environment Agency guidance to assessing climate change impact. This guidance follows the change in supply system resilience requirements to ensure systems are resilient up to a 1-in-500 year event.

Through WRSE, 28 different climate change scenarios were modelled, incorporating UKCP18 Regional Climate Model (RCM) and Global Climate Model (GCM) outputs. A subset of 21 from the 400 stochastic replicates were selected by WRSE for use in the climate change assessment. These replicates were chosen such that a range of drought return periods were contained within them, with checks done to ensure that droughts with magnitudes of between 1-in-100 year and 1-in-500 year return periods were included. This was done to ensure resilience to events with a return period of 1-in-500 years as the key baseline planning scenario for dWRMP24.

As only a selection of stochastic traces were selected, it is important to highlight that the DO impact is focussed on calculating the 'water resources yield' impact of climate change on a range of drought events. Consequently, to assess the impact on DO from the various climate change scenarios, an "English and Welsh" DO method was applied. Each replicate was assessed separately and the demand in the WRZ was scaled until a single failure occurred. The same demand deficit failure metric as used in the baseline DO assessment was used.

The level of demand that could be met at the demand step below which the first failure occurred was taken as the baseline DO for that replicate in that climate change scenario. The results of the baseline DO assessment were used to identify the indicative return period for the worst event within the climate change dataset replicate. The English and Welsh method DO value was compared to the DOs from the Scottish method, and the return period for the corresponding Scottish method DO was assumed to be the return period of the most severe event in climate change replicate.

[17] Microsoft Word - WRSE_File_1335_WRSE MS Climate Change.docx (all WRSE documents can be located in the WRSE library: https://www.wrse.org.uk/library)

The outputs from our Pywr model were processed directly by WRSE. This process occurred outside of the Pywr model and converted results into impacts on the DO at each of the key return periods.

5.5.1 Climate change DO assessment

The climate change DO impacts are linearly scaled prior and post 2070 to provide a profile of climate change across the planning period.

Three sets of climate change impacts were used to feed into the supply demand balances that comprise the pathways for the adaptive planning process (see Table 29). These present plausible climate change impacts reflecting high, median and low DO impacts.

The table below summarises these DO impacts for a range of return periods. CC06 represents the upper quartile of 28 UKCP18 climate change scenarios (resulting in a more challenging impact to the supply demand balance). These will be the 12 regional projections, the 3 global projections from the Hadley Model which were not run through the regional climate model, and the 13 global projections from the CMIP5 ensemble. CC07 represents the lower quartile of 28 UKCP18 climate change scenarios (resulting a less challenging impact to the supply demand balance).

Table 29: Climate change impacts (2070s) for the three scenarios used in adaptive pathways

Return Period	DYAA DO (Ml/d) Median values	DYCP DO (Ml/d) Median values	CC06 DYAA (Ml/d) Median values	CC06 DYCP (Ml/d) Median values	CC07 DYAA (Ml/d) Median values	CC07 DYCP (Ml/d) Median values
2	−17.9	−20.1	−24.9	−31.99	−15.7	−19.4
100	−12.3	−15.4	−19.06	−22.84	−2.05	−10.31
200	−9.1	−10.8	−14.74	−17.06	−8.53	−6.48
500	−4.4	−5.1	−9.03	−10.86	−3.75	−1.42

5.6 Outage assessment”

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.

5.6.1 WRMP19 outage assessment

Outage in WRMP19 was assessed using data from 2007–2016. We employed AECOM to undertake the outage assessment, which was completed in accordance with the relevant guidance:

- EA and NRW ‘Water Resources Planning Guideline’ (April 2017)
- UKWIR ‘Outage allowances for water resources planning’ (1995)
- UKWIR ‘WRMP19 methods – risk-based planning’ (2016).

Historical data were split into outage categories with magnitudes and durations recorded. A Monte Carlo simulation was then undertaken to simulate outage in the future, having justified which events are ‘legitimate’. AECOM used a model called @ RISK to carry out the assessment. All Monte Carlo simulations undertaken for the WRMP19 outage assessment were run for 10,000 iterations to ensure consistent results.

Outage allowances for WRMP19 were calculated for three scenarios:

- Dry Year Annual Average (DYAA)
- Dry Year Critical Period (DYCP)
- Dry Year Minimum Deployable Output (DYMDO)

An assessment of the potential variations in outage was undertaken to take account for planned increases to our supply availability during the planning period. Future profiles of outage were determined using the same standard approach but with probability distributions based on the increased deployable output values applicable at each stage of the planning period.

The calculated outage values were for a probability of 95 per cent, or exceedance probability of 5 per cent.

Table 30: Outage included in previous WRMP19 (Ml/d)

Period	DYAA		DCYP		DYMDO	
	Value in Ml/d	As % of DO	Value in Ml/d	As % of DO	Value in Ml/d	As % of DO
2018–19	13.0	5.7%	12.5	4.5%	14.2	5.7%
2019–20 – 2022–23	13.1	5.6%	12.5	4.4%	14.3	5.6%
2023–24 – 2028–29	13.5	5.5%	12.6	4.3%	14.7	5.5%
2029–30 – 2044–45	14.6	5.5%	15.4	4.5%	16.0	5.5%

5.6.2 WRMP24 outage methodology

WRSE have provided a method statement on the assessment of outage for this dWRMP24[18]. The methodology provides guidance on recording, processing, analysing and modelling outage events to try to ensure consistency between the companies in WRSE. WRSE also provided an Outage Modelling Tool (OMT). The OMT is an excel-based tool developed to enable reporting and analysis for annual reporting to the Environment Agency, reporting to Ofwat for specifying performance against the unplanned outage, and for dWRMP24 outage allowance determination.

All potential outages can be recorded in the OMT, with screening for legitimacy carried out within this tool. This ensures a clear and transparent audit trail for our outage allowance, with explanation for any variation between annual returns and outage allowances. The tool has also been developed to capture how capital investment has been accounted for and to explain any other adjustments to outage. The OMT provides a clear explanation for the scope of and limitations for any WRMP options to reduce outage.

We commissioned Mott MacDonald to undertake the outage assessment for the revised WRMP19 using the OMT tool developed for WRSE. This assessment is in Appendix 5A.[19]. The

[18] method-statement-outage-aug-2021.pdf (wrse.org.uk) (all WRSE documents can be located in the WRSE library: https://www.wrse.org.uk/library)

assessment reflects the current position and therefore remains appropriate for this dWRMP24.

The assessment screened and processed outage event data in the OMT following the relevant guidance:

- 'Water Resources Planning Guideline' (December 2021)
- UKWIR 'Outage allowances for water resources planning' (1995)
- UKWIR 'WRMP19 methods – risk-based planning' (2016).

5.6.2.1 Assessment timescales

The most appropriate data record for determining the outage allowance is from April 2013 to October 2020. This period was selected as it provides a good balance between the length of data available and data quality.

5.6.2.2 Screening for legitimate outage events

The analysis of future outage is based on events that are considered to be 'legitimate'. Many of our recorded outage events are not legitimate outage events to assess a suitable outage allowance for the supply-demand balance. Event impacts were determined as the product of magnitude and duration, and the highest impact events were selected for further investigation. Additional detail on the exclusion of outage events is provided in Appendix 5A.

5.6.3 dWRMP24 outage results

Our outage assessment has generated the following results for DYAA, DYCP and DYMDO. Results are presented for a 90 per cent probability. Results for additional probabilities are presented in Appendix 5A.

Table 31: DYAA, DYCP and DYMDO outage allowances for dWRMP24 (Ml/d)

Scenario	MC P90 Ml/d
DYAA	6.7
DYCP	6.4
DYMDO	4.6

The revised outage allowance is lower than the allowance in the published Final WRMP19 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. 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.

Outage has been assessed for each works. The figures are not cumulative as outage events will not occur at all sites at the same time. The main contributory factors to our outage allowance are those of chlorine failures and pollution events.

Event durations of chlorine failures were historically longer on average, when compared to other companies, as we did not have a remote or automatic restart following system shutdown events. A physical site visit was required to inspect and verify failure reasons before restarting supply. In the past 12 months we are implementing a new control room system that allows remote start-up, leading to a reduction in outages related to chlorine failures. Although this may help reduce our outage allowance in the future, the impact cannot be quantified until more data has been collected.

Pollution events have also had a significant impact on the outage allowance. In the past our sites were shut down for longer durations as a precaution. Newly installed VOC monitors are likely to reduce the outage durations of any future pollution events related to oil spills, although similar to chlorine failures, the impact cannot be quantified until further data is collected.

Havant Thicket Reservoir has been excluded from the baseline outage allowance. However once in use it is anticipated that the outage allowance would increase only marginally – by no more than 0.3 Ml/d. Additionally, as assessment of 1-in-500 year drought DO conditions on outage was assessed and no material change to the outage allowance was determined.

5.7 Process losses

Process losses occur between the point of abstraction and the point at which water enters the supply network and account for the loss of water during the treatment process. Losses can occur at both groundwater and surface water sources. Groundwater sources usually require a simpler treatment process relative to surface water sources and consequently groundwater losses are often treated as negligible. We have two works with full conventional treatment and three works with membranes for Cryptosporidium removal. At two works there is a compensation water condition in the licence, but this raw water loss is not included in process losses.

In general, complex treatment works such as Treatment Works A have losses of around 5 per cent of DO. At Treatment Works B, membrane filters have now been replaced with a UV treatment plant and losses have fallen to less than one per cent.

Table 32: Process Losses for the DYAA and DYCP planning scenarios

Source Works	Treatment	Average (Ml/d)	Peak (Ml/d)
Treatment Works A	Complex	1.9	1.9
Treatment Works B	Complex	0.2	0.2
Source F	Membrane	0.1	0.1
Source K	Membrane	0.1	0.1
Source P	Membrane	0.1	0.1
Total		2.4	2.4

We do not include treatment works losses in the calculation of DO. Treatment works losses and raw water losses are entered as separate lines in the dWRMP24 tables. The tables then combine these entries to give the overall process loss.

The River Ems augmentation flow has been removed from the process losses because it has been provided by raw water since 2016. The augmentation is provided by Source U which has been removed from the overall DO assessment.

5.8 Water available for use

The supplies used to assess against demand and uncertainty reflect the "water available for use" (WAFU) - which effectively shows the water available from our own sources (DO minus any DO reductions, outage and process losses), and account for any exports. WAFU also accounts for environmental destination (including licence capping) and sustainability reductions. Table 33 presents the WAFU for the reported core pathway / situation 4 under DYAA conditions for 2024–2025 until 2074–2075.

Table 33: Water Available for Use summary table for pathway / situation 4 under DYAA conditions

	2025–26	2029–30	2034–35	2039–40	2044–45	2049–50	2074–75
Deployable Output	206.8	206.8	206.8	204.5	204.5	204.5	204.5
Bulk Supplies	-39	0	0	0	0	0	0
Environmental Destination	0	-11.03	-11.03	-56.65	-64.22	-85.62	-107.02
Climate Change	-4.08	-4.53	-5.1	-5.64	-6.21	-6.77	-9.59
Outage	-6.7	-6.7	-6.7	-6.7	-6.7	-6.7	-6.7
Process Losses	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4
Other Changes to DO	0	12	12	12	12	12	12
Water Available for Use	154.62	194.14	193.57	145.11	136.98	115.01	90.78

Figure 54 illustrates the water available for use in our WRZ across the future scenarios. The plot highlights the averse, moderate and benign scenarios as described in Section 2. Only three scenarios are plotted as 'growth' does not affect the water available for use and instead affects the demand element of the supply-demand balance. Additionally, the pairings of proposed environmental destination and climate change are consistent across the growth scenarios, i.e. medium environmental destination is always paired with median climate change impact and so forth.

Within the scenarios shown in Figure 54,

- the adverse scenarios capture adaptive pathways / situations 1, 4 & 7,
- the moderate scenarios capture pathways / situations 2, 5 & 8, and
- the benign scenarios capture pathways / situations 3, 6 & 9.

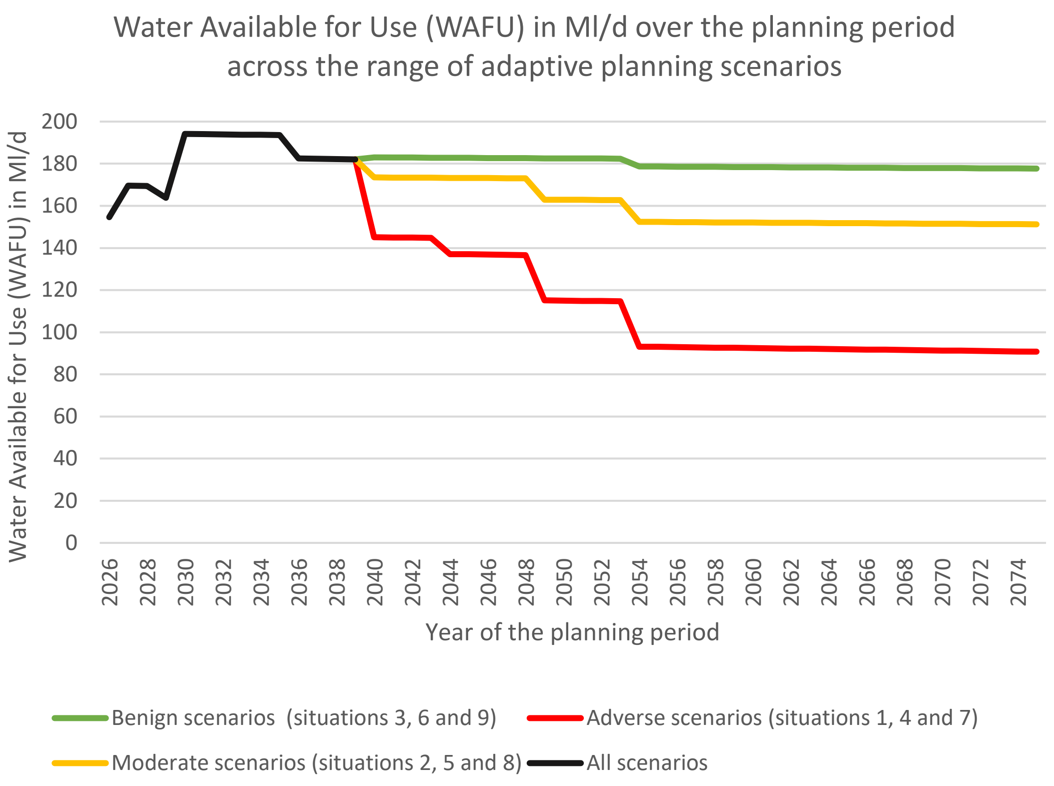


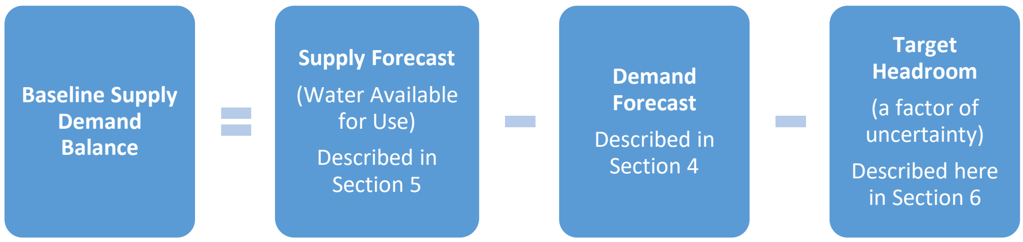
Figure 54: Water Available for Use across the planning scenarios from 2020 to 2075.

6 SUPPLY DEMAND BALANCE

The baseline position for the supply demand balance is a forecast of what would happen if we did not take any new supply or demand actions and did not implement any changes in company policy or existing operations. The baseline supply forecast includes the water available for use from current sources under the design drought scenario. It also includes the Havant Thicket Reservoir scheme approved under WRMP19, and currently under construction.

Our baseline supply demand forecast has is based on supply, demand and headroom forecast information for our water resource zone. It has been calculated using consistent assumptions across the Southeast regional planning area.

The baseline supply demand balance compares our baseline supply forecast (defined as WAFU) with the baseline demand. The baseline position is based on the dry year annual average (for demand) and a design drought (for supply). Our agreements with Southern Water to provide bulk supplies are also included.



The amount of water needed in the future for public water supply (water provided by water companies) is being driven by four main challenges which will mean either less water is available for us to use or more water is needed. They are:

Drought resilience – more water needs to be made available so our supplies last longer during severe drought events, those that occur once in every 500 years, so emergency measures are less likely to be needed.

Population growth – an increase in population means more water is needed to supply customers and businesses

Climate change – will reduce how much water is available from our water sources and when it is available, droughts will also become more common

Environmental protection and improvement – we need to leave more water in the environment, reducing how much water we can take from some of our existing sources

The dWRMP24 tables that show the components used for the supply-demand balance have been prepared for both Annual Average and Critical Period scenarios.

6.1 Baseline assumptions for supply and demand

We have planned in line with the Government's National Water Resources Framework and the WRPG so that our system becomes resilient to a 0.2 per cent annual chance of implementing an emergency drought order because of drought conditions by 2039. This can also be described as '1-in-500-year' level of drought resilience.

A 'hybrid' level of resilience underpins the supply-demand balance:

- The years from 2025–26 to 2038–39 are based on planning to be resilient to a 1-in-200 drought event. This is consistent with our WRMP19 planning assumptions.

- The years 2039–40 to 2074–75 are based around an increased level of resilience to a 1-in-500 year drought event.

Planning for more extreme droughts than before also helps us to end our reliance on supply-side drought permits and orders by planning to deliver a reliable water supply in both normal and drought years.

In practical terms, we have built this resilience into our plan by forecasting based on the supplies we would have available in a 1-in-500 year drought situation, and demand as it is estimated to be in a dry weather year just before the point at which drought restrictions are implemented (this is referred to as 'unconstrained' demand).

The baseline demand forecast covers what people and businesses need, together with anticipated losses through leakage and operation. Our baseline assumption is that leakage is maintained at current levels and existing metering policies continue.

A 'Target Headroom' allowance is also included in the supply demand balance to account for the uncertainties within both the supply and the demand forecasts. Our approach to Target Headroom has been revised compared to previous planning cycles to avoid double counting uncertainties that are already allowed for in other areas of our adaptive planning.

6.2 Adaptive planning scenarios

Our adaptive planning approach is based on the development of pathways reflecting alternative investment plans, based around differing but plausible forecasts for population growth, environmental destination (sustainability reductions) and climate change.

The forecasts are produced in line with each of these pathways, and described in greater detail in Section 2, help us to predict future water needs. However, the further ahead we look the more uncertain the future is. We are taking an adaptive planning approach to help inform the right investment decisions and provide resilient water supplies to customers in the years ahead.

The supply-demand balance for the reported core pathway (also referred to as 'Situation 4') is presented in the dWRMP24 tables. This pathway has been core to the development of the preferred best value plan, with other pathways / situations being used to stress test the suitability of the plan to adapt to whichever of these plausible futures turns out to be closest to the actual future.

6.3 Target Headroom

The UKWIR 2002 guidance (An Improved methodology for assessing headroom – Report Ref No. 02/WR/13/2) defines Target Headroom as,

> *"… the minimum buffer that a prudent water company should allow between supply and demand to cater for specified uncertainties (except for those due to outages) in the overall supply demand balance"*

Through the target headroom allowance, risk and uncertainty is translated into an appropriate water resource planning margin. In determining target headroom, we considered the appropriate level of risk for our plan. We do this considering both

- the accuracy of the planning assumptions (associated with measurements and modelling), as well as
- the range of potential future forecasts (uncertainty around longer-term influences such as climate change or changes in demographics).

If target headroom is too large it may drive unnecessary expenditure. If it is too small, the risk is that we may not be able to meet our planned level of service.

An industry accepted methodology (An Improved Methodology for Assessing Headroom, WR-13. UKWIR Report 02/WR/13/2, 2002) sets out the required approach and methodology for calculating headroom uncertainty from which a chosen percentile is used to give target headroom. The WRPG requires annual forecast values of target headroom for the baseline and final plan in the dWRMP24 tables.

The evolving methods and data used to plan water resources across the sector mean that some of the risk that has historically been accounted for in target headroom is now accounted for across several other parts of the plan, such as the adaptive planning situations, and application of 1-in-500 year supply forecast. In practical terms this means that the application of past approaches to calculating target headroom could lead to double counting of uncertainty in the context of this dWRMP24.

There are several reasons why this dWRMP24 contains less associated risk than previous plans, including the following:

- New analytical techniques mean that long-term water resource planning can be based on improved characterisation of the duration and severity of drought events. One example of this is the significantly longer stochastic sequences of plausible hydrometric data can be used to improve the characterisation of drought events (including their frequency) that are more severe than those in the historic record.
- New estimates of the impacts of climate change on hydrological data sets are now available.
- We have taken a fully collaborative regional approach to planning through the WRSE Alliance.
- Regulatory guidelines ask us to use 'Plan-based' property numbers in the central demand forecast despite Local Authority housing plans having historically over forecasted future housing numbers.
- Increased resilience to increasingly severe drought events.
- An adaptive planning approach has been used for decision-making based on multiple plausible versions of what the future might look like. The adaptive planning approach takes account of some of the uncertainty arising from a range of supply demand balance forecasts.

We have adopted a regionally consistent adaption of the UKWIR 2002 methodology (WRSE technical note in Appendix 6A). This approach adjusts the components used in the calculation of headroom uncertainty to prevent double counting of uncertainty within the adaptive planning approach.

To avoid double counting risks, any components used to define an adaptive planning branch (environmental destination, growth, etc) were taken out of the assessment of headroom uncertainty (Set out in Appendix 6A).

To do this we considered how risk was accounted for in the development of the dWRMP24 and stripped the corresponding component out of target headroom accordingly.

We calculated the following three target headroom profiles based on the three chronological phases of branching of the adaptive plan shown in Table 34, for both dry year annual average and dry year critical peak conditions.

A hybrid target headroom profile has been used in the regional resilience model using values from each of these three profiles for the appropriate years of the planning period in line with the timed branching of the adaptive planning approach.

- Full target headroom profile used for the initial core pathway.
- Environmental destination and growth target headroom profile used from the first branching of the adaptive plan until 2039–40.
- Environmental destination, growth, and climate change target headroom profile used from the final branching of the adaptive.

The components used for each of the profiles are set out in Table 34 below. More detail is contained in the Headroom Allowance Assessment Report (see Appendix 6A).

Table 34: Components of our target headroom calculation

Component ID and description		Full target headroom profile Initial core pathway	Environmental destination and growth target headroom profile After first branching in adaptive plan until 2039–40	Environmental destination, growth, and climate change target headroom profile After final branching in adaptive plan
S1	Vulnerable surface water licences Water Resource Management Plan Guidance states this should not be included	no	no	no
S2	Vulnerable groundwater licences Water Resource Management Plan Guidance states this should not be included	no	no	no
S3	Time limited licences Water Resource Management Plan Guidance states this should not be included	no	no	no
S4	Bulk imports (We have no bulk imports so although this could be included in the methodology, it doesn't feature in our calculation.	yes	yes	yes
S5	Gradual pollution of sources causing a reduction in abstraction	yes[20]	yes[2]	yes[2]
S6	Accuracy of supply-side data / overall source yield	yes	yes	yes
S7	Not used	no	no	no
S8	Uncertainty of impact of climate change on source yields	yes	yes	no
S9	Uncertain output from new resource developments	yes	yes	yes

[20] This should be included but only where you haven not written down the DO of sources in the future due to deteriorating raw water trends

	based on the schemes selected in the cost-efficient plan – this only features in final Plan Headroom, not baseline			
D1	Accuracy of sub-component data	yes	yes	yes
D2	Demand forecast variation Post 2030 only for non-growth related components	yes	no	no
D3	Uncertainty of climate change on demand	yes	yes	no
D4	Uncertain outcome from demand management measures	yes[3]	yes[3]	yes[3]

In line with the WRPG, we have not included uncertainty related to the sustainability of surface or groundwater licences (target headroom components S1 and S2 respectively) or the non-replacement of time-limited licences (target headroom component S3) for any of the target headroom profiles.

Component D2 (demand forecast variation) includes an allowance for ongoing uncertainty arising from COVID-19 impacts while we continue to find out what the 'new normal' conditions are for household and non-household demands. The impacts have been quantified based on the 2021 Artesia study.

We have accepted a higher level of risk further into the future as the WRMP process is repeated every five years, and we will better understand some uncertainties and adapt to changing circumstances as time goes on.

Figure 55 and Figure 56 below show the profiles of our target headroom, in Ml/d over the planning period for both DYAA and DYCP conditions.

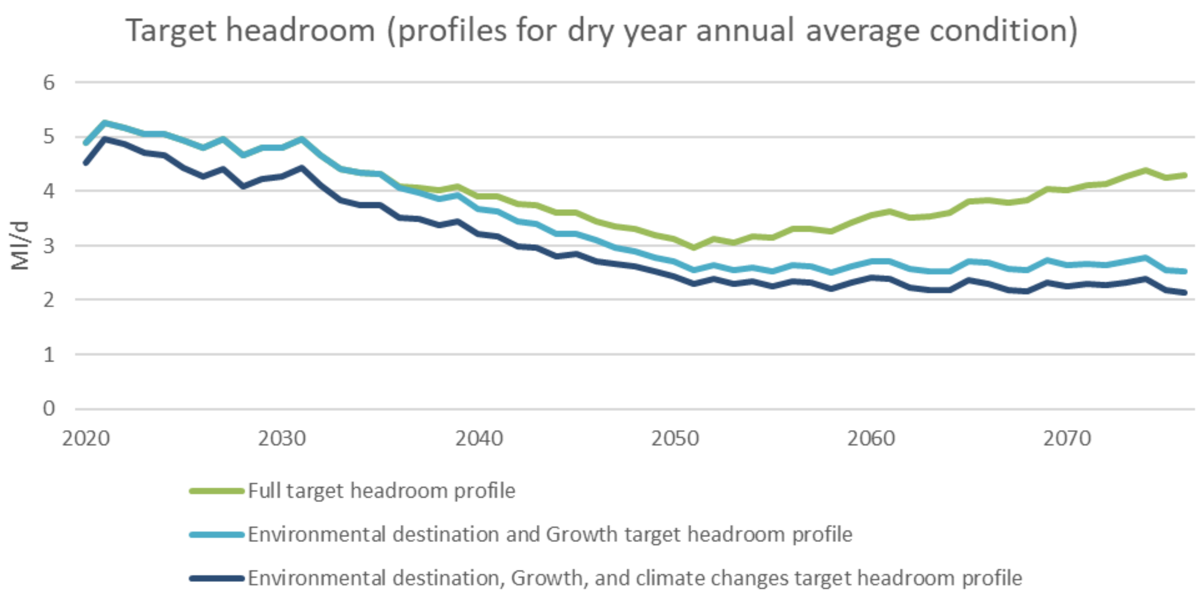


Figure 55 Target headroom profiles for dry year annual average condition

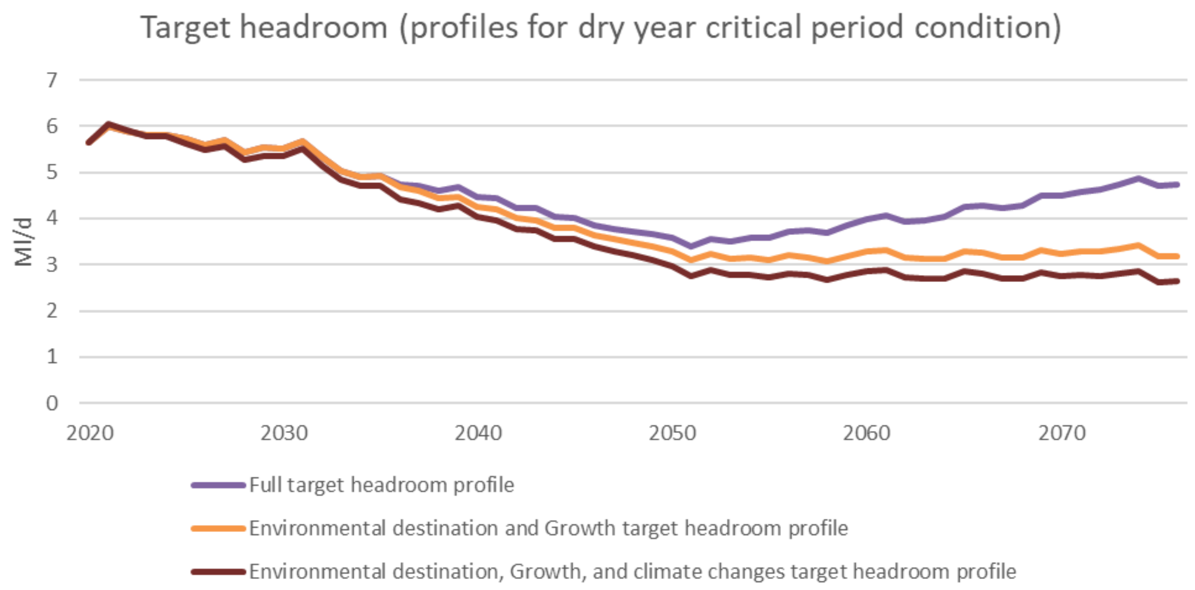


Figure 56 Target headroom profiles for dry year critical period condition

For more information about our calculation of target headroom, please refer to appendix 6A. Further work on the calculation may be required following consultation on our dWRMP24.

In addition to the calculated target headroom, the headroom allowance for 2025-26 and 2041-42 to 2047-48 has been manually reduced in our supply and demand balance to ensure there are no deficits within our dWRMP24. This means there is a reduced allowance for risk and uncertainty in these years, which implies an increased risk of not meeting our planned level of service for emergency drought restrictions. There is a need to review this mitigation measure with the Environment Agency and WRSE prior to the development of our revised WRMP24.

6.4 Supply demand balance for adaptive scenarios

In all nine adaptive situations, our supply demand balance starts in deficit and remains in deficit until 2029–30. This is because drought interventions that are available to us in drought events of 1-in-200 year or more severe events are not included in the baseline. Instead, they are treated as options that the WRSE investment model can select. In 2029–30 the baseline supply demand balance improves significantly with Havant Thicket Reservoir becoming operational.

During a dry year, the supply demand balance is more challenging for the DYAA scenario than under DYCP conditions. This being the case, the DYAA planning condition drives our investment need, and has been used as the basis for modelling the best value plan.

On the supply side, our chief vulnerability is our reliance upon chalk aquifers. The scale and timing of the Environmental Destination (with licence capping) is a significant driver of investment and remains a major uncertainty (please see Section 5.4).

The move to increase resilience from a 1-in-200 to a 1-in-500 year drought event in 2038-2039, combined with the high climate change and high environmental destination scenario, produces a noticeable step change in the balance between supply and demand for five of the nine scenarios in DYAA conditions.

For demand forecasting, it is uncertain how long the changes in patterns of demand that started during the COVID-19 pandemic will continue. There is also uncertainty around the population forecast figures due to the impact of our departure from the European Union.

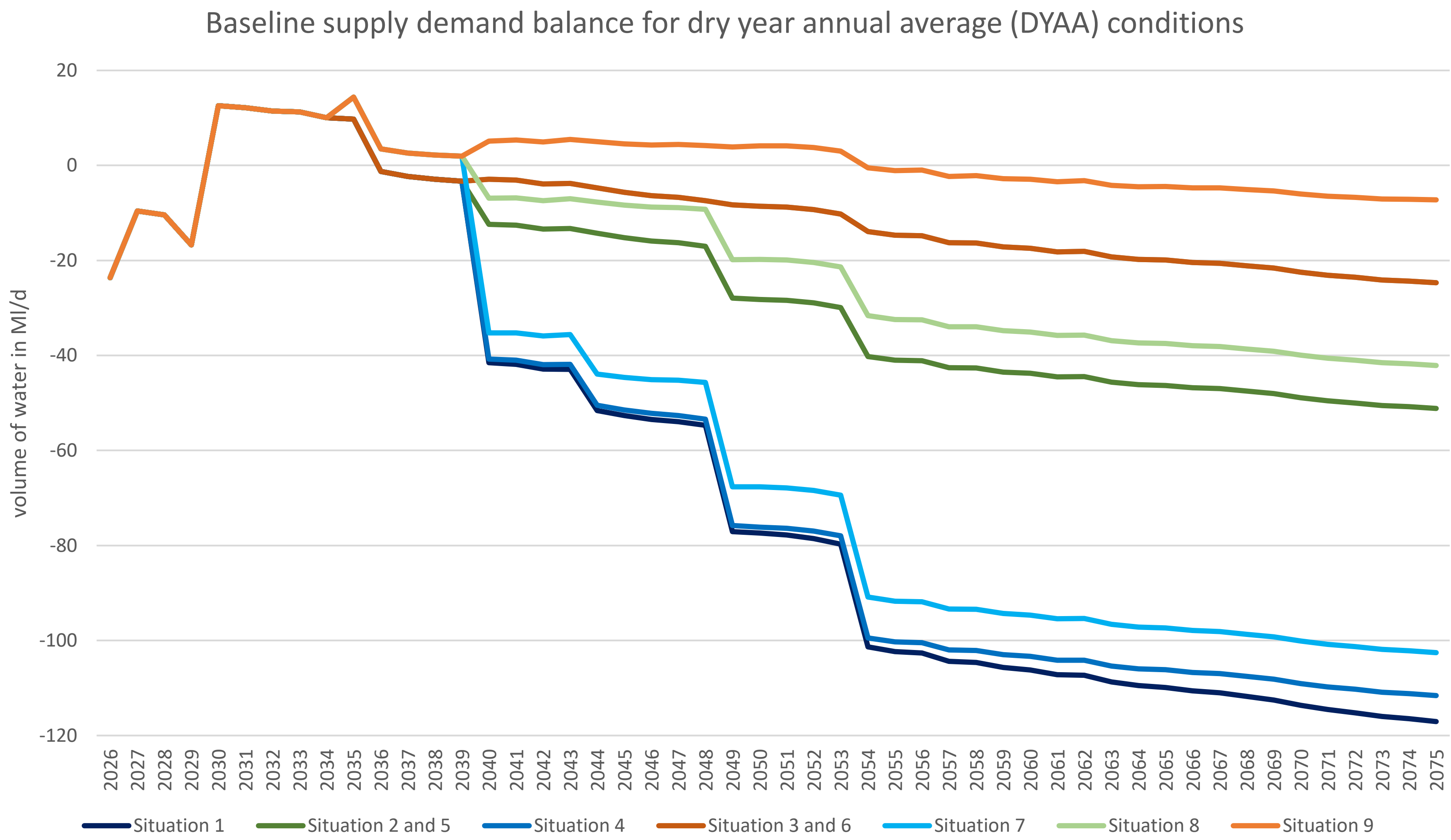


Figure 57: Supply Demand Balance (shown in Ml/d) for each of the nine adaptive planning Situations in the WRSE investment model (in dry year annual average conditions)

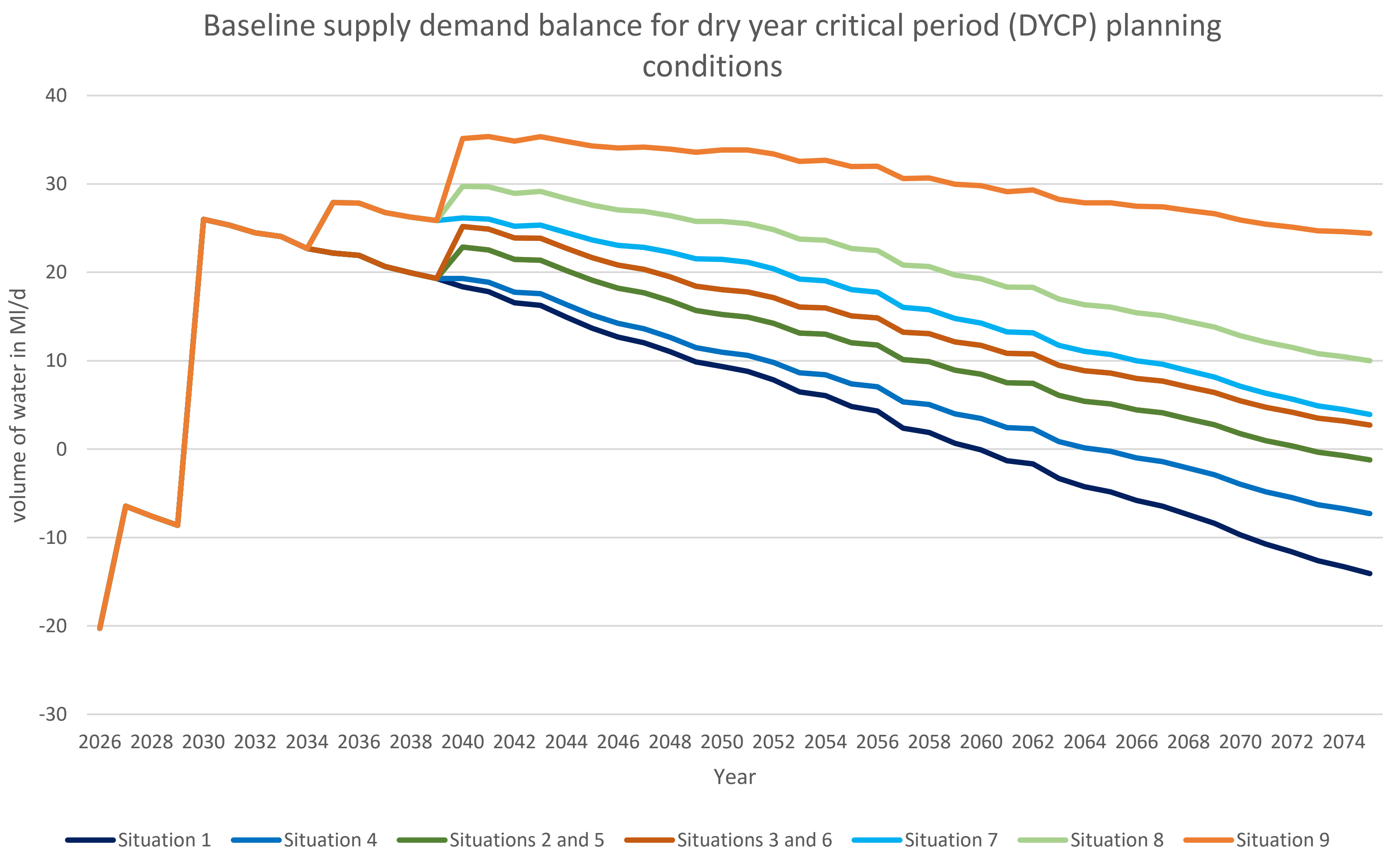


Figure 58: Supply Demand Balance (shown in Ml/d) for each of the nine adaptive planning Situations in the WRSE investment model (in dry year critical period conditions)

Table 35: Supply demand balance for each of the nine adaptive planning situations in the WRSE investment model (for the dry year annual average condition)

	2025–26	2029–30	2034–35	2039–40	2044–45	2049–50	2059–60	2074–75
Situation 1	-23.63	12.58	9.78	-41.54	-52.66	-77.40	-106.21	-117.06
Situations 2 and 5	-23.63	12.58	9.78	-12.39	-15.21	-28.22	-43.77	-51.15
Situations 3 and 6	-23.63	12.58	9.78	-2.89	-5.67	-8.60	-17.43	-24.69
Situation 4	-23.63	12.58	9.78	-40.78	-51.46	-76.11	-103.35	-111.59
Situation 7	-23.63	12.58	14.39	-35.26	-44.62	-67.64	-94.65	-102.55
Situation 8	-23.63	12.58	14.39	-6.86	-8.38	-19.75	-35.07	-42.11
Situation 9	-23.63	12.58	14.39	5.11	4.51	4.13	-2.90	-7.25

Table 36: Supply demand balance for each of the nine adaptive planning situations in the WRSE investment model (for the dry year critical period condition)

	2025–26	2029–30	2034–35	2039–40	2044–45	2049–50	2059–60	2074–75
Situation 1	-20.27	26.00	22.18	18.36	13.67	9.35	-0.09	-14.09
Situations 2 and 5	-20.27	26.00	22.18	22.87	19.09	15.24	8.47	-1.23
Situations 3 and 6	-20.27	26.00	22.18	25.19	21.65	18.03	11.73	2.73
Situation 4	-20.27	26.00	22.18	19.29	15.16	10.95	3.47	-7.30
Situation 7	-20.27	26.00	22.18	22.87	19.09	15.24	8.47	-1.23
Situation 8	-20.27	26.00	22.18	25.19	21.65	18.03	11.73	2.73
Situation 9	-20.27	26.00	27.91	26.15	23.66	21.47	14.28	3.93

6.5 Supply demand balance for the reported core pathway

Adaptive planning pathway 4 (also referred to as 'Situation 4') is our **reported core pathway** for this dWRMP24. The eight alternative pathways cover the full range of scenarios between 2025 and 2075. Each pathway is equally likely.

Our reported core pathway is adopted from the WRSE draft regional plan reported pathway and informed by an update from regulators setting out their preference for pathway / situation 4. This is the pathway that we have used to identify the investment programme for our draft best value regional plan and our dWRMP24. We have also identified the investment that would be needed in the alternative pathways.

Our reported core pathway meets the regulatory guidance. It uses growth scenarios that are compliant with regulatory guidance, incorporates climate change impacts and an environmental destination preferred by Natural England and the Environment Agency. Critically, it includes all activities that need to be undertaken to be ready for all plausible future scenarios.

From 2040, there are eight alternative pathways to the core pathway, each with a different combination of environmental improvement, climate change and population growth scenarios. This allows us to look ahead at the full range of possible futures that we may experience and the schemes that we would need to progress.

If we experience a different future scenario to our reported core pathway, we will be able to move to an alternative pathway. We have included decision points where we will decide if we need to change course. If we do, there will then be a branching point to move to the appropriate pathway.

There are three main factors that would require us to change pathway:

Population growth - This will impact future demand for water. We have included a decision point in 2030 where we will assess whether the growth in population and the updated population forecasts are in line with our reported core pathway. If it is either above or below our assumption, we will move to an alternative pathway with alternative investment requirements.

Environmental improvement - The level of abstraction reduction will impact how much water is available to supply. We have included a decision point in 2035 following the completion of the environmental investigations that will take place from 2025 via the WINEP. These will determine how much water companies will need to reduce their abstractions by to deliver environmental improvement by 2050. If this differs to our reported core pathway, we will move to the appropriate pathway in 2040.

Climate change - The impact of climate change will also affect how much water is available to supply. Again, we may need to move to an appropriate alternative pathway in 2040.

The regional plan will be updated every five years to inform the water companies' future WRMPs. The trigger points we have included align with the completion of the five-year business plans that should include the investment needed for the pathway we are following.

The baseline supply demand balance for our reported core pathway is provided in Table 37.

Table 37: Baseline supply demand balance for our reported core pathway (situation 4) for dry year annual average (DYAA) condition

Year	2025–26	2029–30	2034–35	2039–40	2044–45	2049–50	2059–60	2074–75
Supply in Ml/d **WRP 11BL**	154.62	194.14	193.57	145.11	136.98	115.01	92.48	90.78
Demand in Ml/d **WRP 45BL**	174.5	177.8	180.6	183.8	186.7	189.8	194.6	201.4
Target headroom in Ml/d **WRP 48BL**	4.06	4.80	4.31	3.22	2.54	2.44	2.41	2.17
Supply Demand Balance in Ml/d **WRP 50BL**	-22.87	12.58	9.78	-40.79	-51.16	-76.11	-103.35	-111.59

6.6 Comparison with WRMP19

It is not possible to make a meaningful comparison between the baseline supply-demand balances for our revised WRMP19 and dWRMP24. This is because in dWRMP24, Havant Thicket is part of our baseline unlike in WRMP19. Furthermore in dWRMP24 the existing bulk supplies to Southern Water are only treated as baseline until contract renewal dates (instead of being included in the baseline throughout the planning horizon). Significantly, the revised WRMP19 also assumes no sustainability reductions, whereas the dWRMP24 includes potential sustainability reductions associated with environmental destination (with licence capping).

7 OPTIONS APPRAISAL

7.1 Overview

We have a twin track approach, considering options that reduce demand for water as well as options to increase supply. The sensitive nature of our supply area means that there are no new options to abstract water from the chalk aquifers underneath the ground, or the chalk streams and rivers that flow from this geology. Similarly, our neighbouring companies have the same constraint in the short term and so importing water for them is not an option until major infrastructure can be constructed. This situation has led us to focus upon options to reduce the forecast demand for water, look for ways to use water better by improving the connectivity across our pipe network, and explore new ways of supplying water through desalination and water recycling.

The limited supply options available to us was only one of the factors that led to our focus upon options to reduce customer demand. We also needed options with a short delivery time that could help to reduce the deficit between supply and demand near the start of the plan. In addition, we want to support delivery of the Government's aspiration of reaching a national average per capita consumption of 110 litres per head per day by 2050 and help to deliver the UK Water Efficiency Strategy published by Waterwise in 2022.

Havant Thicket Reservoir has not been included in our option appraisal process for this dWRMP24 as it already forms part of our baseline plan and has been pre-selected in the WRSE regional investment model. The reservoir has received planning permission and is currently in construction phase. It is to be filled and topped from Source B Springs in winter, providing a water supply in dry years and droughts.

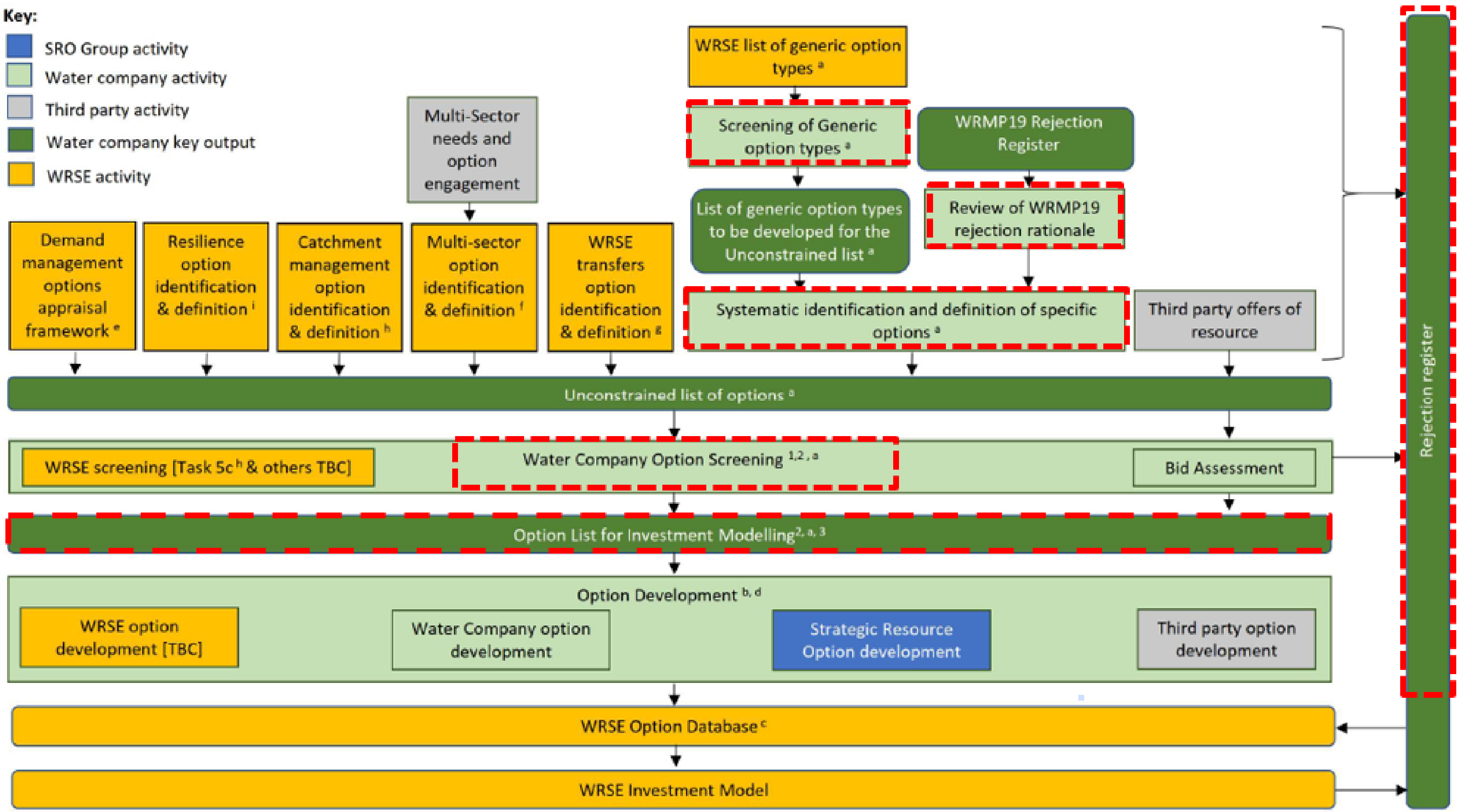
The options appraisal process for this dWRMP24 differs from previous WRMPs in that we have aligned our process much more closely with the other water companies in the region via WRSE.

Before options appraisal works began, WRSE commissioned a gap analysis of all the water companies WRMP19 plans across the Southeast of England. This resulted in a methodology based on wider regulatory guidance and best practice from across the companies. This methodology provided a regional framework so that options across the water companies in the Southeast were developed in a consistent manner and therefore could be compared fairly in the WRSE regional investment model.

Figure 59 summarises the overall options appraisal process for WRSE, from the exploration of generic option types, through to investment modelling. Starting with the widest range of options, it sets out how the list was refined by allowing option types and specific options to be rejected for robust reasons at different stages. It indicates where WRSE-led workstreams and water company activities run in parallel. Appendix 7A presents the approach and outputs of our contributions highlighted in red.

The regional framework follows a similar process to that used in previous WRMPs. Initially a list of options was developed, known as the unconstrained list. This consisted of options identified in previous WRMPs and new options identified for this dWRMP24, as described in Section 7.2. These options were put through a two-stage screening process to screen out options that could be demonstrated as environmentally unacceptable or that offered an insignificant water resource value. More details of this process can be found in Section 7.3.

The screened set of options forms our Feasible Options list (see Section 7.7) for which we developed appropriate costing information (Section 7.6). These options were then collated with those developed by other water companies in WRSE, and further options developed separately by WRSE. This list of options was then taken forward for investment modelling by WRSE from which the draft regional plan and our dWRMP24 was derived.



Note 1: Screening processes will vary between companies and may include a one or two stage approach, company specific feedback has been provided to improve robustness of option screening

Note 2: The Option List for Investment Modelling may be the full Feasible List of options, or a Constrained Feasible List, where this has been agreed with stakeholders (including the EA), provided that care is taken when constraining the Feasible List to ensure options that could benefit other companies are not rejected at this stage.

Note 3: Demand management options are represented as strategies comprising baskets of consumption and leakage reduction options combined by Water Companies to achieve different levels of total demand reduction'

Note a: Task 2a gap analysis and screening process (this report)
Note b: Task 2b option development (this report)
Note c: Task 3 options database
Note d: Task 4 a – d options development (this report)
Note e: Task 4e Demand management
Note f: Task 5a Multi-section options
Note g: Task 5b WRSE transfers options
Note h: Task 5c Catchment management options
Note i: Task 5d Resilience options

Figure 59: Summary of the options appraisal process for WRSE through the exploration of option types, with the elements completed by us shown in red dashed boxes. An adapted figure 2–3 within Mott MacDonald 2020a

7.2 Unconstrained options set

To produce our unconstrained options list, we collated options from several sources, see Figure 60. This included:

- A review of WRMP19 options
- A review of WRMP19 rejected options
- A systematic process of reviewing generic option types to develop new options
- Third parties submitted options
- WRSE led development of options

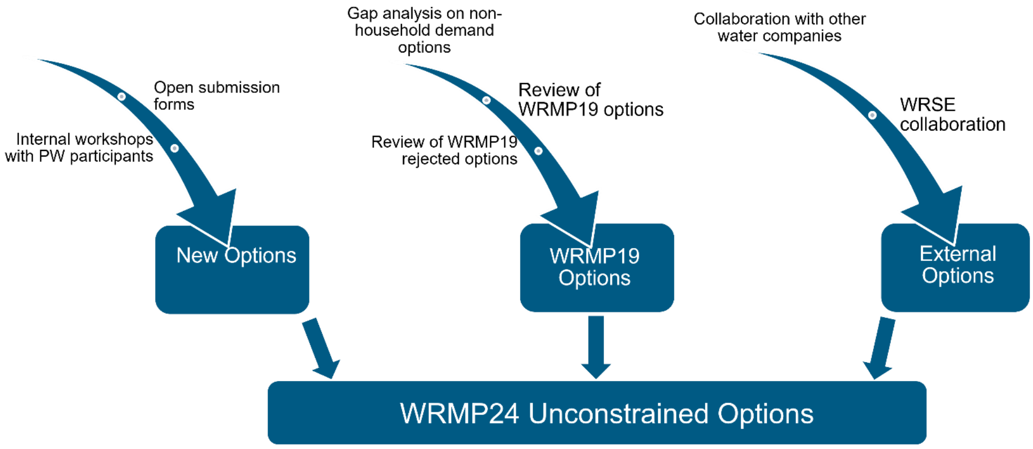


Figure 60: Overview of the dWRMP24 options appraisal process.

7.2.1 The internal process for generating new options

WRSE defined four broad multi-sector categories for investigation of new options, as shown in Figure 61. These categories cover a wide range of generic option types, and we reviewed each option type for their appropriateness. See appendix 7A for details of our generic option screening.

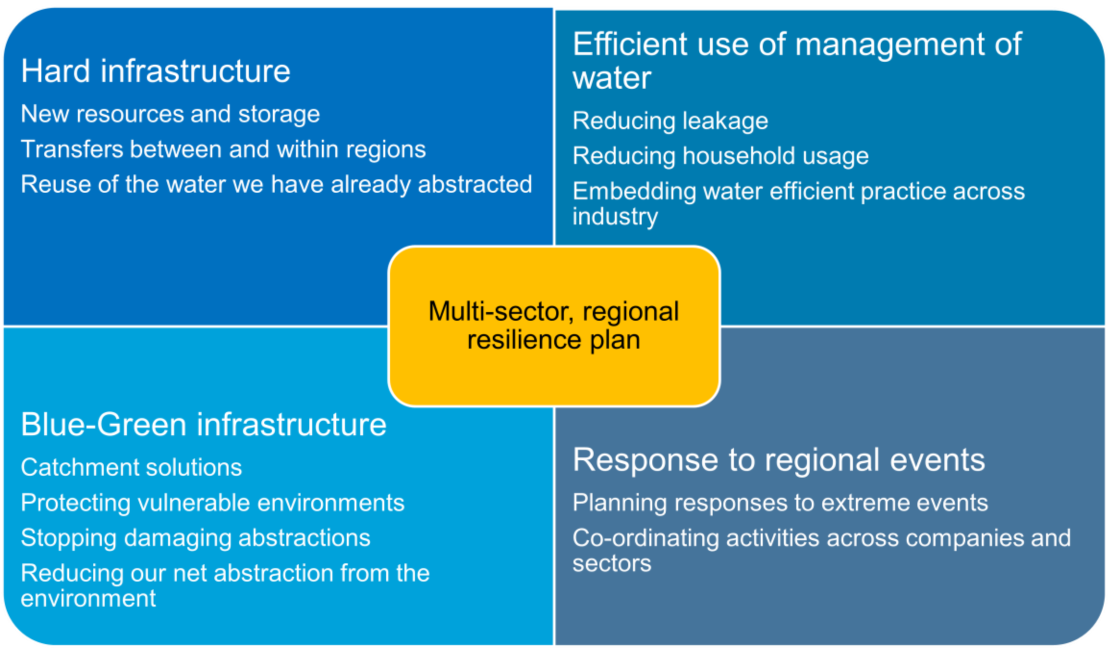


Figure 61: Option groups categorised by WRSE. Adapted from Wood (2022).

To investigate the potential for new options from the types defined in the generic option list, we ran four focus groups for each of the four broad categories, inviting staff from across our company. This allowed the inclusion of those not normally involved in the options process to be included, generating new ideas.

We collated notes on options from the workshops to undergo an initial screening and placed them in each of the four option categories shown in Figure 61. Through the workshops we identified 59 options. We carried out an initial screening to identify if there was any repetition in suggestions, and their feasibility, reducing it to 29 options.

We also encouraged an open submission of options from staff by sending out submission forms. Our staff submitted an additional 18 options which were reduced to 15 following the same initial screening process as for the focus group options.

The gap analysis carried out by WRSE of our WRMP19 plan also demonstrated the necessity for non-household demand options. To address this, we carried out an analysis of non-household user and demand data to understand the user base, and to identify differences in water use and demand drivers (domestic uses and leakage). We generated a further 9 options though this process.

Using insight from the water resource model of our supply system created in the Pywr modelling package we have identified one further option. During analysis of the modelling results, a bottleneck was identified in our supply system which facilitates west to east transfers within our supply area. This led us to develop a further option to increase the booster capacity at our Source O location. More information can be found on the Source O Booster in Addendum A, Appendix 7A.

7.2.2 External

To generate external options, we worked with WRSE, other water companies and third-party groups. This included working with Southern Water to understand possible additional uses for the Havant Thicket Reservoir (see Section 7.8 for further details).

WRSE's Transfers workstream carried out a thorough review of potential inter zonal and inter-company transfers for subsequent testing within the investment model. Options identified via that process were screened and developed separately by WRSE's team.

WRSE's Resilience Options workstream worked with the WRSE member companies to identify and screen additional options for resilience-building purposes (resilience of individual sources, network connectivity, and solutions to build resilience to non-drought hazards).

Table 38 sets out how the work completed by external WRSE groups by mapping it onto the four different option categories defined as part of the WRSE guidance.

Table 38: Generic option type categories and WRSE workstream contributions

Generic option type categories	Validation for WRMP19 options	WRSE workstream
Catchment management options	WRMP19 contained few options in this category. WRMP19 focused on addressing deficits, in contrast to the WRSE regional plan which seeks wider benefits (e.g. river enhancement, habitat creation – and schemes which build resilience and offset the need for licence reductions).	Conducted separate search for catchment and multisector options via workshops and consultations.
Efficient Use and management of water	Multitude of options in this category. Gaps identified were linked to non-household users using independent and mains supplies. Leakage detection and advice for non-household users could be further explored in addition to rainwater harvesting and outage reduction.	N/A
Hard infrastructure	Variety of options due to 'traditional' nature, but gaps found related to shared resources and transfers.	Review of interzonal and intercompany transfers for testing in investment model. Options identified were screened and developed by WRSE.
Response to regional events	Most already covered by unconstrained list. Resilience to non-household users should be further considered.	Worked with WRSE and Portsmouth Water to identify options for resilience purposes such as network connectivity and non-drought hazards.

7.2.3 WRMP19 option review

We reviewed all options that had been considered for WRMP19 in case circumstances had changed in the intervening years and an option that had been ruled out previously was now feasible. Following WRSE guidelines, all WRMP19 options were mapped to the new WRSE option categories and re-screened consistently with new options.

There were 184 WRMP19 options, and these broke down into the WRSE option groups, shown in Figure 60, as follows:

- 1 within blue green infrastructure/catchment management group.
- 97 within efficient use and management of water.
- 69 within hard infrastructure; and
- 17 within response to regional events.

During WRMP19, 158 of these options had been rejected. For WRMP24 we rescreened the entire option set to ensure any changes since WRMP19 have been considered.

The full list of our options can be found in appendix 7A.

7.2.4 New options to increase supply

The catchments in our supply area are designated as ‘over-abstracted’ within the Environment Agency’s Catchment Abstraction Management Strategy. As set out in our baseline supply forecast, we are forecasting a reduction in the amount of water we take from the environment to protect the precious chalk landscape and habitat we operate in.

In light of the ‘over-abstracted’ concerns, we have not considered any new options that increase our demand on catchments in our area. However, given the scale of the supply-demand deficits we are forecasting within our planning window there is a need for further large-scale additional sources of water to prevent water shortages across our company area and in the wider WRSE region. To cover this gap, we have considered the use of wastewater recycling and desalination schemes.

Effluent re-use and desalination options were reviewed with Southern Water (the Company that provides wastewater services to our customers). Most options were included by Southern Water in their unconstrained options list. Some elements were included in their Strategic Resource Option (SRO) investigations, and many are linked to enhanced use of the Havant Thicket Reservoir.

7.2.5 New options to reduce demand

WRSE provided a high-level framework for the demand reduction strategy of our wider options process. Demand reduction interventions were included in the WRSE investment modelling as combined demand management options, or groups of measures (‘baskets’) that provide total demand reduction rather than costs and savings with individual measures. WRZ level demand management strategies include leakage reduction, household demand reduction and non-household demand reduction for all necessary climate scenarios.

7.2.5.1 Metering

Low, medium, high and high plus metering strategies have been developed for dWRMP24.

Metering allows demand reduction to be achieved faster and more effectively, and a universal metering policy (included in our high plus strategy) benefits from increased certainty in the level of meter penetration and the opportunities (including reduction of customer-side leaks) available with metering strategies.

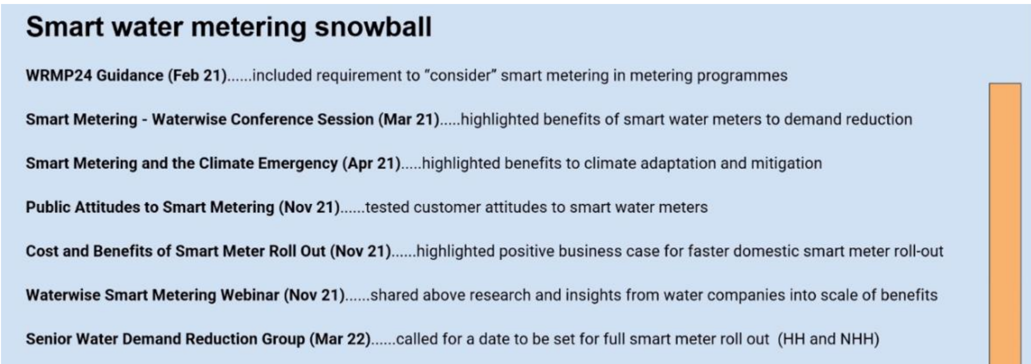


Figure 62: The smart metering ‘policy snowball’ as described by Waterwise

Metering has been proven to deliver a reduction in household demand. Across the Southeast, South East Water and Southern Water have completed universal metering programmes, and Thames Water, Affinity Water and SES Water are in the progress of rolling out universal metering. All these companies, in addition to Anglian Water, outside the WRSE planning region, have shared evidence of the water savings delivered through this approach.

Figure 63 shows the headline findings that Thames Water shared in June 2022 at a CIWEM webinar about smart metering. As well as the water saving delivered by reducing household consumption, it also highlights the additional benefits of identifying leaks in household and non-household properties that are running continuously and wasting water. Carrying out a water efficiency visit at the same time as metering has also been shown to have an additional water saving for high household consumers and help with affordability for people who are struggling financially.

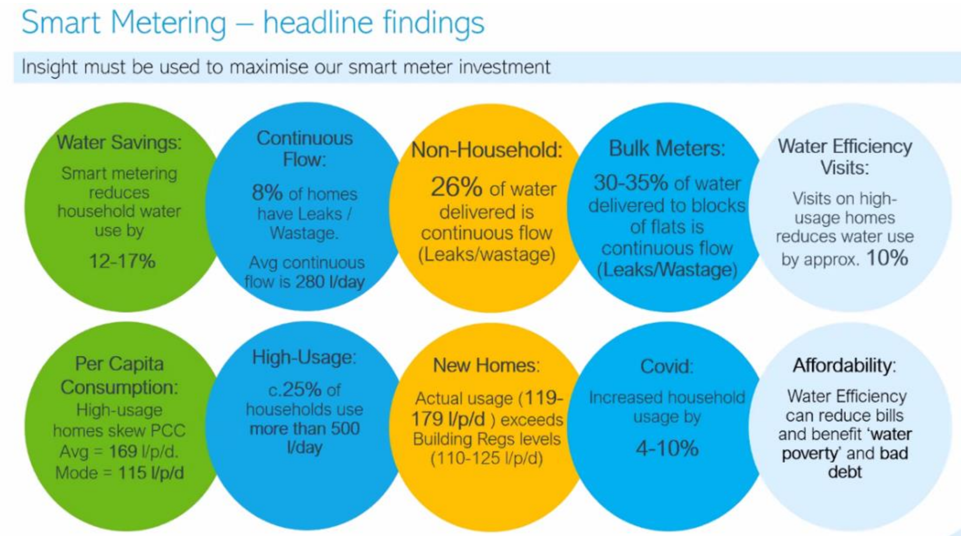


Figure 63: Headline findings shared by Thames Water of their experience installing smart meters (Shared by Thames Water at a CIWEM Smart Metering webinar in June 2022)

We have listened to the shared experiences from other water companies about universal metering to develop a programme that is evidence based and suitable for our customers. As well as the technical details, for instance on the type of meter and billing technology, we have also considered how to engage with vulnerable customers through this programme and how to support customers with affordability concerns.

Based on existing evidence and our knowledge of our supply area we propose to deliver compulsory smart metering over 10 years starting in 2025–26 until 94 per cent of the homes in our area are metered in 2034–35.

We will try to meter every household but, based on the experiences of others, expect that some homes will not be possible to meter either because of the pipe configuration of the water supply going into their homes or the logistics involved of installing a meter on the supply pipe.

Our assumption is that household customers will reduce their water use by twelve percent. After consideration, we have chosen to adopt this conservative estimate of savings in reflection that our water bills are lower than some of the water companies and therefore the fiscal advantages of using less water are less compelling.

The yield savings assumed by the metering options include both those generated from customer behaviour change and those achieved through reducing underground supply pipe leakage.

In addition to delivering water savings through reducing unnecessary use and leakage, metering will enable us to explore tariff options in the future.

7.2.5.2 *Leakage*

Leakage feeds into the demand-side of the options appraisal process.

Low, medium and high leakage reduction strategies were developed based on targets developed and agreed regionally. We then used our own modelling to identify how we could achieve these reductions in the most cost efficient and optimal way. Table 39 shows the activities in each of these leakage strategies.

Our high plus demand saving also incorporates activities which will further drive down leakage such as including non-household customer leak detection for the top ten per cent of users.

Table 39: Leakage activity included in each of the low, medium and high option strategies

	2025/26	2030–31	2035–36	2040–41	2050–51	2074–75
Fixed Network Noise Logging,	Low Medium High	Low Medium High	Low Medium High	Low Medium High	Low Medium High	Low Medium High
Active Leakage Control,	Low Medium High	Low Medium High	Low Medium High	Low Medium High	Low Medium High	Low Medium High
Pressure Optimisation,	Low Medium High	Low Medium High	Low Medium High	Low Medium High	Low Medium High	Low Medium High
Enhanced Plastic Mains Correlations,		Medium High	Medium High	Medium High	Medium High	Medium High
Dedicated Trunk Mains Leak Detection,		High	Medium High	Medium High	Medium High	Medium High
Enhanced Active Leakage Control,		High	Medium High	Medium High	Medium High	Medium High
Dedicated Supply Pipe Leakage Programme					Medium High	Medium High

Water UK leakage route-map to 2050

In 2019 the English water companies made a Public Interest Commitment to “Triple the rate of sector-wide leakage reduction” by 2030. The water sector has also taken up the National

Infrastructure Commission's challenge by committing to halving leakage from 2018 levels by 2050.

Published in 2022 by Water UK, the document details the actions for water companies to take, to meet both their 2030 leakage goal and the 2050 proposed reduction. These include the following:

- Improved quantification of background levels of leakage – that is leakage that cannot be detected with current technology
- Improved quantification of leakage inside customers' properties
- Development of a sector-wide code of practice on how to ensure that water mains are laid without leaks
- Development of a strategy to tackle leaks on customers' water supply pipes.

Building on the PALM model (Prevent, Aware, Locate & Mend), the report recommends future adaptive pathways, to take account of a range of potentially variable factors. It also considers different leakage reduction scenarios, including increased active leakage control, smarter networks and improvements due to upgrading assets, such as pipes and control systems.

The Route-map calls on regulators to support the replacement of leaky pipes. Unless replacement rates closer to European levels are achieved, then the goals for 2050 will be much harder to realise. Reducing leakage presents a significant technological challenge. With over 345,000 kilometres of water pipes, enough to go around the world eight and a half times, England's water companies are adopting some of the latest technology and innovation to reach every leak.

7.2.5.3 Water efficiency

We have an active water efficiency programme. In our WRMP19 we committed to reduce domestic demand, measured in per capita consumption, by 5 per cent in the current five year period to 2024–25, but domestic demand for water has been higher than planned. This has, in part, been due to the impact Covid has had on consumption patterns over the last 2 years but is also a result of the impact of covid isolating restrictions on our planned initiatives.

Our water efficiency activities have been enlarged over the last few years as part of a 'PCC recovery strategy'. Following a cost benefit review of the effectiveness of a number on interventions we selected a suite of activity we felt represents our most influential mix of activity, whist also providing value for our customers.

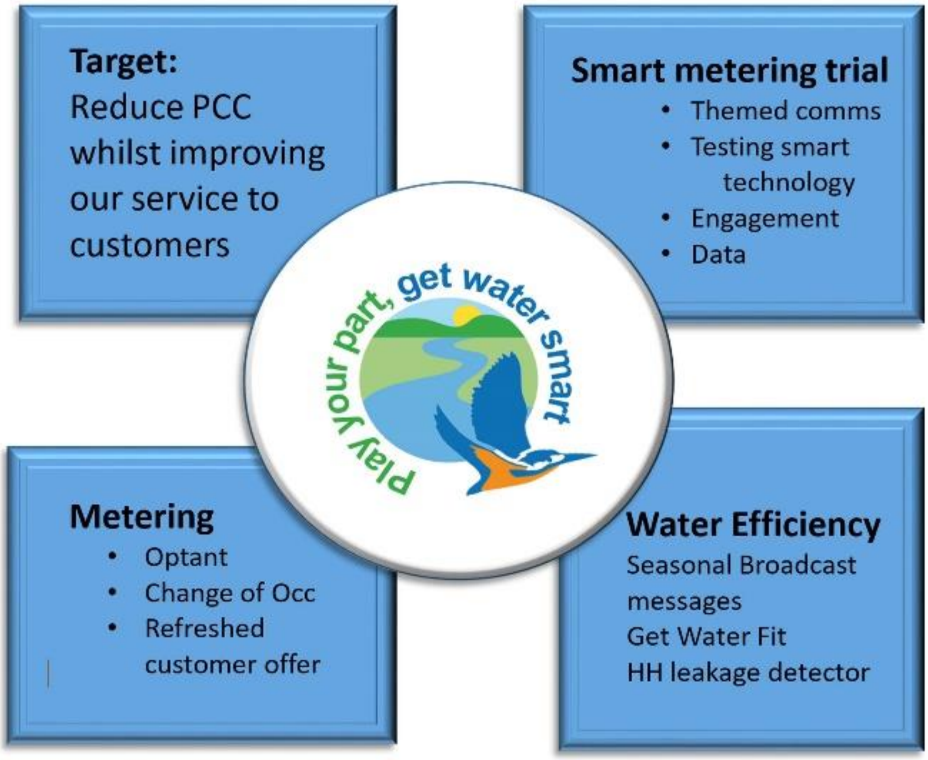


Figure 64: Summary of our PCC recovery strategy

Our current delivery experiences have helped us understand further possible options. In addition to building on our own experiences of how to effectively engage with customers, we also consulted leading industry experts, and looked to industry best practice and shared experience.

For example, a 2019 study commissioned by Water UK, and delivered by Artesia Consulting[21] assessing the savings, costs and benefits of a wide variety of interventions to reduce demand. This study was intended to help provide evidence to support development of a delivery strategy for the Government's ambition to see reduced household water use as set out in its 25 year Environment Plan.

This report concluded that the most effective way to reduce household water use involves both Government and water companies working together to deliver both mandatory water labelling for water using appliances, and domestic smart metering.

This can be seen in Figure 65 which shows the different options considered and the potential of these options to save water in the long run up to 2065. Government options are shown with red bars, and the potential options of water companies are shown with the pale blue bars. It can clearly be seen that a government mandatory water labelling scheme has significant potential to save water, and at a lower overall cost, measured in pounds per mega litre, than all but one of the other options considered.

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[21] Pathways to long-term PCC reduction (water.org.uk), Artesia Consulting, 2019

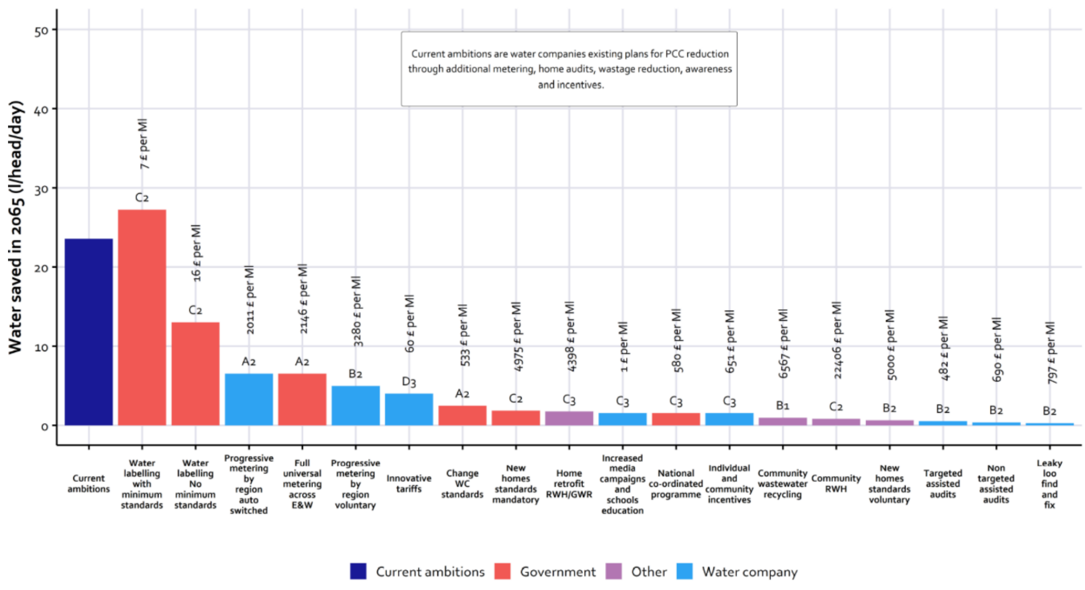

Figure 65: The potential of a wide variety of water efficiency interventions to reduce domestic water demand over the long term, and concluded in the 2019 Artesia study, commissioned by Water UK

The process of developing options to promote water efficiency resulted in 59 unconstrained options for our supply area.

It also led to discussions at regional level with regulators about including a range of government-led demand options that would include the introduction of a mandatory water labelling scheme. Further information on the development of these options, in the form of a WRSE Defra demand saving profile technical note, is provided in Appendix 7C.

7.2.5.4 Customer priorities on demand options

Customer engagement, described in Section 3.8, helped us to understand which options our customers preferred, and their prioritisation of option types.

Customers were strongly in favour of the current development of Havant Thicket Reservoir (now part of our baseline supply) due to sustainability, and positive community benefits.

Our customers also showed support for investing in technology and infrastructure to reduce water leakage and the use of grey water recycling. The majority of customers support water recycling due to the reliability aspect, however, customers show concerns over quality and safety. Desalination and water transfers show the least priority due to the perception of being damaging to wildlife and energy intensive.

Metering is not seen as the most urgent priority by customers. This is due to hesitancy in data sharing, and anxieties around larger bills for vulnerable customers and larger families. However, smart metering roll outs were supported by seven out of ten customers surveyed, after the benefits of metering (reduction in leakage and saving money and water) were communicated.

We found those who do not support universal smart metering are more likely to already struggle with affording their bill – reflecting anxiety for some that metering will increase their bill.

In response to these concerns, we are working on support strategies to support and focus on water poverty for vulnerable customers. This has been conducted through developing networks within the community and working with business networks and charities.

Information is key. Seventy per cent of customers who have listened to an explanation of smart metering, support smart meter usage, whereas only forty-eight per cent of less informed customers support metering, as shown in Figure 66.

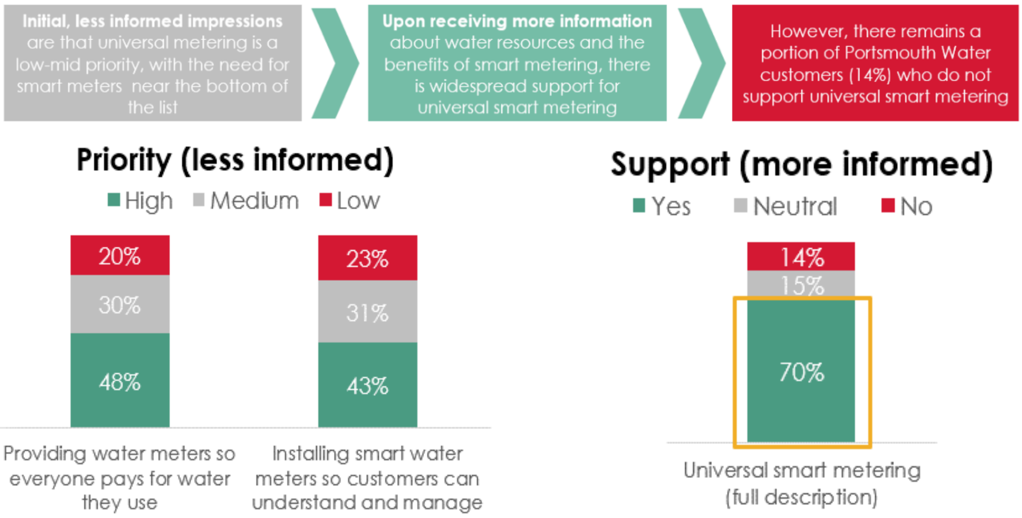

Figure 66: Support for metering increases if customers have received information about smart metering

Attitudes towards water conservation again vary with the knowledge held by customers, with 66 per cent of our customers claiming to be saving water. For example, lack of awareness around the benefits of chalk stream environments, and catchment management measures (which may appear as experimental to some customers) could impact attitudes towards saving water. Additionally, the 65+ age group appear to make more of an effort to save and conserve water, meaning there needs to be a bridging of gaps between customer demographics.

Environmental reasons for saving water seem to be more generalised, with “reducing waste” and saving money being the main reasons for customers prioritising saving water. It appears that barriers such as lifestyle, family size and attitudes hinder people’s motivations to conserve and reduce water usage.

Customers’ suggestions of how we could aid water saving include rewarding those who reduce their use, more prominent messaging, and demonstrating our efforts to fix water leaks.

Additional information for customer preferences can be found in appendix 3C.

7.3 Option screening

WRSE developed an options appraisal process that integrated with our requirements for environmental, resilience and water quality assessments as shown in Figure 67. The options appraisal approach undertaken by WRSE and ourselves promotes integration between the regional and water company dWRMP options appraisals, allowing both to actively inform the other.

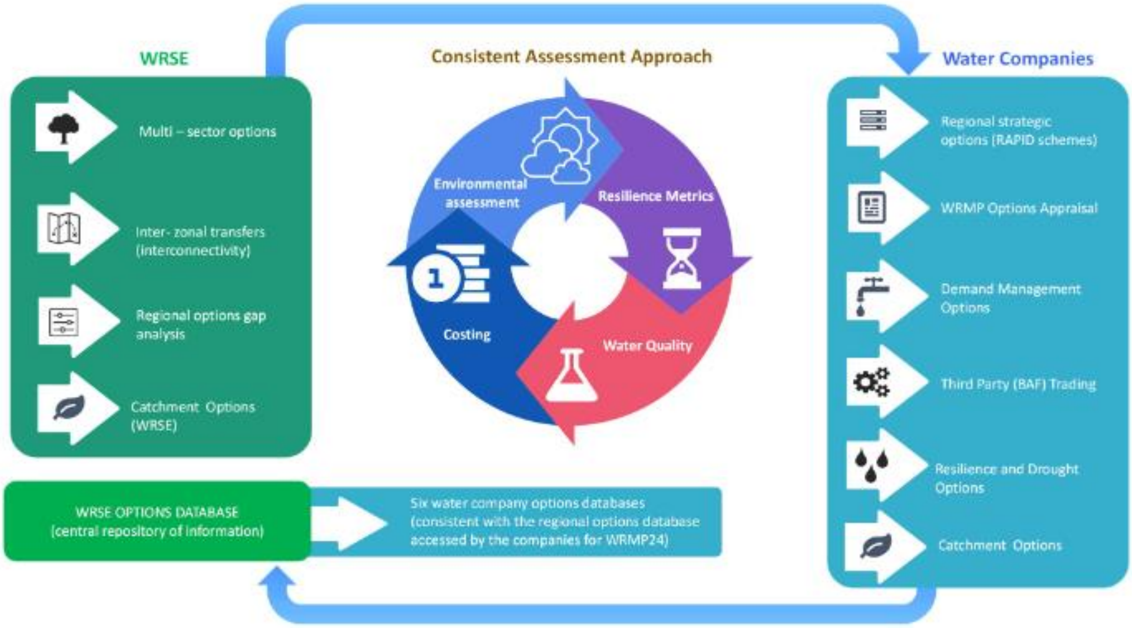

Figure 67: Integrated options appraisal methodology

Initial environmental assessments were undertaken by WRSE. With respect to our dWRMP24, a total of 259 options were considered in the 'unconstrained list', with 184 WRMP19 options, and 75 new options identified.

A list of the unconstrained options can be found in appendix 7A.

Primary screening reviewed the options conducted with 5 test questions, considered on a pass/fail basis, with failure of a test eliminating the option/screening the option out. The criteria were agreed and applied across the WRSE regional planning area, and were as follows:

- Is the option technically feasible?
- Does the option address the planning problem?
- Does the option avoid breaching any legal/planning constraints?
- Is the option promotable with regulators and customers?
- Is the option likely to be prohibitively expensive for the volume of water produced?

Passed options were then carried through to a secondary screening, with rejected options and AMP7 options added to the rejection register.

Secondary screening takes a more measured approach in comparison to primary screening, where the final decision is based on several factors. Initially environmental screening was undertaken including:

- Habitats Regulations Assessments (HRA).
- Strategic Environmental Assessments (SEA).
- Water Framework Directive (WFD) measures for environmental impacts.

Further criteria were assessed using a RAG approach (red, amber, green). The criteria assessed included:

- Option costs

- Promotability.
- Deliverability and constructability.
- Adaptability to future scenarios.
- Reliance on vulnerable sources.
- Uncertainty around key assumptions.

Options failing at the secondary screening phase were added onto the rejection register. The environmental screening questions can be found in Appendix 7A. The overall summarised process can be seen in Figure *68* and option numbers are summarised in Table 40.

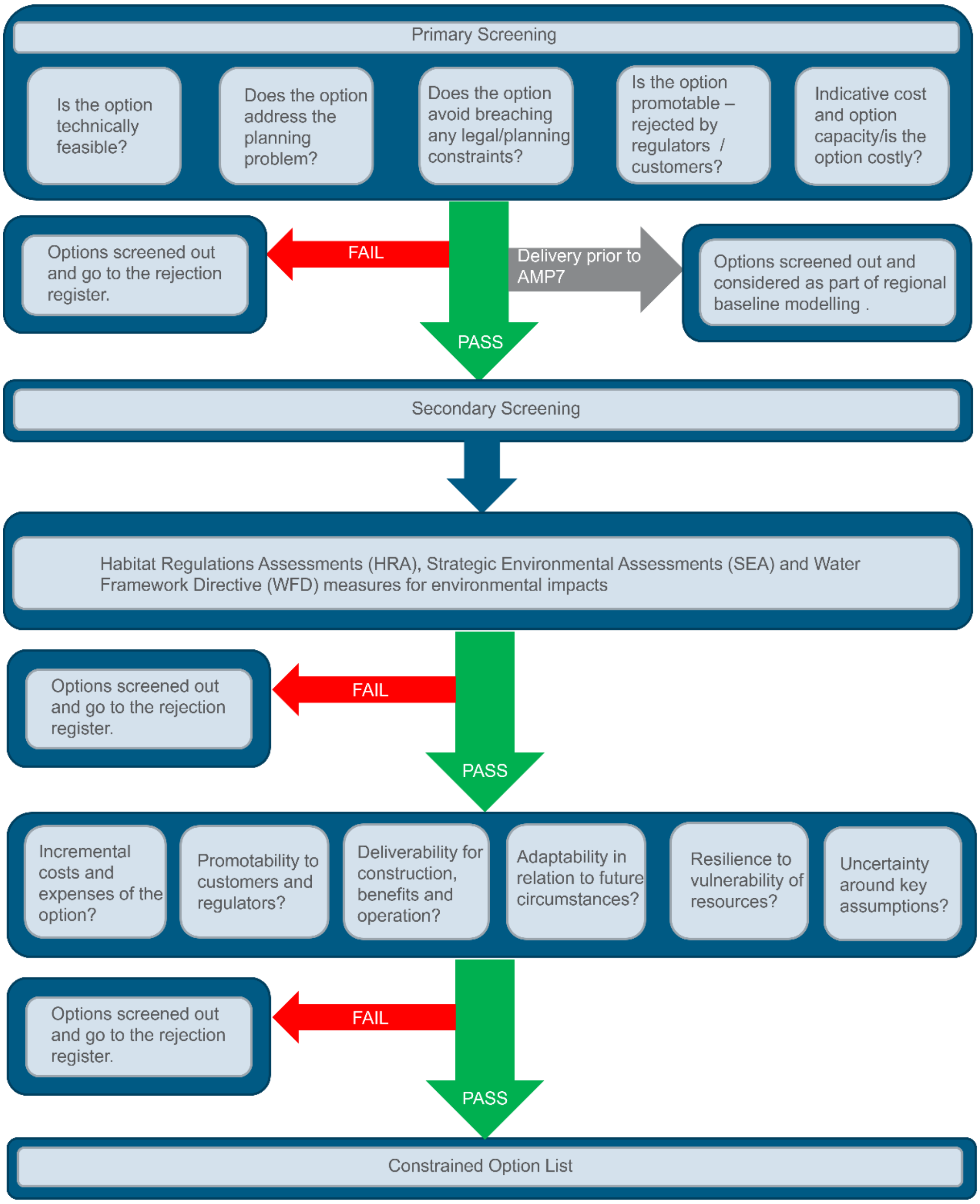

Figure 68*: Summary diagram of screening process.*

Table 40: Options screening summary table.

Screening	Option screened out	Options carried forward	Additional information
Primary	137	121	Promotability of the option removed 59 Feasibility of the option removed 43 Retrofitting toilets and their issues described from other companies removed 4 Options flagged for future review removed 2
AMP7	6	115	Considered as part of the baseline within regional modelling.
Secondary	41	74	These 74 feasible options included 59 demand management options which were subsequently translated into 4 baskets of demand management. In addition, the Havant Thicket Reservoir was removed as an option after it received planning permission. This left a total of 18 feasible options that were taken forward and included in the WRSE regional option set.

The unconstrained list of options started at 258, which was reduced at each stage, 137 at primary screening, 6 due to AMP7 and 41 at the secondary screening stage. A summary of the options from the screening process is presented in Table 40. Additional information on option rejections can be found in appendix 7A.

Deployable output has not been provided for unconstrained options, as it would not have been logistically feasible to estimate and calculate DO for each of the options rejected. DO has been provided for constrained and feasible options.

7.4 Environmental assessment

During the option appraisal process, environmental considerations were at the forefront of option development due to the pressure of demand and supply of water, and the environmental affects that are produced through the delivery of new options.

7.4.1 Carbon and Climate Change

We have committed to becoming net zero carbon by 2050, as the UK has domestic targets under the Climate Change Act to reduce greenhouse gas (GHG) emissions. This is inclusive of carbon dioxide (CO_2) in addition to methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride.

One of the elements to achieving this ambition will be the investment in energy efficient measures to streamline consumption. This will include minimising water leakage and promoting more efficient water usage as well as sub-metering across production sites to assist with better monitoring energy consumption.

New options will be powered through renewable energy sources and carbon impact will be minimised in the construction and land-use of options.

7.4.2 Environmental Assessments

During the development of our dWRMP24, our feasible options underwent environmental assessments following the methodology in line with WRSE regional plan. This involved Strategic Environmental Assessments (SEA), Habitat Regulations Assessment, Biodiversity Net Gain (BNG) Natural Capital Assessment (NCA) in addition to Invasive and Non-native Species (INNS) and Water Framework Directives (WFD).

Options remaining following the primary and secondary screening exercise and subsequently proposed as solutions by the regional investment model were further assessed. These options were considered through the assessments described above and via the process outlined in Figure 69.

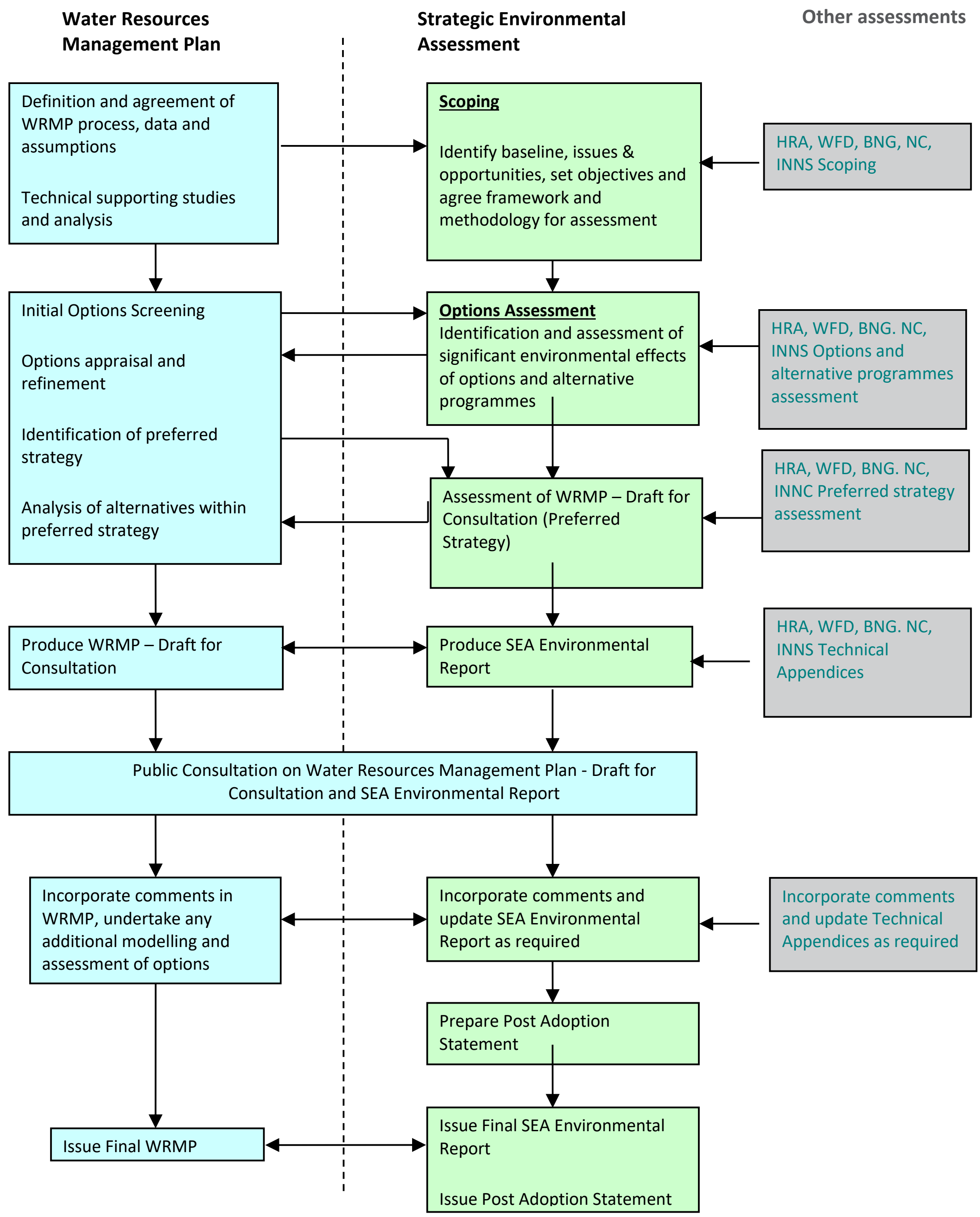

Figure 69: WRMP and environmental assessment (reproduced from our SEA scoping report).

Application of the environmental assessment framework utilised a bespoke Geographical Information System (GIS), which allowed identification of environmental and social constraints through a series of maps and associated information layers to help provide quantitative consideration of where options are located spatially within our supply area.

Each option was considered within its own right in terms of environmental effects and anticipated effects (beneficial or adverse) were identified for both the construction and operational phases of the potential option. Consideration of the identified anticipated effects also allowed a scale of effect to be applied to each option considering each of the SEA Objectives – those effects deemed to be moderate or major were considered to be significant.

Each option was subsequently considered alongside other options with which it could interact with to generate cumulative effects. Further information can be found within our SEA and HRA reports, included within Appendix 1D and 1G.

Where possible, WRSE has been informed of the results of the assessments to allow further consideration of more 'local' issues within the draft regional plan. The results also helped to provide relevant information to be considered alongside other technical issues to help identify our preferred best value plan.

7.5 Drinking Water Safety Plan screening

The drinking water directive and inspectorate ensures that water supplied to customers meets regulatory standards, and these quality standards and risks should be accounted for when operating, supplying, and through catchment transfers.

The Drinking Water Safety Plan (DWSP) should ensure that a source to tap risk assessment is completed to limit impact to public health, via mixing, developing options and through upstream sources.

Working with both the Water UK Water Quality Group, and through WRSE, we have developed a screening process for DWSP risks identified as part of the source to tap assessment. This is documented in Appendix 1B.

This work has also been shared with our neighbouring company, Southern Water, where appropriate, to ensure a consistent approach is taken for schemes that are common to both companies.

7.6 Costing

We have developed a consistent approach to costing our options to ensure they can be compared on a like for like basis. This approach has been aligned with the cost consistency guidance to water companies from WRSE to ensure that our options have been assessed to a similar level of detail as other WRSE water companies. The WRSE guidance was in turn based on national guidance from the All Companies Working Group (ACWG) to support development of the regionally and nationally important SRO schemes.

By following the guidance, we have produced cost profiles for all our options that are in a consistent format with other WRSE companies. This has allowed us to participate in the regional investment modelling run by WRSE. This modelling allows us to develop robust plans to meet demand in a range of potential futures. See Section 2 for more details on our adaptive planning process.

Each option has been assessed for several variables that make up the overall cost of an option. This includes:

- Capital Costs (CAPEX) - To comply with WRSE guidance, all CAPEX costs have been split into asset life categories as defined in the WRSE Cost Consistency Methodology (Mott MacDonald, 2020).
- Operating Costs (OPEX) – this has been split into fixed (cost per annum) and variable (cost per unit of water).
- Carbon – this has been split into fixed (tonnes per annum) and variable (tonnes per unit of water).
- Electricity – Electricity (kWhr per unit of water) costs have been separated out from other operating and carbon costs to allow the assessment of the impact of national energy policies on the price and carbon.

- Optimism bias – each option has been assessed for its level of development using the methodology set out in the supplementary guidance of the HM Treasury Green Book (HM Treasury 2020). Using this guidance, a value for optimism bias has been assigned to each option, expressed as a percentage of the CAPEX costs.

The cost benefit of each option was calculated, producing an Average Incremental Cost (AIC) based on pence per cubic meter over the lifetime of the planning period. This is shown in Table 41 along with the earliest point that the option can be selected to start and the maximum benefit it is likely to deliver to the supply demand balance.

7.6.1 Costing supply options

Our supply-side options have been costed using a range of sources, this includes our own cost database based on previous projects we have completed in the past. Where we have had little previous experience with an option type, we have consulted with industry experts to develop cost estimates based on current best knowledge.

Following industry best practice, we then had our costs assured by independent consultants prior to submitting our costs to WRSE, and then again audited by Jacobs who assured the ways that options were costed at a regional level.

7.6.2 Costing demand options

Demand side options consist of leakage and water efficiency options to reduce network leakage and encourage more sustainable usage by customers, known as water efficiency options

WRSE asked each company to use their own tools and calculations to cost demand side options including for leakage and usage reductions. For leakage we have a well-established method of optimising the most cost-effective way to deliver specified leakage target. This was audited in 2021 before the demand options were submitted to the WRSE for modelling.

For water efficiency and metering, we identified costs, savings and delivery approaches based on evidence from trials we have run ourselves, but also published best practice across the industry. Profiles were developed of demand reduction, along with CAPEX, OPEX and carbon.

For universal metering we considered the experience that has been shared by the other water companies across the Southeast, several of whom started delivering universal metering over ten years ago and engaged industry experts to review and comment on the cost.

We will continue to gain insight and confidence in the costs associated our metering programme as we progress into a procurement exercise with the supply chain. It is anticipated that the costs for this option will be subject to change between this draft plan and the submission of our final plan in 2023.

At this point in time we do not believe that the variance in cost we might identify will be significant enough to affect the choice of a metering option by the investment model.

7.7 Feasible Options

Our feasible options list contains 18 options to increase supply, reduce demand and optimise our network (see Table 41). Further detail on the feasible options can be found in appendix 7A. They include:

- Four baskets of demand reduction measures.

- Three drought measures.
- One option to improve network connectivity.
- Ten supply options consisting of different capacities of two variants to transfer and treat water from Havant Thicket Reservoir and take it to other parts of our supply area.

This feasible option set was independently assured and then submitted to WRSE where they formed part of the regional option set, along with the feasible options set from other water companies and third parties across the region.

Table 41: Earliest possible start date, maximum benefit, and AIC rate of all feasible options

Option Name	Option Variants	Group Earliest Possible Operational Start	Max Benefit (Ml/d)	AIC (p/m^3)
Portsmouth Water Demand Basket **(4 options consisting of baskets of demand reduction measures)**	High Plus	2025/26	34.03	122
	High	2025/26	34.10	133
	Medium	2025/26	24.19	146
	Low	2025/26	5.37	362
Drought options **(3 options with variations)**	Non-essential use bans	2025/26	6.5	n/a
	Temporary use bans	2025/26	10.8	n/a
	Drought Permit: Source S* Earlier finish dates	2020/21	4.5	11–33
	Drought Permit: Source S* Finishing in 2040–41	2025/26	4.5	44
Network improvement **(1 option)**	Upgrade Source O Booster to 25Mld	2027/28	1.3	10
Havant Thicket transfer to Reservoir B via Works A **(4 options with variations)**	Havant Thicket to Reservoir B via Works A 10 Ml/d	2030/31	10	50
	Havant Thicket 20 Ml/d to Reservoir B via Works A: Phase 1 10 Ml/d WTW	2030/31	10	49
	Havant Thicket 20 Ml/d to Reservoir B via Works A: Phase 2 10 Ml/d WTW	2030/31	10	45
	Havant Thicket 30 Ml/d to Reservoir B via Works A: Phase 1 10 Ml/d WTW	2030/31	10	68
	Havant Thicket 30 Ml/d to Reservoir B via Works A: Phase 2 10 Ml/d WTW	2030/31	10	64

Option Name	Option Variants	Group Earliest Possible Operation al Start	Max Benefit (Ml/d)	AIC (p/m^3)
	Havant Thicket 30 Ml/d to Reservoir B via Works A: Phase 3 10 Ml/d WTW	2030/31	10	64
Havant Thicket transfer to SWS Source A spur to Reservoir C **(6 options with variations)**	Havant Thicket to SWS Source A spur to Reservoir C: 10 Ml/d	2030/31	10	58
	Havant Thicket to SWS Source A 20 Ml/d spur to Reservoir C: 10 Ml/d WTW Phase 1**	2030/31	10	60
	Havant Thicket to SWS Source A 30 Ml/d spur to Reservoir C: 10 Ml/d WTW Phase 1**	2030/31	10	62
	Havant Thicket to SWS Source A spur to Reservoir C: 10 Ml/d	2030/31	10	58
	Havant Thicket to SWS Source A 20 Ml/d spur to Reservoir C: 10 Ml/d WTW Phase 1**	2030/31	10	60
	Havant Thicket to SWS Source A 30 Ml/d spur to Reservoir C: 10 Ml/d WTW Phase 1**	2030/31	10	62
	Havant Thicket to SWS Source A 40 Ml/d spur to Reservoir C: 10 Ml/d WTW Phase 1**	2030/31	10	66

* A range of end dates were modelled in case the date that we moved to increased drought resilience significantly impacted the cost-efficiency of the plan. This is reflected in the range of AIC values. The option becomes better value for money if it is available to use for a longer period.

**These are options relating to the timing and scale of exports to Southern Water

In addition to our own feasible options, the impact of government led demand interventions were modelled. This option assumes that the government introduces measures to save water through water labelling and water regulations. The assumed start date is modelled as 2025–26 with a maximum saving over the life of the dWRMP24 of 23.79 Ml/d.

Furthermore, amongst other regionally generated options, WRSE modelled variations to our bulk supplies including a potential reversal of flow direction in our western bulk supplies to Southern Water ('Southern Water Source A to our Source A') i.e. we start to import water instead of export water.

7.7.1 Feasible demand options

Demand side options are those options that aim to improve the supply-demand balance by reducing demand from customers and reducing leakage in our network.

The complete set of constrained demand side options consists of 74 options, of which 59 are efficient use and management of water. The categories of efficient use and management of water that are covered in the constrained list are:

- Advice and information.
- Rainwater harvesting.
- Promotion of water saving devices.
- Customer supply pipe leakage reduction.
- Awareness campaigns.
- Enhanced metering.
- Leakage reduction.
- Meter installation policies.
- Improved leakage detection and reduction on raw water mains.
- Water use audit and inspection.
- Promotion of water saving devices – retrofitting.

Following our screening process, we have selected 34 demand reduction options and 11 leakage reduction options to be assessed by the WRSE investment model. Remaining options include rainwater harvesting, rainwater butt subsidies, engagement with target groups, subtle option variants and options to engage with non-house customer groups.

To avoid the model selecting a suite of options that would be unrealistic to deliver in parallel, we have grouped the options into four aggregated options that deliver different levels efficiency. These are:

- Low
- Medium
- High
- High plus (includes universal metering)

These are shown in Table 42 below, along with the per capita consumption figures that are forecast because of implementing each of the basket of measures by 2030 and again in 2050.

Table 42: Components of each of the demand option baskets along with the forecast pcc values from implementing each of these

Low	Medium	High	High Plus
PCC in 2030 *142 litres per person per day* *PCC in 2050 141 litres per person per day*	*PCC in 2030* *137 litres per person per day* *PCC in 2050* *129 litres per person per day*	*PCC in 2030* *136 litres per person per day* *PCC in 2050* *121 litres per person per day*	*PCC in 2030* *133 litres per person per day* *PCC in 2050* *119 litres per person per day*
Continued optant and void metering	Continued optant and void metering Change of occupancy metering	Continued optant and void metering Change of occupancy metering Not for revenue metering (with existing boundary boxes) Switch of existing meters to smart meters starting in 2030 and delivering over 10 years	Continued optant and void metering Universal smart metering seeking to deliver over 10 years Switch of existing meters to smart meters starting in 2030 and delivering over 10 years
Home audits of high users (online or over the phone)	Home audits of high users (online or over the phone) Home audits for newly metered customers (online or via video call)	Home audits of high users (online or over the phone) and face to face Home audits for newly metered customers (online or via video call) and face to face. Home audits for all existing metered customers switching to a smart meter	Home audits of high users (online or over the phone) and face to face Home audits for newly metered customers (online or via video call) and face to face. Home audits for all existing metered customers switching to a smart meter
Web order water efficient devices	Web order water efficient devices Water efficient devices as part of home assessments	Web order water efficient devices Water efficient devices as part of home assessments	Web order water efficient devices Water efficient devices as part of home assessments
Community reward programme to engage newly metered customers	Community reward programme to engage newly metered customers	Community reward programme to engage newly metered customers	Community reward programme to engage newly metered customers
Background communications and engagement	Background communications and engagement	Background communications and engagement	Background communications and engagement

		Waterfit engagement platform available to all businesses	Waterfit engagement platform available to all businesses
Non-household water use assessment for schools	Non-household water use assessment for schools Non-household site assessments for small businesses (online or over the phone)	Non-household water use assessment for schools Non-household site assessments for small businesses (online or over the phone) Site leak detection offered to top 10% of non-household water users	Non-household water use assessment for schools Non-household site assessments for small businesses (online or over the phone) Site leak detection offered to top 10% of non-household water users

7.7.2 Feasible supply options

An overview of our feasible supply options is presented below.

- Havant Thicket to Service Reservoir B– three variations supported by expanded treatment capacity at works A (10/20/30 Ml/d variants)
- Drought Permit Source S – an 8.5 Ml/d DO increase at the source level, resulting in up to a 4.5 Ml/d benefit at the water resource zone level.
- Upgrade Source O Booster – Network reinforcement to increase connectivity and unlock trapped DO from 10 Ml/d to 25 Ml/d
- Havant Thicket to SWS Source A Spur to Service Reservoir C (10/20/30/40 Ml/d variants)
- Southern Water Source A to our Source A - reversal of flow direction in our western bulk supplies to Southern Water i.e. we start to import water instead of export water.

7.8 Southern Water options that interact with Havant Thicket Reservoir

Our Havant Thicket Reservoir project is being delivered in partnership with Southern Water who will be the major beneficiary of this scheme. Currently, Southern Water is exploring potential future uses of the Havant Thicket Reservoir. Some of the options under investigation would result in changes to the source and volume of water moving through the reservoir. Careful investigation will be required to ensure that the final water quality of the reservoir meets the regulations for its intended use. The proposals include:

- Building a new water recycling plant south of Havant and using advanced treatment techniques to turn treated wastewater into purified, recycled water. The water would then be transferred via a new underground pipeline to Havant Thicket Reservoir so there is more water available for use during a drought.
- Building a new underground pipeline to transport raw water from the Reservoir to Southern Water's Hampshire Southampton East (HSE) WRZ, where it would be treated further to become drinking water.

Water recycling is an advanced treatment process which speeds up the natural water cycle to provide a sustainable source of clean, safe drinking water that reduces the amount needed to be taken from the environment.

These proposals are still in the early stages and need to go through further extensive consultation and planning approval before they could proceed. To be clear, these proposals would be funded by Southern Water's drinking water customers and our customers would see no changes to their bills because of these plans.

We are committed to ensuring that all the environmental and community commitments made in the original planning application for Havant Thicket Reservoir are maintained if these plans were to go ahead.

We will work closely with Southern Water to ensure that the water quality modelling process meets our high standards and is robust.

The scheme requires approval from us to proceed and we will not give our approval unless we are completely satisfied with the results of the water quality modelling. As a result, the scheme will not progress without sufficient evidence that the water quality will meet the required standards.

8 DEVELOPING THE PLAN

8.1 Introduction

8.1.1 What does the plan have to do?

Our dWRMP24 must demonstrate how we intend to achieve a secure supply of water for our customers and a protected and enhanced environment over a minimum planning horizon of 25 years (we look at a 50 year horizon in our plan from 2025 to 2075). The duty to prepare and maintain a WRMP is set out in sections 37A to 37D of the Water Industry Act 1991.

The **preferred plan must solve any forecasts of future deficits**, whilst allowing for the inherent uncertainties involved in forecasting into the future. For this planning round, there are new requirements of what a company WRMP must do. Water companies should take a leading role in a more holistic and integrated approach to water management, exploring opportunities to deliver cross sector mutual benefits, for society and the environment.

The government expects regional groups and water companies to address the challenges set out in the National Framework for water resources using the approaches described in the WRPG. WRMPs should align with regional water resources plans (regional plans).

Where we identify a risk of a deficit occurring over the planning period, we identify both demand-side and supply-side options that together could be put in place to resolve those deficits. **The plan identifies the preferred set of options that are needed to address any deficits**. Our plan also takes account of government policies and wider objectives.

Therefore, there are two key sets of inputs needed for investment modelling: the supply and demand forecasts for the planning scenarios being tested; and the feasible set of options (with associated data on the costs of those options and the benefit they provide in terms of helping to satisfy a deficit).

Traditionally, plans were developed to meet deficits at the least cost. Whilst this is still an important criterion, there are other factors which are considered. Our aim is to develop a plan that represents '**best value**'. A best value plan is defined as: "*one that considers factors alongside economic cost and seeks to achieve an outcome that increases the overall benefit to customers, the wider environment and overall society*".[22]

Our plan also addresses the **inherent uncertainties involved in forecasting both supply of water available and the demand for water over the planning horizon**. Therefore an '**adaptive planning**' approach has been adopted – one in which we identify low regret options that are needed in the near term, and longer term sets of options that may be triggered at certain points over the planning horizon.

8.1.2 Design drought scenarios

In water resources planning, we are not generally concerned with what would happen in "normal" or wet conditions. We focus instead on dry years – the WRMP effectively provides a long term strategy that interfaces with drought conditions and the management of water resources under those conditions. This is because, from a water resources perspective, dry conditions provide a key stress on the ability of the system to supply enough water to meet customer demand (which often tends to increase during dry, hot weather).

[22] Water resources planning guideline, https://www.gov.uk/government/publications/water-resources-planning-guideline/water-resources-planning-guideline#section-9--aspects-to-consider-in-compiling-a-best-value-plan

Within any given year, the state of supplies and the levels of typical demand will vary. For this reason, we examine through the dWRMP24 a number of drought scenarios (or planning scenarios), which must be solved simultaneously to ensure that sufficient water is available throughout the year in dry years. This is in accordance with the WRPG.

These design scenarios are examined in all the different 'futures' that we consider to test the robustness of our plan to future uncertainties. They ensure that the conditions that could occur in any given drought year are assessed across the planning horizon, for the whole range of future scenarios that are examined.

8.1.3 Planning for a range of plausible 'futures'

Forecasting the future is inherently uncertain. There could be a range of different assumptions that are plausible but that could affect the forecast of supply and demand significantly and in different ways. In Section 2 of this dWRMP24, we have described how the various future scenarios have been developed to reflect differing uncertainties.

We have then used these different futures to examine a range of adaptive plans that could address those possible futures. A total of 9 future pathways were identified through WRSE for examination with the investment model to identify the combination of demand management strategies and resource development options or transfers that would satisfy deficits in the future pathways.

The adaptive planning approach is described in detail in in the sub-section below.

8.2 Selection of our decision-making approach

8.2.1 A regional approach

We review and update our WRMPs every 5 years, in accordance with legislation. So much of the current plan is built on our previous WRMPs and work by WRSE. However, this planning round, the regional planning groups have been given a stronger role in co-ordinating and developing techniques across each region to ensure consistency and compatibility of approaches and outputs across all the water companies in the WRSE region – of which we are one of six companies.

WRSE were tasked with developing the decision making approach and tool (the investment model) that would be used by all companies in WRSE to select their preferred plan.

WRSE developed a series of method statements which were issued for consultation to allow the approaches to be refined to reflect feedback they received, if needed, prior to developing the draft regional plans. This included one relating to the decision-making approach: WRSE, *Method Statement: Investment Programme Development and Assessment* (Consultation version July 2020)[23].

We review the outputs from the regional modelling outputs and ensure these are appropriate and compatible with our own objectives and policies. It has been an iterative process, with companies reviewing and challenging the WRSE investment model outputs and providing feedback to the regional modelling team to refine and improve the modelling process and outputs.

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[23] https://www.wrse.org.uk/media/wvxjachq/wrse_file_1318_wrse-ms-investment-programme-development-and-assessment.pdf (all WRSE documents can be located in the WRSE library: https://www.wrse.org.uk/library)

The figure below (Figure 70) shows how the plan has been developed from its component parts, and the interface between Portsmouth Water and the WRSE regional planning group.

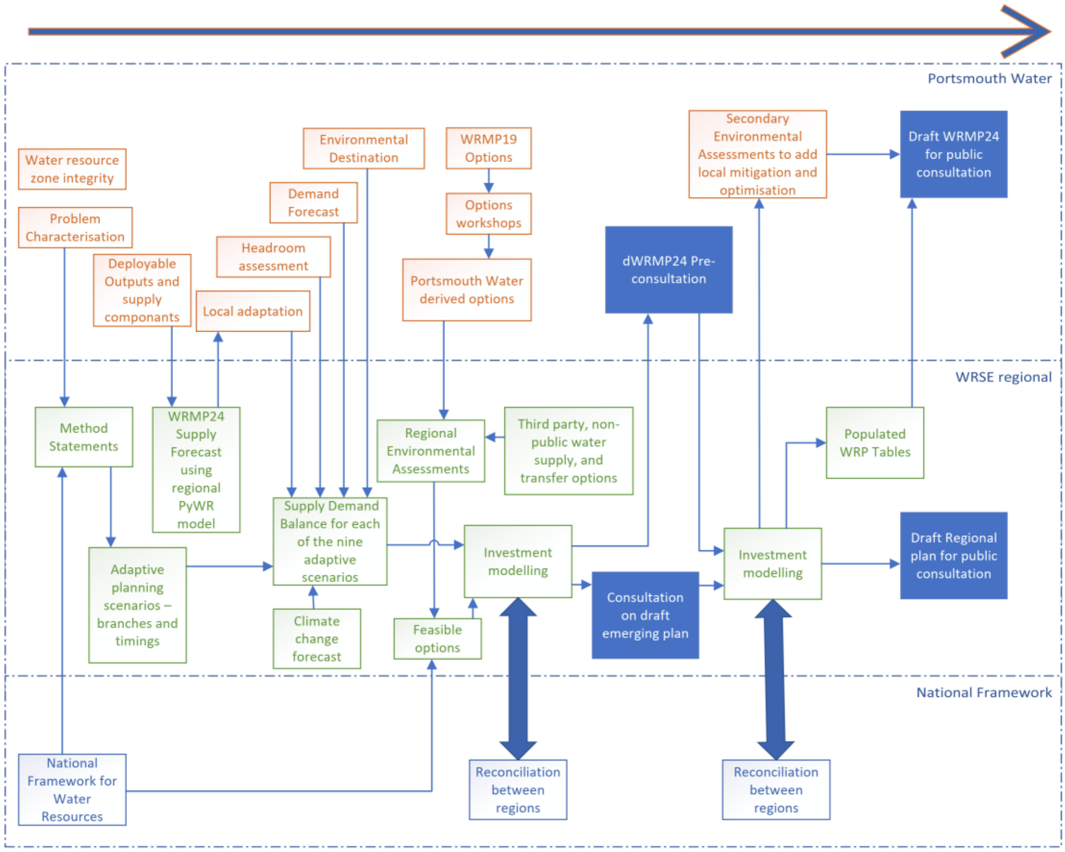

Figure 70: Plan development – interfaces between Portsmouth Water and regional and national water resources planning

8.2.2 Problem characterisation

The process of problem characterisation is used to understand the scale and complexity of the planning problem faced, so that relevant methods can be adopted. This assessment of strategic issues, risks and uncertainties, was undertaken at a regional planning level, to support the selection of the appropriate risk-based methods and the decision-making approach by WRSE.

The problem characterisation was set out in the WRSE *method statement: best value planning*[24] (Jan 2022) and follows UKWIR (2016) guidance[25]. The overall risk to the Southeast was deemed to be high. This characterisation supports the use of extended or complex methods. The decision support tools developed through WRSE and used to underpin our dWRMP24 reflect the problem characterisation risk level for the Southeast of England. However, as explained in Section 1.7, the problem characterisation risk level for our own

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[24] WRSE, *Method statement: Best Value Planning* (Jan 2022), https://www.wrse.org.uk/media/sy1bu4to/method-statement-best-value-planning.pdf (all WRSE documents can be located in the WRSE library: https://www.wrse.org.uk/library)

[25] UKWIR (2016), Decision-making process: guidelines (16/WR/02/10)

supply area is considered to be similar to the level of risk for the wider region. The decision-making approach adopted is described below.

8.3 Decision-making approach

Traditionally, WRMPs have developed a single future forecast which was stress tested to ensure robustness and revised and updated in subsequent WRMPs as required. However, owing to the potential challenges and significantly wide range of possible futures against which we must plan, it was recognised that, as a region, we needed to develop a different approach.

8.3.1 Adaptive planning

It was agreed that WRSE would lead the development of an **adaptive plan**, on behalf of all the water companies in the Southeast region, – one which will select all the options needed to meet a wide range of possible future uncertain scenarios i.e. it shows how the investment programme may change through time as key decision points are reached that trigger an alternative pathway. This is an advanced decision-making method, which is necessary because of the scale and complexity of water resources planning required by the water companies in the Southeast.

Some of the factors affecting the potential pathway will follow forecast trends (such as climate change or population growth), while others may involve relatively significant step changes in the deficit forecast. The initial choices made early in the planning period will affect the later branches, which is why the early stages focus on 'least regrets' options and enabling activities.

This adaptive planning approach is recommended by both the WRPG and the National Framework for Water Resources. The selection of the adaptive planning scenarios or pathways (described in Section 2 of this WRMP) was developed between all the companies through WRSE. These have been examined through the WRSE investment modelling process. The adaptive planning approach includes the following elements:

- A set of pathways that demonstrate how investment is planned for under different possible futures, and so how investment may change as a different pathway is triggered.
- The initial set of actions and activities required in the short term – the no regrets actions and activities that are needed regardless of which future pathway eventually emerges.
- The above includes actions that ensure that longer term options are kept open as we move onto alternative pathways.
- A monitoring plan that sets out how we would track progress and identifies the triggers that would confirm that we need to shift on to an alternate pathway and when that might be.

The pathways branch at certain points in time. The selection of branching points was agreed through WRSE to address key regional policy objectives by specific points in the planning period. There are several branching points that have been identified, both in the emerging regional plan and through the consultation responses to that emerging plan. This resulted in consideration of risk-based triggers and policy based triggers:

- Risk based triggers – driven by future uncertainties due to environmental ambition, climate change impacts and population growth, and the point at which these exceed the headroom uncertainty allowance that are built into the supply demand forecasts (at a regional level).

- Policy based triggers – to reflect key policy changes. For example the optimum point from which to transition from a 1-in-200 year level of resilience to a 1-in-500 year level of resilience (which is driven by requirements in the WRPG); or the point in which environmental ambition scenarios should be fully implemented.

An example of this branching was provided in Section 2 (Figure 32). The changes to different pathways are driven by monitoring of the impacts of the three factors of population growth, environmental ambition (improvement) and climate change (as discussed in Section 2 of this WRMP). At key decision points, we will understand, as future uncertainties become clearer, which of the pathway we are most closely aligned to. If necessary, this will trigger a change in the pathway and associated investment programme.

For the investment model it is assumed that by 2030 uncertainties relating to growth rates will have been largely resolved, so that a decision of which of the three growth pathways to follow can be made. Similarly, by 2035 uncertainties in relation to different environmental destination and climate change futures will have emerged, and so identification of the 2040 branch can be made.

Two distinct phases in the regional adaptive planning work have been identified as described in Section 2. A 2025–2035 Priority 'least regrets' phase and a 2035–2075 Adaptive phase.

8.3.2 Best value plans

To determine, for any given adaptive pathway, the optimum set of options, we have, through the WRSE regional planning group, assessed the **best value plan**. As a reminder, The WRPG described a best value plan as: "*one that considers factors alongside economic cost and seeks to achieve an outcome that the overall benefit to customers, the wider environment and overall society*".

The process of how the best value plan has been identified and decided upon is described in detail in the section below and the journey to the best value plan is shown in Figure 71.

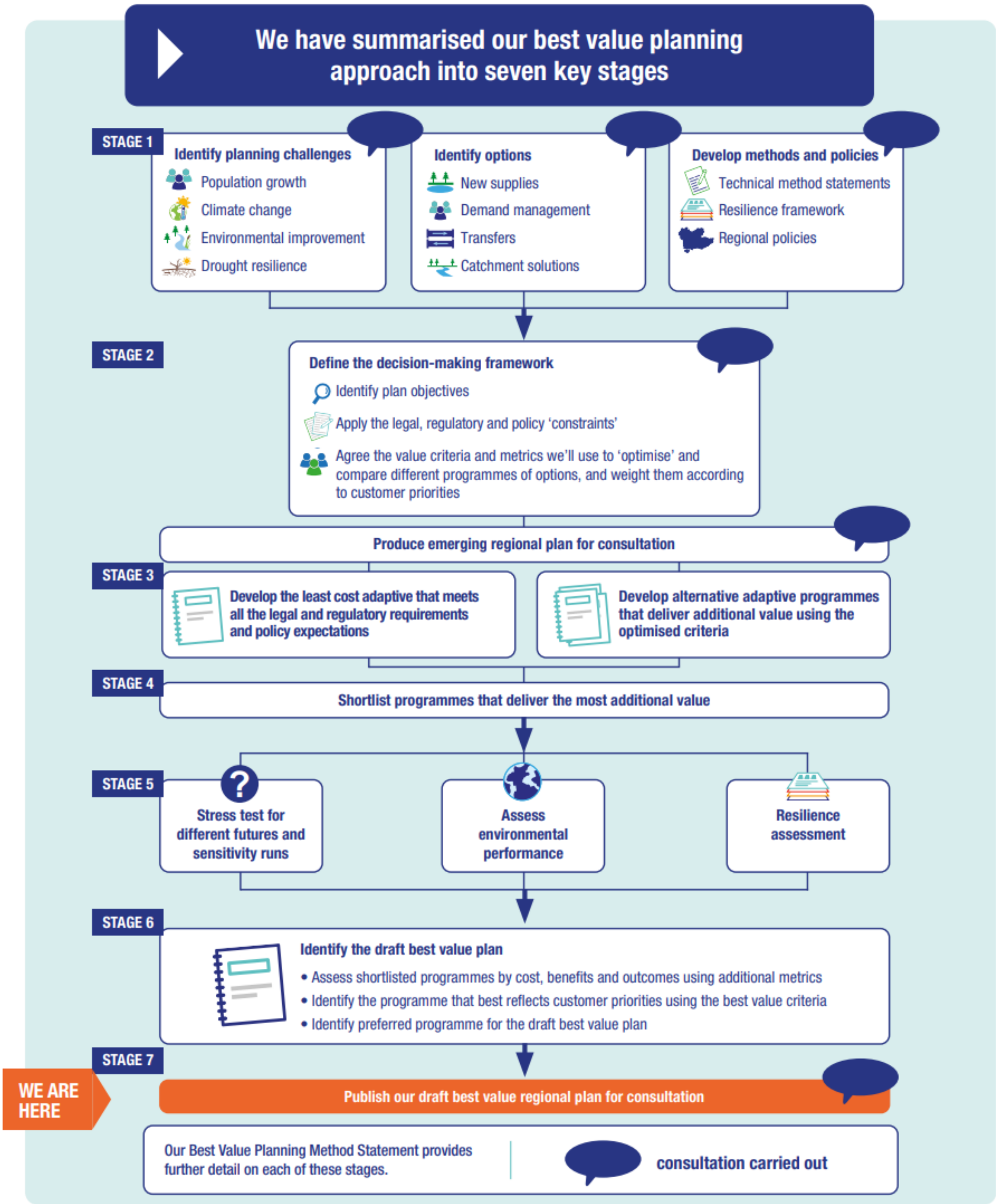


Figure 71 The regional approach to best value planning (from WRSE Draft Plan Annex 1, 2022)

8.4 Deciding on best value

We have followed the approach developed with WRSE and set out in their method statement[26] (Jan 2022) and in the summary note, *Developing or 'best value' multi-sector regional resilience plan*[27] (Feb 2022).

The investment model has been developed through the WRSE regional planning group. The model identifies the options needed to meet forecast deficits and schedules those programmes of options i.e. when each of the options needs to be implemented over the planning horizon.

The model has been set up to be able to optimise for a range of different objective functions and can examine and optimise for multiple functions at the same time. This means that it will always ensure that there are no deficits in any of the years over the planning horizon, but the way it selects the set of options to achieve this could be based on cost, or environmental benefit, or minimal carbon, and so on.

It can also be used to solve the deficit using several objective functions so that the solution optimises the values of both functions together – for example, it may solve for minimum cost and maximum environmental benefit, or minimum cost ad maximum resilience.

The range of objective functions that were available in the regional investment model are described in the WRSE method statement (Jan 2022).

8.4.1 Least cost plan

A series of least cost runs has been undertaken, in accordance with the WRPG. The model is run in adaptive mode, solving all the future branches and design drought conditions simultaneously, but optimising to minimise cost only (i.e. no other objectives are optimised).

The outputs from various runs of the least cost plan help to identify the options that are selected most frequently, and the potential tipping points along the adaptive pathways. This helps to inform decision-making around best value.

8.5 Factors considered in deriving the best value plan

Aside from cost, the regional plan considers the following **objectives to derive a best value plan**. These are to:

- Secure a wholesome supply of water to customers and other sectors (multi-sector plan) over the planning period. This is an absolute constraint – the plan must achieve this to receive approval.
- Deliver environmental and social benefit.
- Increase the resilience of the region's water systems.
- Deliver at an acceptable cost (i.e. not necessarily least cost, but one that provides other values to the environment and society yet is still acceptable to customers).

There is a set of value criteria for each objective, and where quantifiable, a value metric that allows the additional benefit of that value criteria to be accounted for.

[26] WRSE, *Method statement: Best Value Planning* (Jan 2022), https://www.wrse.org.uk/media/sy1bu4to/method-statement-best-value-planning.pdf

[27] WRSE, *Developing our 'Best Value' multi-sector regional resilience plan, our decision making framework* (Feb 2022) https://www.wrse.org.uk/media/imqmmxv2/wrse-best-value-business-summary-v22-spreads.pdf

Some of the value criteria are set as hard constraints and they must be satisfied. For instance, securing a wholesome supply of water and demonstrating how the selected plan will achieve this are essential. Other value criteria are used to show how additional value could be added, and the impact that this would have on cost. The value criteria and metrics are used to shortlist best value programmes of options and to aid in the comparison of alternative programmes of options – which solve the key constraint (ensuring no supply deficit over the planning period) but at different financial costs and with different additional value.

We examine the trade-offs between the anticipated additional value that different portfolios of options could provide against the least cost criterion to try to derive something that is best value for the environment, society and our customers.

To examine these objectives to derive best value, the regional investment model is run in 'Pareto mode'. That means it solves all the future branches for each design drought criteria, but with several objective functions – i.e. in addition to cost it may look at resilience, or environmental benefit.

There are almost always several different sets of options that could solve the plan, but at different cost and with different benefit values.

8.5.1 Resilience

We want to plan to be resilient to future uncertainties, and so through WRSE, a resilience framework was developed through which we can review our plan to ensure it provides resilience benefits in terms of both water supply and the natural environment. This is described in the WRSE resilience framework method statement. Resilience has been assessed in terms of:

- The baseline public water supply system.
- An assessment of the feasible options in terms of how and whether they provide resilience benefits.
- Assessments of alternative plans as part of the best value assessment.

A range of resilience metrics were identified and reported through WRSE. These have been combined to provide an aggregate score for each option assessed.

A key feature of this plan has been to improve the resilience of the Southeast to drought events. On the recommendations of the National Infrastructure Commission (NIC) (Preparing for a drier future, 2018), and in accordance with the WRPG, we plan to reduce the risk of needing to implement emergency drought orders (such as rota cuts or standpipes) to no more than once in every 500 years on average.

In accordance with the WRPG, a transitional period is allowed to move from planning to a level of 1-in-200 year drought events in the previous plan, to 1-in-500.

We aim to achieve system resilience to 1-in-500 drought events by 2038-39, in accordance with the wider WRSE region.

8.5.2 Drought permits and orders

Supply-side drought permits and orders can be used in severe droughts by allowing additional abstractions from certain sources, provided the permit or order is approved. This is a key component of drought management.

As we move towards increasing the resilience to droughts, the plan also considers that these supply-side options would remain available in very extreme droughts (i.e. of 1-in-500 year return period) but would aim to use them only where necessary and only use the permits or orders which are deemed to have the least potential to harm the environment.

Demand-side 'ordinary' drought orders (TUBS and NEUBs) are assumed to be available throughout the plan in accordance with the planned levels of service agreed with our customers.

It is important to keep the use of permits and orders as a measure companies can adopt, to reduce the risk of the potentially more significant need for emergency drought orders such as rota cuts and standpipes, which are generally considered unacceptable to customers.

8.5.3 Water saving policies

There may be a range of policies which influence the best value plan. Some may effectively be viewed as constraints, policies that will be implemented because it aligns with government policy or aspiration for society as a whole. While others can be considered as 'options' because they provide some benefit (increased supply or reduced demand for water) that helps to solve the planning problem we face, and so can be assessed for best value alongside other resource development options.

This sub-section sets out some of the policies that have been included within the best value adaptive plan.

8.5.3.1 Level of leakage

We have, along with all the companies in the WRSE region, committed to reducing leakage by 50 percent by 2050 (from the levels seen in 2017/18). The successful delivery of this policy, which is reflected in the baseline supply demand forecasts, will be kept under review on a regular basis to check whether it has been possible to successfully deliver the reductions.

Post-2050, where there are further leakage reduction options, these are considered in the conventional way against other options in the investment model.

8.5.3.2 Planned target level of per capita consumption

There is currently no mandatory national target for Per Capita Consumption (PCC) by households, although the Environment Agency have suggested that a national average of 110 litres per person per day could be achieved by 2050 (in a 'normal' climatic year – as we would generally expect demand to be higher during dry years), although this would be reliant on various government interventions that have not yet been introduced through legislation. For example, significant reductions in PCC through improved water efficiency are likely to require government policy around labelling white goods and tightening of building regulations.

There are numerous levels of Government intervention that have been sensitivity tested in the WRSE model, although one profile has been assumed within the Best Value Plan. Appendix 7C contains a WRSE technical note detailing the different profiles. This assumption of government intervention, along with the Portsmouth Water High plus demand management basket (with universal metering) in the best value plan would allow us to get below an average of 110 litres per person per day across our supply area.

8.5.3.3 Level of metering

To aid reductions in PCC and leakage, it is beneficial if all households are metered. This allows customers to make informed choices to adjust their water using behaviour as well as providing insight into levels of customer-side leakage. Typically, we see metered customers use less water than unmetered customers.

Because the South east is designated as an area of serious water stress, we can propose universal metering of all households. We have included a high plus demand management option to test a universal metering policy as part of our assessment of best value.

8.5.4 Environmental destination

We believe there is a widespread desire from our customers and stakeholders to protect our environment and enhance the resilience of the natural environment. This may include reducing our abstractions from existing water sources (rivers and groundwater) where there is a risk that the level of abstraction could cause unacceptable harm, particularly during drought events.

There is already an extensive programme to investigate the impacts of current abstractions through the Water Industry National Environment Programme (WINEP). To date, these have tended to look at priority sources in 5 year blocks.

However, in future, reductions to abstraction may need to go further, and so for this round of planning, longer-term environmental destinations (with licence capping) have been considered, to provide a longer-term view and an indication of what further reductions would mean in terms of investments. The scale of possible further reductions (beyond those identified in the WINEP investigations to date) could be very significant for us, although there is a great deal of uncertainty attached to the long term estimates.

Several environmental scenarios have been identified and agreed between the companies comprising WRSE, and we have fed our assessments into this process. These scenarios are one of the key factors examined in the adaptive pathways. Further information on our approach to environmental destination (with licence capping), is provided in Section 5.4.

8.5.5 Environmental assessments

Environmental assessments were conducted in accordance with the WRSE method statement on environmental assessments.

This covered assessments of each option, informing the development of the feasible options set, and an environmental review of shortlisted programmes of options.

This considers and compares the selection of specific options in terms of their environmental and social issues or benefits, to allow the selected programmes of options to maximise benefits, or to mitigate or minimise environmental risks or concerns where possible.

A cumulative assessment of the in-combination effects of options selected in a given programme was also conducted by WRSE to consider whether the combination of options may contribute to more severe concerns for a sub-region or WRZ.

8.5.6 Stakeholder and customer engagement

The process for stakeholder and customer engagement was described previously in Section 3 of this dWRMP24. This includes engagement with regulators during the development of this dWRMP24 and in the development of the emerging and draft regional plans.

The feedback from customers and stakeholders can influence the decisions on the preferred plan, informing the discussions and decisions of the trade-offs between costs and different best value criteria.

8.6 Stress testing the plan – "what if?"

To ensure that the solution is robust to future uncertainties, scenario and sensitivity analysis was undertaken. This is described in more detail in Section 9. Through this performance testing analysis, we are typically examining 'what if?' questions:

- What if - a key scheme cannot be delivered? A particular area of focus in the scenario testing is to explore the robustness of the plan to risks that key schemes cannot be delivered. The purpose is to identify the alternative schemes that are or may be needed.
- What if - a key scheme is significantly more costly or does not deliver the expected benefits? the purpose again is to identify the alternative schemes. This may also include assumptions around demand management i.e. what if the leakage reduction target is not achieved, etc.

Through the adaptive planning process, we already cover many of the 'what if?' questions relating to uncertainties in forecasting supply and demand components, such as population growth, customer behaviour, impacts of climate change, impacts of environmental destination on the available sources.

The stress testing can help to identify and finalise triggers and timing for the final adaptive pathways used for the preferred plan. In this way, the whole process is iterative, involving multiple reviews and feedback mechanisms.

Section 9 of this dWRMP24 describes the scenario and sensitivity testing carried out as part of the WRSE investment modelling, and its relevance to us in deciding our preferred best value plan. A series of comparisons for different objective functions is used to assess the relative merits of difference scenario and sensitivity runs.

Such runs can help to identify alternative programmes of options.

8.7 Our preferred plan – an adaptive best value plan

As described previously, we have taken the outputs from the WRSE regional investment model, which solves the regional planning problem, and have reviewed and refined this where necessary to reflect the preferred plan for our customers.

As described in the WRSE method statement (Jan 2022), there is an iterative process involving the selection of the preferred plan, with provisional plans reviewed by the water companies to allow us to assess the plan at WRZ level and submit proposals for minor amendments where appropriate. Minor changes are driven by WRZ-specific factors and with practicalities of delivering the plan in a timely fashion.

This iterative review phase also involves a review of the adaptive pathways and in particular the key decision dates for delivery of the plan, ensuring they are clear, practical and achievable, and that suitable monitoring can be implemented to assist the identification of when a change to an alternative pathway needs to be triggered.

In our preferred best value plan presented in Section 10, we have only reported on those options and activities that directly relate to our supply area. This includes any regional schemes that may also provide additional resilience or other benefits to our supply area.

Through the performance testing described in Section 9, we can understand the implication for our company of excluding some regional schemes. For example, Southern Water's scheme to use Havant Thicket Reservoir as part of a water recycling scheme.

9 TESTING THE PLAN

9.1 Introduction

This section, and the accompanying Appendix 9, sets out how we tested the sensitivity of our best value plan against changes to the baseline assumptions used, and what insights this provided about the resilience of our best value plan.

After considering potential risks to the plan including population growth, climate change, sustainability changes, resilience, risk profile and delivery of our preferred programme, we have selected appropriate sensitivity tests to understand and identify strategic alternative schemes or plans.

The decision-making approach already adopts an adaptive planning approach, solving nine different plausible future scenarios simultaneously relating to the impacts of population growth, climate change and environmental destination on availability of sources. Some degree of testing is therefore inherent through that adaptive planning process. This has been described previously in Sections 2 and 8.

The **purpose of this section is to explain how we stress tested the plan** for a range of other "what if?" scenarios, to **ensure it is as robust as possible.** By demonstrating the resilience of our best value plan to a range of sensitivity tests we confirmed the decision that our best value plan is also our preferred plan for dWRMP24.

As described previously, the investment modelling was carried out at the WRSE regional level. The range of assessments and scenario tests has been used to inform the development of best value through the regional planning group. All the contributing water companies have been involved in reviewing and challenging the outputs, and identifying key scenarios for testing, so that, across the region, we can be confident in our plan.

What we present in this Section are the stress testing outputs that are relevant to the derivation of our preferred plan, for our customers. We do also provide commentary around the implications of some of the regional schemes for our supply area.

Our preferred best value plan is described in in Section 10.

9.2 Stress testing

We have identified a number of key areas of stress test relevant to our dWRMP24. These include the following:

- Demand management.
- Environmental destination.
- Excluding the options to use drought measures to reduce customer demand.
- Bulk supplies with neighbouring water companies.
- Excluding the Havant Thicket Reservoir effluent recycling option.

Many other stress tests have been applied during development of the regional plan. These key areas were chosen to test how resilient the best value plan is by assessing how it performs if our planning assumptions turn out to be very different to our expectations.

Table 43 presents the sensitivity tests that were carried out, what the impact on the outputs of the regional investment modelling were, and what insight this has provided about the resilience of our best value plan.

Table 43: Sensitivity runs, and what their results have told us about the best value plan

Description of sensitivity test carried out	Why we chose this sensitivity test	The key features from this run on the best value plan	What this told us about the resilience of our dWRMP24.
We tested the plan with lower assumed demand management savings. We achieved this by not allowing high plus or high demand option baskets to be selected in the modelling.	This tests the resilience of the plan if the government doesn't introduce mandatory water labelling, leakage activities fail to deliver, or customers water use remains as it is currently despite the introduction of universal metering.	More water would be imported from Southern Water under the high environmental destination scenarios in the 2040's and beyond.	The impact of a reduced water saving from demand management is that we are in a less strong position to support our neighbours and are likely to rely on imports from Southern Water under high environmental destination scenarios – so are more reliant on the development of Southern Water's strategic resource options.
We compared the different environmental destination futures We achieved this by modelling what would happen if the environmental destination were brought in at a medium impact from 2028-29 (instead of the low environmental destination which is assumed until 2040 in each of our 9 supply demand balance situations, as set out in Section 2)	Environmental destination is a dominant and significant driver of potential deficit over the planning period. The inherent uncertainty around its impact on the investment needed to ensure a reliable future water supply is its reliance on assumptions. The test was requested following our discussions with the Environment Agency on our environmental destination (with licence capping).	At the regional level, this scenario was unsolved – meaning there was a residual deficit early in the planning period because there were simply not enough options that could be brought in early enough to meet the increased regional deficit driven by the medium environmental destination compared to starting at low. For our supply area, the water available for use in the years 2029–2040 is around 9 Ml/d lower than in the best value plan example.	An earlier move to the medium environmental destination scenario would prove challenging for our supply area and our neighbouring water companies too. The Havant Thicket water recycling scheme would be utilised to a greater extent earlier in the planning period (i.e. throughout the 2030s in all pathways). We would have less water available to provide to Southern Water via a bulk supply. The mitigation for this is to monitor the progress of the WFD no deterioration studies and option appraisals (WINEP)

Description of sensitivity test carried out	Why we chose this sensitivity test	The key features from this run on the best value plan	What this told us about the resilience of our dWRMP24.
			carefully over the first five years of the planning period.
We excluded drought interventions that aim to reduce demand (Temporary Use Bans and Non Essential Use Bans)	The purpose of this run is to examine whether the plan can solve the deficits without the ability to select media, TUBS or non-essential use ban options.	At the regional level, this scenario was unsolved. This means there was a residual deficit in the planning period because there were simply not enough alternative options that could be brought in to make up for the lack of drought interventions. The key difference for our supply area is that, in the high environmental destination scenarios, the need for an import from Southern Water is brought forward to the early 2040s (in contrast to the best value plan, when these are not required until 2049 at the earliest). The existing bulk supply exports to Southern Water under these scenarios tend to cease, but for the lower environmental destination scenarios they continue through the planning period to some degree.	No additional options have been triggered for us.

Description of sensitivity test carried out	Why we chose this sensitivity test	The key features from this run on the best value plan	What this told us about the resilience of our dWRMP24.
We reduced bulk supplies with neighbouring water companies Currently, we are a **net provider of water to our neighbouring water supply areas, which contributes to greater regional resilience**.	Our ability to provide a 9 Ml/d bulk supply to Southern Water from 2024-25 is linked to the success of on-going borehole investigations at our Source J. We wanted to check whether excluding the 9 Ml/d bulk supply would trigger the development of other resource options to be developed by neighbouring companies.	There is less risk of the need for non-essential use bans or the Source S drought permit during the first 5 years of the planning period Other than that, there is little other changes to our plan. There is, however, a small deficit in the initial years of the plan for Southern Water's HSE WRZ, which is where the 9 Ml/d bulk supply driven by Source J would have been supplied to.	No additional options have been triggered for us. Southern Water is aware of the delivery risks to the Source J scheme and therefore the 9 Ml/d bulk supply.
Excluding the Havant Thicket recycled water recharge option A scenario has been run without the strategic water reuse scheme being able to refill Havant Thicket Reservoir to explore its impacts on the region and our supply area.	The recycled water recharge option received several comments from customers and stakeholders during the pre-consultation on the regional emerging plan.	The high environmental destination scenarios require an import from Southern Water from the 2040s onwards, and the maximum magnitude of this is just under 40 Ml/d. Under these circumstances, the existing supplies to Southern Water's Hampshire area cease (although there may be a small supply to Southern Water's Sussex North WRZ.	No additional options have been triggered for us. Whilst the existing bulk exports tend to continue under the low and medium environmental destination scenarios, they may not always be able to meet the full capacity amount. We have discussed this run with Southern Water, so they are aware of the impact on their plans.

The best value plan performs well and shows itself to be robust in the face of the uncertainties examined in the sensitivity runs carried out i.e. the core option components of our plan remain stable under each of the different stress tests it was tested against.

We are intrinsically linked to the resilience of the region. We are a net provider of bulk supplies to neighbouring company areas throughout the first 15 years of the plan at least, and under the medium or low environmental destination scenarios throughout the whole planning period.

We remain a net exporter of water through the planning period, except under the higher environmental destination scenarios from the 2040s onwards. In some circumstances, driven only by the high environmental destination scenarios, later in the planning period, we can reduce or cease our existing exports and start to import water from Southern Water.

The impact of a reduced water saving from demand management is that we are in a less strong position to support our neighbours and are likely to rely on imports from Southern Water under high environmental destination scenarios. We become more reliant on the development of Southern Water's strategic resource options.

No key alternatives are required in our plan. However, the strategy may be impacted under high environmental destination scenarios if the Southern Water water recycling scheme is not deliverable. An alternative strategic option or options will need to be developed by Southern Water.

Our best value plan has been shown to be resilient to key potential risks in baseline assumptions. This being the case, no changes have been made to our best value plan before confirming it to be our preferred plan for dWRMP24.

10 OUR PREFERRED BEST VALUE PLAN

10.1 Summary of our preferred best value plan

This section draws together the findings from each of the previous sections and presents the details of our preferred best value plan to increase resilience to drought events and maintain the supply-demand balance across our supply area over the 50-year planning period from 2025–26 to 2074–75.

Our preferred plan resolves the supply-demand deficit identified in Section 6 using the feasible options identified in Section 7. Section 8 describes the process of developing this plan, and Section 9 describes the sensitivity runs that tested the resilience of this plan.

Our preferred plan is based on pathway / situation four of the adaptive planning pathways described in Section 2. This is based on local authority housing plans, CC06 climate change forecasts and prepares for a high level of impact on our existing supplies to deliver environmental ambition and cap existing abstraction licences at recent actual levels.

Our dWRMP24 preferred best value plan consists of the following components:

Starting in 2025–26: Implementation of the 'high plus' basket of demand management measures which aims to reduce leakage by 50 per cent and overall customer demand for water by around 16 per cent by 2050 compared to 2017–18 levels. This basket of measures includes universal household 'smart' metering over 10 years starting in 2025–26. Existing 'dumb' meters will also be replaced with smart meters, ensuring by 2040 every household meter will be smart. By 2034–35 we expect that 94 per cent of the households we serve will have a meter, compared with 37 per cent in 2021–22. Installing 'smart' meters will deliver added benefits to reducing water demand, the data from the meters will help reduce leakage inside and outside properties and improve the quality of our customer engagement.

From 2025–26 until 2039–40: When required in extreme events, the continued use of existing drought schemes in accordance with our drought plan (temporary use bans, non-essential use bans and our supply-side Source S drought permit). Beyond 2039-40 the Source S drought permit is no longer used, although the implementation of temporary use bans and non-essential use bans is continued.

From 2025–26: Continued provision of existing and planned bulk supplies to Southern Water, including the Havant Thicket and Source J bulk supplies from WRMP19. This involves providing up to a 15 Ml/d transfer to Southern water at our eastern border and providing up to a 24 Ml/d transfer to Southern Water at our western boundary from 2025, rising to a 45 Ml/d capacity transfer by 2030. The actual transfer rates vary throughout the planning horizon depending on the amount of water we have available for transfer and the needs of Southern Water. The delivery of the bulk supply linked to our Source J is also reliant upon the success of on-going borehole investigations.

Starting in 2026–27: To optimise the effectiveness of our own water efficiency efforts, our best value plan assumes that the Government will introduce mandatory water labelling for white goods and strengthen water regulations standards to improve water efficiency in homes. This assumption has been applied consistently across the WRSE regional planning area and discussed with regulators.

By 2030: A network enhancement to improve the way we can move water resources around our supply area.

By 2049: Bulk import of potable water from Southern Water to the west of our supply area. This represents a reversal of flow in the existing and planned bulk supplies to Southern Water. Once Southern Water has more water in Hampshire through the delivery of a supply development detailed within the WRSE draft regional plan and Southern Water's dWRMP24, we would be able to start receiving supplies from Southern Water to support our own supplies in future.

In addition to the above components, a WINEP programme will take place in two phases over the first 10 years of our WRMP24. The programme includes environmental assessments for all the river catchments in our supply area, to ascertain the extent of any capping or reduction of our abstraction licenses necessary to deliver improvements for the environment (our environmental destination). Developing the evidence base will determine what reductions are required to our current sources of supply to achieve good ecological status of the water bodies in our area. There is a possibility that less demanding abstraction reductions could be required following these no deterioration studies and would inform future WRMPs. The scale of future sustainability reductions (our environmental destination) is a key driver of the level of investment needed to meet potential future deficits.

This dWRMP24 fully aligns with the outcomes of the WRSE draft regional plan. It is consistent with our previous plan (WRMP19) and aligns with the stated preferences of our customers in engagement work we have undertaken to date both through the WRSE and directly.

10.2 Selecting our draft Preferred Plan

This Preferred Plan has been developed and proposed through our participation in the regional planning process.

We have developed data inputs to the regional plan modelling, contributed to developing and approving the approaches and methodologies used. We have participated in the discussions and approval process for developing the Plan. Key decision points were discussed and agreed as a regional group via vote.

Section 8 sets out the decision-making process for this draft Preferred Plan, based around core metrics, regulatory requirements and stated government preferences. The timing of delivery of the options and other measures in the draft Preferred Plan has been optimised to balance customer and environmental resilience with the affordability of the programme and deliverability of supply and demand schemes.

Section 9 describes how we used the regional modelling process to test the sensitivity of the plan to some alternative scenarios based upon what were considered the main areas of uncertainty around supply and demand. The testing demonstrated the resilience of the draft Preferred Plan to a range of risks, including possible future sustainability changes. We believe the plan is robust to minor changes in supply and demand forecasts in the near future and moderate changes as the plan progresses.

As a check that we had confidence in the regional draft plan provided, we have discussed the plan with our regulators and key stakeholders and compared the results with the findings of our customer research and our SEA. We are satisfied that there is no reason for us to challenge the regional plan based on our customer research.

The preferred plan is integrated with the SEA Environmental Report and as a result performs well against SEA objectives. In addition, it has been identified that environmental improvements can be delivered in many areas through scheme design and catchment management.

10.3 Our draft Preferred Plan

We consider the options presented here to be the most appropriate to adopt over the next fifty-year planning period to maintain the balance between water supply and demand.

Our preferred draft plan is summarised in Table 44, outlining the selected options and their planned start dates.

Table 44: Our dWRMP24 preferred plan

Component	Average Incremental Cost (p/m3)	Year first utilised in the Preferred Plan	Max Ml/d benefit delivered by option (DYAA)	Max Ml/d benefit delivered by option (DYCP)
Demand Basket “High Plus” comprising: • Universal metering, and adoption of smart meters • Leakage reductions of 50 per cent by 2050 • Enhanced water efficiency activity	122	2025–26	The demand option increases each year. The cumulative saving is expected to be 39.14 Ml/d for both annual average and critical period planning conditions.	
Upgrade of Source O Booster to 25 Ml/d	10	2029–30	2.38 Ml/d in a 1-in-200 year event and 1.30 Ml/d in a 1-in-500 year event.	3.23 Ml/d in a 1-in-200 year event and 1.58 Ml/d in a 1-in-500 year event.
Bulk import of potable water from Southern Water to the west of our supply area This option is driven by the impact of environmental destination on existing water supplies. It is only selected for adaptive situations 1, 4 and 7. These are the situations that include ‘high’ environmental destination.	49	2048–49	This option is first selected for use in 2048–49 as providing 8.5 megalitres per year under dry year annual average conditions and is used at greater and less volumes every year for the remainder of the planning period. The most this option is used is in 2064-65 when it provides 33.8 megalitres per year under dry year annual average conditions.	
Continue existing bulk supplies to Southern Water.	n/a	Transfers are assumed to be available for the whole planning period, although the amount of water that is	Effectively maintains the existing bulk supplies by continuing them when the current bulk supply agreement was due to end. This includes the assumptions that, under all return periods, we would be able to provide the following:	

Component	Average Incremental Cost (p/m3)	Year first utilised in the Preferred Plan	Max Ml/d benefit delivered by option (DYAA)	Max Ml/d benefit delivered by option (DYCP)
		assumed to be used fluctuates in response to demand and to the amount of water we have available.	in 2027 we will extend the existing bulk supply agreement Export: PWC at SRN Source D extension (up to 15 Ml/d) in 2030 we will extend the existing 15 Ml/d bulk supply agreement from Source A and the AMP7 Source J 9 Ml/d agreement (maximum capacity and utilisation is 24 Ml/d) Havant Thicket bulk supply of up to 21 Ml/d plus 11.52 Ml/d conjunctive use benefit of using the reservoir as an integrated part of the existing Portsmouth Water and Southern Water supply systems.	
Continue to use existing drought options in accordance with our drought plan. Supply-side drought permits are not available for use after 2039–2040 when the level of resilience that is planned for in the WRMP improves from a 1-in-200 to a 1-in-500 year drought event. Non-essential use bans Temporary use bans Drought Permit: Source S	n/a n/a 44	Temporary Use Bans and Non Essential Use Bans are both available to use during drought events throughout the planning period. Drought permit option available from the start of the plan in 2025–26 until 2039–40	7.3 Ml/d in a 1-in-200 year event 6.5 Ml/d in a 1-in-500 year event 9.3 Ml/d in a 1-in-200 year event 10.8 Ml/d in a 1in 500 year event 3.6 Ml/d in a 1-in-200 year event 1.3 Ml/d in a 1-in-500 year event	7.3 Ml/d in a 1-in-200 year event 7.00 Ml/d in a 1-in-500 year event 9.3 Ml/d in a 1-in-200 year event 13.8 Ml/d in a 1in 500 year event 4.5 Ml/d in a 1-in-200 year event 1.00 Ml/d in a 1-in-500 year event

10.4 Options to reduce demand

While individual demand management options were identified and screened through our options appraisal process (see section 7.3), demand reduction interventions (including leakage reduction measures) were included within the WRSE investment modelling as combined strategies, or baskets of measures, that provided **total** demand reduction timeseries, rather than the costs and savings (demand reductions) associated with each measure acting in isolation. This ensures that the scale of savings that can be achieved is aligned to the water resources problem faced and allows for potential efficiencies with running combined demand management activity to maximise the potential savings and minimise costs.

One of these combined strategies, known as the 'High Plus' Demand Basket, was selected in the regional investment modelling. It includes universal metering, leakage reduction, household demand reduction and non-household demand reduction. This basket of demand management activities was based on agreed regional reduction strategy targets[28] (and so aligns with the other water companies in the South East, with the addition of universal metering).

This basket of measures incorporates the universal compulsory metering of our customers in a programme starting in the first year of AMP8 (2025) and being delivered over a 10 year period (other companies in the southeast have previously implemented universal metering and so this measure increases alignment across the water providers in the southeast). The metering effort will be supported by the full range of supplementary activities to deliver the maximum reduction in demand, such as water use audits, the supply of water efficient devices, a leak repair policy and tailored messages to customers based on individual household usage.

The savings from these activities under the high plus demand basket were calculated for three planning conditions (NYAA, DYAA, DYCP). They are forecast to reduce the per capita consumption for our customer base to 119 litres per person per day in a 'normal' year by 2050.

The National Framework for Water Resources contains an aspiration to achieve a national average of 110 litres per head per day by 2050. This took forward and increased an earlier target developed by the National Infrastructure Commission (NIC) in their 2018 report 'Preparing for a Drier Future', which was to reduce the demand for water by around 1,400 million litres per day (Ml/d) by 2050. This equates to a per capita consumption (PCC) of 118 litres per head per day (l/h/d) by 2050.

However, to reach these national aspirations for domestic water use, it is expected that it will require, in addition to water company activity, government action to improve water regulations and introduce a mandatory water labelling scheme. An increasing saving over time has been included in our planning because of these anticipated government actions, however there is a risk that delay in implementation of these actions will result in the assumed savings not being achieved. These risks are allowed for in the adaptive planning approach.

[28] The WRSE targets are set out in WRSE technical note, "Task 4e Technical Note Alignment of Demand Management Strategies and Options, March 2021'

Year	2035–36	2039–40	2044–45	2049–50	2059–60	2074–75
Anticipated demand reduction in our supply area (in Ml/d) due to government demand interventions, for DYAA planning conditions	3.26	4.98	5.10	8.72	10.75	22.27

Figure 72: Demand reduction forecast due to government demand management interventions

Considering the high plus demand basket and the government led demand interventions in combination, achieves a forecast pcc of 109 by 2050.

This 'high plus' demand basket is ambitious and will deliver a step change in water use across our supply area through working with customers to empower them to understand and manage their water use. It is also an important contribution to the delivery of the 2022 UK Water Efficiency Strategy[29].

10.4.1 Leakage

In line with national aspirations, we aim to deliver a 50 per cent reduction of leakage by 2050, measured against a base year level in 2017–18, and then an additional two per cent each subsequent 5-year AMP period following 2050. These ambitious leakage targets have been adopted by all water companies in the region. We have undertaken leakage modelling to identify how we could achieve these reductions in the most cost efficient and optimal way.

We believe we would be able to achieve this through existing technologies, although at increased cost compared to current spend on leakage. This is because as leakage levels reduce the cost of further reducing leakage increases as the remaining leaks are harder to find. Progressively as overall leakage reduces, each leak is more resource intensive to find, and once fixed, saves a smaller volume of water.

Section 7 (options) shows the increased activities required to continue to reduce leakage to the level set out in the high plus demand basket.

We, and the water industry, are committed to finding more cost-effective ways to reduce leakage and are continuingly reviewing and implementing innovative technologies, to reduce the costs of reducing leakage.

We are also heavily involved in the development of the leakage road map, working with the rest of the industry.

10.4.2 Universal metering– delivered within 10 years.

Our plan is to install 206,000 smart domestic meters in the first 10 years of the planning period (in AMP8 and AMP9). This will be supported by a programme of communications and engagement to maximise water savings and support vulnerable customers to ensure water remains affordable for all.

[29] UK Water Efficiency Strategy to 2030, Waterwise, 2022, www.waterwise.org.uk

This component of the high plus demand basket includes a continuation of our baseline assumptions of metering of voids, but the removal of change of occupancy metering and a steep drop off of optant metering numbers as universal metering is implemented. Existing dumb meters reaching the end of their deployable life will be replaced with smart meters and by the end of a 15 year deployment period all meters will be smart. This will provide additional service benefits in helping to identify customer supply pipe leaks and network operability, in addition to supporting customers to understand their water using behaviour and providing a financial incentive to save water.

This metering programme is anticipated to increase the company's overall level of meter penetration to 72 per cent by 2029-30 and to 94 per cent by 2034-35. This will bring our supply area in line with the metering penetration across the rest of the Southeast of England.

10.4.3 Water efficiency

Our 'High Plus' basket of demand activities, as currently conceived, aligns with the roll out of universal metering as well as supporting all existing metered household and non-household customers.

It includes the following for household customers:

- A community reward programme to engage newly metered customers and all existing metered customers.
- Home audits for newly metered customers and all existing metered customers switching to a smart meter.
- Home audits for identified high water users.
- Provision of water efficient devices via web orders and as part of home assessments.

Non-household site assessments are also planned for all education establishments and will also be available virtually for small businesses.

An online engagement platform will also be available to all businesses by the end of the plan period and site leak detection will be offered to the highest 10% of non-household water users (assessed by volume).

10.5 Options to improve supply

10.5.1 Upgrade to Source O Booster

This option was developed because of our recent Pywr water resources modelling to improve our understanding of how our system behaves against a wider range of stochastically generated climatic conditions.

We have identified that by upgrading one of our network booster stations to increase the quantity of water we can move from one area of our network to another from 10 Ml/d to 25 Ml/d we can 'unlock trapped deployable output'. This booster upgrade improves the way we will be able to move water around our supply network when we need it most in dry weather events.

10.5.2 Bulk import from Southern Water to the west of our supply area

We currently provide bulk exports of water to Southern Water. This option represents a reversal of flow in the existing bulk supplies so that we would instead receive water from Southern Water through existing pipelines.

It is first selected for use in 2048–49 as providing 8.5 megalitres per year under dry year annual average conditions and is used at greater and less volumes every year for the remainder of the planning period. The most this option is used is in 2064-65 when it provides 33.8 megalitres per year under dry year annual average conditions.

This option is driven by reductions to our existing supplies in the event of high environmental destination impact. It is enabled by regional options outside of our supply area providing Southern Water with more water in Hampshire, so water is available to meet our forecast demand.

10.6 Options in Southern Water's preferred draft plan with potential to impact our customers

The Southern Water dWRMP19 describes planned exports from Havant Thicket Reservoir (to Southern Water's supply area zones to the West and to the East of Portsmouth Water). Their preferred plan also contains the following Strategic Resource Options (SROs), starting in 2031 and relying on Havant Thicket reservoir.

- Conjunctive benefit in water available for use resulting from using the system after the development of Budds farm recycling to Havant Thicket
- Recycling: Recharge of Havant Thicket reservoir from Budds Farm and new water recycling plant (60 Ml/d)

Under current plans, for which we have received planning permission for Havant Thicket Reservoir, the water in the reservoir would be used to supply our customers. As a result, if these future proposals were to go ahead it is important to note that some of our customers would receive recycled water as part of their normal drinking water supply.

These proposals would be funded by Southern Water's drinking water customers and our customers would see no changes to their bills because of these plans.

These schemes require approval from us to proceed and we will not give our approval unless we are completely satisfied with the results of the water quality modelling. As a result, the scheme will not progress without sufficient evidence that the water quality will meet the required standards. We will take customer consultation responses into account.

We are committed to ensuring that all the environmental and community commitments made in the original planning application for Havant Thicket Reservoir would be maintained if these plans were to go ahead.

As well as collaborating on current and future schemes, we are working with Southern Water to develop a joint Water Resources model of the Hampshire region to allow a more detailed assessment of the conjunctive use benefit of Havant Thicket for both companies across a range of configurations, stochastic drought events, and scenarios. Analysis from the joint water resource model will be included in our Revised WRMP24. More widely, it will enable future water resources modelling studies for both companies, in support of the solution for Hampshire, and specific assessments supporting analysis of the Thames to Southern Transfer (T2ST) and Havant Thicket Reservoir Strategic Resource Options (SROs).

10.7 Final planning supply demand balance

The 'final planning' supply-demand balance includes the influence of the preferred draft plan options.

The options selected as part of the preferred plan will balance supply and demand over the 50 year planning period while increasing resilience from a 1-in-200 year design drought until 2038–39, to a much more severe 1-in-500 year design drought from 2039–40 onwards.

Implementing the preferred options at the right time over the planning horizon should, enable us to continue meeting our planned levels of service (set out in Section 1.8) to customers throughout the planning period.

Figure 73 and Table 45 show that the preferred plan balances supply and demand throughout the planning period under dry year annual average conditions. The preferred plan is driven by the need to resolve a baseline deficit forecast under annual average conditions. Figure 74 and Table 46 show the same, but for dry year critical peak conditions, with a healthy surplus throughout the planning period.

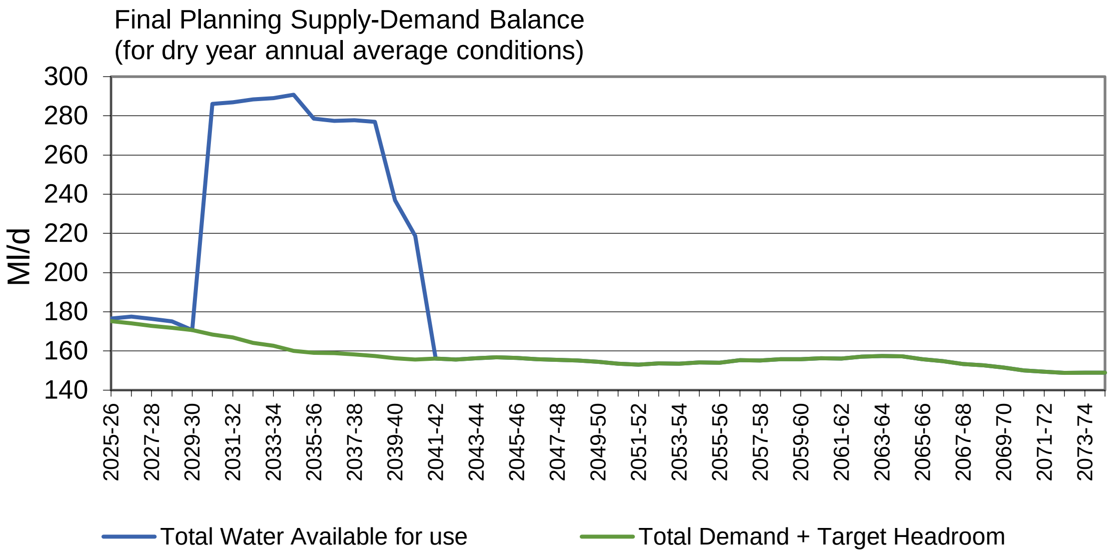


Figure 73: Final Plan supply demand balance for dry year annual average conditions

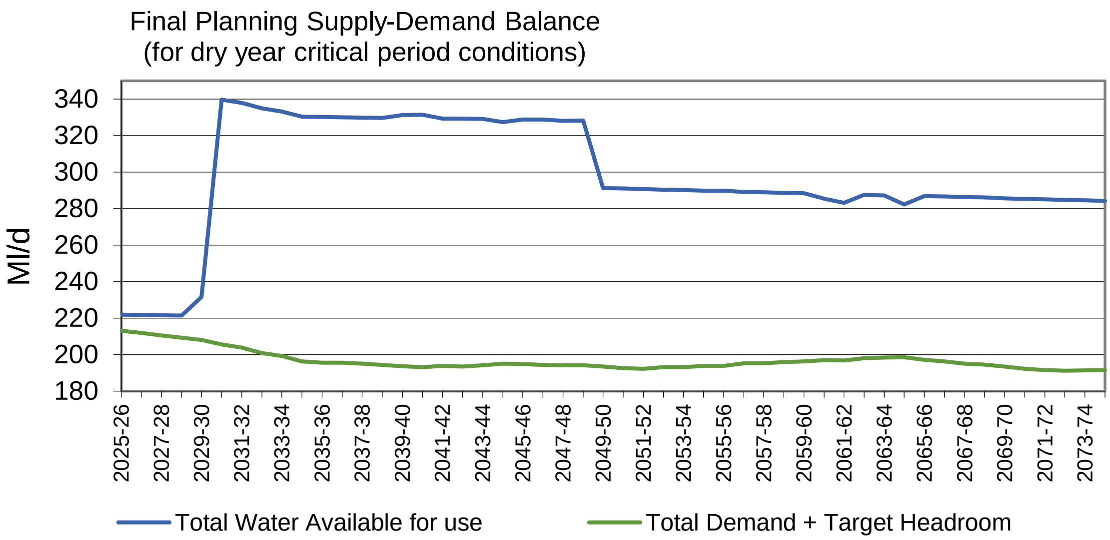


Figure 74: Final Plan supply demand balance for dry year critical period conditions

The surplus within our preferred plan in the 2030s is associated with spare resource that is available from Southern Water's water recycling option. The WRSE investment model represents a collaborative approach, and any excess water needs to be assigned to a specific WRZ. At present it is assigned to our WRZ in the model, although this will be reviewed between dWRMP24 and final WRMP24.

The WRSE investment model currently assumes that it's prudent to build a larger capacity water recycling scheme as part of an adaptive planning approach, although the full capacity is not required until the 2040s. In part the increased need for water in the 2040s is driven by the shift from a 1-in-200 year level of resilience to 1-in-500 year. It is possible that Southern Water will apply a modular approach to developing the water recycling option, given that a lower capacity is required during the 2030s.

Table 45: Final plan supply demand balance for key dates over the planning period for dry year annual average conditions

Year	2025–26	2029–30	2034–35	2039–40	2044–45	2049–50	2059–60	2074–75
Supply in Ml/d WRP 11FP	175.52	172.96	290.76	236.96	156.80	154.42	155.80	148.98
Demand in Ml/d WRP 45FP	171.46	166.94	156.82	153.82	154.21	151.79	153.25	146.73
Target headroom in Ml/d WRP 48FP	4.06	4.80	4.31	3.22	2.54	2.44	2.41	2.17
Supply Demand Balance in Ml/d WRP 50FP	0.01	1.21	129.64	79.92	0.06	0.19	0.14	0.09

Table 46: Final plan supply demand balance for key dates over the planning period for dry year critical peak conditions

Year	2025–26	2029–30	2034–35	2039–40	2044–45	2049–50	2059–60	2074–75
Supply in Ml/d WRP 11FP	221.94	235.05	330.39	331.28	327.38	291.19	288.47	284.30
Demand in Ml/d WRP 45FP	212.11	207.38	196.60	194.45	195.87	194.56	197.59	193.38
Target headroom in Ml/d WRP 48FP	5.58	5.51	4.92	4.04	3.55	2.96	2.86	2.62
Supply Demand Balance in Ml/d WRP 50FP	4.24	22.15	128.87	132.80	127.96	93.67	88.02	88.30

10.8 Our draft Preferred Plan in a regional context

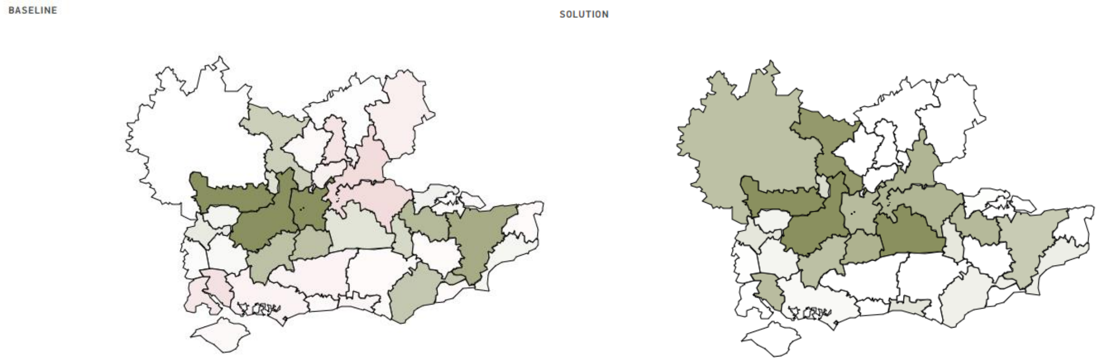
Our draft Preferred Plan not only supports our own future challenges, but also supports a resilient reliable water resources solution for the South East region.

The following regional maps showing the scale of the supply demand balance in Ml/d before and after the draft Preferred Plan options have been implemented.

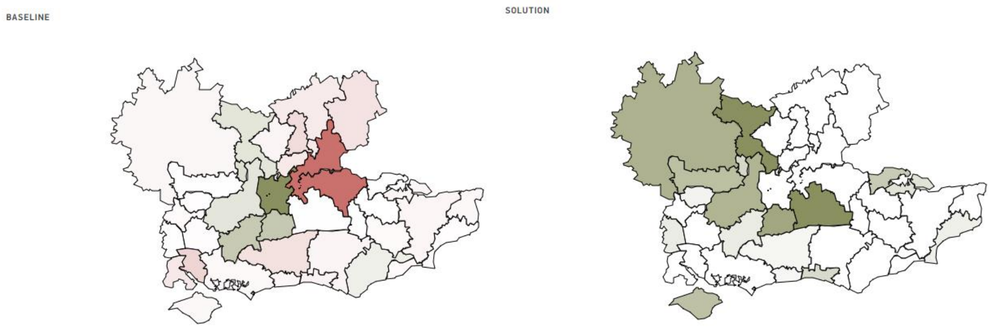
Key to the regional supply demand balance, by water resource zone in Ml/d.

-350	-300	-250	-200	-150	-100	-75	-50	-25	-10	-5	0	5	10	25
-350	-300	-250	-200	-150	-100	-75	-50	-25	-10	-5	0	5	10	25

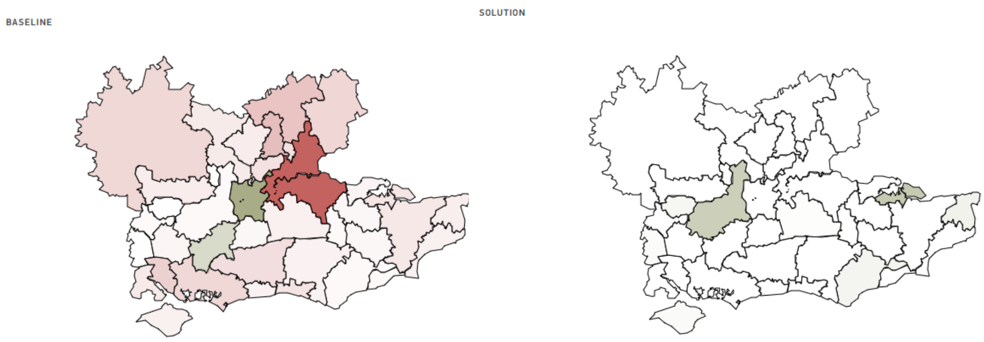
Baseline and final supply demand balance for all situations (DYAA) for 2025–26



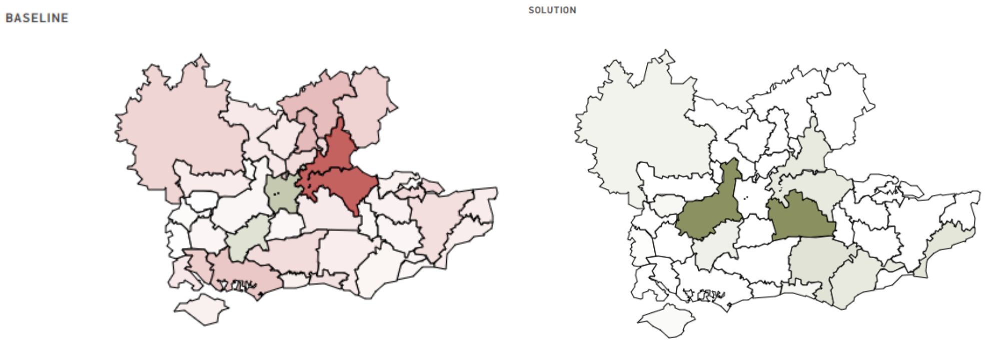
Baseline and final supply demand balance for situation 4 (DYAA) in 2035–36



Baseline and final supply demand balance for situation 4 (DYAA) in 2049–50



Baseline and final supply demand balance for situation 4 (DYAA) in 2074–75



10.9 Adaptive planning and strategic alternatives in our draft Preferred Plan

Through the process of adaptive planning and considering strategic alternatives to our plan, we considered the modelling outputs of all nine adaptive planning pathways, and a variety of optimisations to consider both what plans would look like if it was optimised on Least Cost, or on producing the best environmental and social metrics.

Comparing outputs for all nine adaptive pathways for our best value plan, our draft Preferred Plan is resilient and largely unchanged across the variety of adaptive planning situations considered.

Table 47: A comparison of when options are triggered to resolve each of the nine adaptive planning situations.

	Adaptive planning situation (DYAA)								
	S1	S2	S3	S4	S5	S6	S7	S8	S9
Portsmouth Water Demand Basket High Plus	2026	2026	2026	2026	2026	2026	2026	2026	2026
Upgrade Source O Booster to 25Mld	2030	2030	2030	2030	2030	2030	2030	2030	2030
Bulk import of potable water from Southern Water	2054	n/a	n/a	2049	n/a	n/a	2049	n/a	n/a
Continuing drought measures until 2040									
Drought Permit: Source S	2026	2026	2026	2026	2026	2026	2026	2026	2026
Non-Essential Use Ban (NEUB)	2026	2026	2026	2026	2026	2026	2026	2026	2026
Temporary Use Ban (TUB)	2026	2026	2026	2026	2026	2026	2026	2026	2026

Figure 75 shows the total expenditure of the best value plan driven by each of the nine adaptive planning supply demand balance situations. The more costly pathways / situations to resolve are those defined by high climate change impact and high impact of sustainability reductions and licence capping to meet environmental destination.

Although the differences between the local authority housing and Ox-Cam housing plans didn't make any difference to the supply demand balance in our area, the distinction has impacted the most appropriate solution. There is a different cost implication for each of the two housing forecasts visible in the differences between situations two and five, and between three and six.

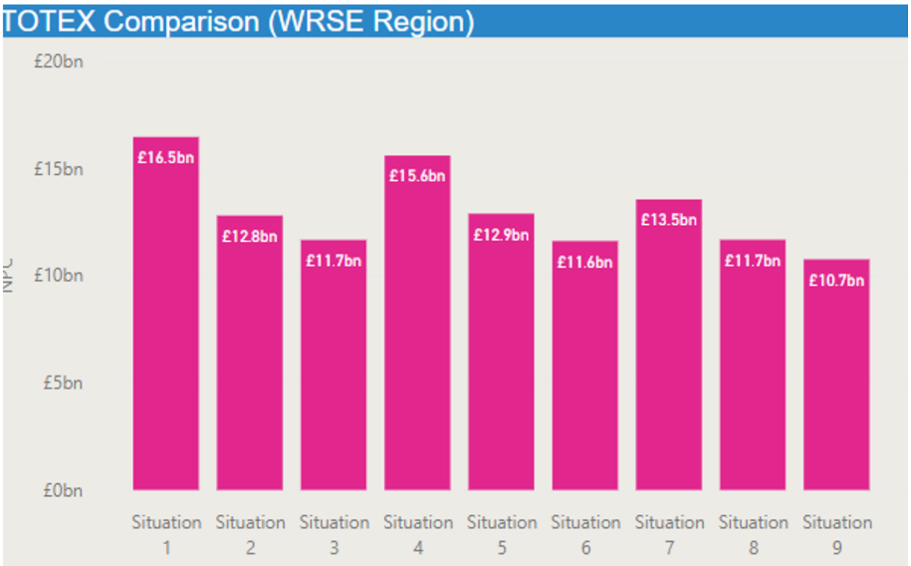


Figure 75: Total expenditure (Totex measured in Net Price Calculation) for best value plan modelling for DYAA conditions of all nine adaptive planning situations

The total expenditure for our preferred Best Value Plan reported core pathway ('situation 4') is £243m Net Present Value (NPV), and the total expenditure for the other adaptive planning branches ranges between £227m and £249m NPV.

The total expenditure for the Least Cost Plan (and 'situation 4') is £243m NPV i.e. the same as the Best Value Plan. Further information on the cost of alternative plans is provided in the supporting WRMP tables.

We have estimated that our 50-year preferred Best Value Plan will add around £5 on average to bills from 2025 to 2030, increasing to £14 from 2046 to 2051.

10.10 SEA Assessment Findings

The SEA and other assessments carried out during the development of this dWRMP24 has been thorough and comprehensive. Assessment was made of an initial long list of sites and environmental issues were considered through all stages of short listing and option development. This was at both a regional level and at a more local level that considered issues in light of the environmental context of our supply area. Two SEA teams have been involved and have acted independently of each other, though liaison has been maintained and results of assessments shared. These teams have also liaised closely with our dWRMP24 team and have challenged that team when appropriate.

As would be expected from any WRMP, there are environmental implications of the implementation of the Preferred draft plan and some of these are adverse, with adverse effects anticipated resulting from the implementation of a number of options. Nevertheless, it is considered that such adverse effects can be mitigated to an acceptable level and appropriate monitoring can be undertaken to ensure that effects are as anticipated.

Remedial action can be taken if unexpected effects arise or if it is shown that option implementation is causing unanticipated effect.

Overall, it is considered that the dWRMP24 represents a well balanced approach in terms of environmental performance across the range of potential key effects delineated in the assessment framework. This conclusion should be viewed alongside the WRSE cumulative environmental assessment of the options.

11 QUALITY ASSURANCE, AND OUR BOARD ASSURANCE STATEMENT

We developed elements of our dWRMP24 in-house. The Board also approved the appointment of expert third parties to undertake preparation of certain parts of the WRMP and approved the development of other parts of the WRMP to be carried out in regional collaboration. This is shown earlier in Figure 28 and Figure 70.

The data input into the WRMP was checked and reviewed internally with additional peer reviews and assurance points at key points to ensure the quality of work produced and its compliance with the WRPG. Figure 28 shows the aspects of our dWRMP24 that have been audited and assured.

The Board considered an assurance report from Jacobs, our Technical Assurance provider on the dWRMP24. The report checked:

- that we have met our obligations in developing our plan.
- that our draft plan incorporated the long-term government requirements for leakage and demand reduction.
- that our draft plan aligns with the WRSE regional plan and that it has been developed in accordance with the national framework and relevant guidance and policy.
- that the WRMP and PR24 planning assumptions are consistent.

This assurance report is included as Appendix 11A to this dWRMP24.

The Board also considered the views of the WRMP24 Steering Group. This was a group of Key internal stakeholders from across the business who met monthly throughout the development of the WRMP. The purpose of the Steering group is as follows:

- To ensure the visibility and buy-in of the WRMP24 development and decision-making process to key representatives within our company
- As a quality assurance measure
    - to provide robust challenge to the WRMP24 process
    - to review progress, issues and key programme risks
    - to approve and document key business decisions
    - To escalate specific decisions to the Executive and Board where appropriate
    - to provide confidence to the Executive and Board when it comes to their sign off of the WRMP24
- To provide the linkages between the WRMP24 process and wider business functions, including Business Planning for PR24 and net zero - so that the outputs of WRMP24 are fit for purpose going forward into the Business Plan.

The WRMP24 Steering Group is included as Appendix 11B.

Board Assurance Statement

In preparing this statement, the Board have considered its overall vision for the company and the strategy for Water Resources. It has reviewed the views of Customers and Regulators as well as reports from third parties, conducting elements of the work and reviewing aspect of it. It has also considered the work of WRSE of which we are a key member.

The Board agreed the Core Strategy for the Business Plan and the Water Resource Management Plan which set the tone for this draft plan.

Board Approval

At its meeting in September 2022, the Board reviewed the draft Plan including the least cost assessment and how the draft best value plan was chosen, and confirmation that it reflected accurately policy decisions taken by the Board. It also considered reports from third parties as described above. As a result of this process of review and challenge, the Board is satisfied that the draft plan being presented aligns with customer priorities, represents the most cost-effective and sustainable long-term solution, and will make a major contribution to resilient water supplies in the South East in the future.

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