Water Resources Management Plan 2019: Technical Overview

December 2019

from Southern Water

Contents

WRMP Annexes (all separate documents available on Southern Water website):

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Note: Annexes 12 (FAQ) and 13 (Audit Checklist) were published as part of the draft WRMP consultation. These are not required to be published as part of our final WRMP.

1. Executive Summary

1.1 Our Water Resources Management Plan

Our Water Resources Management Plan (referred to as our WRMP) sets out how we propose to ensure that there is a secure and reliable supply of water for our customers over a 50 year period. It is updated every five years to take account of new information.

Our WRMP contains detailed proposals that take account of challenges we know already exist, and a range of future uncertainties. We identify a number of improvements and new developments in the WRMP that we propose in response to these challenges and uncertainties, to ensure water supplies are available in the future.

This document provides a technical overview of our WRMP. It is supported by detailed information set out in a series of Annexes, as explained below.

1.2 WRMP document structure

We have designed the structure of our WRMP to be accessible for our customers, stakeholders and regulators. The WRMP is presented at three levels:

- Level 1: Non-Technical Summary – setting out a high level outline of our WRMP, with a focus on how we plan to meet the demand for water over the next 50 years. This document was written for customers and stakeholders to provide them with a suitable summary of the overall plan.
- Level 2: Technical Overview – setting out our approach to the WRMP, the outcomes of our plan and the strategy for the next 50 years. This document was written for an informed stakeholder and the regulators who are more familiar with the technical aspects of developing a WRMP. This document summarises the overall plan and signposts where further detail and explanation can be found in the WRMP Annexes (Level 3).
- Level 3: WRMP Annexes and supporting documents – a series of Annexes that comprise our WRMP setting out the methodology we have followed in preparing it and the results of our work, along with the Strategic Environmental Assessment (SEA), Habitat Regulations Assessment (HRA) and Water Framework Directive (WFD) assessments of the WRMP. Most of the technical annexes have appendices, which provide further information .

Therefore, level 2 and 3 constitute the WRMP and demonstrate how we are compliant with the WRMP Direction 2017. The non-technical summary is a simple summary which is aimed at customers only.

1.3 Our challenges and opportunities

In planning to provide resilient supplies for customers we face a number of challenges and opportunities. The greatest challenge is the sustainability reductions to our abstraction licences to protect and improve the environment.

Changes made to our abstraction licences in Hampshire in 2019 have resulted in a significant loss of our currently available water in drought conditions. These changes were the subject of an Abstraction Licence Public Inquiry in March 2018 during which we signed a Section 20 Operating Agreement (s20 agreement) with the Environment Agency (EA). The s20 agreement acknowledged the threat to supplies and the protection required for the environment, and committed both ourselves and the Environment Agency to a series of measures in the short term to protect the environment and customers' supplies in drought

conditions, and to ensure the delivery of sustainable alternative water resources for the long term as part of our WRMP.

In addition to the licence changes already made, there are further potential reductions in resource availability in Hampshire, the Isle of Wight, Sussex and Kent. The full scale of the reductions is not yet certain as further investigations are required, but the scale of the potential challenge cannot be underestimated. We need to investigate, design and secure permissions to build a number of large scale solutions over the next few years, particularly in Hampshire, but also keep our plans flexible so we can adapt to the final scale of the Environment Agency's further licence changes. This position will become clear in 2023, when the outcome of our investigations will be used by the EA to determine the extent of changes needed to our abstraction licences.

In addition to this, we also plan for future climate change uncertainty, and increasing levels of households and population within the area we serve. We need to continue to reduce the demand for water, reduce leakage, and help our customers become more water efficient, particularly when these have the potential to impact on our supply sources.

Given this uncertainty and variability in the future, we believe that traditional approaches to water resource planning are not adequate. This is set out in Annex 1 where we characterise the complexity of the problems we face. Therefore to ensure we have a robust plan to meet the challenges we are facing we have used complex models to help us to plan for a series of potential futures, based on different assumptions about the future, in particular relating to abstraction licence changes, growth and climate change. By planning to meet a number of different futures, our plans will be more resilient to change, and we will avoid making investment choices now that later prove to be unnecessary.

Our WRMP identifies strategies to balance the demand for water with the supply of water over the period of 2020 to 2070. We consider this balance across a number of different potential water futures. The range of schemes that may be required over the long term varies significantly depending whether we face more or less challenging futures. We will initially investigate and seek permissions to implement the schemes that are required in the period up to and including 2030.

WRMPs are subject to regular five year reviews, and we will update our forecasts and account for changes in uncertainties and risks in future WRMPs. This will include us reviewing the need for longer term schemes identified in this WRMP.

In this WRMP we are proposing a broad range of interventions including leakage reductions, significant demand management and new resource developments, and water trading across our Eastern, Central and Western areas of supply. The need for these is due to a combination of changes to our abstraction licences, increasing demand, the effects of climate change, and expected further reductions in the water available for use from our existing sources as a result of licence changes to protect and enhance the environment. The most significant driver for our proposed strategies in this WRMP is licence changes.

1.4 Preparing our WRMP

We published our draft WRMP in March 2018 for consultation. We then reviewed the 130 consultation responses we received, and the outcomes of wider customer and stakeholder research, and updated our proposals and made a series of changes to our WRMP. We published a 'Statement of Response' document which explained how we considered the comments received, and the changes we have made to the WRMP as a result. We submitted that Statement of Response document and a revised draft WRMP to Defra on 3

September 2018. Defra wrote to us in March 2019 and asked us to provide further information which we published as part of a Statement of Response Addendum in June 2019.

Following its review of our proposals, Defra confirmed in November 2019 that we could finalise and publish our WRMP.

1.5 Our proposed WRMP strategies

The strategies for the three supply areas are summarised below in Figures 1.1 to 1.3. These should be read in conjunction with the full strategies set out in section 7 of this document and related WRMP Annexes 9, 10 and 11. Annex 8 sets out the decision making process for the selection of the strategies and preferred plans and Annex 6 highlights the options that were considered.

Figure 1.1 – Summary of our WRMP Eastern area strategy

Eastern Supply Area

SUMMARY

The Eastern Area supplies 336,000 homes and 794,000 people across 4 water resource zones. During the course of the next 50 years we anticipate that each of these zones would face a water shortage if we did nothing at all.

SCHEMES WE ARE PROPOSING TO MEET THE FUTURE CHALLENGES

Reduce leakage by 50% by 2050
This will reduce the need to generate more water by using what we have more efficiently

Work with customers to save more water
Our customers are already some of the most efficient in England and Wales. Over the next couple of decades we will work with them to help save more water so that average water use falls to 100 l/h/d.

Medway WWTW water reuse scheme.
Recycle water that is currently discharged to the estuary

Develop infrastructure
Utilise full existing transfer capacity (from Faversham4) to Thanet.

Transfer water
From South East Water to Kent Thanet Water Resource Zone near Canterbury.

Licence Variations
Commence discussions with the Environment Agency about variations for the West Sandwich and Sandwich sources.

Asset enhancement and catchment management schemes
Develop nitrate treatment at identified sources and implement as early as possible catchment management activity at these sources. Also develop treatment for pesticides for the River Medway scheme and implement catchment management activity at this source. In-stream catchment management measures on the River Medway

INCREASING DROUGHT RESILIENCE

There is a 22% chance that a Southern Water customer will live through a severe drought and a 15% chance they will experience an extreme drought. This WRMP, coupled with our Drought Plan, seeks to put in place measures to ensure a continuity of supplies during these events.

While climate change and population growth put further pressure on water supplies, our proposed infrastructure developments coupled with our leakage reduction programme, water efficiency campaigns and drought interventions would be sufficient to ensure we can maintain supplies during severe and extreme droughts.


Reduce leakage by 50% by 2050

Consume 100l/h/d by 2040


Improve water quality


Improve our water supply grid


Licence variations at Sandwich


Lower Medway water reuse

Figure 1.2 – Summary of our WRMP Central area strategy

Central Supply Area

SUMMARY

The Central Area supplies 347,000 homes and 813,000 people across 3 water resource zones. During the course of the next 50 years we anticipate that each of these zones would face a water shortage if we did nothing at all.

SCHEMES WE ARE PROPOSING TO MEET THE FUTURE CHALLENGES

Reduce leakage by 50% by 2050
This will reduce the need to generate more water by using what we have more efficiently

Work with customers to save more water
Our customers are already some of the most efficient in England and Wales. Over the next couple of decades we will work with them to help save more water so that average water use falls to 100 l/h/d.

Pulborough licence variation by 2025
This variation seeks to allow the groundwater source, during more extreme droughts.

Water reuse scheme from Littlehampton WTW by 2030.
This scheme is critical to ensuring continuation of supplies under a wide range of drought conditions.

Coastal desalination by 2030.
This scheme is critical to ensuring continuation of supplies under a wide range of drought conditions following licence reductions in order to protect the environment.

Asset enhancement schemes
Develop additional nitrate treatment at identified sources and implement catchment management activity at these sources Also develop treatment for pesticides at surface water works potentially at risk and implement catchment management activity at these sources. Rehabilitation of existing boreholes

In-stream catchment management
Gather evidence to implement in-stream river restoration measures on the River Arun and Western Rother

Additional metering
Undertake extension of the universal metering programme to achieve 92% metering of households through implementation of a compulsory metering programme in AMP7.

INCREASING DROUGHT RESILIENCE

There is a 22% chance that a Southern Water customer will live through a severe drought and a 15% chance they will experience an extreme drought. This WRMP, coupled with our Drought Plan, seeks to put in place measures to ensure a continuity of supplies during these events.

While climate change and population growth put further pressure on water supplies, our existing infrastructure coupled with our leakage reduction programme and water efficiency would be sufficient to ensure we can maintain supplies during severe and extreme droughts. The biggest driver for investment is the need to replace existing sources whose outputs either have to reduce or be switched off in order to protect the environment. The deadline to complete this work is 2027. Our new resource developments, and reductions in demand, will increase the resilience of our supplies to customers.


Reduce leakage by 50% by 2050

Consume 100l/h/d by 2040


Improve water quality


Pulborough Licence variation


Desalination at Shoreham


Littlehampton water reuse

WATER for LIFE from Southern Water

Figure 1.3 – Summary of our WRMP Western area strategy

Western Supply Area

SUMMARY

The Western Area supplies 366,000 homes and 867,000 people across 7 water resource zones. During the course of the next 50 years we anticipate that each of these zones would face a water shortage if we did nothing at all.

SCHEMES WE ARE PROPOSING TO MEET THE FUTURE CHALLENGES

Reduce leakage by 50% by 2050
This will reduce the need to generate more water by using what we have more efficiently

Work with customers to save more water
Our customers are already some of the most efficient in England and Wales. Over the next couple of decades we will work with them to help save more water so that average water use falls to 100 l/h/d.

Drought plan measures
In the short term the EA and SWS have put in place a legal agreement, which sets out a modified drought permit process and the inclusion of force majeure clauses in proposed licence changes to ensure supplies are maintained in the western area. This agreement has been incorporated into our Drought Plan. The agreement terminates in 2030

Catchment management
Develop additional nitrate and pesticide treatment at identified sources and implement catchment management activity at these sources, together with in stream catchment management in the upper Test and the River Itchen.

Additional metering
Undertake extension of the universal metering programme to achieve 92% metering of households through implementation of a compulsory metering programme in AMP7.

Water transfers
- Work with Portsmouth Water to secure the additional bulk supplies in a phased manner - 9Ml/d by 2024, and a further 21Ml/d, relying on the development of Havant Thicket reservoir.
- Develop the 20Ml/d bulk supply from South West Water from the Bournemouth area by 2027
- Develop increased transfer capacity between our water resources zones, with development of a new reversible link main in Southampton, and the development of the Hampshire grid scheme to provide greater system resilience to the Western area.

Desalination
Plan for implementation of a 75Ml/d desalination scheme at Fawley by 2027, including the potential for a larger or smaller scale plant in combination with water reuse schemes, and direct industrial water re-use.

Water reuse
Plan and develop a 9Ml/d water reuse scheme at Sandown by 2027

Asset enhancement
Increase supplies from Newbury WSW in 2027 and investigate a scheme to reinstate the WSW near Cowes in 2065

Strategic alternatives
Investigate strategic alternative schemes in parallel with the preferred strategy including Itchen Water Reuse

INCREASING DROUGHT RESILIENCE

This WRMP, coupled with our Drought Plan, seeks to put in place measures to ensure a continuity of supplies during severe and extreme droughts.

While climate change and population growth put further pressure on water supplies, our proposed infrastructure developments coupled with our leakage reduction programme, water efficiency campaigns and drought interventions would be sufficient to ensure we can maintain supplies during severe and extreme droughts.

The Western area has the biggest sustainability reductions to licences. By 2029 we anticipate there will be a deficit of approximately 190Ml/d if we do nothing. In the short term we solve this using our drought plan measures. In the medium term we will import more water from neighbouring water companies (particularly from the Havant Thicket reservoir) and we will continue to use water efficiently by reducing leakage and helping customers save water. In the longer term we will also use a desalination plant to treat sea water to drinking water standards.


Reduce leakage by 50% by 2050

Consume 100l/h/d by 2040


Improve water quality


Regional water supply grid


Produce up to 75Ml/d of desalinated water


Sandown water reuse

2. Introduction

2.1 Purpose and basis of this WRMP

This document provides an overview of how we propose to ensure that there is a secure and reliable supply of water to meet the anticipated demands of all our customers over the 50-year planning period from 2020-21 to 2069-70. All water companies must produce a WRMP and update it every five years, reviewing the proposals to reflect the latest information, technology and the views of customers and communities.

The WRMP process requires us to look ahead over at least the next 25 year period to assess what the balance between supply and customer demand might be if it were a 'dry' or 'very dry' year, where supplies are stretched and demand for water tends to be higher than normal. We have chosen to look out over 50 years, from 2020-21 to 2069-70, to ensure our supplies are resilient and the strategies that are put forward are adaptable. In doing this we need to take account of the likely effects of climate change, population growth, and changing environmental legislation.

In a normal or wet year, or a succession of such years, we generally have plenty of water resource capacity to supply customer demand. Average or higher than average rainfall gives rise to correspondingly average or high river flows and groundwater levels, with plenty of water available for abstraction from rivers or groundwater. Customer demand also tends to be lower.

By contrast, in a 'dry year' the ability of our resources to supply customer demand can be significantly reduced. Not only does customer demand for water tend to be higher, particularly in summer months, river flows and groundwater levels tend to be much lower. In these dry years, the spare water resource capacity starts to reduce and the risk that we may have a shortfall of water to supply demand starts to increase.

The primary objective of our WRMP is therefore to ensure that there are always enough supplies available to meet anticipated demands in our area of supply, even under various weather conditions, but in particular in 'dry' and 'very dry' conditions. Figure 2.1 provides an overview of the process for developing a WRMP.

Through our WRMP we identify strategies across our supply area for developing new water resources, reducing demand and using our existing water resources more efficiently. We prepare these strategies for each of the areas that we supply water to.

We summarise our water resource strategies in terms of the following key periods:

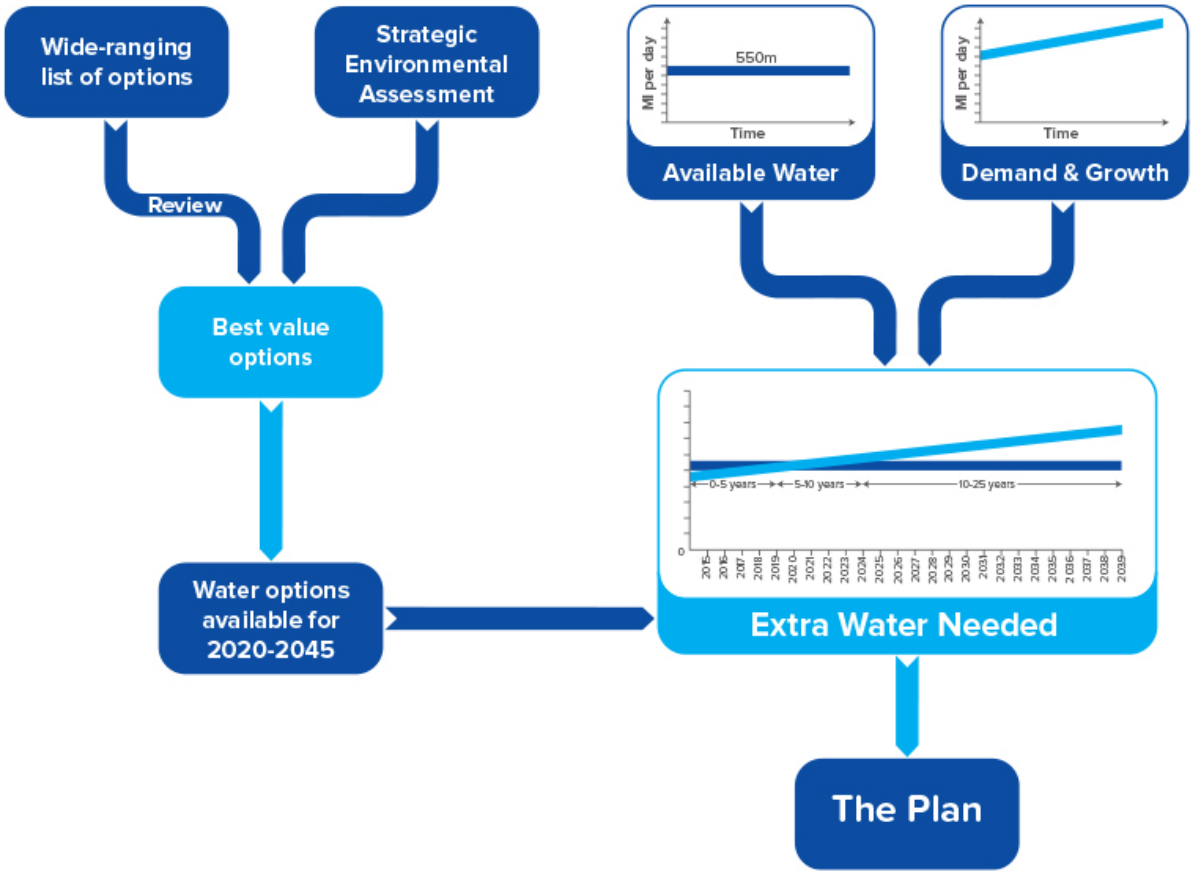
The next five years: from 2020-21 to 2024-25 – also known as AMP7
Years five to ten: from 2025-26 to 2029-30 – also known as AMP8
The medium term: from 2030-31 to 2044-45 – also known as AMP9-AMP11
The longer term: from 2045-46 to 2069-70

Our strategy for the next five years (2020-21 to 2024-25) is critical as it is the one where we obtain funding through the Business Plan process to implement our strategy and it is aligned with our Drought Plan. We are already undertaking preparatory work for some of our schemes now, to ensure we can deliver them in the timeframes needed.

The following five-year period (AMP8) is also important, as options which are required from 2025-30 are likely to require some form of investigation to be carried out during AMP7, to ensure that any required

planning permissions are, or can be, obtained, and any environmental issues can be addressed and mitigated. A large number of existing and potential licence changes to protect and improve the environment could be implemented by or in 2027, and so there is a considerable number of investigations for us to complete in AMP7 so that we can implement licence changes and promote new water resources schemes that may be required in AMP8.

Figure 2.1 – Overview of process for developing a WRMP



The proposals identified in the medium term (2030-2045) and longer term (2045-2070) are identified now to help us and our stakeholders to understand the nature of schemes which may be required in the future. However, these are options planned for the long term, and the precise need for them and their timing will be reviewed in subsequent WRMPs prior to their implementation being confirmed.

This future work will include reviewing climate change and population growth assumptions, and take account of actual changes to our available resources resulting from environmental legislation. As a result of this work it is entirely possible that different medium and longer term options may be identified.

2.2 Our progress so far

Through working closely with our customers and investing in our infrastructure, we currently put less water into supply than we did in the early 1990s despite a growing population.

Household demand (per head) for water has decreased over time, driven by changes in lifestyle, development of more efficient devices such as washing machines and dishwashers, the implementation of

our leakage reduction, metering and water efficiency programmes and our campaigns to increase customers' awareness of water as a precious resource. We have installed water meters for most of our customers, with nearly 90% of our customers now having a water meter and paying for the volume of water they use.

Together with leakage and the water efficiency measures, we've seen total water use fall by 16% in the past 7 years.

Alongside this, we have improved the resilience of our water supply network through the development of service reservoirs and strategic main schemes which allow us to share water with neighbouring water companies.

As proposed in our last WRMP in 2014, we have introduced water efficiency and leakage reduction schemes across our supply area. We have also implemented other changes to our existing water resources network, including new transfers to share resources with neighbouring companies.

In some of our supply areas however, particularly in Hampshire, we have experienced some difficulties implementing all of the proposals in our last WRMP as a result of environmental investigations and abstraction licensing issues. As a result, we have reviewed the previously proposed schemes in preparing this WRMP, and included new options as appropriate.

2.3 Our approach for this WRMP

Our strategy for the future is about securing a resilient future for water in the South East by transforming the way we work and innovating to meet the challenges ahead.

Water is our most precious resource and the water environment is facing enormous pressure from climate change and increasing episodes of severe flooding and drought. Our plan aims to capture the true value of water in our daily lives. Environmental legislation is already requiring us to make changes to some of our existing sources of water, restricting the water available in dry and very dry years. These and other licences are predicted to continue to be restricted into the future, to protect and improve rivers, aquifers, reservoirs and coasts for the future.

We need to ensure our environment is protected, and also to provide water to support a resilient South East economy. So, we are embarking on a journey to transform the way we provide services to our customers, the role we play in our communities and the value we place on water and the natural environment.

The WRMP process allows us to undertake long term planning of our water supplies, work collaboratively with customers and stakeholders, and ensure that we deliver clean, safe and sustainable water and make sure bills are affordable for our customers. Our WRMP will ensure that the infrastructure and services we provide are effective and fit for the future.

Given the challenges we face we are forecasting our demand and supply of water over a 50 year period so we can take a longer term view and build resilience into our plan.

Our customers have told us that we should invest in new technology and infrastructure to ensure supplies for future generations. We can innovate to create sustainable communities through reducing leakage and improving water efficiency, together with recycling more water.

Our approach for the WRMP is to address these challenges head on, in particular, to plan to meet and overcome uncertainties. Our WRMP presents robust, flexible and resilient water demand and supply

strategies for our supply areas. We believe our approach is the right one at this time, and capable of adapting to cope with whatever the future may bring.

2.4 Overview of the regulatory process

Our WRMP has been prepared in accordance with the statutory requirements of section 37A to 37D of the Water Industry Act (WIA) 1991 (as amended by the Water Act 2003) and the Water Resources Management Plan (England) Direction 2017. We have followed Government guidelines and the instructions issued by the Environment Agency, Ofwat and Defra. Figure 2.2 provides an overview of the regulatory process.

In accordance with Section 37B(10) of the WIA 1991, our WRMP does not include any information that is considered commercially sensitive, nor does it include any information that is adjudged to be contrary to the interests of national security. We are required to 'anonymise' the names of our existing sources of water for security reasons, but have tried to use readily understandable names for them so that our proposals can be easily understood.

2.5 Board assurance

The Board have been engaged during the development of our WRMP. Prior to the publication of the draft WRMP during 2016 and 2017, there were several presentations to the Board on the water management planning process, as well as visits to our water supply sites. A legal and technical review of the draft WRMP was undertaken and a technical paper was submitted to the Board in November 2017. At the meeting the Board gave its formal approval to the submission of the draft WRMP to DEFRA.

During 2018, our draft WRMP was subject of a further technical audit and to expert external challenge. Outcomes from these were incorporated into the revised draft WRMP. Following the draft WRMP consultation, our Statement of Response was also subject to legal and technical assurance to ensure compliance with relevant legislation and directives, that the Section 20 agreement had been represented correctly in the Plan and that consultation responses had been adequately addressed. Through this process the non-executive Board were provided with updates to ensure alignment with the Business Plan.

In August 2018, independent legal and technical assurance advice on the draft Statement of Response, confirmed that they were materially compliant.

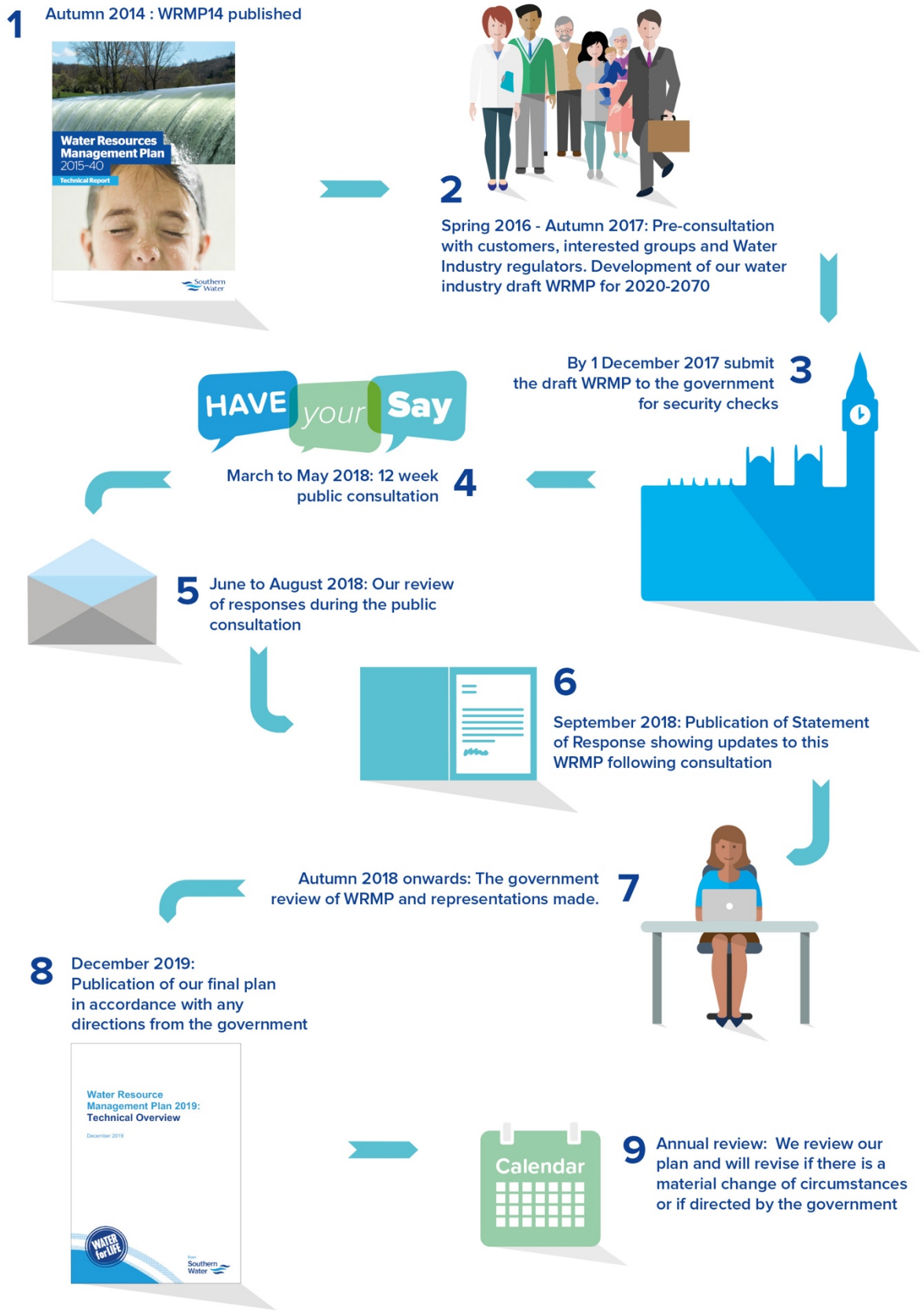
Following receipt of the letter from the Secretary of State granting it permission to publish its final WRMP, the final WRMP was again subject to assurance and presented to the Board, along with the assurance findings, for permission to publish.

2.6 Links to other plans

Our WRMP is one of a number of plans we prepare to plan for the future. Together with Let's Talk Water (our company strategy and vision), Business Plan and Drought Plan, the documents set out a co-ordinated strategy for meeting our statutory duties as shown in Figures 2.3 and 2.4.

Our plans are prepared in a joined up way within our business, and in close partnership with our regulators, customers and other stakeholders.

Figure 2.2 – Overview of our regulatory process for developing a WRMP



In planning for the future, we take account not only of our own regulatory duties, but also those policies and proposals in the plans and strategies of Government and other partners, all of which relate to and affect our own Plans. These plans inform us about levels of growth we can expect to see in the future, and the locations where development and economic activity is forecast to increase. We take account of the Environment Agency's list of environmental investigations that need to be undertaken to inform decisions on existing and future licences. A close working relationship also exists with other water companies in the South East, in which we exchange information on existing and possible new ways to share available resources, to benefit the environment and customers.

Figure 2.3 – Links to our other plans

Let's Talk Water - a resilient future for water in the South East
Let's Talk Water sets out our company's strategy and vision for how we will deliver great customer service and resilient services for the next 25 years.
southernwater.co.uk/our-story/consultation-documents

Business Plan
We produce a business plan every five years which sets out what services we will deliver and how much they will cost. When finalised, we expect our 2020 to 2025 business plan to allow us to immediately deliver the first five -year tranche of investment set out in our 2020 to 2070 WRMP. The final determination from Ofwat on the business plan is due to be made in December 2019.
southernwater.co.uk/our-story/our-plans-2020-2025/our-business-plan-2020-2025

Drought Plan
Our Drought Plan shows how we manage the security of our supplies in the event of impending or actual drought, which are normally of short duration and outside the conditions we typically plan for in our WRMPs. Our current Drought Plan was published in 2019.
southernwater.co.uk

Figure 2.4 – Links to other plans and programmes

2.7 Summary of customer and stakeholder pre-consultation

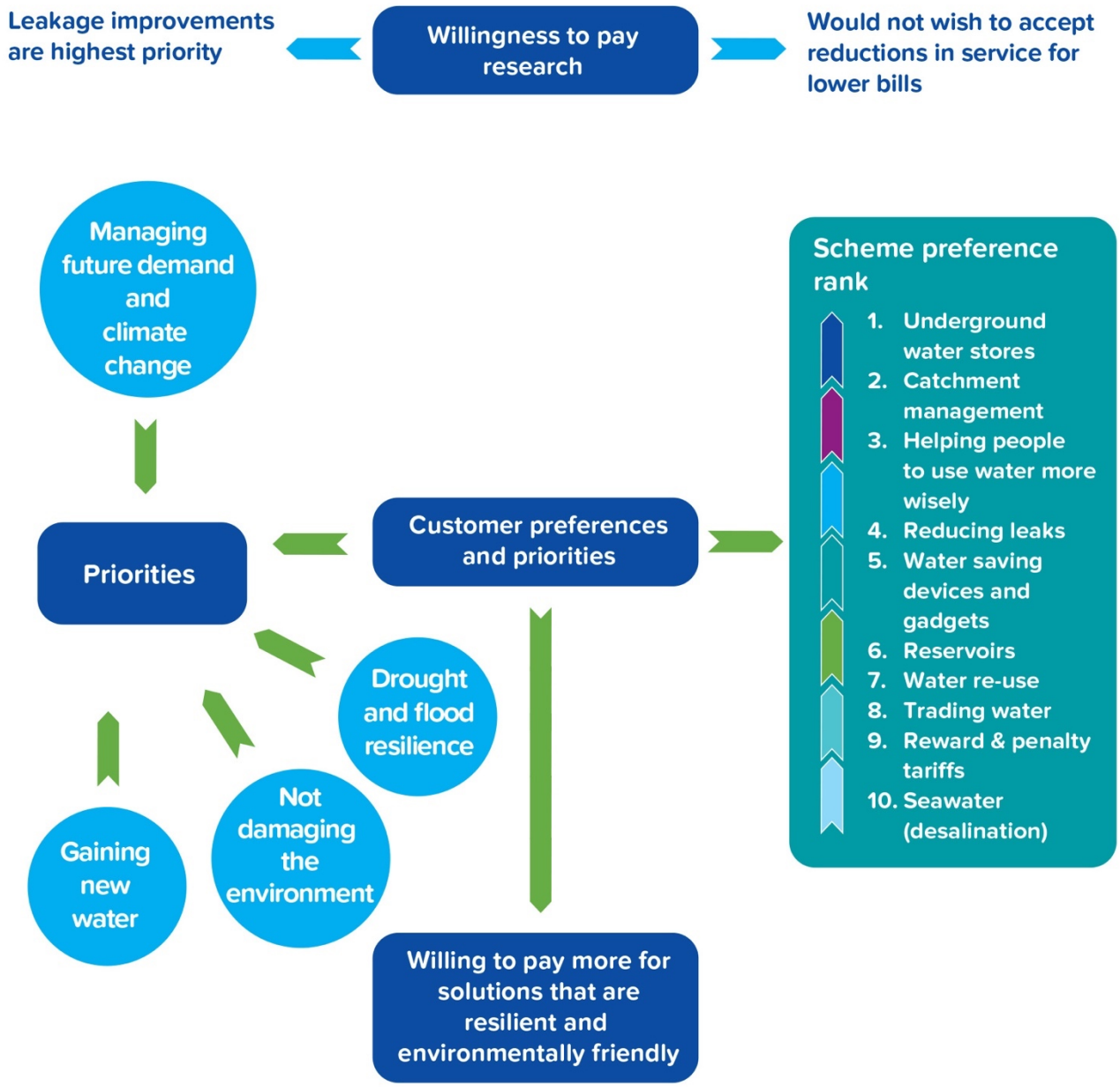
We have been engaging with our regulators since summer 2014, and with customers and stakeholders since November 2015 (see details of this engagement in WRMP Annex 1). Our engagement has focused on identifying their priorities, and seeking views on the development and delivery of our water resource strategies.

Building on the customer preferences established during the preparation of our previous plan, we revisited these preferences with our customers, and collected more data through online surveys, willingness to pay research and workshops.

The outcomes of the customer engagement are shown in Figure 2.5.

We established the views of stakeholders through county-specific stakeholder workshops (Kent, Sussex, Hampshire and the Isle of Wight), stakeholder panels and pre-consultation notification to stakeholders. During the pre-consultation phase, we met with the Environment Agency, Natural England and Ofwat to

Figure 2.5 – Outcomes of customer and stakeholder pre-consultation



report progress with developing our plan, explain our approach and report results. The outcomes of the stakeholder and regulator engagement are shown in Figure 2.6.

The views of customers, stakeholders and our regulators during this pre-consultation phase was critical to the development and formulation of WRMP. This includes understanding customers' views on levels of service and stakeholder and customer expectations on the supply and demand management options contained within our strategies.

We have also established an independent panel, the CAP (Customer Advisory Panel) to work with us to ensure we deliver our customer priorities and promises. The CAP is acting as the Customer Challenge Group for our business plan, ensuring that customer and engagement outcomes are reflected in the future strategies we take forward to balance future water supply and demand.

Figure 2.6 – Outcomes of regulatory and stakeholder engagement

2.8 Commitments incorporated into our WRMP

From the time of publishing our draft WRMP, there have been a number of developments and commitments that are now form part of our WRMP. These include:

- Drivers for change between the draft and final WRMPs;
- The Inquiry into a number of abstraction licences in Hampshire, and the content of an agreement we reached with the Environment Agency;
- Our increased commitment to leakage reduction;
- Further explanation of our Target 100 Initiative;
- Other commitments we have made relating to future planning.

These are set out in the following sections.

2.8.1 Drivers for change

We made some changes to our plan following the publication of the draft WRMP, driven by the following:

- Publication of Government plans, guidance and guidelines, along with further strategy documents by WRSE Group and the Environment Agency;
- Consultation on our draft Drought Plan in 2018 and finalisation of that Plan in 2019;
- Further consultation with the public and our customers to understand what they liked and did not like about our plan.

These changes included:

- Stronger leakage reduction targets at a Company level across all of our Area;
- In our Western Area: increased water trading, decrease in the amount of water from desalination and interim use of Drought Permits and Orders;
- In our Central Area: decrease in the amount of water from water reuse, decrease in the amount of water from desalination and Pulborough licence variation;
- In our Eastern Area: the removal of raising Bewl Water by 400mm from the preferred plan, however it remains a strategic alternative should one of the other schemes prove not to be deliverable.

2.8.2 Changes to abstraction licences for the River Itchen, River Test and Candover boreholes

A Public Inquiry was instigated following our challenge to the Environment Agency's proposed variations to a number of abstraction licences in our Western area. The need for licence changes for more sustainable abstraction was never a principle that was opposed by Southern Water. Southern Water's concern was that, particularly during times of drought, the conditions were such that they had the potential to impede the ability for the company to meet its statutory duties to supply public water.

The Inquiry took place in March 2018 and focused on a proposed operating agreement between Southern Water and the Environment Agency (EA) under Section 20 of the Water Resources Act 1991 ("the s20 agreement"), supported by packages of monitoring, mitigation and Habitats Regulations compensation measures. The s20 agreement was signed and presented to the Inquiry at its closure on 29 March 2018. Following the close of the Inquiry and the consideration of the Inspector's Report, the Secretary of State authorised the amendment of the Abstraction Licences by the Environment Agency in March 2019.

The s20 agreement

The s20 agreement provides the mechanism for the protection of public water supplies and the habitats and ecology of the River Itchen and River Test. Through the s20 agreement we accepted the abstraction licences changes as proposed by the EA, and the EA agreed to a modified drought permit determination process and the inclusion of force majeure clauses in the proposed new River Test license. Importantly for customers, the s20 agreement sets out how we can utilise the Drought Permit and Drought Order process to maintain public water supplies pending the implementation of new reliable water supplies to replace the water resources lost by the licence changes. This is a short to medium term solution for the duration of the s20 agreement, and not a permanent arrangement, and is referred to within the s20 agreement as the "interim abstraction scheme". These drought options have been incorporated into our WRMP19.

Alongside this, we committed to a significant package of environmental monitoring, mitigation and compensation measures associated with the potential Drought Permits and Drought Orders that may be

needed over the next ten years or so. It has been agreed that many of these measures will be carried out in advance of (and irrespective of the implementation of) any Drought Permit or Drought Order meaning that there is an overall positive benefit to the environment.

The main elements of the s20 agreement have been incorporated into our Drought Plan, and our WRMP. The preferred strategy for the Western area in this WRMP is consistent with the water resources strategy in the draft WRMP at the time of the Inquiry, which was known as 'Strategy A' at that time.

Incorporation in our Drought Plan

The Drought Plan has been updated to reflect the commitments we gave in the s20 agreement, including a significant package of monitoring, mitigation and compensatory measures that we have discussed and agreed with the Environment Agency, Natural England, the Hampshire and Isle of Wight Wildlife Trust, and other environmental partners. These measures will be put in place to ensure that potential effects on the environment arising from our proposed use of Drought Permits and Drought Orders, in the period until alternative supplies of water can be put in place, are mitigated, monitored and where appropriate compensated for. We also included further information in the Drought Plan on our potential Drought Permits and Orders, consistent with what was agreed as part of the Inquiry.

Incorporation in our WRMP

Our WRMP reflects the commitments we gave in the s20 agreement. In particular, we agreed to use “all best endeavours” to implement measures to develop alternative water resources to replace water that is effectively “lost” through the proposed licence changes, and to respond to other factors influencing our forecast future supply demand balance.

The WRMP sets out both our preferred strategy for the Western area, and also potential alternative schemes which are intended to be developed concurrently with the preferred strategy in the first instance. The reason for this is simple. The s20 agreement interim abstraction scheme will currently only be available until 2030. Ideally, with little or no reliance on the interim abstraction scheme past 2027. Sufficient measures therefore need to be capable of delivery within this timeframe to avoid a significant risk to the supply of water to the area but there are a number of factors that can influence the timing of the measures becoming fully operational (e.g. planning consent timeframes, third party delivery etc.). To address this uncertainty and to be confident of having measures operational within the timeframe, the need to concurrently progress a number of alternative measures that can "step-in" if needed, is essential.

The scale of securing alternative supplies following the abstraction changes is massive, involving multi-million pound investment in large scale new developments to provide supplies to customers where the new licences will prevent us from abstracting from existing sources. For the most part, the schemes we will need to develop are complex engineering projects, with considerable environmental investigations required in advance of planning and other permissions being able to be secured. Until we have secured those permissions, and built the new schemes, our supplies to customers will remain at risk.

Pursuing a single strategy which has those inherent complexities and hoping that there will no issues during implementation, we believe would be irresponsible given the threat to supply. Progressing alternatives initially in the short term allows us to best use the time where the interim abstraction scheme will operate to adapt to any obstacles or delay and still be confident that a long term solution can be delivered within the timeframe. Once a measure is sufficiently secured (and the risks to delivery therefore significantly less) the need to substantively progress certain alternatives reduces. We will still favour the progression and implementation of the preferred strategies as the best value plans but this allows adaptation. Similarly, once alternative sources of water are built and become operational, the level of reliance on Drought Permits and

Drought Orders under the interim abstraction scheme reduces in tandem with the rate the new schemes are able to provide water.

Not all of our proposed new resource developments can be implemented by us alone, as they involve the transfer of water from other water companies through existing or new transfer pipelines. Some of these transfers are reliant on the other water company making improvements to their own sources, or developing new ones. This can also involve significant investigations and applications for consents of their own, increasing the potential risk that they could be delayed. While we will work with those companies to best reduce that prospect, for the purpose of this plan, again we need to act responsibly and anticipate, account for and be ready to respond to any obstacles or delays.

The WRMP schemes that form our preferred strategy for the Western area are informed by engineering, environmental and planning assessments, and consideration of the potential risks relating to scheme delivery.

We will work closely with RAPID (the Regulators Alliance for Progressing Infrastructure Development), the Environment Agency, Natural England, other environmental partners and stakeholders including the relevant local planning authorities through our detailed technical work and to progress our WRMP preferred strategy.

We propose to maintain regular liaison and engagement through steering group meetings, and technical working groups relating to each of the individual schemes. Within the s20 agreement we have also committed to regularly report on progress with the implementation of our preferred strategy and our assessment and promotion of the alternatives. While this is primarily to keep drought permits / orders under review (so as to remain application ready) it will also act as an update on progress so as to reduce the level of reliance on the interim abstraction scheme as early as practicable.

In addition to our regulatory reporting requirements, we will regularly report progress on our WRMP publicly on our website and proactively with stakeholders and regulators (NE, EA, Ofwat, Defra). In particular, given the strategic nature of the Western area solution, we will update for that solution at key milestones (e.g. approval, planning approval, procurement, construction start) and as part of our annual performance report. This will include where external influences / other transfers are progressing or could be at risk of delay (planning delays, construction in other companies etc).

2.8.3 Application of leakage reduction policy

Managing leakage is an important part of our water resources strategy. A low level of leakage is desirable for two main reasons. It allows the efficient use of the water abstracted which in turn keeps more water within the environment, and it reduces the scale of investment necessary into new resources, which in turn can impact on customer bills. However, it is not necessarily always economic to reduce leakage to very low levels, because to do so could then involve very large additional costs for relatively small savings of water.

However, our approach, and that of our regulators, is to set leakage at a level that meets the level of expectations of our customers and society as a whole (even if not necessarily optimal in terms of cost). The WRMP sets out our combined strategy of continued active leakage control in the short term followed by mains replacement programmes in the medium to longer term to ensure that we continue our drive down on leakage by 15% by 2025. This commitment was supported in consultation on our draft WRMP, but our customers and other respondents encouraged us to commit to do more.

As a result, following customer and stakeholder feedback, and recommendations in the recently published National Infrastructure Commission report that companies should aim to be much more ambitious in terms of potential leakage reduction, in our WRMP we have committed to meeting the aspirations of that report to

achieve a 50% reduction in leakage from current levels by 2050. We also had developed, prior to the NIC report being issued, our own target of achieving 40% reduction from current levels by 2040, and so we have adopted this as an interim target as part of our leakage reduction policy.

The leakage reduction activity proposed to achieve these profiles of reductions are described more fully in WRMP Annex 6 (Appendix C). There will be a need for innovation in leakage reduction, however within our target date of 2050 there is considerable scope for innovation in technology, methods and process.

Achieving this level of leakage reduction will require significant investment, and we are very aware of the potential impacts on customer bills (although our customer engagement on this suggests that customers don't mind a level of increase towards reducing leakage, as it is an action they want to see). We are exploring this with our financial regulator Ofwat, and are committed to ensure that customers' bills, and in particular those of vulnerable groups, are protected from unacceptable increases.

2.8.4 Application of 'Target 100' water efficiency policy

We are committed to delivering our 'Target 100' water efficiency policy, which aims to achieve a per capita consumption (pcc) of 100l/h/d by 2040. This is well-aligned with Defra's 25 Year Environment Plan (Defra, 2018) which states that "We will work with the industry to set an ambitious personal consumption target and agree cost effective measures to meet it". We will adopt a variety of measures that will be kept under continuous review in order to deliver the highly ambitious reduction in pcc the strategy aims for. Our Target 100 strategy has four key strands:

Installation of smart metering technology: We are currently undertaking trials of devices that can read meters and send the reading to customers using their WiFi. The aim is to provide customers with near real-time information so that they can see the consumption associated with various water-using activities and take measures to conserve water where they can. If the trial proves successful, we plan to roll out 100,000 devices over AMP7.

Home audits: We currently undertake home audits to promote water efficiency. The programme, which supports the installation of water saving devices, has a high uptake rate and can result in up to 10% further savings on top of the savings achieved through metering. We plan to continue with this programme and combine it with leak detection so that whilst we offer help and advice on water efficiency, we can also help detect and fix any plumbing losses or supply-pipe leaks.

Proactive customer contact: As a large number of consumers are now metered, we will develop a system that uses that information proactively to identify significant increases in consumption so that we can proactively engage with our customers to distinguish and identify potential leaks from changes in circumstances. This will also allow us to specifically target customers or geographical areas for water efficiency messages during periods of high demand.

Incentivising water efficiency behaviour: Our customer and stakeholders have shown little appetite for seasonal tariffs as way of managing demand. In acknowledgement of this, we are looking to reward customers for conserving water. Given the scale of sustainability reductions in the Western area, the first scheme will be rolled out in Hampshire in partnership with the Eastleigh Borough Council. The scheme will offer rewards to residents for recycling waste and reducing water consumption on a monthly basis. The scheme was will be introduced in the Central area towards the end of AMP7 and in the Eastern area during AMP8. We are also launching Water Levels - a collaboration behavioural change project with Ebbsfleet Development Corporation, Thames Water and WaterAid. In addition to incentivising water efficient homes and pooling resources on 'Smarter Homes' visits, both companies will work with WaterAid to link the amount of water saved to an increase in available clean water in a community in a partnership country. Customers

and stakeholders have told us they prefer incentives to reduce their consumption, rather than penalties, and this type of 'nudge' is more likely to encourage sustained behaviour change.

Further details of these measures are described in WRMP Annex 6.

2.8.5 Other commitments to future planning and scheme implementation

With each WRMP we aim to improve on the last. The evolution of our plans has seen the introduction of stochastic forecasts of supply, strong demand management options and increased environmental forecasting. The delivery of this plan introduces a real options and futures method to allow our plan to adapt to uncertainties but we recognise that there is still more that we can do both in the implementation of the schemes presented in this plan, and in ensuring a confident adaptive approach can be taken into our future WRMP's.

To advance our future planning, we will therefore commit to:

- Further improve the way that we plan for uncertainty, by considering a greater range of climate change scenarios, incorporating Regional Climate Model outputs into our weather generator model and working with regulators and regional groups to develop an industry-consistent climate change dataset.
- Develop a more quantitative metric for considering customer preferences so that this feedback becomes a more integrated feature of our investment model when deriving the initial least cost plan and best value plans.
- Develop an environmental net gain concept, and means of valuation, specifically for use in water resource planning that sufficiently balances economic social and environmental capital (and which goes above and beyond biodiversity net gains principles required under the planning consent regime). This environmental net gain concept can then be used to influence the decisions for future strategies. We have already commissioned a review of our preferred plan strategies to assess environmental net gain. We will also build on Natural Capital valuations.
- Creating a resilient water future for the South East, consistent with our Business Plan commitments. Continue being a visible and proactive contributor to regional and national water resource groups, collaboratively supporting the development of methodologies and a regional South East WRMP, and improvements to national water resource planning frameworks.
- Encourage the use of local partnering opportunities with regulators, stakeholders and local/regional groups in the development, implementation and delivery of schemes and any required mitigation measures.
- Producing a company policy outlining the core principles that we intend to adopt to develop planning strategies and to consult on those principles.
- Develop our robust decision making process which combines adaptive planning approaches with Real Options to ensure that future plans remain robust to meet the growing diverse range of challenges that we face.
- Further develop our environmental forecast, building on the work set out in Annex 4 of WRMP19.
- Continue to develop and improve links between drought management plans and water resource management planning such that the drought plan sets out the actions we take during a drought and the strategic elements of the Drought Plan are incorporated into the WRMP.
- Providing collaboration and support to improvements to water trading methods between abstractors for future resource resilience improvements, e.g. with farming sector.
- Continue to develop catchment first solutions to provide alternative innovative ways to solve future resource challenges.
- Work with the DWI to incorporate a wider and broader range of water quality considerations into the development of a WRMP.
- Improving our data collection and analysis for water resource planning, in particular for outage allowance.

2.9 Summary of engagement on our WRMP

We undertook extensive engagement on our draft WRMP during the consultation period between March and May 2018. This included consultation with stakeholders and customers on our draft WRMP proposals, through our website and printed circulation of materials. We also undertook targeted engagement and customer and stakeholder research around our draft WRMP.

We received 130 consultation responses on our draft WRMP, and the details of these and the wider research and engagement, are set out in the Statement of Response document that we published on 3 September 2018, alongside submitting a revised draft WRMP to Defra. The Statement of Response identified our response to the comments we received and set out how we changed the draft WRMP as a result. The changes are reflected in this WRMP.

Further information on our consultation and engagement is in WRMP Annex 1, and in the previously published Statement of Response.

3. Overview of our supply area and water resources planning

3.1 Our supply area

We supply water to just over 2.4 million customers across an area of 4,450 square kilometres, extending from Kent, through parts of Sussex, to Hampshire and the Isle of Wight in the west. Our supply area is shown on Figure 4.1.

Our water supplies are predominantly reliant on the transmission and storage of groundwater from the widespread chalk aquifer that underlies much of the region. This extends throughout parts of Kent, Sussex, Hampshire and the Isle of Wight and makes up 70% of our total water supply.

River abstractions account for 23% of our water supplies, most notably: the Eastern Yar and Medina on the Isle of Wight; the Rivers Test and Itchen in Hampshire; the Western Rother and Arun in West Sussex; the River Eastern Rother and River Brede in East Sussex; and the River Teise, River Medway and Great Stour in Kent.

Four surface water impounding reservoirs provide the remaining 7% of our water supplies: Bewl Water, Darwell, Powdermill and Weir Wood. The total storage capacity of these four reservoirs amounts to 42,390 million litres. South East Water is entitled to 25% of the yield from the River Medway Scheme, which incorporates the storage within Bewl Water reservoir.

We share borders with eight other water companies and water is shared between us and a number of these companies through existing pipeline transfers. There are potentially opportunities to increase the sharing of water in this way.

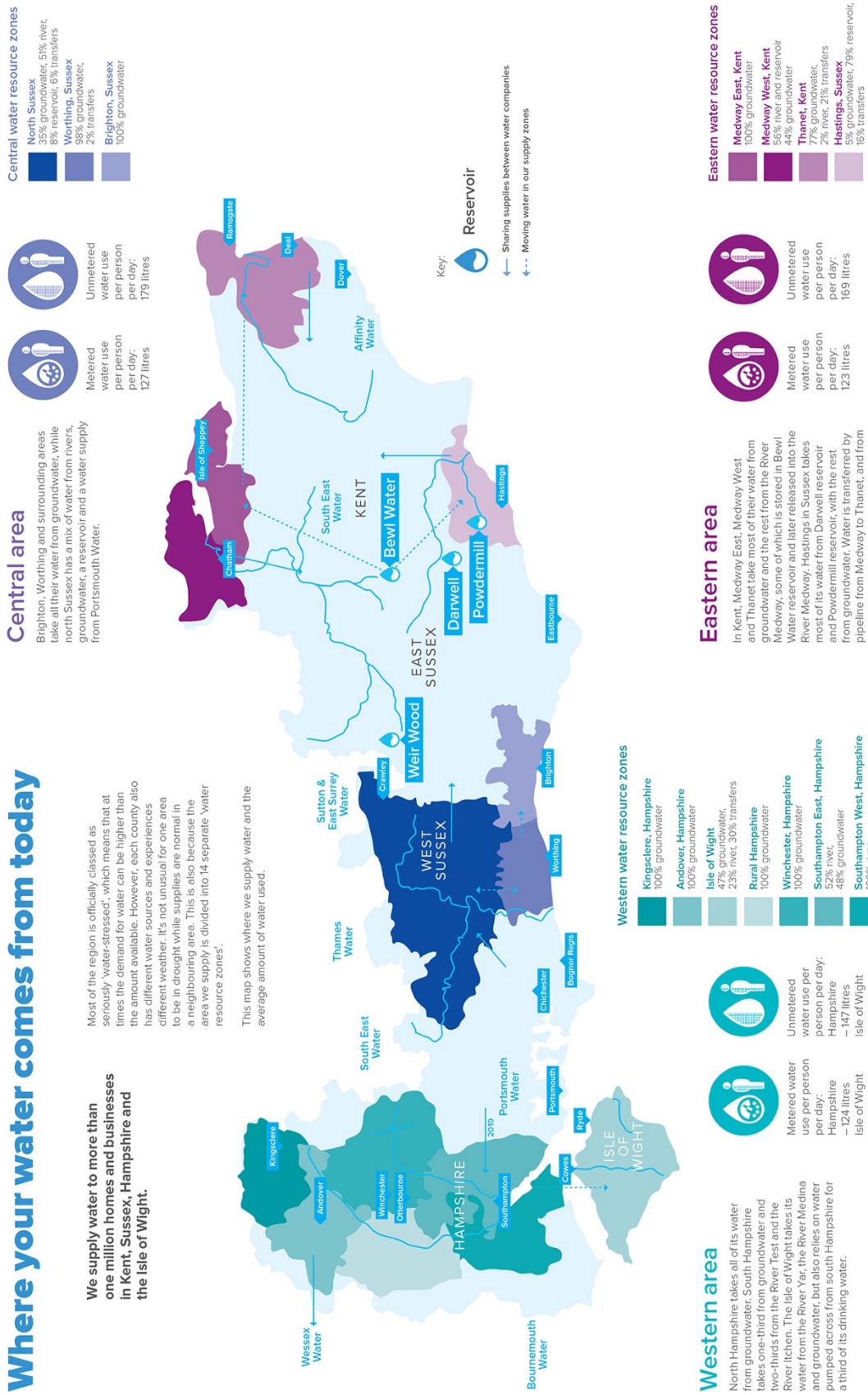
3.2 Water resources zones

Our area of supply is divided into 14 water resource zones (WRZs) as shown on Figure 3.1. The WRZs are drawn to include large groupings of customers who all have the same risk of loss of supplies. The 14 WRZs are then amalgamated into three larger, sub-regional supply areas: Western, Central and Eastern areas. This approach helps us to plan to meet the demand for water for customers within these WRZs both individually, and collectively at a sub-regional level.

We have changed the way we have drawn our WRZs since our last WRMP, to better represent the sources of water supplying the individual WRZs and the network connectivity with them. This increases the number of WRZs, and so means we can plan at a finer level of detail. We can now highlight smaller areas which may be at risk of experiencing shortages of water, and then plan schemes to address this, such as transferring water from another WRZ.

Our WRZs face a number of pressures, some common to all WRZs and some unique to that specific area. This can include existing water resources becoming vulnerable as a result of climate change or licence changes due to environmental legislation. In addition, some geographic areas are predicted to experience significant growth over the coming decades, increasing the demand for water. Section 4 of this document summarises the challenges we face.

Figure 3.1 – Our supply area and water resources zones



3.3 The WRMP planning process and planning scenarios

The WRMP planning process

In Figure 3.2 we provide a schematic overview of our WRMP planning process. The diagrams illustrate the stages of developing the WRMP. Each step refers to specific WRMP annexes, where further details of the sub-process that was undertaken can be found.

The process outlined in the Figure 3.2 summarises the key stages that we take as we develop a WRMP. Each of the individual steps have one or more annexes associated with them which should be referred to for more detail. Whilst the key risk that is considered in the plan are droughts, we also test the plan against other planning scenarios and other weather events.

Planning scenarios

The balance between available supplies and the demand for water can fluctuate throughout the year, and from year to year. However it is important that we ensure that we can supply customers both in an average year and years in which we experience a drought. This variability means that in assessing the future need for water we need to consider different periods or 'planning scenarios'.

The Environment Agency requires us to assess two planning scenarios in our WRMP – the dry year annual average (DYAA) and dry year critical period (DYCP). We have added to these scenarios to ensure that our plan is robust to other water resources situations that we face. Our planning scenarios we have considered are therefore as follows:

- The demand for water expected under normal conditions – the **Normal Year Annual Average (NYAA)**;
- the annual average demand in a year with low rainfall, but without any demand restrictions in place – the **Dry Year Annual Average (DYAA)**;
- the peak demand over a 7-day rolling period – the **Dry Year Critical Period (DYCP)**; and
- the demand during the autumn period in a dry year (when groundwater levels and river flows are generally at their lowest and sources are operating at their minimum deployable outputs) – the **Dry Year Minimum Deployable Output (DYMDO)**

Each of our WRZs has its own mix of water supply sources and each source reacts differently to weather conditions. Some sources are therefore more susceptible to certain planning scenarios than others. This is considered and explored within the WRMP. In our Eastern area it is the annual average demand in a dry year (DYAA) against available supplies that is critical. In the Central area it is the autumn minimum deployable output (DYMDO) period. In the Western area the autumn minimum deployable output (DYMDO) is currently critical, but in the longer term peak demand (DYCP) will also be critical.

3.4 Levels of service

Levels of service set out the standard of service that customers can expect from their water company (WRMP Annex 1, Business Plan & Drought Plan). The objective of our plan is to ensure that there is enough water available to meet anticipated demands in all WRZs up to our defined level of service and resilience. We express our levels of service in terms of the frequency of restrictions (temporary use bans and non-essential use bans) that our customers are willing to accept (Customer target levels of service) and the frequency of Drought Permits and Orders allowing modified abstraction regimes at some of our sources (Environmental target level of service).

Figure 3.2 – Our WRMP development process

WRMP Development Process

Below is a step by step process that we went through to develop the WRMP. It shows the key considerations in each step and also references the main technical annexes that document those considerations.

STEP 1 WRMP FRAMEWORK

This first step in the process sets out the complexity of the problem the company faces in deriving a plan including sustainability reductions; climate change; population growth and other material factors such as the uncertainty of some of these forecasts. The main elements of technical work are:

- Problem Characterisation (Identifies problems and what the appropriate methods are to deal with them);
- Customer insight into the willingness to pay for changes to the Levels of Service (LoS);
- Regulatory Pre-Consultation;
- Method Statement Consultation.

Ref: Annex 1

STEP 2 SUPPLY DEMAND BALANCE FORECASTS & SCOPE

This second step establishes the scale of the problem and identifies the key requirements in terms of the amount of water needed and environmental considerations for any options.

- Forecast of demand and supply to 2070;
- WRZ Deficits and scale of problem;
- Headroom and uncertainty (Integrated Risk Model);
- Baseline supply demand balance;
- SEA Scoping Consultation.

Ref: Annex 2, Annex 3, Annex 5; Annex 14

STEP 3: OPTIONS

Step 3 (A-G) is the process of identifying, screening and refining options starting with an unconstrained list and resulting in a feasible set of options.

3A. Identifying Unconstrained Options

This part of the process pulls together an overall list of schemes that could provide benefit to any future supply challenges. The list, as the name implies, is unconstrained and open to any ideas.

Typically the list is derived from:

- Historic Options (that were considered in the previous WRMP);
- Blue Sky thinking and market or technological influences;
- Third party ideas (that had been presented to the company);
- Customer ideas from historic consultations and general continual engagement.

3B. Consult (Unconstrained)

This part of the process broadens the consultation on the unconstrained list to see if there were any other options that weren't on the list.

We also publish notices requesting potential options to be considered through:

- An OJEU notice; and
- Our Website

We consult on this list of unconstrained options with:

- Regulators;
- Stakeholders;
- Working Groups;
- Customers.

3C. Screening of unconstrained options

Following consultation on the list of unconstrained schemes we use a high level screening process to derive a list of constrained options

- High-Level Review Incl. engineering, environmental and planning considerations of each of the unconstrained options.
- Options are either screened in or out of the options list. A level 1 fact file of each option records the assessment against the screening criteria.

3D. Constrained Options assessments

Following the high level screening we undertake further assessment of the list of constrained options.

Within the company we undertake a further engineering, environmental and planning review of the options and pre-draft consultation responses (to the unconstrained list) and produce:

- Level 2 Fact file about the schemes;
- We also undertake a SEA screening which is incorporated into the level 1 fact file.

3E. Consult (Constrained)

The constrained list is consulted on with:

- Regulators (EA & NE);
- Stakeholders;
- Working Groups.

3F. Technical Screening (Constrained)

Following consultation we undertake further screening of the constrained options to enable us to conclude which are feasible options. The feasible list of options are derived from the constrained list.

The constrained list of options are further screened based on:

- Engineering;
- Planning and risks;
- Resilience benefits;
- Initial Combined Environmental issues.

G. Feasible Options assessment

The feasible list of options are then subjected to more detailed engineering, environmental and planning assessments to provide sufficiently detailed information to enable the costs and benefits of the schemes, their consenting risks and potential delivery programmes to be identified.

The additional reviews of the feasible list of options ensures that they are:

- Technically feasible;
- Could achieve planning consent;
- Could be delivered from an environmental and social assessment perspective (either that they do not pose a significant risk to the environment or can be mitigated).

In addition, we still consider at this stage any feasible options that have been submitted by third parties.

The options are further developed from an engineering perspective.

- Level 2 fact file updated with additional engineering detail, including planning and construction periods, and therefore the earliest potential start date;
- Costs of feasible options are competed, including for drought options
- SEA assessment;
- A WFD assessment;
- A HRA assessment.

This list of feasible options are then subject to pre-consultation engagement with customers of categorised option types with cost averages to gather both quantitative and qualitative information. The questions for these surveys are reviewed by the CCG before being used.

Ref: Annex 1; Annex 6; Annex 7; Annex 14; Annex 15; Annex 16

STEP 4: INVESTMENT MODEL RUNS/REAL OPTIONS

A. Least Cost Scheme - (5 Branches of 7 States of the World)

The least cost plan defines the starting point of a WRMP. It is determined through a computer model which seeks to determine the most cost effective schedule of feasible options (a portfolio of schemes) which can meet the anticipated deficits every year of the plan and within the regulatory deadlines of key licence changes.

The least cost plan is derived by the model simultaneously solving the supply demand deficits over the 70 year planning period for a range of different drought events at different times of the year (representing different points of water resource stress), and across a range of plausible future forecasts (representing the inherent uncertainty associated with forecasting). The selection (and ordering) of schemes generated by the model will therefore address all of these eventualities for the least cost.

B. Best Value Plan - (5 Branches of 7 States of the World)

The best value plan is derived by re-running the investment model but this time programming the model to have regard to customer preferences and SEA assessment on schemes (to ensure that there are no in-combination environmental effects).

The best value plan still seeks to simultaneously solve a series of different eventualities. These are our different states of the world and different future conditions.

We consulted on this draft plan (step 5) and have taken into account feedback and consultation representations to derive a revised draft plan (step 6). Only when the Secretary of State gives the company permission to publish does this revised draft plan become the final WRMP.

C. Selection of the Preferred Plan plus alternative

The preferred plan is selected based on professional judgment and undertakes a balance of:

- the best value plan;
- SEA/HRA/WFD issues;
- Policy Issues;
- Customer Preferences;
- The output of the sensitivity and scenario testing.

This plan feeds into the wholesale business plan and the supply/demand balance chapter in the plan.

D. Scenarios and Sensitivity Testing - (5 Branches of 7 States of the World)

This range of tests seek to identify alternative strategic options (alternatives to preferred plans); testing the plan under different scenarios and to understand the sensitivity of the plan to different assumptions
(in essence changing the variables and having regard to greater uncertainties to test that the plan can adapt).

The Tests consider:

- Unconfirmed Sustainability Reductions;
- Timing delays;
- Cost differences;
- Alternatives to strategic options;
- Changes to the volumetric benefit of a scheme;
- Assumptions around drought options.

Stages C and D are iterated to ensure that the final preferred plan is robust.

Ref: Annex 4; Annex 8; Annex 9; Annex 10; Annex 11

STEP 5: PUBLIC CONSULTATION

Undertake a 12 week public consultation to gather feedback on the preferred draft plan. In order to publish the draft plan for consultation Defra provide the companies with permission to publish the draft plan. Following publication of the draft WRMP we also:

- Repeat our customer You.Gov survey to test the customer acceptability of the plan;
- Undertake Qualitative Workshops to gain further insight into the draft WRMP;
- Promote the plan across the region through the media and stakeholder groups an in order to gain further insights into the acceptability of the proposed portfolio of schemes.

Ref: Statement of Response

STEP 6: SOR / REVISED WRMP

Revise the draft WRMP , where appropriate to do so, to take account of consultation feedback from customers, regulators, stakeholders and other interested parties.

- Consultation Responses;
- Post-Consultation DEFRA communications;
- Post-Publication Policy Documents;
- Updated SEA/HRA/WFD;
- Strategic Alternatives Included.

The first ten years of the revised draft WRMP feeds in to the wholesale water business plan.

Ref: Statement of Response and Revised WRMP Technical Overview (and annexes)

STEP 7: FINAL WRMP

Publish Final WRMP as directed by the Secretary of State.

Ref: Further information submitted to defra on 14 June 2019. Secretary of State letter dated 4 Nov 2019.

Our current target levels of service are set out in Table 3.1.

Our pre-consultation research looked at willingness to pay for changes to our previous levels of service, specifically the frequency of Temporary Use Bans (TUBs), and of Emergency Drought Orders leading to rota cuts in supply. Our customers appear to disfavour any reduction in level of service relative to water supply and only weakly prefer an improvement to levels of service. We consider this to be a strong signal that there is limited customer support to change our current levels of service.

A key stated preference by customers and current guidance is that the water supply system should be 'resilient'. We have assessed our water supply system against a range of drought scenarios, including low probability droughts (1 in 500 year). The use of these low probability droughts is designed to ensure that there is no unacceptable risk that the supply system might fail to balance supply and demand given the drought intervention measures and levels of for each supply area.

Through our WRMP we have sought to achieve the target levels of service set out in Table 3.1. We have adopted a 'fully risk based' methodology to test the drought resilience of our plan.

However, under some of the potential planning scenarios we have considered (see WRMP Annex 8) these targets, particularly for environmental Drought Orders and Permits cannot be met immediately. This is particularly the case in the Western area where known licence changes are implemented in full. In these circumstances we will rely on the interim abstraction scheme as set out in the s20 agreement.

Table 3.1 – Target Levels of service

	Annual probability	Return period	Probability of at least 1 occurrence within our 50 year planning period
Customer target levels of service			
Advertising to influence water use	20%	1 in 5 year	100%
Temporary Use Ban on different categories of water use	10%	1 in 10 year[1]	99%
Drought Order (Non Essential Use Ban) to restrict water use	5%	1 in 20 year[1]	92%
Emergency Drought Order to restrict water use	0.2%	Only in a civil emergency (1 in 500 years)	10%
Environmental target levels of service			
Drought Permit/Order to increase supplies through relaxation of licence conditions, increase in licensed quantities, or other measures[2]	0.5%	1 in 200 year	22%

[1] Frequency of first implementation but would be introduced via a phased approach
[2] For Hampshire Southampton East and West Water Resource Zones we expect the short term level of service for these Drought Permits and Orders to be less than our target

In our Western area, our levels of service are aligned with the s20 agreement reached with the Environment Agency at the Western area Inquiry. This states that after 2027 we should aim to not rely on the River Itchen or Candover Drought Orders, and only use the River Test Drought Permit/Order in extreme (<0.5% annual probability) drought events. This strategy is to reduce abstraction pressures on sensitive receptors in these catchments. The s20 agreement specifies the phasing of Temporary Use Bans and Non Essential Use Bans in the affected resources zones. Temporary use bans are required before implementation of the River Test Drought Permit and partial implementation of Non Essential Use Bans is required before the River Test or River Itchen Drought Orders are applied for. The expected frequency and probability of these events has been incorporated into our forecast levels of service.

We will also need to align with the interim abstraction regime in our Western area and our Drought Plan during the next 5 to 10 years until we can deliver additional supply solutions. In our Central and Eastern areas we anticipate that we will require the use of environmental drought permits and orders in the early stages of our plan (until 2025) during severe droughts (0.5% annual probability, or 1 in 200 year events). These Drought Permits and Orders are required to ensure that we can maintain supplies in the face of proposed sustainability reductions and water quality related reductions in supply.

In the longer term, under all of our planning scenarios we consider that, if our preferred plan is delivered, we will not require the use of environmental Drought Permits and Orders to increase abstractions beyond licenced quantities out to droughts more severe than 1 in 200 year drought (0.2% annual probability) in any zone. Emergency Drought Orders for standpipes and rota cuts will not be required unless faced with extreme drought (<0.2% annual probability) beyond a 1 in 500 year event.

4. Water futures

We commissioned an independent view of the challenges in the South East of England entitled 'Water Futures' which sets out a number of challenges for the South East of England. We reflect on some of these challenges in the next few sections.

4.1 Our challenges and opportunities

We are facing significant challenges that our WRMP will need to meet and overcome, but also a number of major opportunities. These are summarised below.

4.1.1 Abstraction licence changes to protect and enhance the environment

We supply water in a part of the country that has been classified as water stressed by the Environment Agency, and also an area where the sustainability of future water abstraction is being continually re-assessed. We already know that we will be facing further limitations on how much water is available from our sources, and this will increase the gap between supply and demand in parts of our supply area. Our existing asset base will need to be transformed to cope with these challenges. The difficulty we face is planning for these changes, as the timing and extent of these could vary considerably, both over time and between WRZs.

As identified in section 2.8 of this plan, we have already committed through the Western area Inquiry, and the s20 agreement we have signed with the Environment Agency, to implement significant changes to some of our licences in Hampshire. Other potential licence changes are being driven by the Environment Agency's application of the Water Framework Directive, a European directive which aims to protect and improve the water environment. The Directive defines a list of mitigation measures (referred to as environmental improvements) which need to be implemented by a set deadline, the next one being 2027, to improve the water environment. The application of a set deadline of 2027 across our supply area means that many of our sources could face new limitations all at the same time, the scale of which could be very significant. We also have sustainability reductions which are driven by water quality deterioration trends at individual sources. These tend to be spread across our planning period.

Our WRMP will need to respond to these known and currently uncertain licence changes by identifying both demand management and new resource developments to enable us to meet our statutory duty to supply customers. The uncertainty of when these future reductions will come into play and the extent of the reductions does make planning for the future difficult. Our work to date, and discussions with the Environment Agency, has however enabled us to plan for a number of different possible outcomes from the investigations in the Eastern, Central and Western areas, and to ensure our Plan is flexible as a result. The scale of potential licence changes represents one of the most significant challenges we face. We know that we will need to find innovative solutions to address deficits in our supplies.

4.1.2 Climate change

Climate change is likely to lead to a generally drier and warmer climate with an increased frequency of extreme events (storms, floods, droughts etc.). We need to ensure that we account for this, along with uncertainties in predicting climate change effects, in our assessment of water supply and demand.

We need to ensure that our strategies are adaptable to possible climate change effects, and that we consider not just possible climate change effects on our existing sources of water but on potential new schemes as well. We achieve this by investigating different climate change outcomes, and ensuring our proposed strategy is resilient to the different potential futures.

4.1.3 Playing our part to support a resilient South East economy

We supply water to an area that is officially identified as an area of significant population and economic growth. Our forecasts indicate that population within our supply area is expected to grow to over 3 million people by 2045; representing a 22% increase. Total connections to our water supply system are expected to increase by 27% to just over 1.4 million.

We need to have effective, integrated water infrastructure that is fit for purpose to meet the needs of a growing population. We innovate to create sustainable communities, to manage the increased demand for water, and work with Government, local authorities and developers to make new homes more water efficient. We work closely with other water companies to share resources, as part of the Water Resources in the South East (WRSE) group. This helps us to develop integrated plans for a resilient water supply network.

WRSE is a sector-wide partnership that develops a south-east strategy for water every five years. The core membership comprises six water companies (Affinity Water, South East Water, Southern Water, SES Water, Portsmouth Water and Thames Water) working alongside the Environment Agency, Ofwat, the Consumer Council for Water, Natural England, the Department for the Environment, Food and Rural Affairs (Defra), the Canal and River Trust, the Greater London Authority, and other partners.

The aim of WRSE is to identify how best to share the water resources at a regional level. It also looks further afield, working with neighbouring regions of the UK and their water companies to explore inter-regional water transfers. Our work focuses on exploring opportunities across the region for existing and new water resources to be shared in the most efficient and effective way, to provide reliable, sustainable supplies at best value to customers while also protecting the environment. This is because we expect the pressure on water supplies in South East England to increase in the future due to many reasons including climate change, population growth and the need to further protect the environment.

The water supply network within south east England is a complex pattern of different water company areas and water resource zones. This is a result of the historic development and integration of local systems over more than a century, plus the fact that division of the region after privatisation did not necessarily align with catchment or water resource system boundaries. Therefore, the fundamental approach of the WRSE is to ignore water company boundaries, and look across the region, to assess best ways to share available water.

Many of the water resource zones across the South East currently, or in the future, will experience shortfalls in water availability. However, there are also areas that have water that can be shared. By looking at a regional scale we can try to maximise the benefits of sharing of water resources across the area, and in doing so, reduce the need for new water schemes or developments, and reduce existing abstraction. Our planning work helps us to understand which options might be best for the south-east in the long-term (such as identifying strategic schemes that can be optimised to provide benefit on a regional scale) which will help the region become more resilient to drought, outage and the environment.

For the PR19 planning cycle, the WRSE looked over a very long horizon of sixty years (from 2020 to 2080) exploring a range of different factors, including a greater range of future droughts of differing severities, different population growth forecasts, resilience to extreme events, and reducing water demand and leakage rates still further.

To inform WRMPs, the WRSE group has examined nine potential futures using an Economics of Balancing Supply and Demand optimisation model, selecting from approximately 1400 options to see what groups of options were the best choice to satisfy the deficit, and to test their resilience. This approach is more sophisticated than an average incremental cost approach (stacking the cheaper unit cost schemes together), but not as advanced as the real options approach we have adopted for our own WRMP.

Following the close of the consultation period on our draft WRMP, further regional modelling was undertaken, exploring more scenarios to assess the feedback from customers. In addition, the scenarios being explored included a range of regional targets to assess the effect of meeting the recommendations from the NIC and Defra on leakage and per capita consumption in terms of option selection.

Our WRMP is based on a higher water efficiency scenario, which is tested against a range of sustainability reductions set against a range of droughts up to and including a 1:500 year design drought, allowing for drought permits and orders to be used. Therefore there is not an exact comparison / match with one of the WRSE scenarios above.

Nevertheless, an analysis of individual company plans has shown that there is a high uptake of the WRSE regional outputs into company draft WRMP preferred plans; the precise number depends up on which of the scenarios are being compared with the company's draft WRMP. Transfers of water within the region contribute the most (mostly over 40%) to satisfying the regional water deficit.

There are two key aspects of regional planning that are particularly relevant to our preferred plan. The first is the potential for joint schemes – for example there are two potential schemes for the joint development of a water reuse option with South East Water. The second, and perhaps more common example relates to water trading – bulk supplies with neighbouring water companies.

Water trading can provide greater supply system resilience which customers support. However, there can also be a number of limitations to water trading, such as:

- The timing by which transfers are available to provide supplies, compared to when we actually face a deficit that needs to be resolved;
- The security of the supply of traded water, and particularly that the source used to provide the supply is not at risk of future sustainability reduction;
- The extent to which the supplying company can provide a guarantee that the water supply will be available during the drought return periods that we are planning to;
- The cost of the bulk supply – bulk supply options must be economic in comparison to our own resource development options, as it would not benefit our customers if trading options were significantly more expensive than our own options. This may occur where, for example, the supplying company charges for the development of the new option and we then also face the cost of the pipeline from that source to our own supply area whilst also paying relatively high costs per unit of water supplied.

Nevertheless, we continue to discuss and explore water trading options with neighbouring water companies. We have led the development of more robust water resources planning by introducing stochastic modelling into the sector to provide insight into potential future droughts and the use of real options methods to provide adaptive and scalable solutions.

We continue to actively support the WRSE group as it moves towards building a regional plan for the South East that takes into consideration other sectors' demand for water and wider resilience issues. Our WRMP has considered the latest WRSE modelling outcomes and many of the proposed solutions are consistent with our plan and provide building blocks for future resource sharing and trading opportunities. We also attend the West Country Water Resources group to support the consideration and investigation of schemes from this region which could benefit Southern Water and other companies in the South East.

We are committed to the development of a regional water transfer grid that will support water trades between companies and increase the level of resilience to drought and other incidents for customers in the South East. In Annexes 9, 10 and 11 of the WRMP we have provided further information on how our preferred strategies in each area support the development of this regional grid.

4.1.4 Strategic Water Resources Solutions

We have already developed strong and effective partnerships with water companies and other partners through the WRSE work outlined above. Through its consideration and determination of water company business plans for the 2020-2025 period, Ofwat has incentivised further joint working and collaboration on strategic water resources solutions. Ofwat has included an allowance of £450 million for companies to investigate and develop integrated strategic regional water resource solutions during 2020-25. Water companies and other partners will collaborate effectively and efficiently, to identify assess and progress regional solutions that protect and enhance the environment and benefit wider society. Ofwat has established a 'gated process' through which proposals can be evaluated and progressed alongside each other, enabling robust and consistent decision making across water companies on regional solution delivery. We are playing a key role in this process, both as a potential scheme developer and a recipient company for potential new strategic transfers from outside of our supply area.

4.1.5 Making sure our bills are affordable for all our customers

It costs a lot to maintain and run our water supply network. We must balance day-to-day costs with investing for the future, whilst keeping bills affordable for our customers. The approach we have adopted to developing our WRMP is to invest to ensure our supplies to customers are resilient, but to ensure that we carefully phase that investment over time in response to our forecasts of supply and demand. We use complex computer modelling techniques to assess a range of possible futures, including different scenarios for growth, licence changes and climate change. From these we can be confident that investment we plan to make now, and in the next 5-10 years, will be appropriate under any future we face.

Some of the new technologies that we will need to use in the future, for example water re-use or desalination, can be expensive to build and operate. Many of these options would only need to be fully operated in a dry or very dry year, and so we are designing them to be used at a much lower capacity for most of the time. In this way we can keep ongoing operational costs to a minimum.

4.1.6 Drought resilience

Droughts are naturally occurring events and are typically characterised by a prolonged period of abnormally low rainfall, leading to a shortage of water. Droughts can be of differing lengths and intensities, for instance a short event caused by a hot, dry summer, or a drought over several years where persistent low rainfall over the winter can seriously affect groundwater and river sources. The spatial extent of droughts can also vary widely, from being concentrated in a few catchments, to covering wider areas, such as South East England.

While there is no technical reason why sufficient water supplies cannot be provided to cover all but the most extreme droughts, there is a need to balance the costs to our customers of providing the required infrastructure to maintain supplies in severe droughts, and the potential impact on the environment. To manage droughts of differing severity, we plan to use a range of drought management interventions, which include demand restrictions, supply-side measures and operational management of our sources. The licence changes in our Western area means that we will require permanent solutions to improve our drought resilience, and these will form part of our WRMP. In addition, for the first time, we will be including drought options described in our Drought Plan within the WRMP as this will help us clearly show which events the WRMP will cover and which events the Drought Plan will cover. Depending on environmental conditions, we may need to rely on Drought Orders until we can develop alternative sources of water.

4.1.7 Use of new and innovative sources of supply

Given the scale of known and potential future licence changes, the options for new resources for the future will need to include new and innovative sources of supply, including water reuse and desalination. We have investigated these options extensively, assessing their costs and potential benefits, environmental impacts, and undertaken research with customers on their potential acceptability.

In relation to water reuse, we currently recycle approximately 17% of the water we abstract from catchments. However, we release over 700 million litres a day (Ml/d) of treated wastewater to the estuary and coast. As part of this WRMP we have explored whether options to reuse this water could be cost effectively and sustainably delivered in locations across the Eastern, Central and Western areas.

Similarly, we have assessed the potential for developing desalination plants in each of our three areas, either on the coast or tidal rivers. Both water reuse and desalination plants are expensive to build and operate, but like reservoirs they can provide a reliable source of water for customers. Further innovations and new technology are actively being investigated, including use of graphene as part of the desalination process, which could significantly improve efficiency of this potential water source.

4.1.8 Catchment solutions

Groundwater and rivers within our supply area can be placed under environmental stress from a range of factors, affecting our ability to utilise sources for supplies to customers. Rising nitrate levels within some sources mean that we are actively pursuing catchment management initiatives to ensure that we can continue to make use of existing sources of supply. Additional treatment of water may be required alongside the management measures in some locations. We employ staff who work exclusively on catchment based solutions with landowners, farmers and other stakeholders across our supply area. We are committed to continuing and extending this approach through our 'Catchment First' initiative.

A number of our abstractions are facing known or potential future licence changes due to concerns about the environmental impacts of low flows on protected habitats or species. These are continuing to be investigated, but there is growing support amongst stakeholders for catchment based solutions, including river restoration measures, to be implemented for these rivers. These solutions could bring long term environmental benefits to the rivers, and improve their resilience to low flow conditions. However, it has not yet been possible to reach agreement with the Environment Agency and other stakeholders that these solutions would avoid or reduce the need for licence changes. This makes it difficult for us to include these solutions as water resources options within our WRMP, and for us to secure funding for them in our Business Plan. We will continue to work with the Environment Agency, Natural England and other stakeholders to try to overcome this issue.

4.1.9 Other challenges

Whilst the WRMP has been traditionally focussed on drought conditions, we have included several scenarios of other climate events occurring.

Following the 2016 EU referendum result, the UK is working towards leaving the EU. Leaving the EU brings uncertainty, in particular for our demand forecasts, but it could also provide an opportunity for us to shape the future value of the water in the UK. For the time being EU legislation is being incorporated into UK law, and it will be some time before we will know if any changes are then made to the many EU Regulations that we are subject to. The implications of any changes would be incorporated into our next, or subsequent, WRMP.

The scale of potential licence changes we are facing is driving a significant amount of investment in planned new resources. Whilst we have been investigating these schemes as part of the preparation of this WRMP, we will need to complete extensive environmental assessments and secure planning and other permissions before we can build and operate them. Within Hampshire in particular, where a large number of schemes need to be developed in the next ten years, and also potentially in the Central area, there are risks and challenges to us being able to secure all of the necessary permissions and to build all of the new resources by that date. We will need to continue to work closely with our regulators, local planning authorities and other

stakeholders in the planning and delivery of these schemes to respond to licence changes and environmental conditions.

4.2 Key objectives for our WRMP

Drawing together the challenges and opportunities outlined above, our WRMP needs to set out a robust strategy to deliver:

Long term resilience and sustainability

We need to develop an effective plan that will provide a reliable water supply now and in the future. Our aim is to:

- reduce the amount of water we need on a daily basis and the amount of water we lose to leaks;
- adapt to risks and uncertainties surrounding sustainability reductions, drought and climate change to achieve a resilient natural environment;
- harness technology to secure new supplies from wastewater seawater, particularly for agriculture and industry;
- recycle used water as a valuable resource;
- collaborate with business and agriculture to achieve sustainable economic growth.

Innovation

We need to embrace new and better ways of doing things. Everything we do is about making sure our services, community and environment are protected, secure and reliable. This is not about keeping things the same, but always looking at innovative ways to improve. We need to embrace new technologies where they deliver solutions that are cost effective and benefit the environment. Innovation includes the way we secure power for our water supply network, potentially increasing our reliance on renewable sources of energy.

Affordable bills

We need to ensure that everyone can afford to pay for their water services. Our plan needs to be affordable for our customers whilst being environmentally and socially sustainable.

Great customer service

We need to go beyond the basics and serve customer's different needs. We need to ensure that our WRMP is prepared with increased customer engagement, and that we reflect customer preferences in the selection of our proposals.

Best value

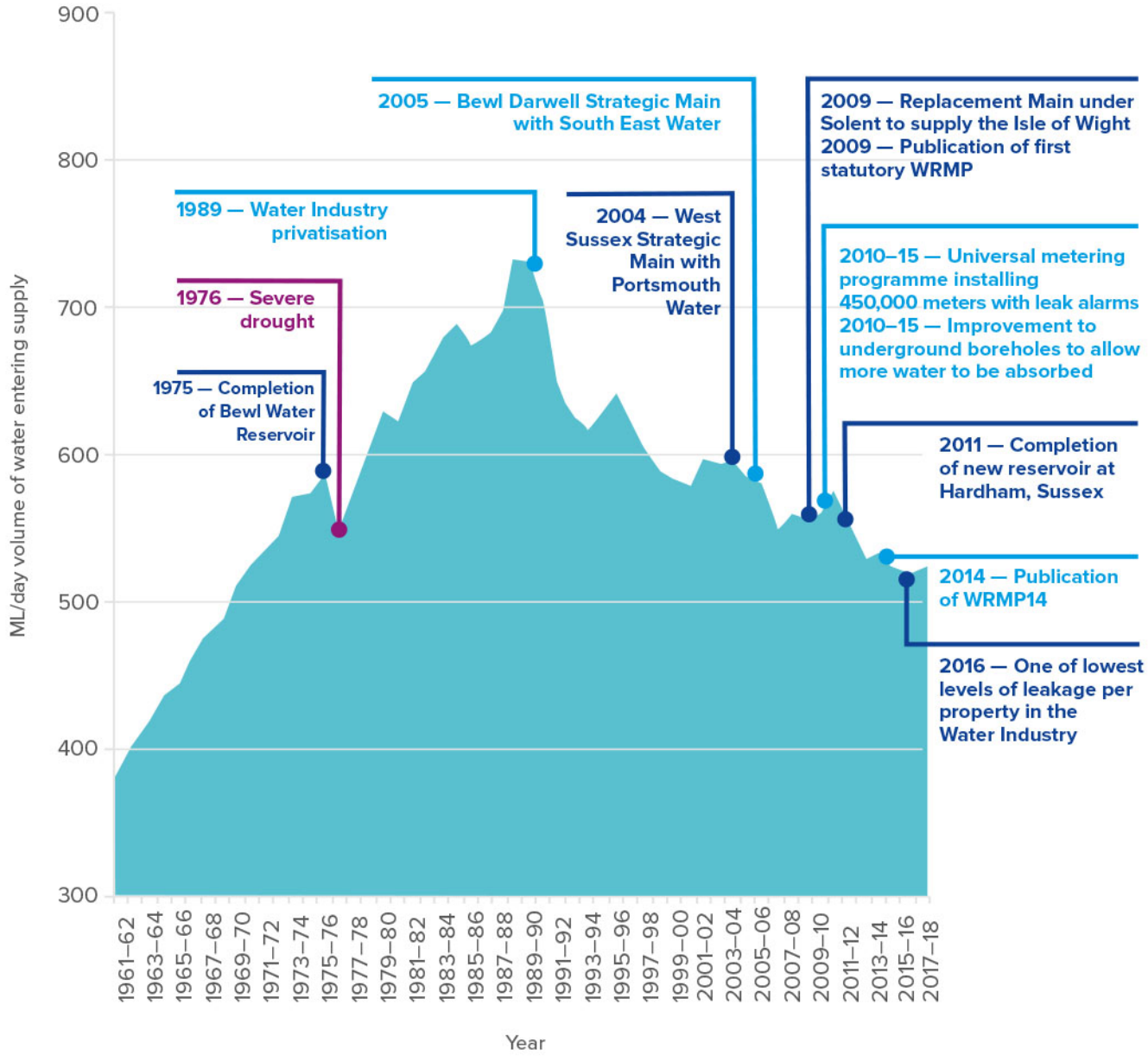
We need to develop a best value plan that takes account of the challenges and uncertainties that we face. Our plan needs to represent the best solution for us, our customers and the environment.

5. Balancing future supply and demand

5.1 Levels of water supplied in the past

Before looking ahead to the future demand and supply of water, it is important to reflect on the changes that have been experienced in the past. There is a widely held view that the amount of water being supplied, and the abstractions that provide the water, have been steadily increasing over time. However, in our supply areas, the reverse is true. Figure 5.1 below provides a summary of how the amount of water that we put into supply each day has changed over the last 50-60 years. It has reduced since the late 1980s, despite an increasing population over the same period.

Figure 5.1 – How the amount of water we supply has changed



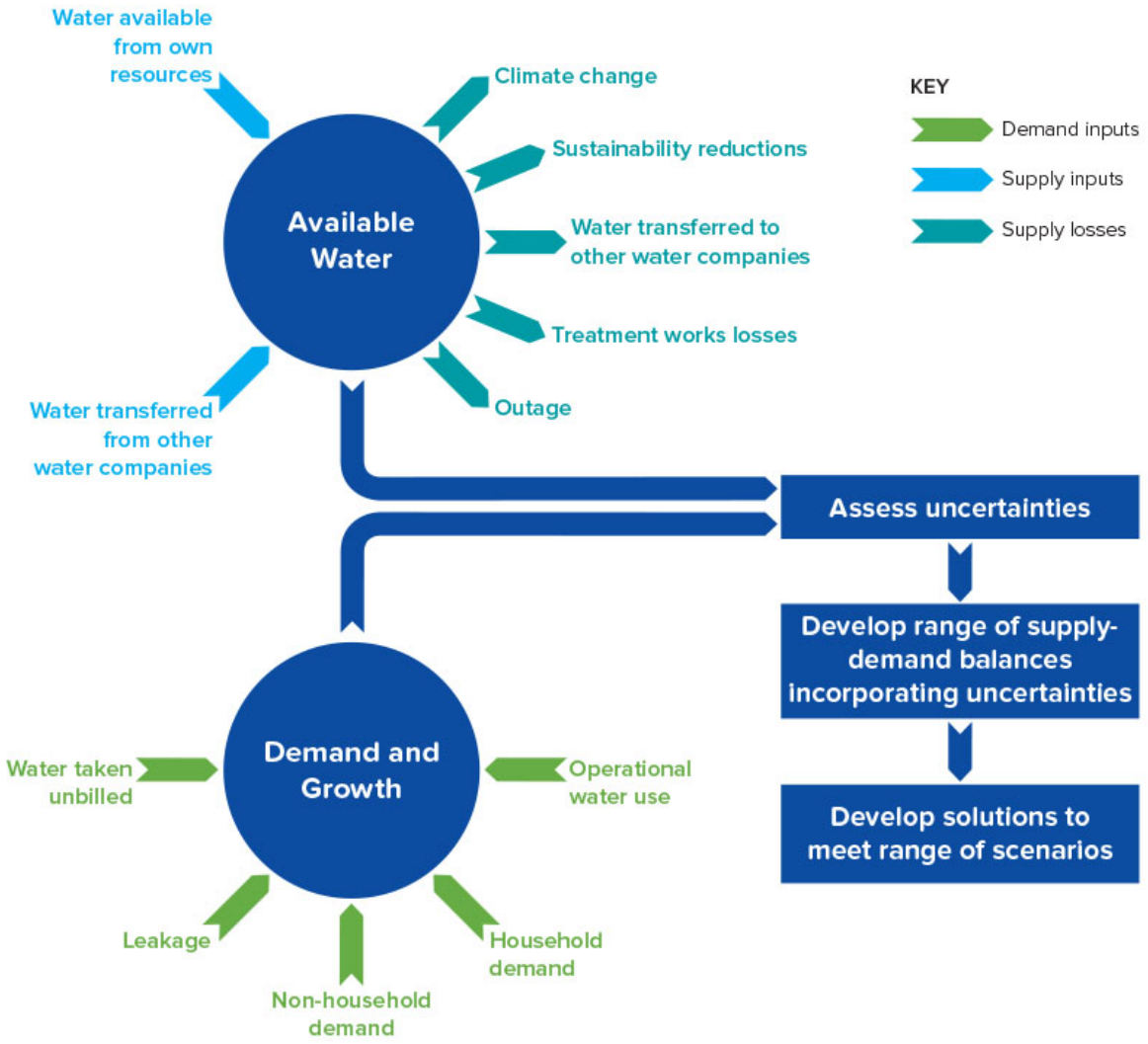
We are proud of the work that we have completed to date, working closely with our customers and other stakeholders to reduce the volume of water we supply each day. Working together we can provide clean, safe and sustainable water, and also protect and improve rivers, reservoirs and coasts for the future.

5.2 An overview of how we balance supply and demand

We need to assess how much water will be needed in the future, so we can make sure the services we provide are effective and fit for the future.

We set out our best estimate predictions of the future supply and demand for water, accommodating risks and uncertainties within the different futures we plan for, and from this derive our supply demand balance. Where the demand for water is greater than supply, this indicates that we will have a deficit in our supply demand balance. An overview of the elements that feed into our supply demand balance are included in Figure 5.2.

Figure 5.2 – How we balance supply and demand



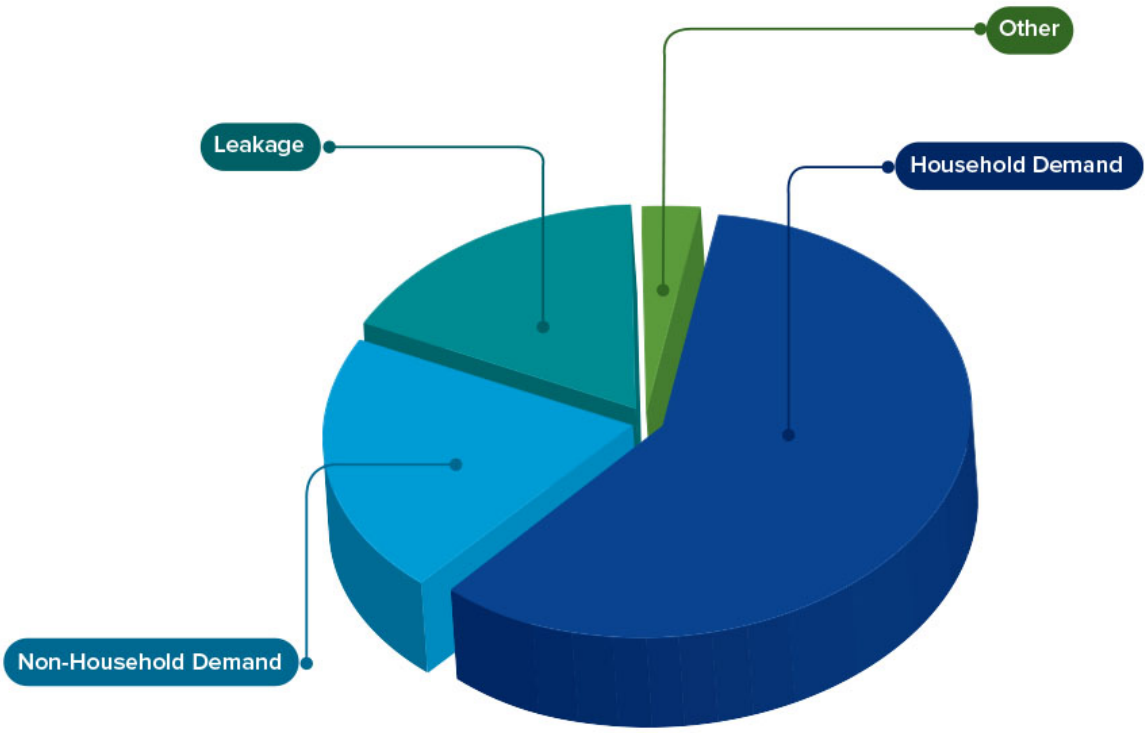
5.3 Our demand forecast

5.3.1 Our current demand and determining the 'base year' of the forecast

For our 50 year WRMP we need to forecast the future demand for water from 2020 to 2070. Our process for determining future demand follows guidance issued by the Environment Agency and recommendations from UK Water Industry Research.

As we explained in section 5.1, the amount of water we put into the water distribution system has steadily declined since the 1980s, despite an increase in population over this time. In 2017-18 we put a total of 541Ml/d (million litres of water per day) into our water distribution system. This can be broken down into various demand components as shown in Figure 5.3.

Figure 5.3 – Breakdown of demand components



The starting point for our demand forecast is to select a base year and use this to forecast future demand. Our base year is 2017-18. Summer weather is the main influence on household demand, which is the largest component of our total demand. The summer of 2017 was warmer and drier than the long term average but not sufficiently to classify it as a dry year. By comparison the summer of 2015 reflected the long term average for temperature and rainfall. Our base year took account of domestic demand in 2017-18 and per capita consumption figures for 2015-16.

2.9.1 Components of our demand forecast

To forecast demand we assess each of the components of demand, as shown in Figure 5.3, and determine how likely they are to change over the planning period, and by how much, as summarised below.

Household Demand - Population growth and changes in household composition are key drivers for demand. Our forecasts are primarily based on housing projections by Local Authorities in our supply area. We have extended the forecast to 2069-70 by using the annual growth rate at the end of 2044-45. Accordingly, population is forecast to grow to over 3.5 million people by 2069-70. Total connections to our water supply system are forecast to increase by 47% to over 1.6 million. The combined effect of population and properties growth results in an overall 8% drop in average household occupancy from 2.43 to 2.23 over the planning period. This is in line with expected demographic trends.

We use micro-component analysis (assessing expected water use within the home – e.g. showers, baths, washing and dishwasher machines etc) to forecast domestic demand. We forecast that total household demand is forecast to increase to 352.2Ml/d by 2069-70, an increase of 16% over the planning period. The increase is due to the projected increase in the population we serve. Per capita consumption is forecast to drop from 120.3 litres/person/day at the start of the planning period to 102.7 litres/person/day by 2069-70 before we consider any interventions to reduce this further. This represents a decrease of 15%, even after accounting for potential impacts of climate change on demand. We have collected data, which includes surveying our customers, and we anticipate that this reduction will be as a result of more water efficient behaviour in the home as well as replacement of older devices such as WCs, washing machines and dishwashers by more water efficient models.

Non-household demand - For non-household demand, we consider a range of sectors and forecast demand for each sector. Total non-household demand is forecast to increase by 10% to 127.7Ml/d by 2069-70. Growth is primarily driven by the financial and business services sector; all other sectors have negligible increases or decreases.

Leakage – Managing leakage is an important part of our water resources strategy. A low level of leakage is desirable, both for the environment, and because it defers the need to invest in new resources which would otherwise be required to meet increases in demand over time. However, it is not necessarily economic to reduce leakage to very low levels, because to do so could involve very large additional costs for relatively small savings of water. Our approach, and that of our regulators, is to set leakage at a level that is optimal for our customers and society as a whole.

Leakage is comprised of two components:

- Distribution losses - losses from trunk mains, distribution mains, service reservoirs and communications pipes which we are responsible for; and
- Underground supply pipe losses - losses occurring between the point of delivery at the property boundary and the point of consumption. These are the responsibility of our customers but following our metering programme and installation of alarms, are much easier to detect.

We have committed to significant additional leakage reduction compared to our draft WRMP, seeking to reduce leakage by 50% by 2050. This plan proposes a series of measures as part of a combined strategy of further active leakage control and mains replacement programs to ensure that we continue our drive down on leakage. This aligns with customer and regulatory views.

Other components of demand – We do not anticipate any change to operational water use or water taken unbilled, and these will therefore be constant at the 2017-18 base year values.

2.9.2 Our demand forecast

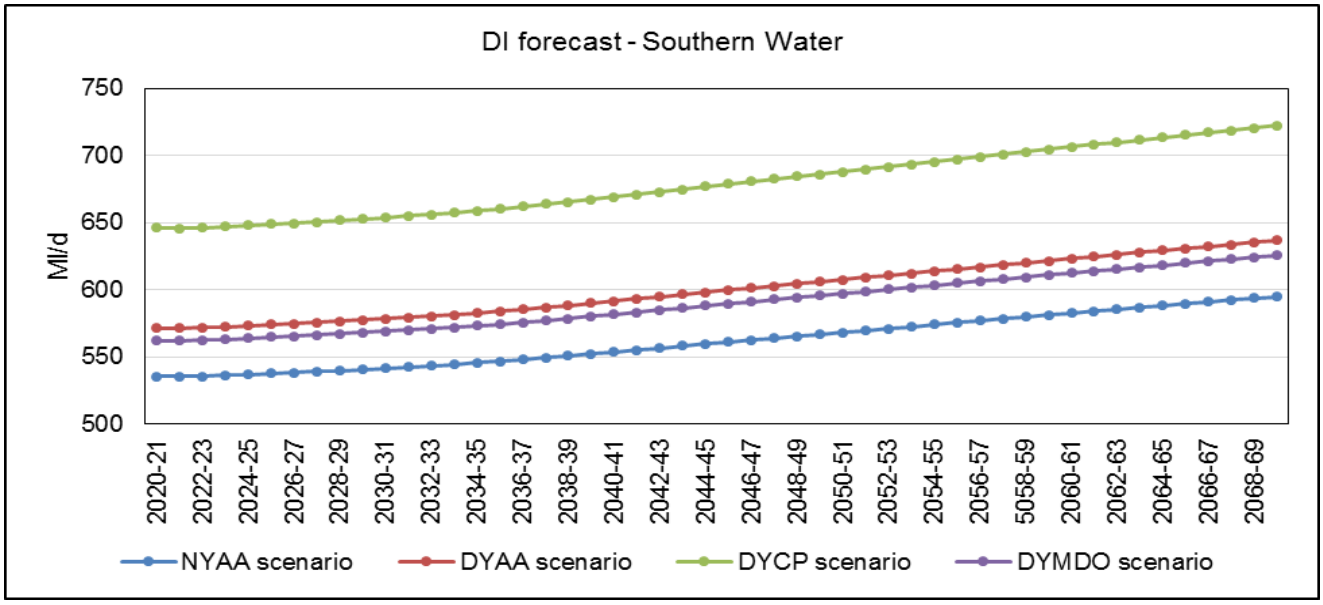
Taking all of the above into consideration, we calculate how we expect the demand for water to change over the planning period (Annex 2). Our forecasts are that we expect demand for water to increase by the following amounts under each of the four planning scenarios.

Table 5.1 – Forecast demand increase under the four planning scenarios

Planning scenario	2019-20 demand (Ml/d)	2069-70 demand (Ml/d)	Net change (Ml/d)	Net change (%)
Normal Year (NYAA)	535.1	594.9	59.8	11%
Dry Year (DYAA)	571.0	636.0	65.0	11%
Peak Demand (DYCP)	643.9	720.0	76.1	12%
Minimum DO (DYMDO)	561.0	624.1	63.2	11%

Figure 5.4 shows this increase in demand over the 50 year planning period for each of the planning scenarios we evaluate, described in section 3.3 of this document.

Figure 5.4 – Demand forecast up to 2069-70 for the four planning scenarios



5.4 Our supply forecast

5.4.1 How we forecast future supply

In order to effectively prepare our WRMP we need to forecast what water supplies will be available over the planning period. This is our water available for use (WAFU), which is calculated based on:

- **Water available from our resources** – Known as our deployable output, this is the water that will be available from our resources in the future, taking into account various factors, such as, quality and treatment constraints and will relate to a specific severity of drought. We also take into account that the amount of water available will be different depending upon the time of year e.g. groundwater and river flow levels are typically at their lowest during the autumn.
- **Bulk imports and exports** - We transfer water into and out of our supply area. Again, water availability can vary depending upon the time of year and we take this into account.
- **Climate change** – We assess the impact of climate change on water supplies. Current projections of climate change impacts on the UK forecast a general rise in temperature and sea level, and changes to the pattern of rainfall.

- **Sustainability reductions** – A number of our sources will definitely be affected by sustainability reductions (licence changes) over the period of the WRMP, and others face investigations and potential changes. All abstractions are operated within the terms of an abstraction licence. Many of these licences were issued in 1965 and the Environment Agency considers that the terms of some of these licences could cause environmental damage, or could have an impact on sites with environmental designations. Our licences are reviewed, and if they are identified as having an unacceptable risk to the environment, the Environment Agency requires that we find and implement solutions to the problem. This may include placing restrictions and controls on the way the licence can be used in future. We have assessed the potential impact of these changes on our sources.
- **Process Losses** – When we treat water, there are some limited process and operational losses. We account for these in our supply forecast.
- **Outage** – Unplanned outages can occur for a variety of reasons, such as mechanical failures or water quality issues. Planned outages occur where we need to undertake maintenance or improvement works. We include a provision for outages within our supply forecast.

Traditionally WRMPs assessed the future based on the environmental conditions that have been experienced in the past. For this WRMP we are utilising a method of forecasting, called stochastic modelling, that allows us to select statistical data over 2,000 years from a master set of 100,000 years. This improved data set allows us to plan for a wider range of possible futures. We have re-assessed the deployable output of our sources since our last WRMP using this approach.

5.4.2 Supply forecasts for the area we supply

Our assessment of our supplies, based on various different scenarios, is set out below for each of the supply areas in turn. The charts (figures 5.5 to 5.10) tell us the following about our regions:

Eastern area

At the start of the planning period (2020-21) in a 1 in 200 year drought, our WAFU in the Eastern area is as shown in Figure 5.5 below. We calculate WAFU as being 165.05 Ml/d (million litres per day). All of the charts show different colour bars. The blue bars represent how much water we have available. The red bars represent how much water is lost from the system and green bars show water gains.

During the planning period in the Eastern area, our available supplies (deployable output) for the region are expected to rise as a result of an increased yield from the River Medway Scheme. However we are anticipating water quality issues within our Kent Thanet WRZ due to the level of nitrates within the water, reducing the amount of water available from our sources.

Whilst we have not yet been notified of any certain sustainability reductions, it is possible that we will need to make changes to some licences by 2027 to protect and enhance the environment. We have allowed for different levels of reductions in the different estimates in our forecasts.

Climate change impacts vary substantially between WRZs. In Kent Medway West WRZ we are predicting an increase in water available from climate change due to improved inflows into the reservoir system and the influence of wetter winters. Kent Medway East is relatively insensitive to climate change and in the groundwater dominated Kent Thanet WRZ, there is climate change uncertainty that could lead to a gain or loss of deployable output.

On the above basis, our forecast is that by the end of the planning period, the WAFU is calculated as 143.32Ml/d in the Eastern area, as shown in Figure 5.6.

Figure 5.5 - Eastern area WAFU for 1 in 200 year drought (ADO) at start of planning period

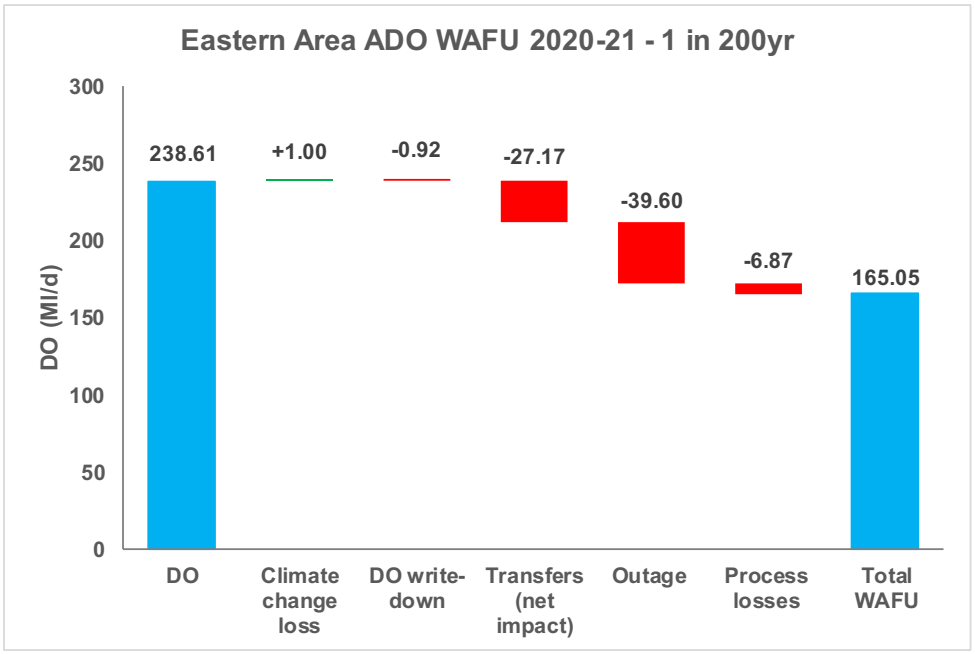
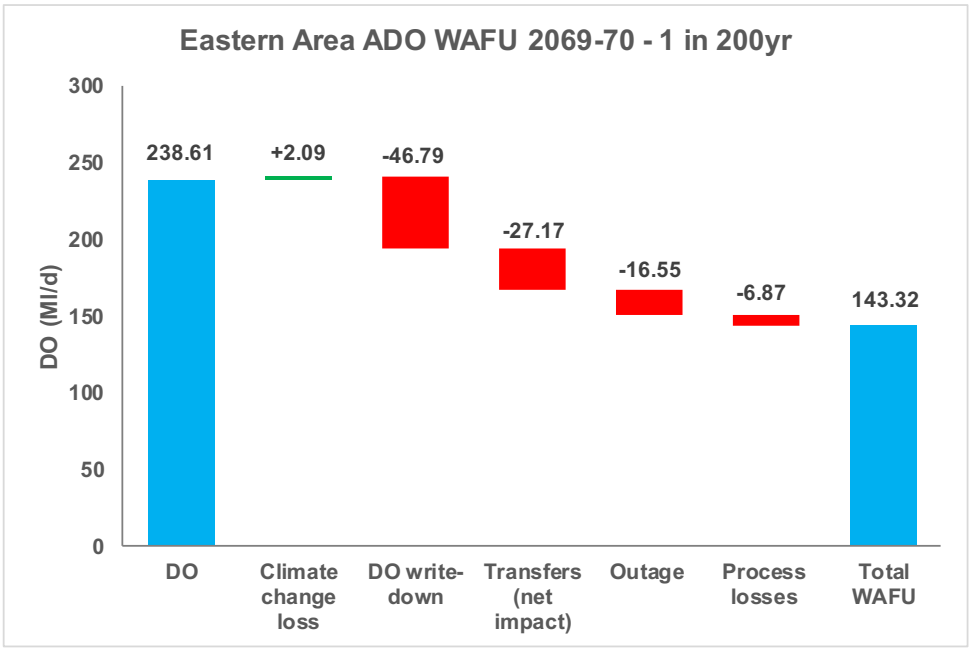


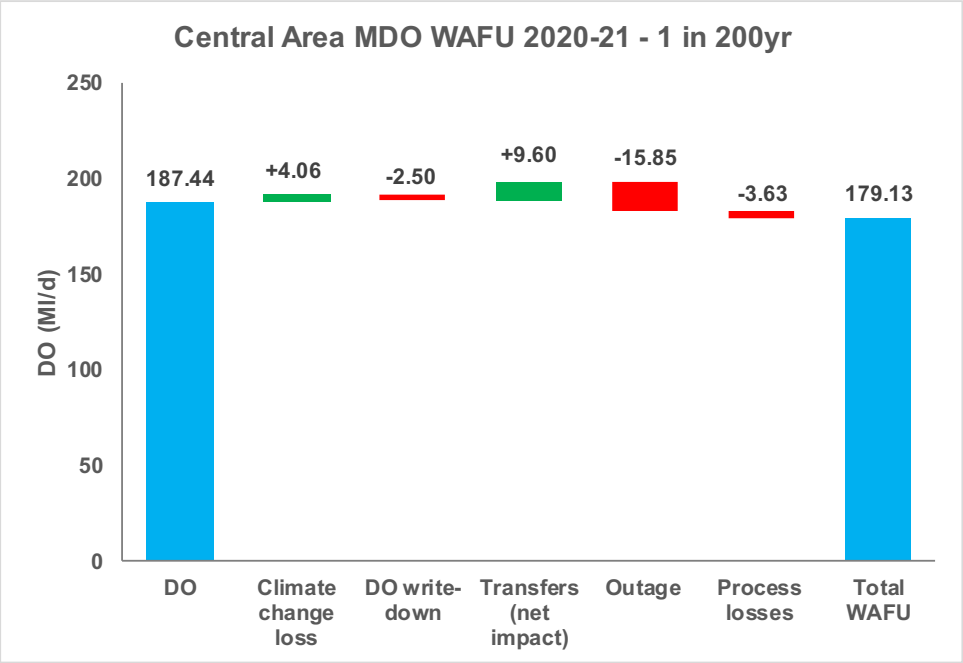
Figure 5.6 - Eastern area WAFU for 1 in 200yr drought (ADO) at end of planning period



Central area

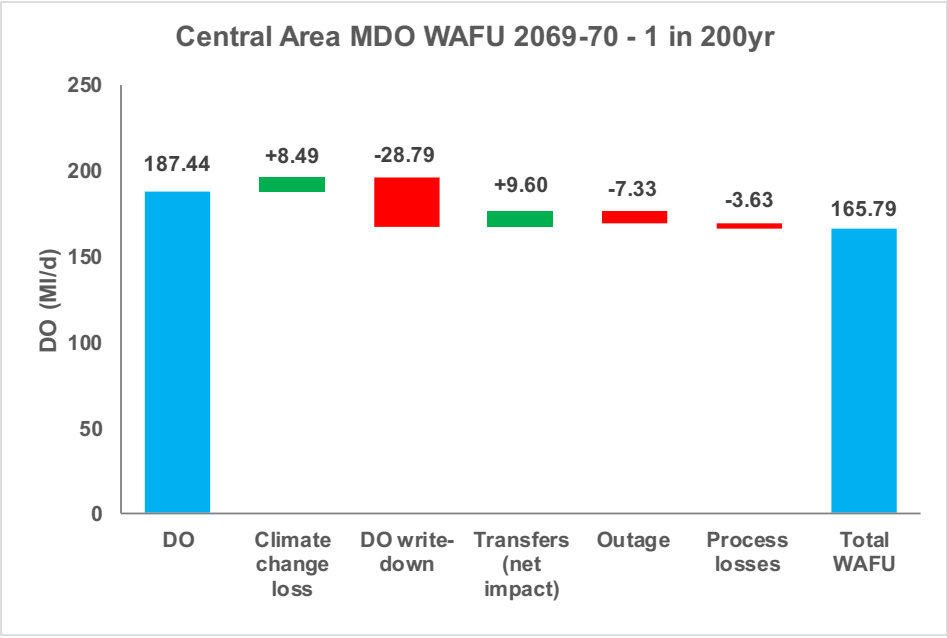
At the start of the planning period (2020-21) in a 1 in 200 year drought, our WAFU in the Central area is as shown in Figure 5.7 below. We calculate WAFU as being 179.13Ml/d at MDO. We are not expecting significant changes to our overall deployable output in the Central area however we have reduced the amount of water we expect to obtain from some of our sources due to water quality and treatment capacity. Drought vulnerability across the area varies depending upon the type of source within each WRZ.

Figure 5.7 - Central area WAFU for a 1 in 200 year drought (MDO) at start of the planning period



Whilst we have not yet been notified of any certain sustainability reductions, it is possible that we will need to make changes to our licences by 2027 to protect and enhance the environment. The potential scale of these could be significant, but is not yet certain. We have allowed for this in our estimates. The Sussex North WRZ shows the greatest vulnerability to climate change. This reflects the reliance on large surface water resources in this zone and licence constraints that limit abstraction at low flows. We estimate WAFU at the end of the planning period as 165.79Ml/d as shown in Figure 5.8.

Figure 5.8 - Central area WAFU for 1 in 200yr drought (MDO) at end of planning period



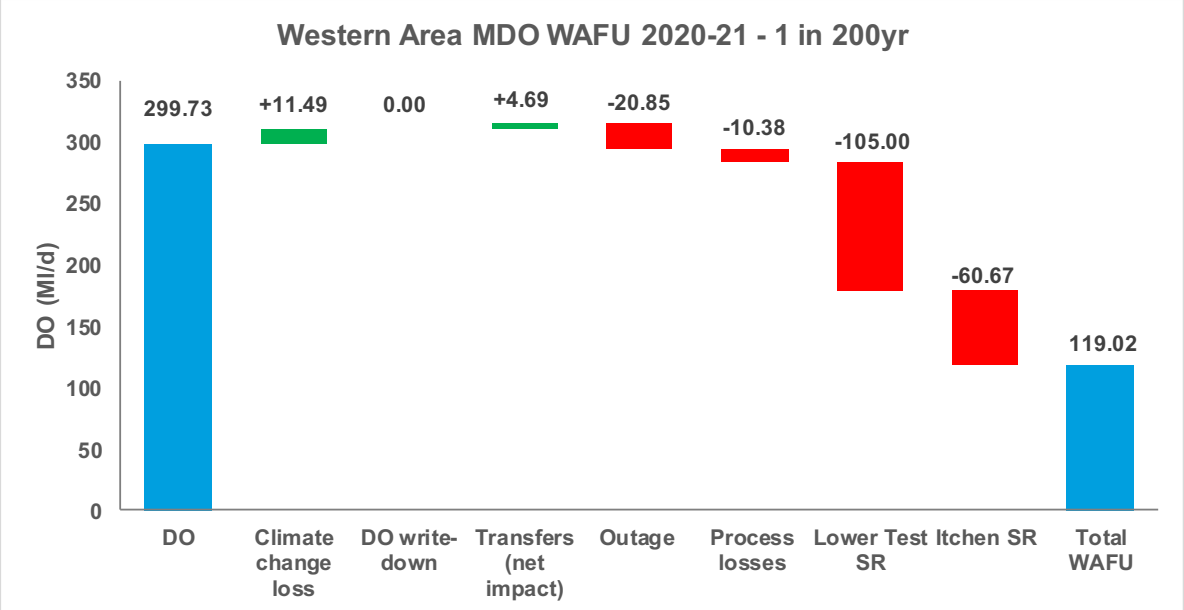
Western area

Our previous (2014) WRMP included a number of major schemes in response to the Environment Agency's changes to our Itchen ground and surface water licences, to seek to maintain the supply-demand balance. We planned to implement these schemes in advance of the licence changes coming into effect, to protect supplies to customers, and have undertaken significant investigation and assessment of those schemes since 2007. Whilst one of these major schemes is now operational, we have been unable to implement two of the major schemes due to changing circumstances relating to abstraction licences.

At the Inquiry in March 2018 Southern Water and the Environment Agency signed the s20 agreement that included various commitments from both parties in relation to licence changes for the Lower Itchen, Test and Candover. These commitments are summarised in section 2.8.1 of this document. As a result of the licence changes we anticipate that in dry or very dry environmental conditions we will lose a significant proportion of our currently available water supplies in Hampshire. In order to maintain supplies to customers following the implementation of these licence changes, significant investment in new water resources will be required. These investments are described in section 7 of this document and in Annex 9 of this WRMP.

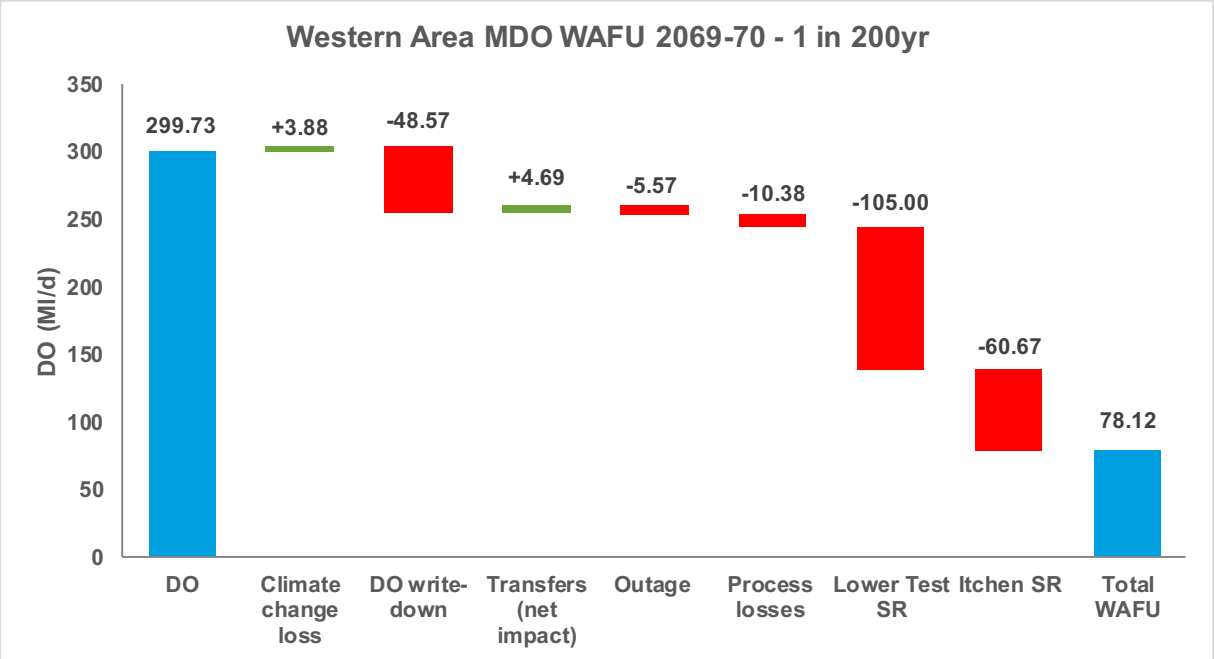
At the start of the planning period, with the Environment Agency's licence changes implemented, we estimate that WAFU in the Western area in a 1 in 200 year drought would be 119.02Ml/d as shown in Figure 5.9.

Figure 5.9 - Western area WAFU for 1 in 200 year drought (MDO) at start of planning period



In addition to the existing licence changes, we anticipate that there will be a need for further licence changes at other sources in the Western area by 2027. These licence changes will be proposed by the Environment Agency in order to protect and enhance the environment, to comply with the Water Framework Directive. The potential scale of these could be significant, but it is not yet certain. We have allowed for this in our estimates. By the end of the planning period (2070) we estimate WAFU for the Western area as 78.12Ml/d as shown in Figure 5.10.

Figure 5.10 - Western area WAFU for 1 in 200 yr drought (MDO) at end of planning period



5.5 Planning for uncertainty

5.5.1 How we incorporate uncertainty into our forecasts

We recognise that there are a number of uncertainties associated with our demand and supply forecasts. We therefore sensitivity test the impact of these uncertainties on our forecasts and build in an allowance into our supply-demand balance. Traditionally the allowance is called target headroom (see WRMP Annex 8), which informs a surplus of supply to allow for uncertainties in the supply and demand forecasts. To calculate our approach to risks and uncertainties we use a series of models as shown on Figure 5.11, and summarised below:

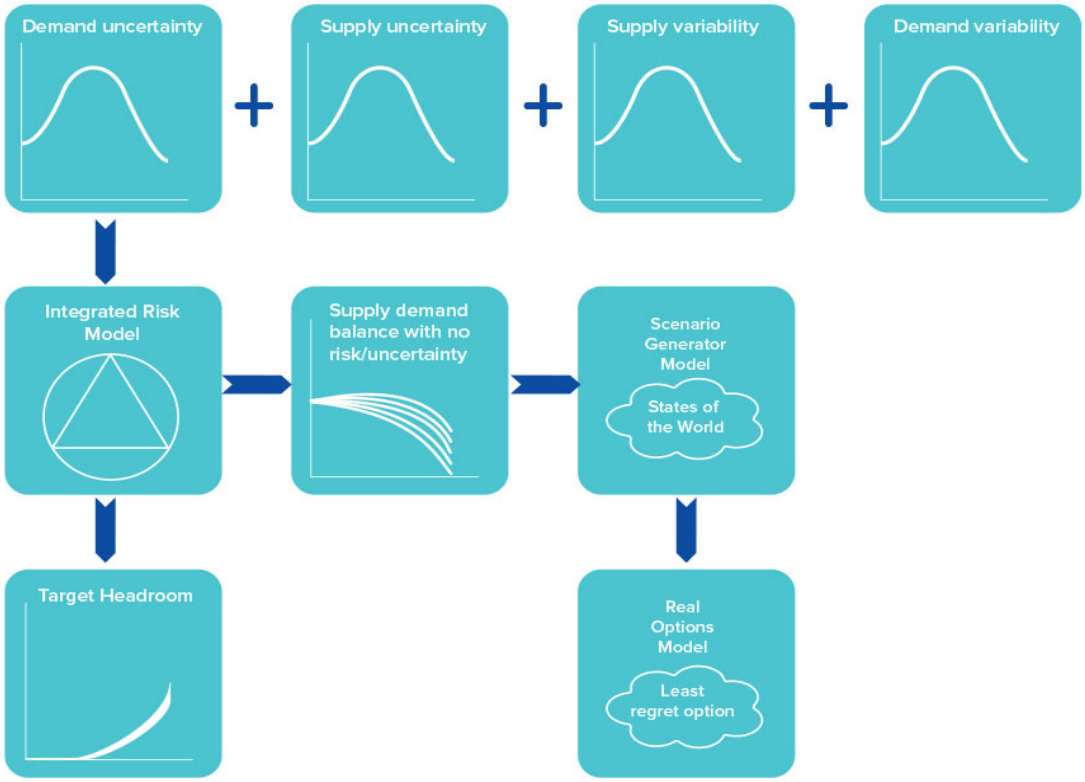
- **Integrated risk model** – this provides an estimate of target headroom and by taking into account a range of risks and uncertainties provides an integrated risk profile of the supply-demand balance that could be encountered in any one year.
- **Scenario generator model** – this uses a technique to quantify risk by simulating a range of possible outcomes, the probabilities of their occurrence and generating a range of supply-demand profiles that occur at different drought scenarios. These scenarios are called ‘states of the world’.
- **Real options model** – this is a decision making tool that allows for an examination of possible futures – this is described in more detail in section 6 of this document.

There are two main sources of uncertainty that we model:

- uncertainties associated with forecasts of long term influences on supply and demand; and
- uncertainties associated with inaccuracies in our measurements and modelling outputs.

These approaches replace the traditional ‘Target Headroom' approach to risk and uncertainty.

Figure 5.11 - How we model for uncertainty



5.5.2 Uncertainties in our demand and supply forecasting

For our demand forecast, we examine uncertainties in:

- **population growth** – forecasting this involves examining trends and demographic, economic and political factors. The further ahead we forecast, the more potential there is for projections to change. We look at lower and higher population growth in our forecasts.
- **water efficiency achieved by changes in customer behaviour** – customer water use behaviour is an important influence on demand but can be difficult to forecast. We look at high and low efficiency scenarios, from a 2% to 22% increase in demand. This includes varying shower times and use of hosepipes for metered and unmetered customers (see WRMP Annex 2 for further details).
- **climate change** – this is likely to lead to a generally drier and warmer climate with an increased frequency of extreme events (storms, floods, droughts etc.). The component of domestic demand most likely to be impacted by a shift in climate is external use (garden watering, paddling pools etc.) but it may also lead to more frequent personal washing and clothes washing. There is also the possibility of changes in behaviour in response to climate change (e.g. allowing a garden to be 'brown' for parts of the year) such that the shift to drier, warmer climate may not necessarily lead to an increase in consumption. There is considerable uncertainty as to how climate change will manifest itself over various timescales and the behavioural response it will invoke. We have therefore analysed various climate change scenarios, although we found that these did not have a significantly different effect upon our forecast (see WRMP Annexes 2, 3, 9, 10 and 11 for further details on climate change). In 2017-18 we reported that our carbon emissions were 65 ktCO2e.
- sensitivities around potential changes to **non-household demand**

For our supply forecast, we examine uncertainties in:

- **climate change** - for water resources, there is a relatively wide range of uncertainty as climate change could mean a drier future in which water resources will become more scarce, and wetter futures where

increased winter rainfall translates to increased resources. We therefore assess a range of possible futures.

- **bulk imports** – the availability of bulk supplies during drought conditions and reliability of supplies from other water companies could vary according to environmental conditions. Variations in the water supplied through bulk supplies is therefore assessed.
- **sustainability reductions** – this is a key area of uncertainty for us, and is addressed in more detail below.

5.5.3 Achieving sustainable abstraction

We have been an active partner in supporting delivery of the Environment Agency's Restoring Sustainable Abstraction (RSA) programme and more recently Water Framework Directive (WFD) programme.

Requirements for investigations, options appraisals and implementation schemes have been set out in the Environment Agency's National Environment Programme (NEP) which is issued every 5 years to align with Ofwat's business plan process to allow funding to be sought.

Over the last 20 years we have undertaken investigations and implemented schemes to improve the environmental sustainability of our abstraction base, including the revocation of an abstraction licence at a groundwater source in the Test valley, the reduction in licence volumes at a source in Sussex (North Arundel) and river restoration to a stream on the Isle of Wight (Lukely Brook).

We believe it is in the best interest of customers and the environment to address unsustainable abstraction as quickly as possible and to look beyond the 5 year NEP / business planning cycle to ensure future risks are addressed. This will ensure optimal solutions can be implemented taking account of the long term availability of supplies. As well as being supportive of the Environment Agency's most recent sustainable abstraction programme, we are also developing a long term environmental forecast. This will consider future scenarios taking account of climate change and its impact upon sustainable abstraction as well as other drivers such as behavioural change.

There are a number of drivers that must be addressed in order for a sustainable abstraction regime to be achieved. These include protecting habitats and species designated under the Habitats Directive, safeguarding Sites of Special Scientific Interest (SSSIs) and protecting Biodiversity Action Plan (BAP) species. In addition the Environment Agency's sustainable abstraction programme now strongly emphasises the WFD objective to ensure water bodies do not deteriorate as well as improving water body status where this is achievable.

A number of investigations are ongoing and the magnitude and timing of the next round of sustainability reductions is not likely to be known until 2023. Sustainability reduction scenarios (lower, middle and upper) have therefore been developed for each WRZ to test what the impact of differing levels of reductions might be. The Environment Agency provided guidance to water companies on developing these scenarios. The lower scenario should represent licence changes which are known or most certain whereas the upper scenario will also include an estimate of potential future licence changes which are currently uncertain.

For our **Eastern area** there are no sustainability reductions in the lower and middle scenarios. For the upper scenario, estimated sustainability reductions from 2029, are 26.9Ml/d for PDO and 21.8Ml/d for MDO/ADO.

For our **Central area** there are also no sustainability reductions in the lower and middle scenarios. For the upper scenario, the estimated sustainability reductions from 2029, are 72.1Ml/d for PDO and 52.4Ml/d for MDO/ADO.
For the **Western area**, as well as the lower, middle and upper scenarios, as part of the preparation of the draft WRMP we considered the timing of sustainability reductions on the Test surface water and Itchen

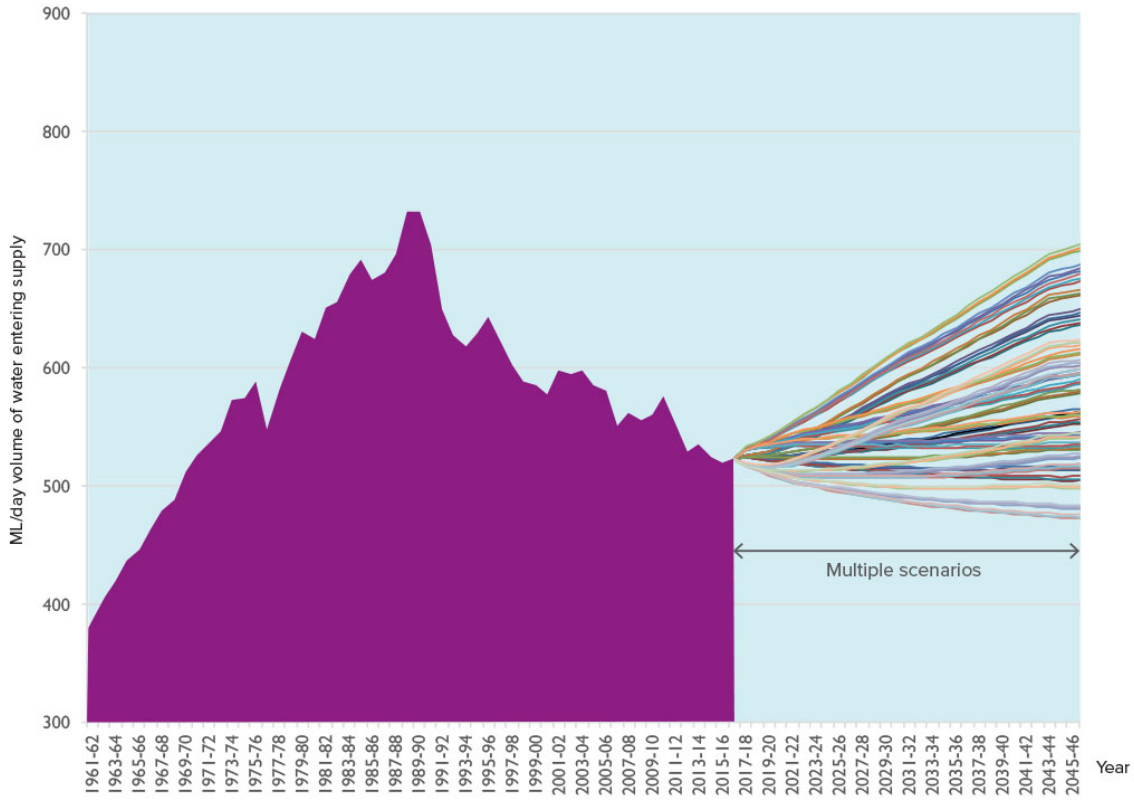
ground and surface water sources. The draft WRMP was based on Strategy A, with outputs from other scenarios included as sensitivity tests in Annex 9. Strategy A took as its starting point the licence changes to the Test surface water and Lower Itchen sources notified by the Environment Agency, and as agreed in the s20 agreement. This included the implementation of Itchen and Test sustainability reductions in 2017, and a further phase of Test surface licence change in 2027. Those licence changes resulted in immediate sustainability reductions in PDO of 125Ml/d rising to between 152 - 227Ml/d across the three scenarios after 2027. The immediate MDO impacts are 166Ml/d, rising to between 166 - 228Ml/d across the three scenarios after 2027. This remains the basis for this WRMP.

5.5.4 Future scenarios

On the basis of all of the above, Figure 5.12 shows the water we have historically input into our supplies and the possible future supplies that may be required in the future based on the scenarios we have tested. As the figure clearly shows, the future is uncertain, and we could experience a wide range of potential futures, each of which represent slightly different challenges for us to meet and overcome. Changes to our demand in the future tend to take place gradually, over a sustained period of time, making them relatively straight forward to accommodate within our WRMP preparation. Changes to supplies as a result of sustainability reductions are either immediate or very short term, and can be very significant in scale, making them harder to plan for and accommodate within our WRMP.

However, our modelling techniques allow us to explore this variability and to identify 'several states of the world' that we should plan to accommodate within our WRMP. We are then able to weigh up the risks associated with these, and to identify the 'least regret' set of options for us to implement to ensure we have resilient supplies for customers.

Figure 5.12 - Water we have historically input into supplies and possible future supply scenarios



5.6 Summary of the supply-demand balance

For each of our areas, we have calculated the future baseline supply-demand balance during a 1 in 200 year drought. These are presented as a series of probabilistic distributions, representing a range of possible futures that we then feed into our decision-making process.

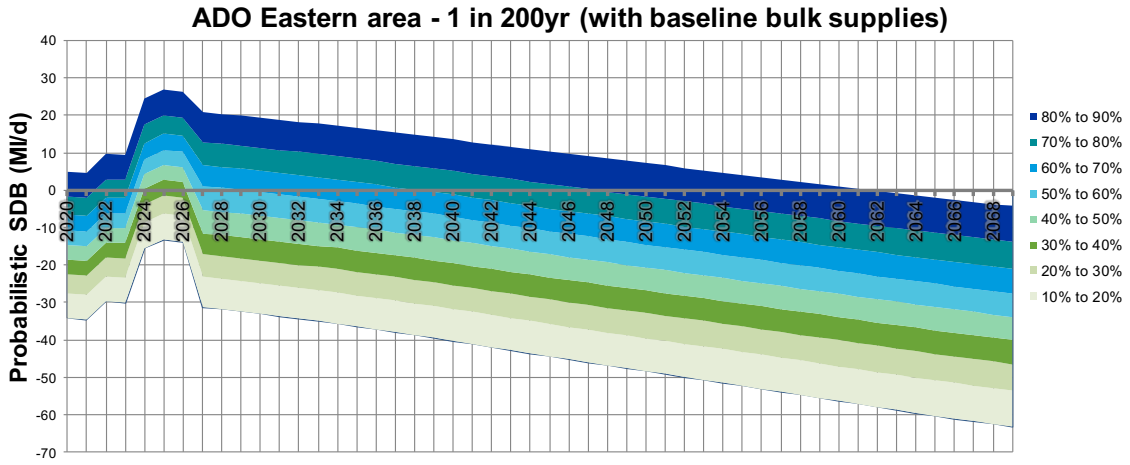
In our Eastern area, we anticipate that in 2027-28, during a 1 in 200 year drought our supply demand balance will move from surplus to deficit as a result of potential sustainability reductions. A further major influence for this area is the water that is exported to South East Water.

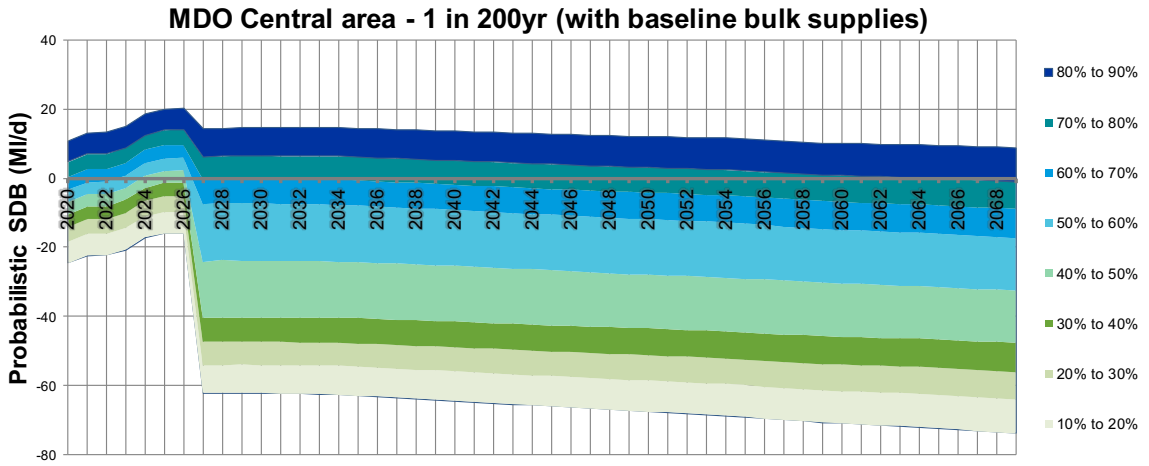
In our Central area during a 1 in 200 year drought, we anticipate that our supply demand balance would move into deficit early in the planning period and with a further decrease as a result of potential sustainability reductions in 2027-28. The bulk import of water into the area will serve to lessen the effect of any immediate deficit as well as the availability of Drought Orders and Permits.

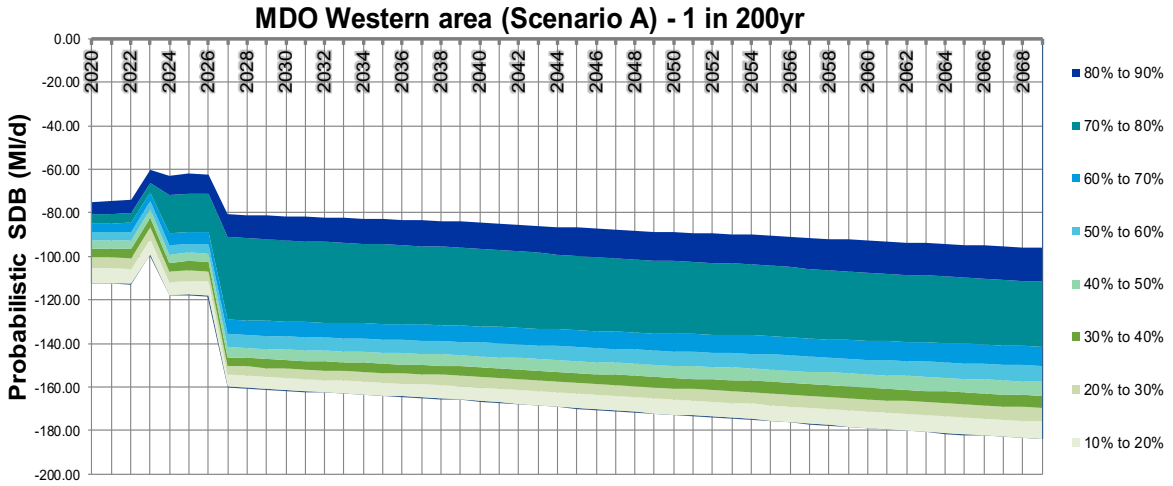
In our Western area, despite an expected reduction in the demand for water, with the introduction of licence changes there will be a significant supply demand balance deficit throughout the planning period during a 1 in 200 year drought event. The risk of further sustainability reductions in 2027 exacerbates this potential deficit. The bulk import of water into the area lessens the deficit, but there is significant reliance on securing Drought Orders and Permits.

The graphs in Figure 5.13 illustrate the potential supply demand balances in the Eastern, Central and Western areas. The colour banding represents the different potential balances between supply and demand that may be experienced, depending whether we experience more or less challenging futures. The “0” line across the centre of each graph represents a balance between supply and demand. Where the coloured bands go below this line new demand management or resource development schemes need to be implemented to restore the supply demand balance. The bottom graph for the Western area highlights the significant deficit under any future.

Figure 5.13 - The baseline supply-demand balance distributions at the ‘severe drought’ level







Further information on our supply and demand forecasting is in Annexes 2 to 5 of the WRMP.

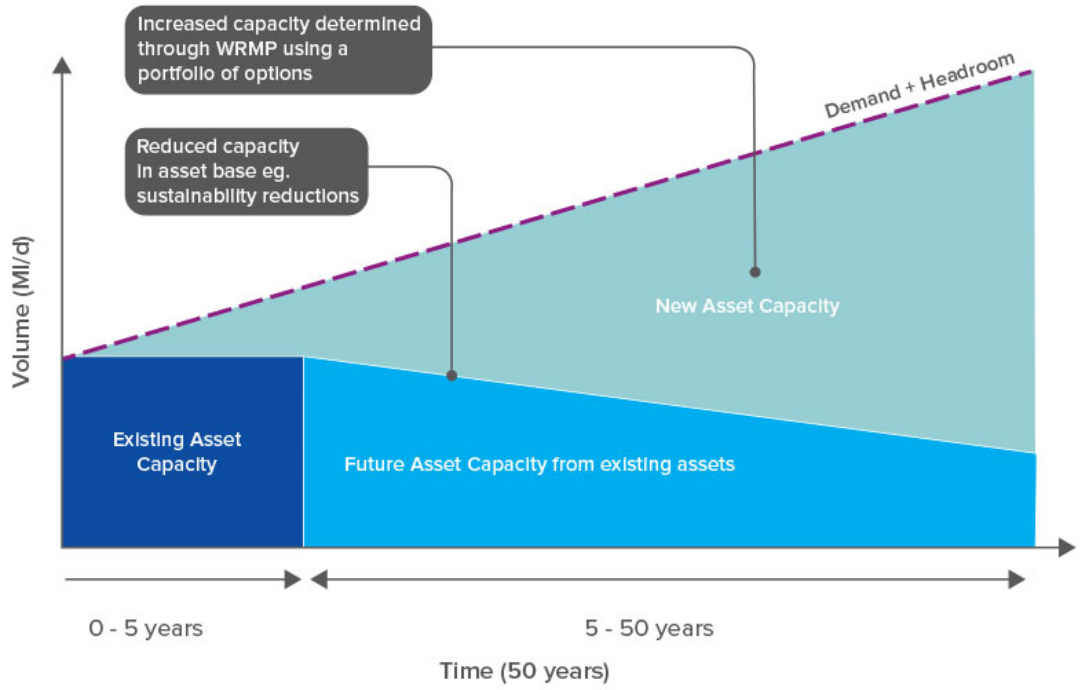
6. Options appraisal

6.1 Options appraisal process

It is clear from our work in preparing the WRMP that there will be deficits in our water supply balance across our supply areas during the plan period. We need to make sure we plan to respond to this, identifying appropriate demand and supply side schemes to maintain resilient supplies for customers. We plan to bridge the gap between the volume of water our existing assets can provide, and our future demand including headroom, through a process of options appraisal, as shown in Figure 6.1.

A detailed explanation of our options appraisal process is in WRMP Annex 6.

Figure 6.1 - Role of option appraisal process in meeting the future demand for water

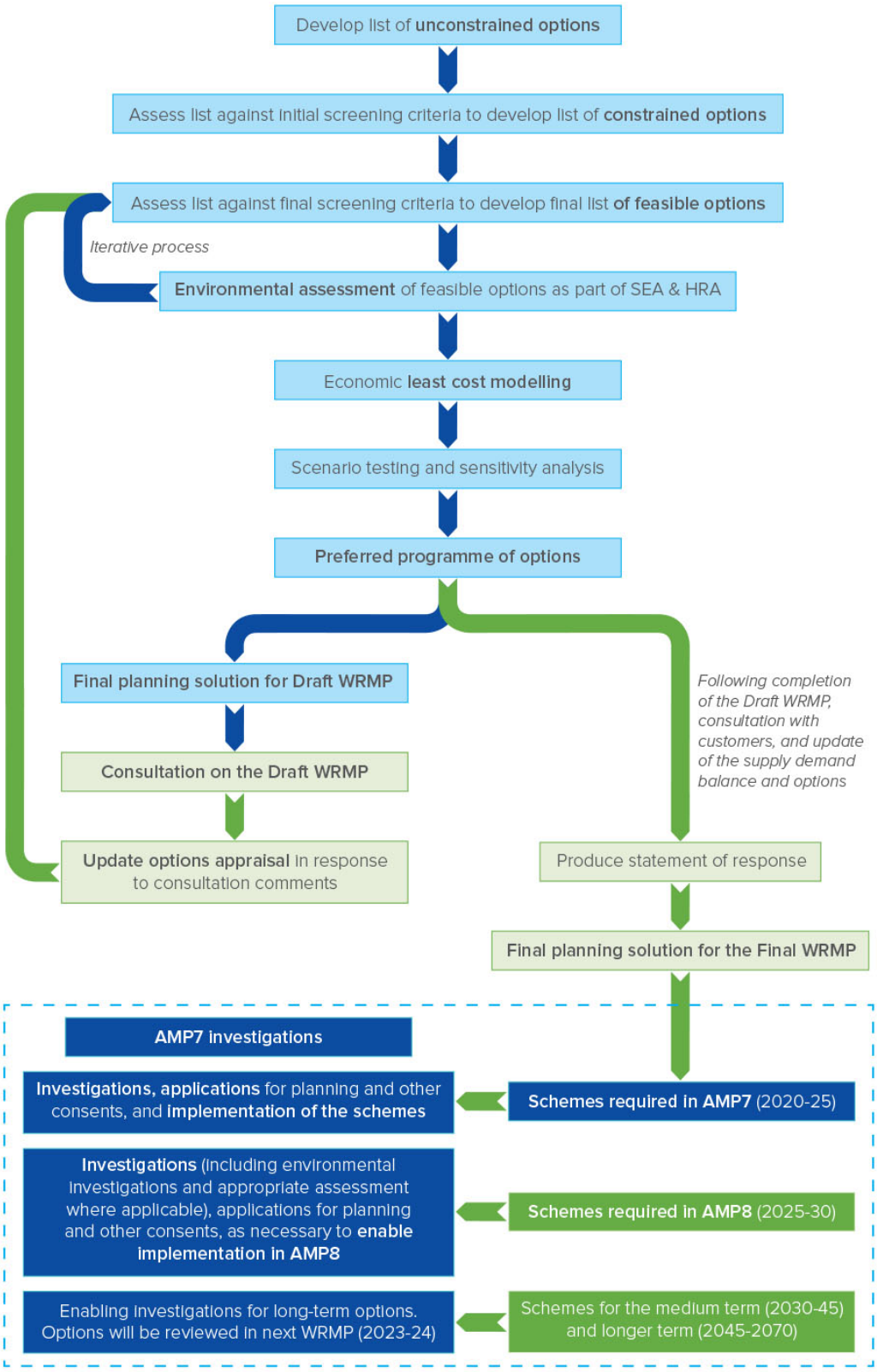


The options appraisal is a critical stage in the development of the WRMP. We identify and assess a wide range of options to both increase water supply (supply side options) and to reduce water demand (demand management options). Our options appraisal process follows industry guidance issued by the Environment Agency and recommendations from UK Water Industry Research. Broadly, our options appraisal process includes the following stages:

- Identification of an **unconstrained list of options**.
- Screening and filtering of the unconstrained list of options against initial screening criteria to develop a **constrained list of options**. Options that are impractical or have unacceptable environmental or economic impacts are removed at this stage.
- Screening and filtering of the constrained list options against final screening criteria to arrive at a **feasible list of options**. Feasible options are taken forward into the decision-making modelling process (see Section 7).
- **Environmental assessment** of the feasible options as part of the Strategic Environmental Assessment (SEA) and Habitats Regulation Assessment (HRA) process.

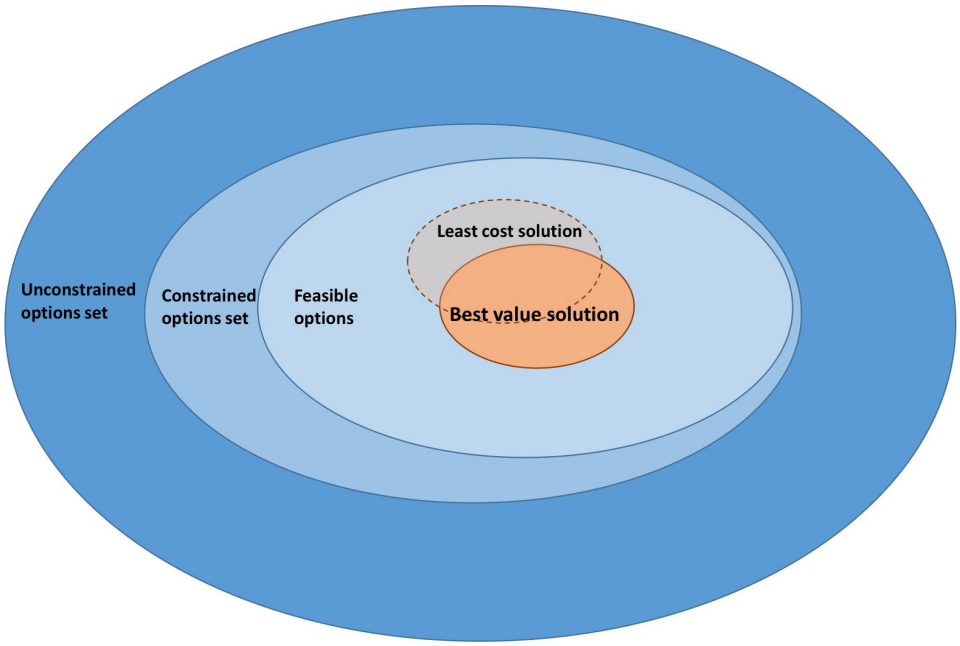
Figure 6.2 shows how the options appraisal process and how it feeds into the implementation of the WRMP.

Figure 6.2 - Options appraisal process



Through this process we screen a wide range of options in order to develop future strategies for each of our areas, as set out in Figure 6.3. Where we can, these will be the best value solution for our customers taking into account a range of social and environmental effects.

Figure 6.3 - Option screening process



Unconstrained list of options

The first stage of the process involves creating a high-level list of options. In developing this list, we take account of Government policy and aspirations, include options from previous WRMPs and identify new options in close consultation with customers and stakeholders.

The unconstrained list of options includes both options to reduce demand (demand management options) and increase water supply (supply-side options). Demand management options can be effective in controlling what might otherwise be unrestricted growth in demand for water. The implementation of demand management measures is an important component of our approach to water resource planning.

A table showing the unconstrained options list is included in Annex 6. Each unconstrained option is assessed against the first round screening criteria to identify if it should be taken forward onto the constrained list of options. The purpose of this screening process is to remove options that are impractical or have unacceptable environmental or economic impacts. The assessment criteria for options are summarised below (further information is included in WRMP Annex 6):

- Is it technically feasible?
- Will it have beneficial environmental outcomes?
- Will it result in increased resilience?
- Can it be implemented in a phased/modular way?
- Does it address water resources planning problem?
- Does it meet customers and regulator expectations?
- Does it avoid disproportionate costs and / or delivers appreciable water?

- Confidence in implementation/output

Based on the answers to the above screening questions, a decision was made as to whether the option should be taken forward onto the constrained list. By applying a consistent set of screening criteria in an objective and systematic approach in this way, we narrow down our assessment to a smaller list of viable options.

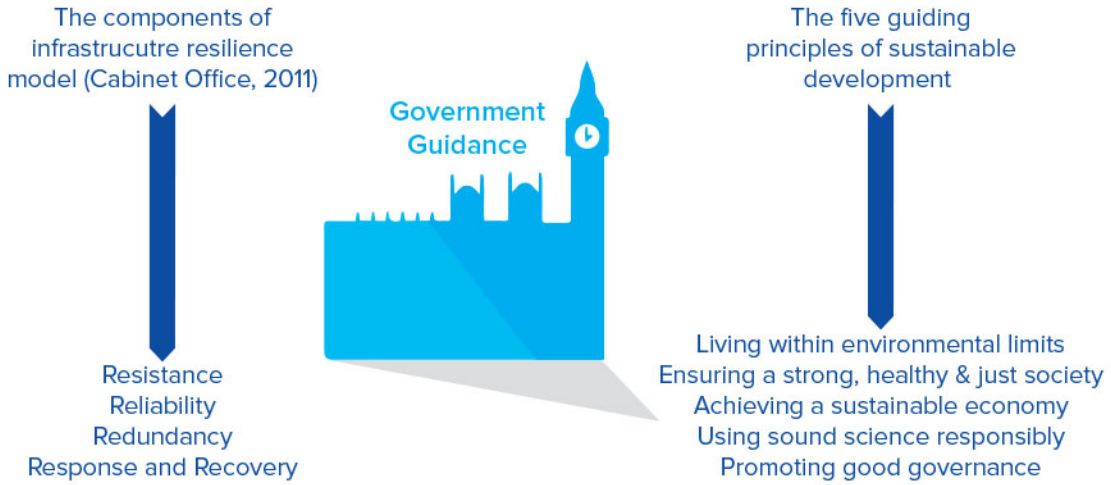
Constrained list of options

We undertake further screening and filtering at this stage to rule out options that are unsuitable due to environmental impacts or have a high risk of failure.

To undertake environmental and social assessment of each option, the assessment utilises the outcomes of the SEA to identify (i) the risk of adverse effects and (ii) the opportunity for beneficial effects (e.g. improved water quality, reduced flood risk, improved catchment management) resulting from the option. Where environmental or social impacts are identified, an assessment is made as to whether they can be mitigated.

The risk of future uncertainties is also taken into account e.g. regulatory changes, acceptability of the option, potential planning constraints and risks or changes in customer behaviour (for some demand management options). The sustainability of each feasible option is considered with reference to the UK Government's guiding principles for sustainable development (see Figure 6.4).

Figure 6.4 - Government guidance informing the assessment of unconstrained list of options



The Government's infrastructure resilience model provides an indication of the confidence that the option will 'deliver' the required reduction in supply demand balance deficit. Where an option depends heavily on assumptions about changes in customer behaviour, or may be significantly impacted by different climatic conditions, it is less reliable than an option that is unaffected by such factors (e.g. water reuse and desalination).

We also consider whether an option is acceptable by evaluating the outcomes of customer engagement and risks in terms of planning uncertainty.

The assessment criteria for the options on the constrained list are summarised below. (Further details on the screening process for this stage is provided in WRMP Annex 6):

- Does the outcome of the Strategic Environmental Assessment (SEA) show a risk of adverse effects?
- Does the outcome of the SEA show opportunity for beneficial effects?
- Is there mitigation to address potential impacts?
- Is there dependencies or mutual exclusivities with other options or third parties?
- Is it at risk of climate change impacts or future uncertainty?
- Can it be implemented in a phased or modular way?
- Does it contribute to overall resilience?

Each of the constrained options were objectively assessed against these criteria, with the outcomes recorded within a 'Level One Factfile' (see WRMP Annex 6). This factfile provides the basis on which a decision can be made on whether an option is considered feasible or ruled out of the WRMP process. A summary of the rejected options is included in WRMP Annex 7.

Feasible list of options

From the assessment of the unconstrained and constrained lists of options, a set of feasible options is identified. These are then subject to more detailed engineering and environmental assessment, to provide consistent and comparable information on each of them as an input to the selection of options for the draft WRMP. The option types in the feasible list of options are shown in Table 6.1.

Table 6.1 - Types of options in the feasible options list

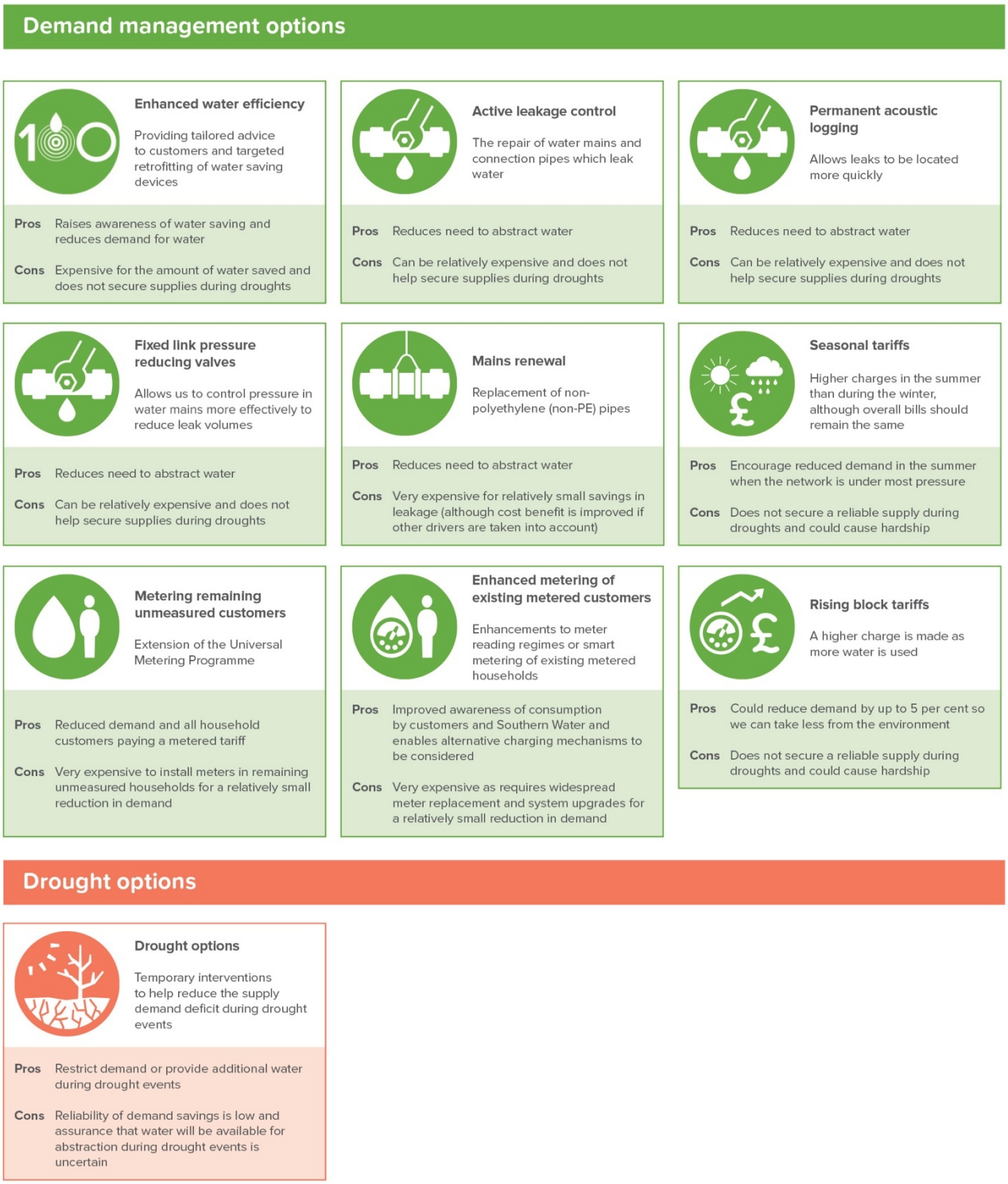
Option group	Option category
Demand management	Leakage management
	Metering
	Water efficiency
Drought options	Demand interventions
	Supply interventions
New water	Desalination
	Groundwater abstractions (new)
	Surface water abstractions
Storing water	Aquifer storage and recovery
	Reservoirs
Water reuse	Indirect potable water reuse
	Industrial water reuse
Managing the water environment	Catchment management
Trading water	Bulk imports and exports
	Inter-zonal transfers (between Southern Water WRZs)
	Licence trading
Managing existing assets	Asset enhancement
	Borehole rehabilitation

A brief summary of the option types is set out in Figure 6.5.

The more detailed assessment of the feasible options undertaken at this stage, includes investigations and assessments to provide:

- Engineering description and designs so we can calculate a cost.

Figure 6.5 - Summary of option types



Supply-side options

Desalination

Saline water is abstracted and turned into drinking water

Pros Reliable water supply in drought, can be switched on and off

Cons High energy use, costs and carbon footprint. Brine by-product to dispose of

Groundwater abstraction

New groundwater abstraction, licence aggregation, recommissioning old licences or increasing surface flows with new groundwater boreholes

Pros Could provide reasonable volume of water

Cons Likely to be governed by licence conditions limiting abstraction to certain times. May conflict with WFD status

Surface water abstraction

New surface water abstraction, additional volume from an existing abstraction or relocation of existing abstraction

Pros Could provide reasonable volume of water

Cons Can only take place when river levels exceed the minimum residual flow so not considered to provide much system resilience without assiciated storage. May conflict with WFD status

Aquifer Storage and Recovery (ASR)

Pumping water from rivers or groundwater in winter to store in underground aquifers

Pros Improves storage to provide extra water in summer and droughts, and makes use of the natural environment

Cons There are few suitable locations in the South East

Storage reservoirs

Building a new storage reservoir or enlarging an existing one

Pros Improves storage for extra water in summer and provides longer term artificially created habitat

Cons Long lead-in times, and impacts on the environment

Indirect potable water reuse

Reusing wastewater to a river for downstream abstraction for drinking water

Pros Reliable supply of water, even in drought, and extra water in the environment

Cons May require relatively expensive treatment processes

Water for industry

Treating wastewater to a higher standard and using for industry

Pros Avoids using drinking water for industrial processes (which is the standard practice at present)

Cons Can be relatively expensive

Licence variations

Changing an abstraction licence with the Environment Agency to allow the abstraction of different volumes of water from existing sources such as rivers or groundwater.

Pros Maximises supplies of water from sources which are not under pressure

Cons The extra water may not always be available all year round or in droughts

Licence trading

Buying existing abstraction licences to abstract water from industry or agriculture

Pros Uses a water allowance which is already available for abstraction

Cons The water traded might not be available if this conflicts, for example, with the 'no deterioration' commitment in the Water Framework Directive

Water treatment works enhancement

Upgrades to treatment processes or capacity at existing water treatment works

Pros Does not require licence changes or external permissions

Cons Regular reviews of existing assets already take place so there may not be many options available

Borehole rehabilitation

Bringing back online disused groundwater sources for which abstraction licences remain

Pros Does not require licence changes or external permissions

Cons May require significant additional infrastructure such as treatment or drilling of new boreholes

Bulk imports and exports

Buying and selling large supplies of water from or to neighbouring water companies

Pros Moves water around the South East to where sources are under pressure and helps deliver a 'regional grid'

Cons Not producing any 'new water'

Catchment management

Working in partnership with landowners and river guardians to better manage the flow and quality of rivers

Pros Low cost compared with developing new water supplies and they provide multiple environmental and societal benefits.

Cons Schemes to address pollution require a long-term commitment and can take time to deliver benefits. River restoration to improve ecological resilience may not be accepted by some stakeholders as an alternative or complement to reducing abstraction.

Asset enhancement

Improvements to Southern Water's existing assets to maximise the DO available within existing licence constraints, particularly addressing network constraints to release 'locked-in' DO

Pros Does not require licence changes or external permissions and makes best use of existing infrastructure

Cons Regular reviews of existing assets already take place so there may not be many options available

- The earliest potential start years taking account of construction complexity, likely planning constraints and risks, and environmental and other investigations likely to be required to implement the scheme.
- Likely costs – capital expenditure, operating and financing costs.
- Carbon emissions – embodied carbon (the lifecycle carbon emissions of materials used in construction) and operational carbon (emitted through operation of the scheme over its lifetime).
- Environmental and social considerations – impacts and costs informed by the Strategic Environmental Assessment (SEA), more general environmental assessment, Habitats Regulations Assessment (HRA) and its ability to meet the Water Framework Directive (WFD) objectives.
- The water savings across a range of potential drought event scenarios.

We record this information in a Level 2 factfile for each of the feasible options (see WRMP Annex 6).

During our options appraisal process, we assess the beneficial and adverse environmental and social effects through a staged approach. The options are considered against defined environmental and social criteria that increase in detail as we progress through the options appraisal process. The demand management and supply side options are assessed in the same way, and to the same level of detail.

All of the options on the feasible options list are considered to be viable and potentially deliverable, and all of the feasible options are therefore made available for selection in the investment modelling process. Unlike previous stages of the options appraisal process, options are not 'screened out' at this stage. The information on the feasible options feeds into the investment modelling process to identify the least cost solution for each WRZ. We use this, and subsequent decision-making processes to derive strategies to meet the supply demand balance deficit in each WRZ, as described in section 7 of this document.

6.2 Strategic Environmental Assessment (SEA), Habitats Regulations Assessment (HRA) and Water Frameworks Directive Assessment (WFDA)

In developing our WRMP, we carried out detailed environmental and social assessments following statutory environmental requirements, national legislation and guidance. We engage with customers and the environmental regulators (Environment Agency and Natural England) on our approach to environmental and social assessment, and on our findings. Feedback informed our assessments, including rejecting or modifying options to take account of the environmental concerns or opportunities. The statutory processes, national legislation and industry guidance that we follow are set out in Figures 6.6 and 6.7.

Figure 6.6 –Statutory environmental requirements - HRA, SEA and WFDA

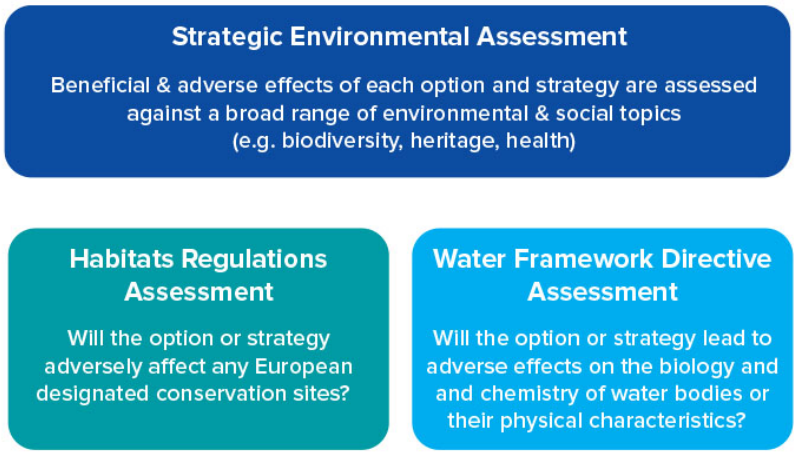
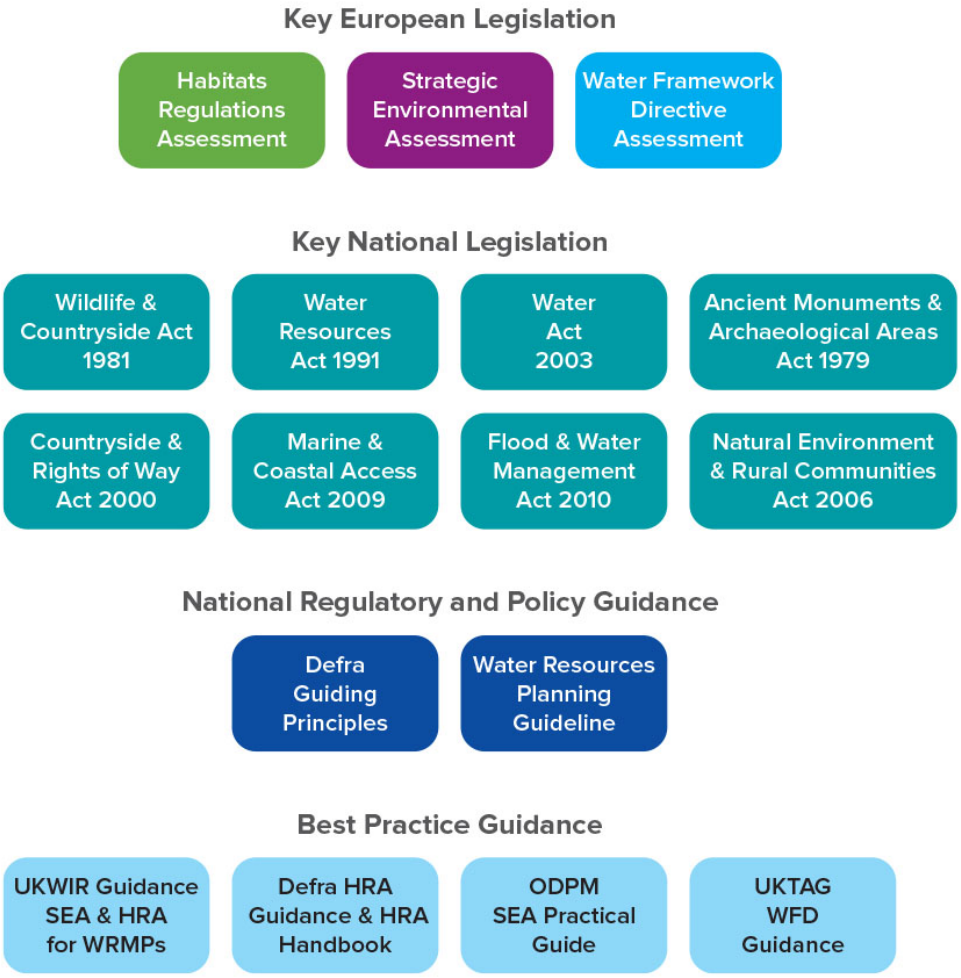


Figure 6.7 - Statutory processes, legislation and guidance



Environmental and social considerations in development of options

We assess the unconstrained list of options against high level screening assessment criteria, which includes:

- Risks to international and national designated sites
- HRA and WFD compliance risks
- Key risks to the water environment
- Key risks to important landscape, recreation and heritage features
- Key planning risks
- Key societal risks

This screening helped identify options that would likely lead to unacceptable adverse effects on the environment or society. We exclude these options from the 'constrained' list of options.

It should be noted that comments received during the public consultation on our draft WRMP relating to pipeline routing to avoid designated areas and important habitats have been addressed in this WRMP.

The assessment criteria we use for the 'constrained' list of options is more detailed and incorporates:

- Risk of Water Framework Directive (WFD) water body status deterioration
- Risk of likely significant effects on European designated conservation sites under the Habitats Regulations
- Potential effects on biodiversity, flora and fauna (including invasive non-native species)
- Potential effects on the water environment (including hydrology, hydrogeology, water quality and flood risk)
- Potential effects on archaeology and cultural heritage
- Potential effects on landscape and visual amenity
- Potential effects on other SEA topics (population and human health; air and climate; material assets; soils and geology)

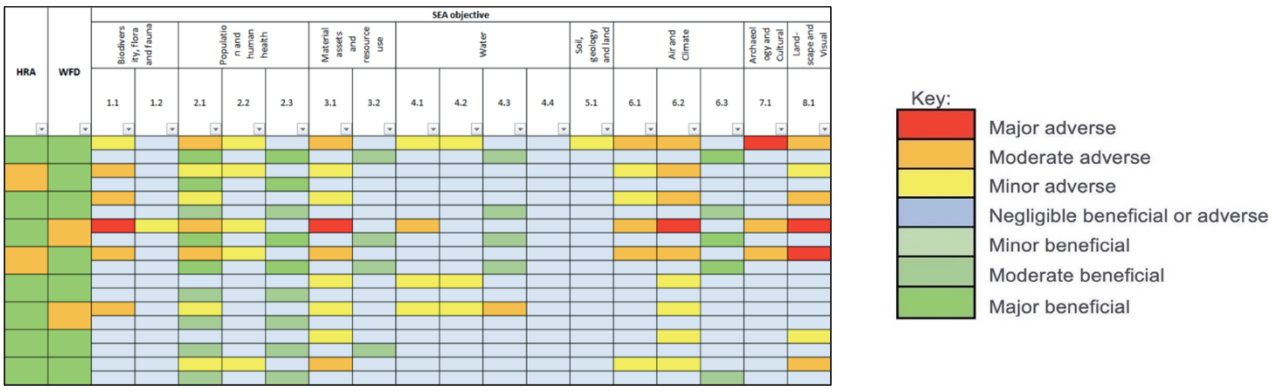
HRA and WFD risks are assessed on a scale from negligible to high, with potential effects scaled from beneficial to major adverse in the SEA. We share and discuss the findings from the constrained options screening process with the Environment Agency and Natural England, along with key stakeholders at our stakeholder meetings. Options are rejected or modified to take account of feedback from stakeholders and the outcome of the screening assessment. Options that have potential for unacceptable adverse effects on the environment and/or on society are excluded from the feasible options list.

Environmental and social assessment of feasible options

Detailed SEA, HRA Screening and WFD assessments were undertaken for all the feasible options. We considered both beneficial and adverse effects of each of the feasible options to fully understand the overall potential effects of all of our options. Where applicable, we identified mitigation measures to prevent or reduce any identified significant adverse environmental or social effects of an option. We take these mitigation measures into account in assessing the potential residual effects on the environment and/or society.

Supply options were assessed against WFD objectives and the HRA test of ensuring no likely significant effects on European designated conservation sites. The Drought Permit and Drought Order options included in our Drought Plan and all of our existing water sources were also assessed. The results are summarised in our assessment tables, an example of which is in Figure 6.8 below.

Figure 6.8 - Example of environmental assessment



The SEA assessment summary table shows for each scheme the adverse and beneficial effects assessment as two separate rows. Each coloured box in the table indicates the significance of effect assessed against the relevant SEA objective linked to the SEA topic area shown in the top row (e.g. biodiversity, flora and fauna). The key next to the table indicates the significance of effect scale. Some SEA topics have more than

one underlying SEA objective (e.g. there are four objectives linked to the SEA 'water' topic). The table provides a quick reference overview of the scale of adverse and beneficial effects associated with each scheme and the strategy as a whole.

These findings feed into the investment modelling and the development of our WRMP strategies, as described in Section 7 of this document.

Further details are provided in the SEA Environmental Report (Annex 14), HRA Report (Annex 15) and WFD Assessment Report (Annex 16).

6.3 Engagement and customer feedback

As explained in Section 2 of this document, we have been engaging with stakeholders and customers since 2014 on our WRMP.

We have learnt about stakeholders and customers priorities, views on the development of our plans, to find opportunities for collaboration, and learn from examples of best practice. We also engaged with our regulators to keep them informed on the developments of our plan, to explain our methods approaches and report results. This is described in WRMP Annex 1.

The outcomes from consultation on our draft WRMP are set out in our Statement of Response document. We have taken into account our understanding of customer preferences from our previous plan. We have also assessed whether those preferences have changed, and collected data through a scheme preference online survey, willingness to pay research and scheme preference workshops.

Our key findings from stakeholders include:

- Stakeholders are keen to work with us on catchment management and to support us doing more of it
- We should work with landowners to help slow and manage flows
- Water efficiency should be the first option we implement to increase the amount of water available, followed by further leakage reduction
- Stakeholders want us to consider demand reduction options before implementing new supply options such as transfers and water reuse
- After demand reduction options, water reuse is the most popular supply option

Our main findings from customers include:

- Customers are averse to accepting reductions in service in exchange for lower bills
- Underground water storage was our customers preferred measure for maintaining a supply- demand balance
- Leakage improvements are the highest priority to customers amongst the water service measures
- For the majority of customers a bill increase to help implement schemes is reasonable

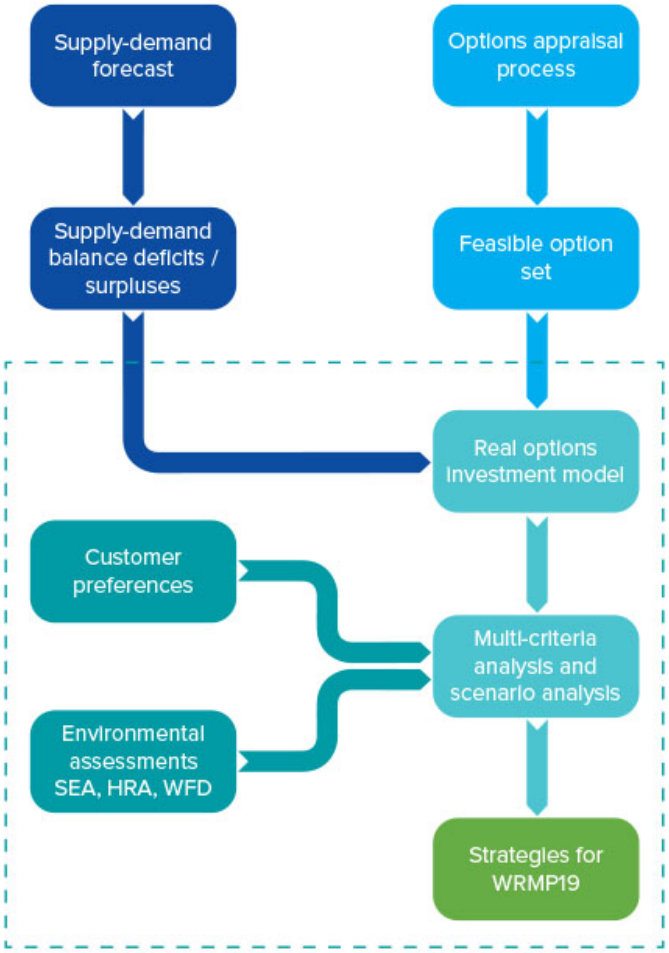
Our pre-consultation was important to better understand customers' views. It has informed us on appropriate levels of service and, together with stakeholders, their views on the supply and demand management options. It has contributed to the development and formulation of our preferred strategy by excluding options that were not likely to meet customer or regulator expectations in the options appraisal.

7. Proposed strategies to meet water futures

7.1 How we develop our strategies

Having identified the scale of potential deficit in our supply-demand balance and developed our list of feasible options, we use an investment model to select a combination of options which will maintain the supply demand balance at least cost. The investment model incorporates all the feasible supply and demand side options in a process shown in Figure 7.1.

Figure 7.1 - How we develop our strategies



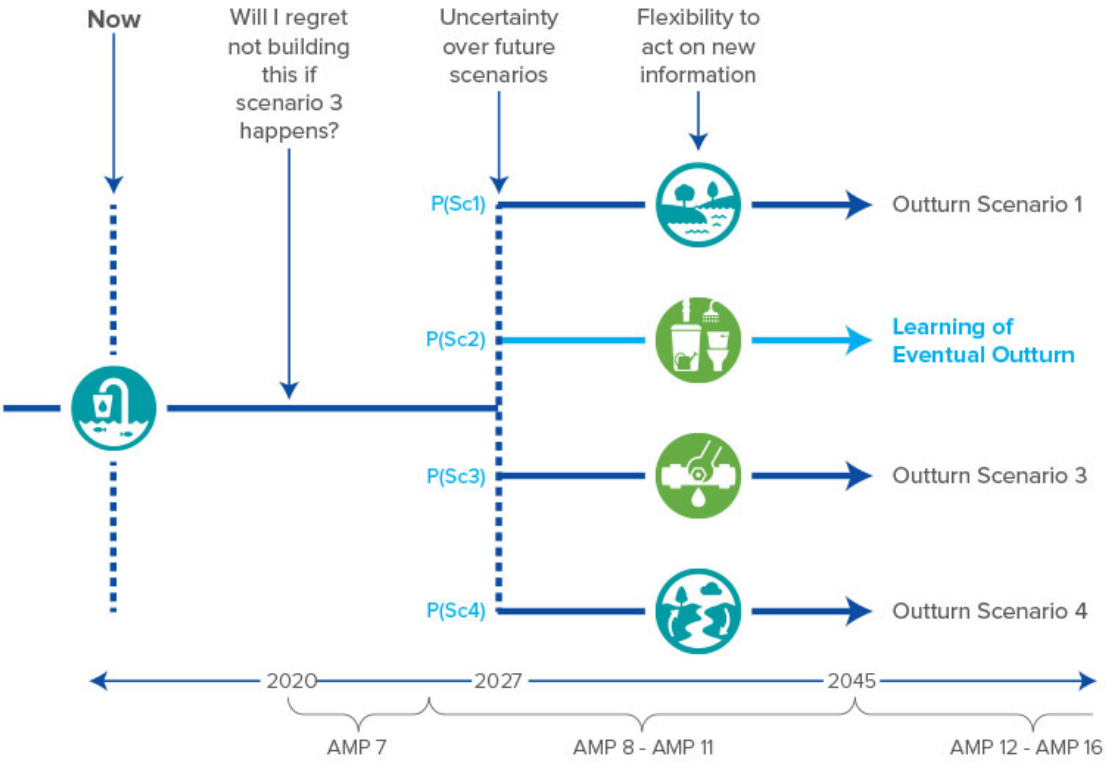
The proposals are formulated through an iterative process of economic least cost modelling. The objective is to define a strategy, comprising a portfolio of schemes that:

- Provides secure supplies of water;
- Protects the environment; and,
- Represents best value for customers.

The real options approach, as illustrated in Figure 7.2, is used to understand how our plan would be best varied in light of possible future scenarios, which result in uncertainty in our future forecasts. Despite uncertainties, our plan must present a preferred set of options, and as a result, a number of schemes may be

required to be investigated and promoted in the short term before the uncertainties are better understood. We wish to ensure that WRMP is flexible enough in the short term against a wide range of possible futures.

Figure 7.2 - Real options modelling process



The statutory process for WRMPs requires them to be reviewed and updated a minimum of every 5 years. At the point when the next WRMP is prepared, it is expected that some of the uncertainties, for example around the impact of sustainability reductions, will be better understood. By this point some of the schemes identified for implementation may not be required or may be delayed until later in the planning period. In such cases, the scheme would have already gone through a certain amount of promotion, investigation, and planning but no further action would be taken.

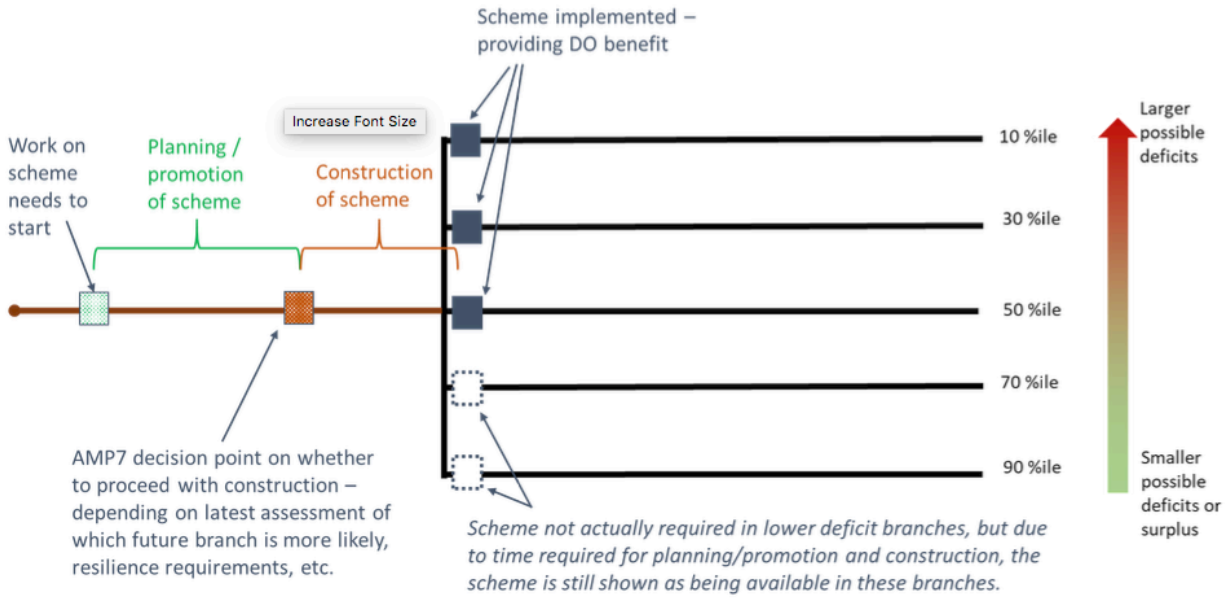
However, if at the point of reassessment the future looks as if there will be higher deficits, then the preliminary work undertaken on a scheme would allow its implementation within the required timeframe. This is summarised in Figure 7.3.

The real options method therefore allows us to learn about uncertainty over time, build in flexibility so that we can act on new information and ensure that any schemes needed in the relative short term are implemented and do not become rapidly redundant, that is, a ‘no regrets’ solution.

Each of our three supply areas (Eastern, Central and Western) have their own decision making models as the three supply areas are geographically separate and effectively isolated for water resources planning purposes. We therefore present strategies for each of the three supply areas separately. We also split our strategies for each of the areas into different planning periods:

- Schemes required in the period 2020-2025 which we will fund through the forthcoming Business Plan

Figure 7.3 – Process of scheme selection and development



- Schemes required between 2025-2030, where investigations are needed to ensure they are feasible before we produce our next plan in 2023 and any required planning permissions or consents are obtained
- Schemes that may be required in the medium term (to 2045) or longer term (to 2070) but which are subject to greater uncertainty and will need to be confirmed or revised in subsequent WRMPs.

As shown in Figure 7.4, an initial 'least cost' run is undertaken to develop a 'basic solution', without further consideration of potential constraints. This is then tested by, for example, modifying assumptions about availability of certain options such as Drought Orders, or factoring in potential delays to the delivery of options, to progress our understanding of the impacts assumptions might have on the strategy. These alternative scenarios are considered through the real options method.

From examination of the various model run tests, and taking into account our policies and pre-consultation discussions with regulators and stakeholders, policy decisions and refinements were introduced to reflect a 'constrained' least cost strategy. The policy decisions were in regard to the inclusion of water efficiency assumptions and the availability of Drought Orders in severe and extreme drought events. These are not the only schemes impacted by customer choices but they are the most strategic changes.

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- Schemes required in the period 2020-2025 which we will fund through the forthcoming Business Plan

- Schemes required between 2025-2030, where investigations are needed to ensure they are feasible before we produce our next plan in 2023 and any required planning permissions or consents are obtained
- Schemes that may be required in the medium term (to 2045) or longer term (to 2070) but which are subject to greater uncertainty and will need to be confirmed or revised in subsequent WRMPs.

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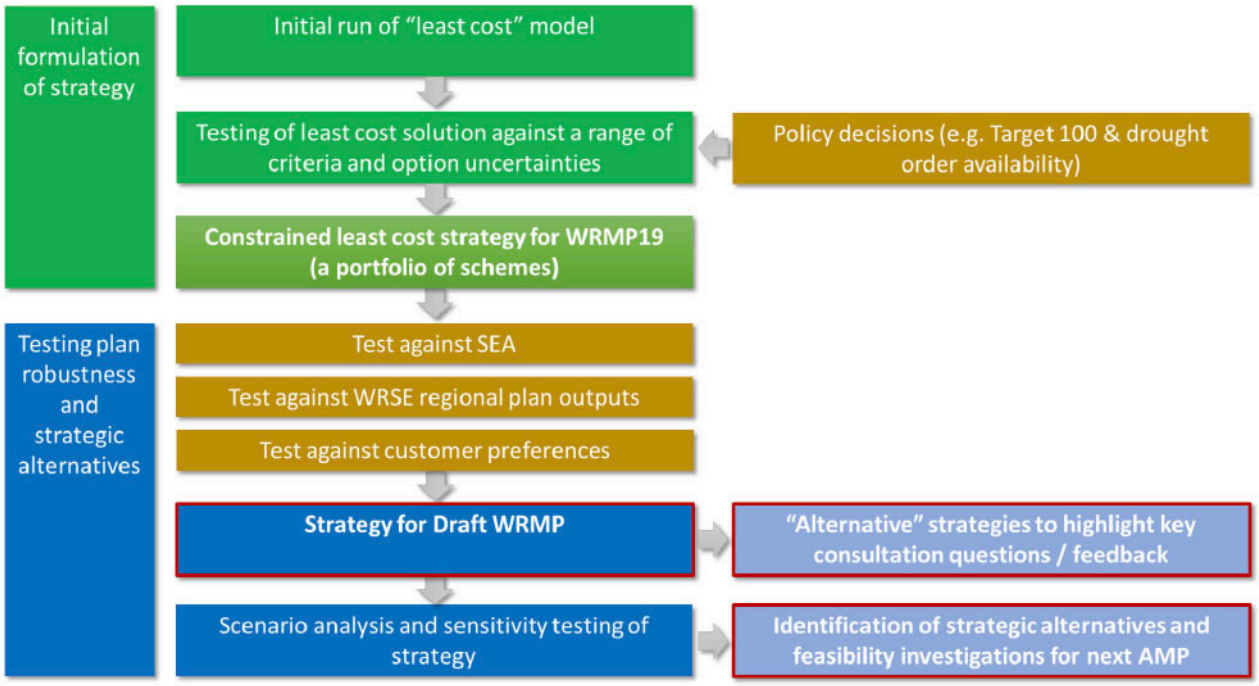
Figure 7.4 - Development of WRMP strategies



From examination of the various model run tests, and taking into account our policies and pre-consultation discussions with regulators and stakeholders, policy decisions and refinements were introduced to reflect a 'constrained' least cost strategy. The policy decisions were in regard to the inclusion of water efficiency assumptions and the availability of Drought Orders in severe and extreme drought events. These are not the only schemes impacted by customer choices but they are the most strategic changes.

Our preferred strategies may differ from the least cost solution as we take account of other criteria to ensure our proposals represent the optimum balance of financial, environmental and social costs. It must also take into account other non-monetary issues, risks and uncertainties and customer preferences.

Overlaying these considerations does not necessarily mean the constrained least cost strategy will need to be changed. It may already adequately address key considerations from these tests. It is also the case that although some schemes may be less favoured by the SEA, regional plans or customers, the availability of suitable, better alternatives or the scale of the deficit faced may mean that some options need to be retained in the feasible list regardless. For the Western area, this was the case to some extent, due in large part to the large scale of potential (and uncertain) sustainability reductions with limited alternative options available.

Further information on how we develop our WRMP strategies is in WRMP Annex 8.

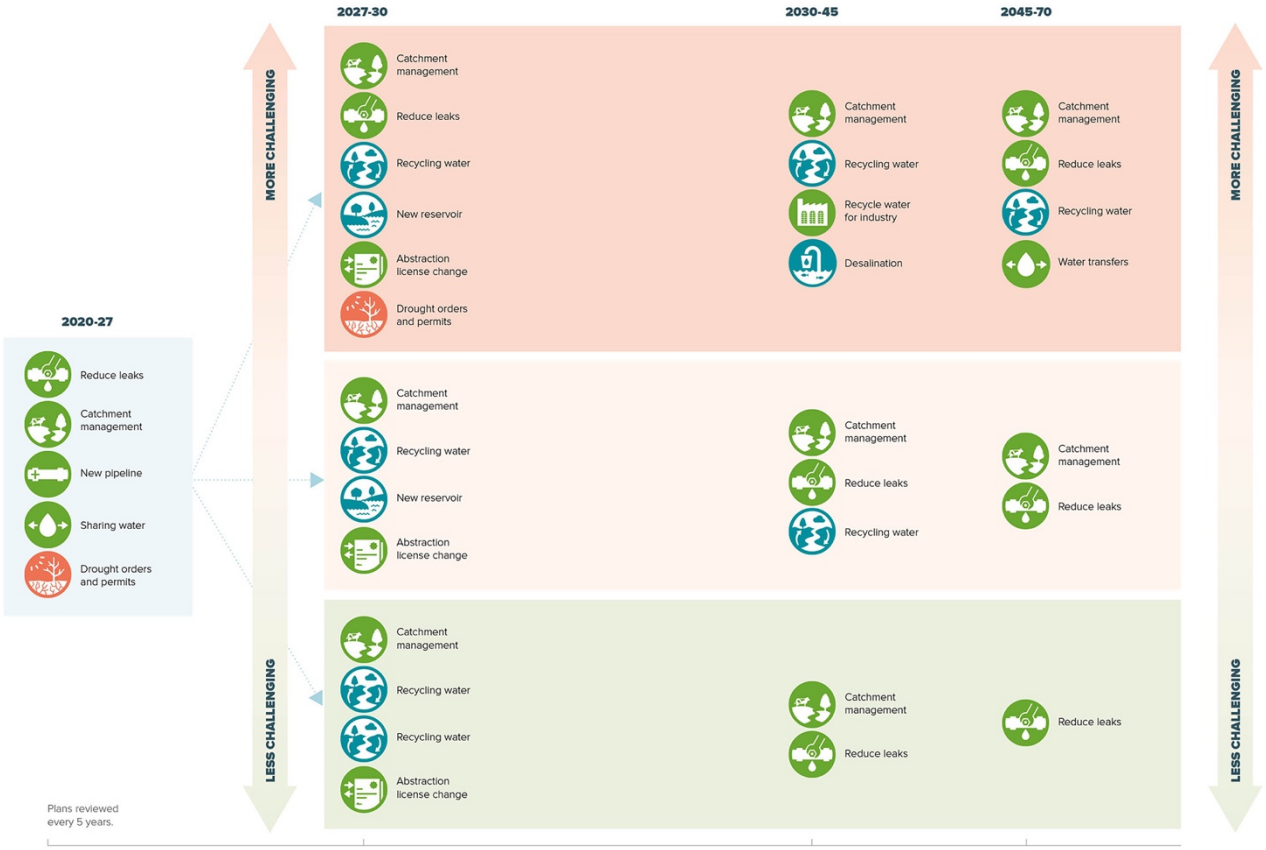
7.2 Introduction to the strategies

Sections 7.4 to 7.6 of this document summarise the strategies for the Eastern, Central and Western areas respectively. This is only a summary, and more detailed information and explanation on the strategies is provided in WRMP Annex 11 (Eastern area), Annex 10 (Central area) and Annex 9 (Western area).

We have consulted on these strategies with stakeholders and customers. We have identified where there are alternative potential strategies that we could adopt, including variations in the individual schemes being selected and their timing. This is particularly important for those schemes in the strategy that are required in AMP7 or AMP8. Where there may be some uncertainty around the delivery of these schemes, we may need to conduct feasibility investigations of alternative schemes (and potentially environmental surveys and planning activities) in parallel to developing the portfolio of schemes selected in the Strategy. This will help us to better understand the alternative strategic schemes that may be needed, should the schemes in the preferred plan not be implementable.

To reflect our real options approach, we have illustrated the options that would be selected in our strategies under different potential futures. These highlight how the choice of options varies according to whether we face a more or less challenging future. We show this in a 'branch diagram', an example of which is shown in Figure 7.5. The more challenging the future, the more options we need to investigate and promote to balance the demand for and supply of water.

Figure 7.5 - Illustrative example of a branch diagram



However, in some cases, due to the scale of the forecast supply deficit, we were not able to remove the option from consideration entirely, but instead we have acted to defer the timescales for needing that option to allow sufficient time for:

- further work to reduce the uncertainties surrounding some of the drivers for the option being required (e.g. sustainability reductions; climate change risks to supply reliability)
- further investigation over medium term to reduce uncertainties for identified adverse effects
- consideration of additional mitigation measures and/or modification to the option
- additional consultation with customers, regulators and stakeholders on the relative environmental and social effects of the option compared to other feasible alternatives

In relation to Drought Permits and Drought Orders, the decision was taken to restrict the use of these powers for extreme drought conditions only (droughts with a frequency of occurrence in excess of 1 in 200 years) in the longer term. In the short term, Drought Orders and Permits will be required in less severe drought conditions in all three of our supply areas but most frequently and for the longest period of time in the Western supply area due to the scale of the supply deficit in this area.

As well as the adverse effects of options, we looked at the beneficial effects of options to decide whether any options should be prioritised in view of the environmental or social benefits they may bring. This led to our decision to preferentially include water efficiency measures in our WRMP strategies as part of our Target 100 initiative to help our customers achieve an average per capita water consumption of 100 litres per day by 2040, along with measures to further reduce water leakage rates beyond the sustainable economic level, seeking to achieve a 50% reduction in leakage by 2050.

7.3 WRMP strategy for the Eastern area (see also WRMP Annex 11)

7.3.1 Context

Our WRMP strategy for the Eastern area included proposals for leakage reduction and demand management measures, the development of a shared new water resource with South East Water, and increasing the water level in Bewl reservoir, amongst other measures.

7.3.2 What are the key drivers for our WRMP strategy for the Eastern area?

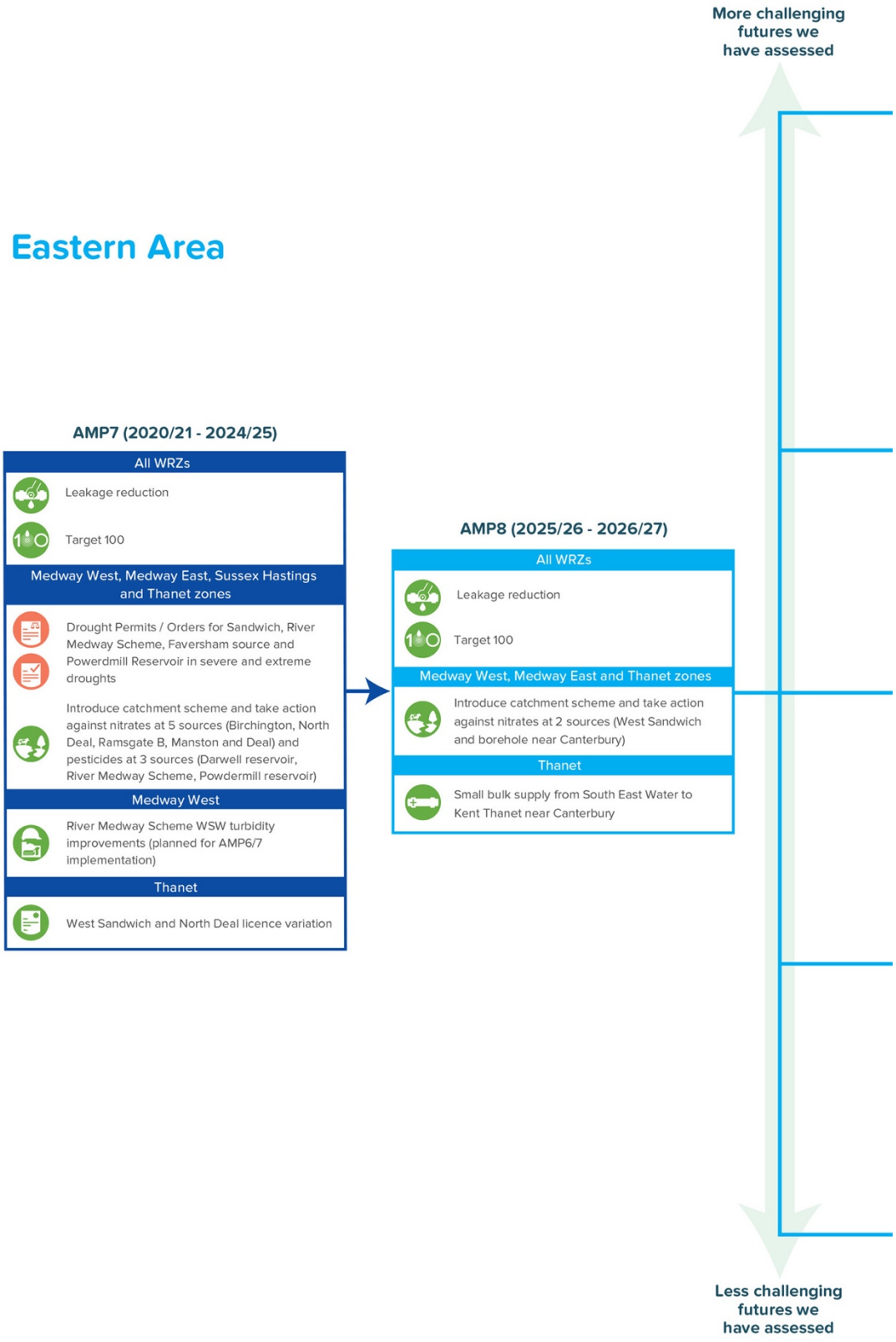
At the start of our planning period in the DYAA scenario there are deficits in a number of our WRZs in the severe and extreme drought conditions, and small deficits or surpluses in the critical period. We are a net supplier of water to our neighbours in the Eastern area, which creates further potential deficits or reduces the surpluses available. A large number of sources, particularly in the Kent Thanet WRZ, are identified as facing risks from nitrates, which will reduce the water available from the start of AMP8 (2025), and there is also the risk that some of our licences may need to be changed to provide further protection of the environment by way of sustainability reductions.

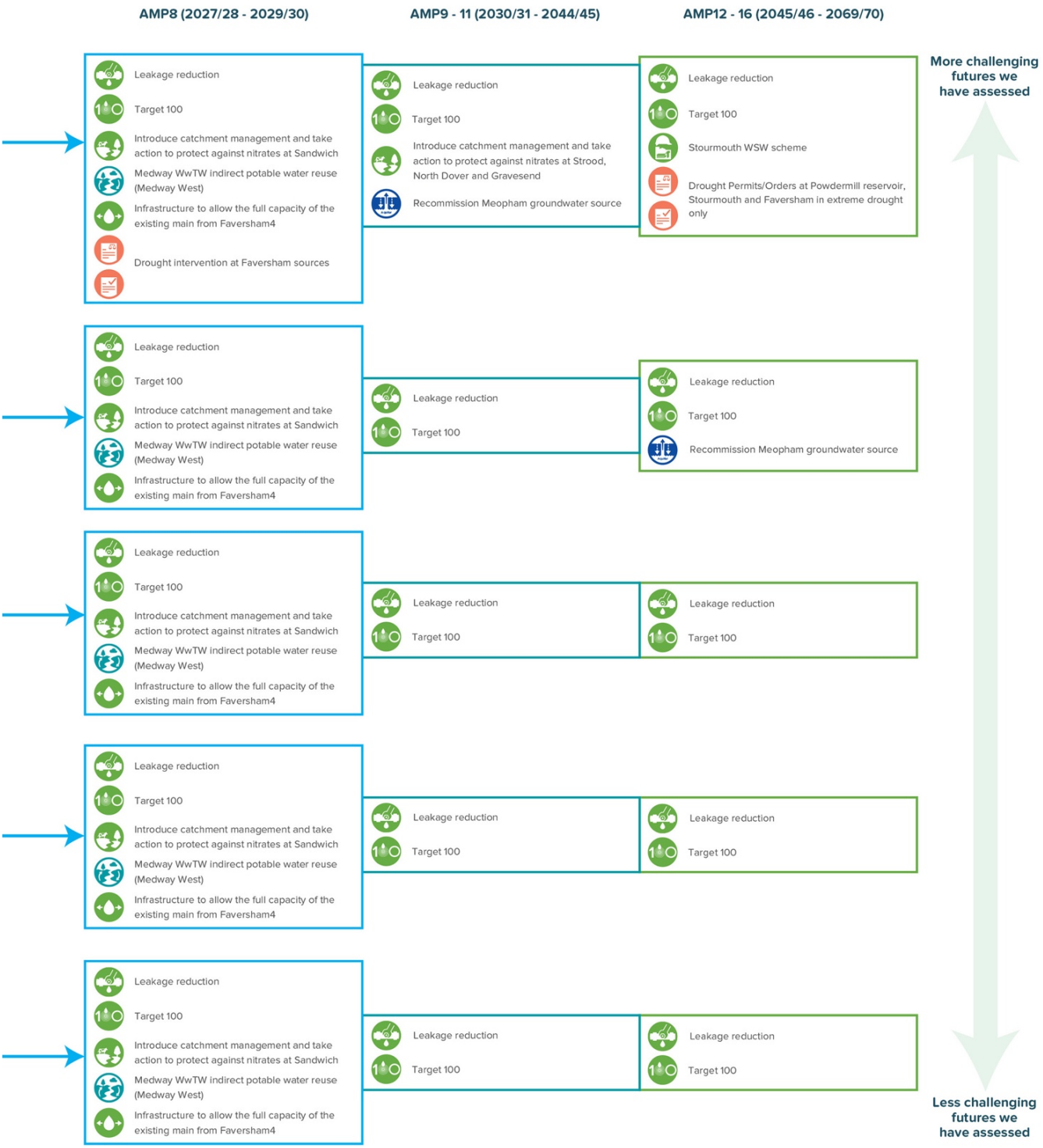
7.3.3 Our WRMP strategy for the Eastern area

The strategy for the Eastern area is set out in Figure 7.6, with detailed information set out in Annex 11 of the WRMP. Our potential investment in water supplies in our Eastern area over the next 50 years is around £285m, expressed in current values.

Our proposed strategy is to implement a series of demand management and leakage reduction measures in the short term whilst we undertake detailed engineering and environmental assessments to enable us to secure consents for our resource options. Those assessments will be undertaken alongside work with the

Figure 7.6 - Diagrammatic representation of our WRMP Eastern area strategy




AMP8 (2027/28 - 2029/30)
AMP9 - 11 (2030/31 - 2044/45)
AMP12 - 16 (2045/46 - 2069/70)
More challenging futures we have assessed
Less challenging futures we have assessed
Leakage reduction
Target 100
Introduce catchment management and take action to protect against nitrates at Sandwich
Medway WwTW indirect potable water reuse (Medway West)
Infrastructure to allow the full capacity of the existing main from Faversham4
Drought intervention at Faversham sources
Introduce catchment management and take action to protect against nitrates at Strood, North Dover and Gravesend
Recommission Meopham groundwater source
Stourmouth WSW scheme
Drought Permits/Orders at Powdermill reservoir, Stourmouth and Faversham in extreme drought only

Environment Agency to explore the extent of potential sustainability reductions in more detail. Post 2020 we will be more certain on the scale of future licence changes we will face, and be in a position to apply for planning and other consents to be secured and for necessary schemes to be constructed and commissioned. The timings within the WRMP are our best estimates for delivery at this point in time, but may be updated to reflect further investigations.

In our Eastern area **during AMP7 (2020-2025)** we propose to start implementing **additional leakage reduction** within all our WRZs. Alongside this, we plan to implement our media and education campaign as the first part of our **Target 100** vision, to work with our customers to increase water efficiency and to reduce domestic demand. The combination of reduced demand and leakage reduction will accommodate planned growth within the Eastern area.

We have a number of sources within the Eastern area that are more prone to experiencing water quality issues which can risk their reliability and resilience. We plan to **implement catchment management and infrastructure solutions** to address rising nitrates and improve resilience at five of these sources within AMP7 (Birchington, Deal, Manston, North Deal, and Ramsgate B) and to tackle pesticides and improve resilience at a further 3 sources (Darwell reservoir, River Medway Scheme, and Powdermill reservoir), to safeguard supplies to customers. We plan to apply to vary two existing abstraction licences to improve the reliability of the supplies from the sources at West Sandwich and North Deal. We will also make **asset enhancements** at the River Medway Scheme Water Supply Works (WSW) to safeguard against water quality issues (this scheme may be capable of delivery earlier than planned).

With these measures in place during AMP7, we believe that our supplies will be resilient to all but severe or extreme droughts, and so we would only very rarely need to apply for **Drought Permits or Orders** at our Sandwich, Faversham, River Medway Scheme and Powerdmill reservoir sources. Further detail can be found in our Drought Plan 2019.

During the **early part of AMP8 (2025-2030)** we will continue to implement our **leakage reduction** and **Target 100** water efficiency and demand management measures. Other schemes that we plan to implement early in AMP8 are to deliver a new pipeline **import of water from South East Water** near Canterbury, and to **implement catchment management and infrastructure** solutions to address rising nitrates and improve resilience at two sources to safeguard supplies to customers. With these schemes in place we do not expect to need to apply for **Drought Permits or Orders**.

Later in AMP8, our forecasts show that there is the potential for a number of sustainability reductions (licence changes) at our existing sources, notably in 2027 as influenced by the next statutory deadline under the Water Framework Directive. Although we will continue with our **leakage reduction** and **Target 100** measures, we will need to implement other schemes in order to safeguard supplies to customers and protect the environment. A further **catchment management and infrastructure solution** to protect against nitrates at Sandwich will be required. We also plan to investigate and then build new below ground infrastructure to enable us to **make better use of the existing transfer main** from the Faversham4 source between Kent Medway East and Thanet WRZs.

The largest of our schemes in this period will be the **indirect potable water reuse scheme in the River Medway catchment**. We will need to undertake investigations of both the Kent Medway East to Thanet transfer from Faversham4 and the Medway indirect potable water re-use scheme within AMP7, including applying for planning and other consents, so that they can be constructed in AMP8. With these schemes in place we only expect to need to apply for **Drought Permits or Orders** at Faversham in extreme droughts in our most challenging future.

Looking further ahead to the **medium term (AMP9-11, or 2030-2045)**, there is a degree of uncertainty in our forecasts. We will review these uncertainties in our next WRMP planned for 2023, and re-assess the need for further water resources and demand management measures to be implemented at that time. We are committed to continuing with our **leakage reduction** and **Target 100** initiatives during the AMP9-11 period, to deliver further reductions in demand. Beyond this, our current medium range forecasts identify that we would only be likely to need to implement further schemes to balance supply and demand under the most challenging futures. These are currently identified as being additional **catchment management and infrastructure solutions** to protect against nitrates at up to three sources (Strood, North Dover and Gravesend), and **works to recommission the Meopham groundwater source**.

Our longer term forecasts at the current time identify that **in the AMP12-16, or 2045-2070 period** we would be likely to need further schemes to meet the supply demand balance, albeit of limited scale. These longer term forecasts will be reworked for future WRMPs, but at the current time, these indicate that we would continue with **leakage reduction** and **Target 100** initiatives to fully implement our commitments. Beyond this, only under the more challenging futures would we need additional schemes, including the **Stourmouth WSW scheme** and **recommissioning the Meopham groundwater source** (if not implemented earlier). Under the most challenging future we may need to rely on **Drought Permits / Orders** at Powdermill reservoir, Stourmouth, and Faversham, in extreme drought events. Further detail is available in our Drought Plan.

Our re-assessment of the medium and longer term options in the next WRMP will include considering whether other potential schemes may be preferable in environmental, social or economic terms (and we are already actively developing a natural capital type approach to address the specific challenges and identify benefits for future water resources planning). Other options including long distance pipeline transfers from other water companies, desalination plants, non-direct potable water re-use, and more intensive (and more expensive) water efficiency or leakage reduction measures.

7.3.4 Summary environmental assessment of the WRMP Eastern area strategy

The SEA summary of our WRMP strategy for the Eastern area is presented in the assessment table overleaf (Table 7.1). Further details are provided in Annex 14 (Strategic Environmental Assessment).

Table 7.1 shows for each scheme the adverse and beneficial effects assessment in two separate rows. Each coloured box in the table indicates the significance of effect assessed against the relevant SEA objective linked to the SEA topic area shown in the top row (e.g. biodiversity, flora and fauna). The key below the table indicates the significance of effect scale. Some SEA topics have more than one underlying SEA objective (e.g. there are four objectives linked to the SEA 'water' topic. The table provides an overview of the scale of adverse and beneficial effects associated with each scheme and the strategy as a whole.

The strategy includes fourteen catchment management options. The SEA assessment findings for these options are very similar: the effects are beneficial in relation to many of the SEA objectives with mainly negligible adverse effects.

Demand management measures are a key component of the strategy. The SEA identified that the effects are mainly beneficial but with some minor temporary adverse effects in respect of materials required for water leak repairs and metering, as well as the risk of temporary traffic disruption and associated carbon and air quality effects of street works for leak repair activities.

The Medway Wastewater Treatment Works indirect potable water reuse scheme provides beneficial effects relating to the provision of additional reliable water supplies by reusing treated effluent. However, the scheme has the potential for major adverse effects relating to archaeology and cultural heritage which will be

Table 7.1 - Summary environmental assessment of WRMP Eastern area strategy and alternatives

Option name	Residual Effects Significance	SEA objective																
		Biodiversity, flora and fauna		Population and human health			Material assets and resource use		Water				Soil, geology and land use	Air and Climate			Archaeology and Cultural Heritage	Land-scape and Visual
		1.1	1.2	2.1	2.2	2.3	3.1	3.2	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
Medway WTW Indirect Potable Water Reuse (18 Ml/d)	Adverse																	
	Beneficial																	
Recommission Meopham Greensand groundwater source	Adverse																	
	Beneficial																	
Utilise full existing transfer capacity (from Faversham4)	Adverse																	
	Beneficial																	
Stourmouth WSW (10Ml/d with 20Ml covered storage)	Adverse																	
	Beneficial																	
SEW bulk supply near Canterbury	Adverse																	
	Beneficial																	
West Sandwich & Sandwich WSW licence variation	Adverse																	
	Beneficial																	
Pesticide catchment management / treatment – Darwell Reservoir	Adverse																	
	Beneficial																	
Nitrate catchment management / treatment – Deal	Adverse																	
	Beneficial																	
Nitrate catchment management / treatment – West Sandwich	Adverse																	
	Beneficial																	
Nitrate catchment management / treatment – Manston	Adverse																	
	Beneficial																	
Nitrate catchment management – North Dover	Adverse																	
	Beneficial																	
Pesticide catchment management / treatment – Powdermill Reservoir	Adverse																	
	Beneficial																	
Nitrate catchment management / treatment – Ramsgate B	Adverse																	
	Beneficial																	
Nitrate catchment management / treatment – Birchington	Adverse																	
	Beneficial																	
Nitrate catchment management / treatment – Strood	Adverse																	
	Beneficial																	
Nitrate catchment management / treatment – North Deal	Adverse																	
	Beneficial																	
Nitrate catchment management / treatment – Gravesend	Adverse																	
	Beneficial																	
Nitrate catchment management / treatment – near Canterbury	Adverse																	
	Beneficial																	
Nitrate catchment management / treatment – Sandwich	Adverse																	
	Beneficial																	
Pesticide catchment management / treatment – River Medway Scheme	Adverse																	
	Beneficial																	
Leakage reduction (15% reduction by 2025; 50% by 2050)	Adverse																	
	Beneficial																	
Target 100 water efficiency activity	Adverse																	
	Beneficial																	

Key:
- Major adverse
- Moderate adverse
- Minor adverse
- Negligible beneficial or adverse
- Minor beneficial
- Moderate beneficial
- Major beneficial

addressed further in consultation with Historic England and other stakeholders through detailed planning, site surveys and design/routing of the pipeline route. Mitigation will be required during construction to avoid impacts to Holborough and Burham Marshes SSSI.

The strategy includes an inter-zonal water transfer (to maximise the full existing transfer capacity from the Faversham area) and a bulk water import from South East Water, both of which were assessed as having potential moderate adverse effects to biodiversity, fauna and flora due to construction effects on sites of nature conservation interest, as well as to landscape and visual amenity within the Kent Downs Area of Outstanding Natural Beauty (AONB). These options will need to be further assessed during detailed design to develop appropriate mitigation measures to reduce the magnitude of effects to an acceptable level.

A short length of pipeline (of approximately 5km) is required for the inter-zonal transfer within the Kent Downs AONB. This has been routed to avoid ancient woodland and areas of woodland and parkland but will require further optimisation at the detailed planning stage to minimise landscape impacts.

The West Sandwich and Sandwich licence variation scheme and the recommission the Meopham greensand groundwater source are assessed as having predominantly negligible adverse effects. Minor adverse effects relate to energy and materials use and associated carbon emissions for water pumping and treatment. Minor beneficial effects arise from making optimal use of existing water sources.

In the longer term, there may be a requirement to recommission our Stourmouth water supply source and treatment works. This would have negligible to minor adverse effects whilst minor beneficial effects arise from making optimal use of existing water sources.

Cumulative effects of the Eastern area strategy have been identified in relation to pipeline and related construction works some distance apart within the Kent Downs AONB relating to the South East Water import in the Canterbury area and the Faversham Main options. Careful planning, design and mitigation will be needed in relation to the pipeline construction to minimise impacts to habitats, heritage features and landscape features that provide the basis for the AONB designation but overall the cumulative effects are considered minor.

Overall, the environmental assessment has concluded that the Eastern area strategy has predominately negligible to minor adverse effects and negligible to minor beneficial effects.

One strategic alternative option is being considered for the Eastern area: the Sittingbourne industrial water reuse scheme and this has been assessed. The SEA (alongside HRA and WFD assessments) concluded that there may be moderate adverse effects during construction after application of mitigation measures due to the proximity to important international wildlife sites, but mitigation would prevent any adverse effects on any European designated site.

7.4 WRMP strategy for the Central area (see also WRMP Annex 10)

7.4.1 Context

Our WRMP strategy for the Central area included proposals for leakage reduction and demand management measures, the development of a shared new non direct potable water reuse resource with South East Water, together with up to two desalination plants, a storage reservoir, and other measures. Since the draft WRMP was prepared, we have undertaken additional technical work and updated our modelling to reflect this. This has also taken into account updated information from our neighbouring water companies on their future needs. As a result of this, South East Water has indicated that it no longer needs some of the supplies that

we had anticipated providing to it in the future, and so the number and nature of the schemes in our preferred strategy has changed in the WRMP.

We have also included the need for alternatives strategies. In order to demonstrate confidence in delivering a long term scheme, given the inherent uncertainties and potential delays that are possible in securing and implementing any complex infrastructure project, we will in the short term concurrently develop alternatives strategies as required. We consider the progression of alternative strategies to be the most responsible course of action, both in terms of mitigating what could otherwise result in a threat to supply if sustainability reductions take place in this area and in giving public reassurance that action must and will be taken.

7.4.2 What are the key drivers for our WRMP strategy for the Central area?

At the start of the planning period, there are large initial deficits in the Sussex North WRZ in severe and extreme drought conditions. The Sussex Brighton WRZ has a small initial deficit in extreme drought conditions and in the MDO state for the severe drought condition. Conversely, the Sussex Worthing WRZ has an initial surplus and whilst it is able to support both Sussex North and Sussex Brighton through existing transfers, there is insufficient surplus to allow it to remove the deficits in these WRZs.

The key factor driving the strategy for the Central area is the potential for significant, but as yet unconfirmed sustainability reductions (licence changes). These sustainability reductions will be confirmed by the Environment Agency following the conclusion of the investigations the company is proposing to undertake early in the AMP7 period (by 2022-23). If licence changes are confirmed, then significant new infrastructure will be required to provide new water resources to offset the water that is effectively “lost”.

7.4.3 Our WRMP strategy for the Central area

The strategy for the Central area is set out in Figure 7.7, with detailed information set out in Annex 10. Our potential investment in water supplies in our Central area over the next 50 years is around £500m, expressed in current values.

As noted above, there is the potential for a number of sustainability reductions due to licence changes at our existing sources within the AMP8 period (2025-2030), notably in 2027 and influenced by the next statutory deadlines under the Water Framework Directive. The strategy for the Central supply area is dominated by the likelihood of future sustainability reductions, the full extent of which remains uncertain at this time. We will need to investigate the extent of any sustainability reductions, and the feasibility / design of the potential solutions to resolve any deficits caused by those reductions, at the same time.

As with the Western area, it will be necessary for detailed engineering and environmental assessments to be undertaken and for planning and other consents to be secured and for the schemes to be constructed and commissioned. The timings within the WRMP are our best estimates for delivery at this point in time, but may be updated to reflect further investigations.

Our detailed plans include the following schemes that potentially need to be developed depending on the future sustainability reductions.

In our Central area **during AMP7 (2020-2025)** we propose to start implementing additional **leakage reduction** within all WRZs. Alongside this, we plan to **increase the percentage of metered households** in the Central area, as part of our overall aim to increase metering from the current figure of 88% up to 92%. We will **increase the frequency of meter readings** for all households in the Central area, and implement our media and education campaign as the first part of our **Target 100** vision, to decrease the demand for water in the Central area.

We plan to introduce **catchment management and infrastructure solutions** to address rising nitrates and increase resilience at our Long Furlong B source, and for pesticides at our River Arun, Weir Wood reservoir, and Pulborough surface water sources. These will increase the reliability and resilience of these sources, to safeguard supplies to customers. We also plan to **improve our existing infrastructure** to bring the West Chiltington source back into service. And to **apply for a licence variation** at our Pulborough groundwater source. Despite these measures, there remains a risk that we might need to apply for **Drought Permits or Orders** in severe or extreme droughts for our Pulborough surface and groundwater sources, Weir Wood reservoir, East Worthing and North Arundel sources in AMP7. Further detail can be found in our Drought Plan.

During the **early part of AMP8 (2025-2030)** we plan to continue to implement our **leakage reduction** and **Target 100** measures to reduce demand. We will **improve treatment and/or rehabilitate a borehole** at Petersfield, and implement **catchment management and infrastructure solutions** against nitrates at the North Falmer A and B sources. There remains a potential need for a **Drought Permit / Order** in extreme droughts for our East Worthing source during this period.

Beyond this, our proposals are directly linked to the scale of potential sustainability reductions, anticipated in 2027. The modelling undertaken for the WRMP indicates that then, under any of the potential futures, we need to investigate in AMP7 and then build in AMP8, a number of major schemes to balance supply and demand in response to the potential deficit created by sustainability reductions. This is despite our continued investments in **leakage reduction** and **Target 100**, and **catchment management and infrastructure solutions** against nitrates at our North Arundel and Brighton A sources and **in-stream options** in the Western Rother and Arun.

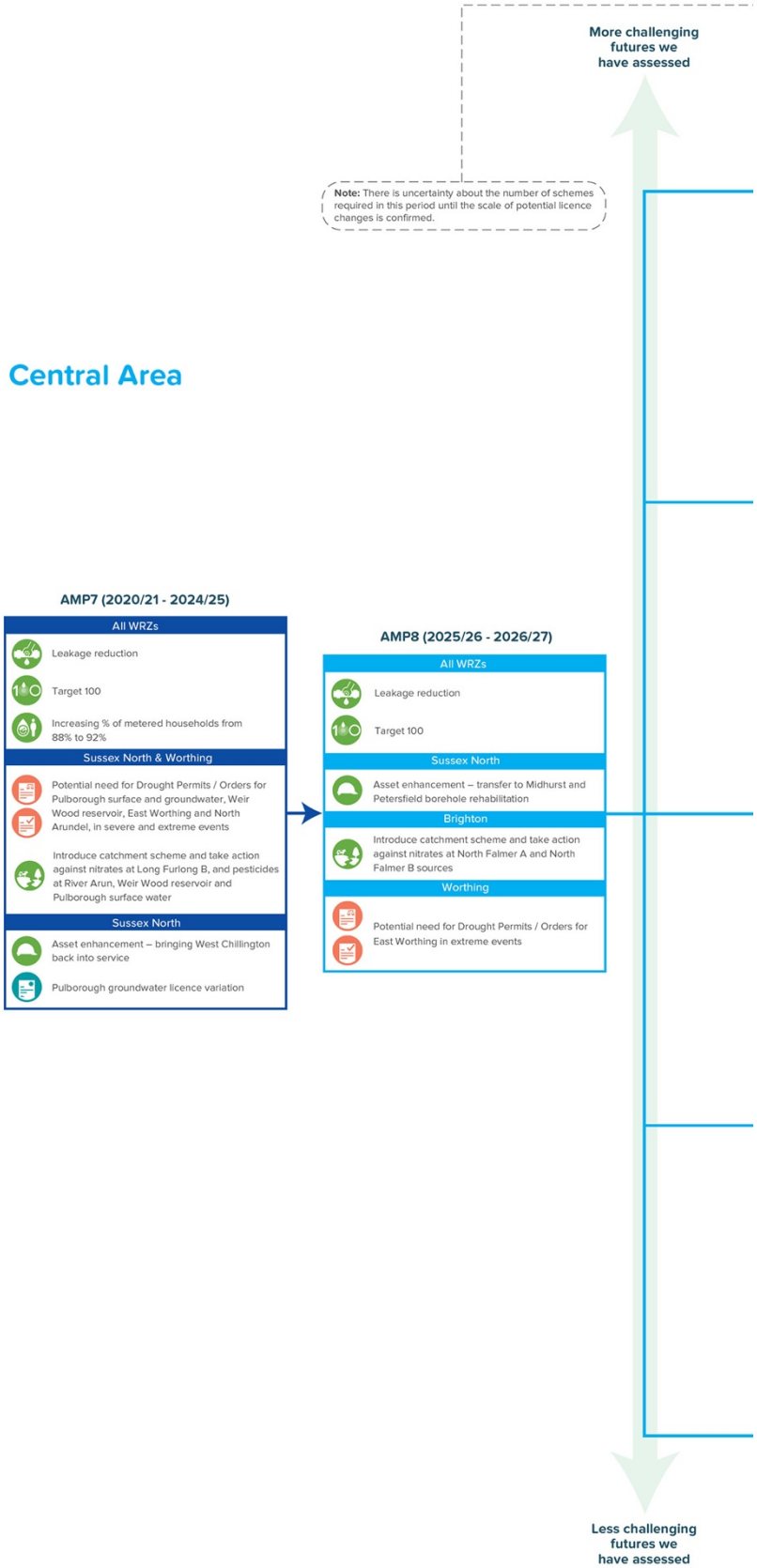
The anticipated larger scale schemes that may be required to be delivered in 2027 include both an **indirect potable water reuse scheme** from Littlehampton Wastewater Treatment Works, and an **aquifer storage and recovery scheme** north of Worthing. The strategies also include a potential desalination plant at Shoreham. There would be long distance below ground pipelines associated with a number of these options, including pipelines in the South Downs National Park, and we would also undertake **improvements to our existing mains** between Shoreham and Brighton. With these schemes in place we forecast that we would only need to rely on a **Drought Permit / Order** for our East Worthing and Pulborough surface water sources in an extreme drought event.

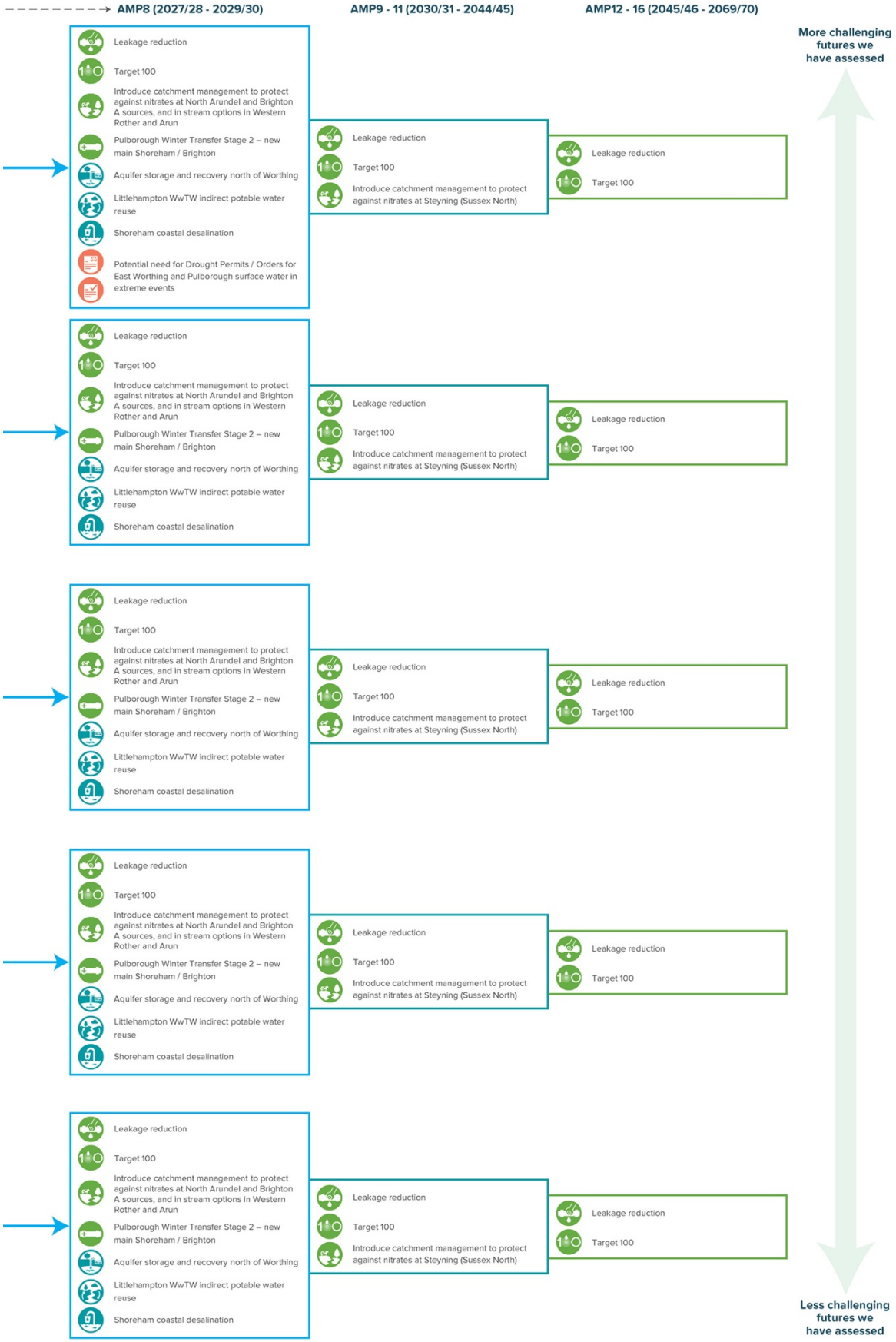
This is a significant amount of new infrastructure potentially required in AMP8 (2025-2030), and we will need to thoroughly investigate and prepare applications for planning and other consents for these schemes over the next few years. This includes having regard to environmental considerations. We will time that work, such that as soon as the extent of sustainability reductions become clearer post 2020, we are already in a good position to proceed to build those schemes that are necessary as a result.

Looking further ahead to the **medium term (AMP9-11, or 2030-2045)**, the degree of uncertainty in our forecasts increases and we will review these uncertainties in our next WRMP planned for 2023-24, and re-assess the need for further water resources and demand management measures to be implemented at that time. Our medium range forecasts at the current time, however, are identifying that in the 2030-2045 period we would be likely to need only limited further schemes to meet the supply demand balance. We would continue to implement our **leakage reduction** and **Target 100** measures to reduce demand. The only additional scheme currently anticipated would be to implement **catchment management and infrastructure solutions** against nitrates at our Steyning source.

Our longer term forecasts at the current time identify that in the **AMP12-16 or 2045-2070** period we would again only be likely to need limited further schemes to meet the supply demand balance. At the current time, this includes **leakage reduction** and our **Target 100** measures.

Figure 7.7 - Diagrammatic representation of WRMP Central area strategy




AMP8 (2027/28 - 2029/30)
AMP9 - 11 (2030/31 - 2044/45)
AMP12 - 16 (2045/46 - 2069/70)
More challenging futures we have assessed
Less challenging futures we have assessed
Leakage reduction
Target 100
Introduce catchment management to protect against nitrates at North Arundel and Brighton A sources, and in stream options in Western Rother and Arun
Pulborough Winter Transfer Stage 2 – new main Shoreham / Brighton
Aquifer storage and recovery north of Worthing
Littlehampton WwTW indirect potable water reuse
Shoreham coastal desalination
Potential need for Drought Permits / Orders for East Worthing and Pulborough surface water in extreme events
Introduce catchment management to protect against nitrates at Steyning (Sussex North)

Our re-assessment of the medium and longer term options in the next WRMP will include considering whether other potential schemes may be preferable in environmental, social or economic terms, (and we are already actively developing a natural capital type approach to address the specific challenges and identify benefits for future water resources planning). Other options including long distance pipeline transfers, desalination plants, and more intensive (and more expensive) water efficiency or leakage reduction measures.

7.4.4 Summary environmental assessment of the WRMP Central area strategy

The SEA summary of our WRMP strategy for the Central area is presented in the assessment table overleaf (Table 7.2). Further details are provided in Annex 14 (Strategic Environmental Assessment).

Table 7.2 shows for each scheme the adverse and beneficial effects assessment in two separate rows. Each coloured box in the table indicates the significance of effect assessed against the relevant SEA objective linked to the SEA topic area shown in the top row (e.g. biodiversity, flora and fauna). The key below the table indicates the significance of effect scale. Some SEA topics have more than one underlying SEA objective (e.g. there are four objectives linked to the SEA 'water' topic. The table provides an overview of the scale of adverse and beneficial effects associated with each scheme and the strategy as a whole.

The strategy includes nine catchment management options. The SEA assessment findings for these options are very similar: the effects are beneficial in relation to many of the SEA objectives with mainly negligible adverse effects. We have also included an in-stream river restoration works scheme for the River Arun and Western Rother to provide increased environmental resilience to the abstraction of water from the rivers in times of drought. This will complement the Pulborough source options and the Littlehampton Wastewater Treatment Works indirect potable reuse scheme included in the strategy. The effects of this option are assessed as beneficial in relation to many of the SEA objectives with only negligible adverse effects.

Demand management measures are a key component of the strategy. The SEA identified that the effects are mainly beneficial but with some minor temporary adverse effects in respect of materials required for water leak repairs and metering, as well as the risk of temporary traffic disruption and associated carbon and air quality effects of street works for leak repair activities.

There are seven supply-side options in our strategy, including a strategic water reuse scheme and desalination scheme which both provide beneficial effects relating to the provision of additional reliable water supplies by reusing treated effluent and seawater, respectively, and thereby increasing resilience to the future effects of climate change. The SEA identified a number of adverse effects for these two schemes:

The Littlehampton reuse option would give rise to a small number of major adverse effects relating to some construction activity within proximity to the South Downs National Park, the significant use of materials for construction and operation, as well as requiring high energy usage with consequent greenhouse gas emissions. The pipeline route for this scheme would avoid adverse effects on the nationally rare ecological communities of the Fairmile Bottom SSSI and minimise effects on other nearby sensitive habitats within the South Downs National Park. The WFD assessment identified that the discharge of highly treated effluent to the Western Rother would not lead to any material adverse effects.

Some moderate adverse effects have been identified in relation to the 10Ml/d Shoreham desalination plant including energy use and carbon emissions. The WFD assessment identified that the discharge of brine waste would not lead to any material adverse effects to water quality or ecology in the marine environment. The option will also make use of the existing long-sea outfall from Shoreham power station, and therefore at sufficient distance from the Adur Estuary SSSI.

Table 7.2 - Summary environmental assessment of WRMP Central area strategy and alternatives

Option name	Residual Effects Significance	SEA objective																
		Biodiversity, flora and fauna		Population and human health			Material assets and resource use		Water				Soil, geology and land use	Air and Climate			Archaeology and Cultural Heritage	Land-scape and Visual
		1.1	1.2	2.1	2.2	2.3	3.1	3.2	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
Littlehampton WTW Indirect Potable Water Reuse (20Ml/d)	Adverse																	
	Beneficial																	
Transfer to Midhurst WSW & Petersfield BH rehabilitation	Adverse																	
	Beneficial																	
Scheme to bring West Chiltington back into service	Adverse																	
	Beneficial																	
ASR (Sussex Coast - Lower Greensand)	Adverse																	
	Beneficial																	
Winter transfer Stage 2: New main Shoreham/North Shoreham and Brighton A	Adverse																	
	Beneficial																	
Coastal Desalination - Shoreham Harbour (10Ml/d)	Adverse																	
	Beneficial																	
Pulborough groundwater licence variation	Adverse																	
	Beneficial																	
Nitrate catchment management / treatment – North Falmer A	Adverse																	
	Beneficial																	
Nitrate catchment management / treatment – North Arundel	Adverse																	
	Beneficial																	
Nitrate catchment management / treatment – North Falmer B	Adverse																	
	Beneficial																	
Nitrate catchment management / treatment – Long Furlong B	Adverse																	
	Beneficial																	
Nitrate catchment management / treatment – Brighton A	Adverse																	
	Beneficial																	
Nitrate catchment management – Steyning	Adverse																	
	Beneficial																	
Pesticide catchment management / treatment – Weir Wood Reservoir	Adverse																	
	Beneficial																	
Pesticide catchment management / treatment – Pulborough Surface	Adverse																	
	Beneficial																	
Pesticide catchment management / treatment – River Arun	Adverse																	
	Beneficial																	
Leakage reduction (15% reduction by 2025; 50% by 2050)	Adverse																	
	Beneficial																	
Installation of AMR meters to take HH meter penetration from 88% to 92%	Adverse																	
	Beneficial																	
Target 100 water efficiency activity	Adverse																	
	Beneficial																	

Key:
- Major adverse
- Moderate adverse
- Minor adverse
- Negligible beneficial or adverse
- Minor beneficial
- Moderate beneficial
- Major beneficial

The Pulborough winter transfer scheme (Stage 2) and the Sussex Coast - Lower Greensand ASR may result in some temporary moderate adverse effects as a consequence of pipeline construction; some small sections of pipeline will be required within the South Downs National Park. Further route optimisation will be required at the detailed planning stage to minimise impacts to priority habitats including avoiding the lowland calcareous grassland and extensive loss of trees. The pipeline avoids the Adur Estuary SSSI.

Once operational, negligible adverse effects are anticipated for both of these schemes, with the exception of moderate adverse effects relating to energy use and carbon emissions. Both these schemes are beneficial for water supply sustainability and resilience, optimising existing water resources, making use of higher river flows in the winter within existing abstraction licence conditions so as to protect groundwater resources for subsequent use in the drier summer months when river flows are much lower in the Western Rother. Subsequently, during the summer, additional groundwater abstraction enabled by varying the existing abstraction licence condition for our Pulborough groundwater source will help secure water supplies to the north Sussex area without adverse effects on the Western Rother.

The options to rehabilitate the West Chiltington and Petersfield groundwater sources have limited construction- related requirements and so no adverse construction effects are likely. However, for the West Chiltington option only, the WFD assessment has identified some uncertainty regarding the potential effects to surface waters (River Chilt) and a potential risk to wetland habitats (Hurston Warren Site of Special Scientific Interest (SSSI)) as a result of the groundwater abstraction. Further investigations will take place as agreed with the Environment Agency and scheduled for completion by 2022.

Cumulative effects of the Central area strategy have been identified in relation to the Lower Greensand Arun & Western Streams WFD water body due to the operation of the Petersfield and West Chiltington groundwater sources, assessed as negligible. Six water supply options would be located within or adjacent to the South Downs National Park. Much of the development will take place at existing Southern Water operational sites and the risk of cumulative effects in respect of construction activities is considered low. Close consultation will be necessary with the South Downs National Park Authority, Natural England and other interested stakeholders. Cumulative major effects on energy use and carbon emissions during operation of several energy-intensive schemes (notably the desalination and water reuse schemes).

Overall, the environmental assessment has concluded that the strategy has predominately minor to moderate adverse effects and negligible to minor beneficial effects. The Littlehampton Wastewater Treatment Works water reuse scheme will present some potential major adverse effects, mostly during construction but also in respect of high energy use. For several of the schemes, we have considered a range of mitigation measures to reduce the assessed effects on the environment and these will be further developed as part of the detailed planning and design of the schemes. We are committed to continuing dialogue with regulators, statutory bodies and interested stakeholders in developing these schemes and as we carry out detailed environmental investigations to inform precise details of any required mitigation measures.

Four strategic alternative options are being considered for the Central area: Brighton Wastewater Treatment Works indirect potable reuse (10 Ml/d), the Pulborough Winter Transfer Stage 1 scheme, a larger coastal desalination scheme at Shoreham Harbour, and Tidal River Arun Desalination. The treated water pipeline route for Brighton Wastewater Treatment Works indirect potable reuse option would avoid impacting receptors including the Lewes Downs SAC, irreplaceable priority habitats, visual amenity of the South Downs National Park, Clayton to Offham Escarpment SSSI. There will be some pipeline construction required further east within the South Downs National Park which we cannot avoid. However, the scheme will ensure there is only one construction corridor required within the South Downs National Park, thereby minimising impacts.

Additionally, there is some uncertainty surrounding the operational effect of increased flows on aquatic ecology in the water body receiving the highly treated effluent from the Brighton Wastewater Treatment Works scheme, with the potential risk of WFD status deterioration. If this alternative scheme was required to be developed, further investigations would be required to assess these potential impacts in more detail, and if necessary develop appropriate mitigation measures if a WFD status deterioration risk was confirmed. The Brighton scheme provides beneficial effects relating to the provision of additional reliable water supplies by reusing treated effluent, thereby increasing resilience to the future effects of climate change.

The Pulborough Winter Transfer Stage 1 scheme makes use of existing water resources and involves improving water treatment processes to enable 2Ml/d to be made available for supply. As such there are negligible effects from construction or operation of this scheme except for some minor adverse effects associated with additional energy and chemical use during operation and the use of materials during the construction phase.

The larger coastal desalination option at Shoreham would have greater adverse effects including energy use and carbon emissions than the smaller variant, but would similarly make use of the existing long-sea outfall for dispersion of the waste stream. The Tidal River Arun Desalination requires a pipeline which crosses the River Arun and extends partly through the South Downs National Park. The section within the South Downs National Park cannot be avoided as Perry Hill WSR is located in the National Park, therefore mitigation will be required to minimise landscape impacts. The waste brine discharge will be mixed with effluent from the Littlehampton Wastewater Treatment Works existing coastal outfall, minimising impacts on the marine environment.

7.5 WRMP strategy for the Western area (see also WRMP Annex 9)

7.5.1 Context

Our draft WRMP strategy for the Western area included significant proposals for new water resources infrastructure, responding to proposed changes to a number of abstraction licences related to the Lower Itchen, River Test and Candover Stream. Those changes, and uncertainty over other potential additional sustainability reductions led to the draft plan including large scale desalination, non-direct potable water re-use, pipeline transfer, demand management, leakage reduction and catchment management measures, with many aiming to be implemented by 2027.

At the abstraction licences Inquiry in March 2018 we entered into a s20 agreement with the Environment Agency. The s20 agreement included various commitments from both parties relating to the Lower Itchen, Test and Candover abstraction licences. We accepted the licence changes as proposed by the Environment Agency, and the Environment Agency acknowledged the significant impact this had on our statutory duties relating to supply. An interim abstraction scheme was agreed in recognition of the potential need to rely more frequently on Drought Permits and Drought Orders until new water resources can be developed. Monitoring, mitigation and compensatory measures for the potential impact of those drought actions were also agreed with many of those measures being put in place irrespective of whether the Drought Permits and Drought Orders are applied for (thereby also being in place in advance of any application if/when needed). Importantly, we committed to use “all best endeavours” to implement a long term water resources scheme, (based on "Strategy A" in the draft WRMP) which would provide the necessary new water resources infrastructure to respond to the impact on supply as a result of the licence changes.

Following the inquiry, the abstraction licences were changed by the Environment Agency in March 2019. We have incorporated the content of the s20 agreement into the WRMP, and have undertaken additional technical work and updated our modelling to reflect this. We have taken into account updated information

from our neighbouring water companies on their future needs, and the potential for the transfer of water between companies. Our final strategy for the Western area in this WRMP is consistent with the strategy at the time of our draft WRMP and the Inquiry (then known as Strategy A).

The need for alternative strategies is simple. The interim abstraction scheme can only be utilised for the term of the s20 agreement (until 2030), ideally with long term schemes to reduce and remove the need to use the interim abstraction scheme in place by 2027. In order to demonstrate confidence in delivering a long term scheme within this time frame, given the inherent uncertainties and potential delays that are possible in securing and implementing any complex infrastructure project, we will in the short term concurrently develop alternatives strategies. We consider the progression of alternative strategies to be the most responsible course of action, both in terms of mitigating what could otherwise be a significant threat to supply and in giving public reassurance that sufficient action will be taken.

7.5.2 What are the key drivers for our WRMP strategy for the Western area

The implementation of the licence changes on the Itchen and Test result in significant deficits in the supplies available to meet demand for water – affecting the Hampshire Southampton East and Hampshire Southampton West WRZs respectively. This means that Drought Permits and Orders will need to be relied on prior to new resources being available. The interim abstraction scheme agreed under the s20 agreement is an acceptance of this position by the Environment Agency.

The deficits faced in the other Hampshire WRZs (Hampshire Rural, Hampshire Winchester, Hampshire Andover and Hampshire Kingsclere) tend to be smaller initially (or are in surplus). However under some of the sustainability reduction scenarios under the different 'futures' approach, the deficit can become more significant from 2027.

The Isle of Wight WRZ is in deficit but is supported by the Hampshire Southampton West WRZ through the existing cross-Solent main. As a result of the sustainable reductions to the licences at the Test (and Itchen), the support to the Isle of Wight WRZ therefore becomes stressed.

7.5.3 Our WRMP strategy for the Western area

The strategy for the Western area is summarised below and represented in Figure 7.8, with detailed information set out in Annex 9. As has been noted throughout this document, the Western area represents the most significant challenge we face in preparing this WRMP. As a result, our potential investment in water supplies in our Western area over the next 50 years is around £1,100 million, expressed in current values.

In our Western area **during AMP7 (2020-2025)**, we propose to start implementing additional **leakage reduction** within all WRZs. Alongside this, we plan to **increase the percentage of metered households** in the Western area, as part of our overall aim to increase metering from the current figure of 88% up to 92%. We will **increase the frequency of meter readings** for all households, and implement our media and education campaign as the first part of our **Target 100** initiative, to decrease the demand for water in the Western area. Although important, the overall contribution that this will make is limited in the context of the deficit presented by the licence changes, and we will need to undertake significant investment in new infrastructure as well.

We plan to introduce **catchment management and infrastructure solutions** to remove nitrates from our Twyford and Romsey sources, and to protect against pesticides at Sandown and the Test surface water source. This should increase their reliability and resilience and safeguard supplies to customers. We also plan to secure the **transfer of an additional 9Ml/d of water** from Portsmouth Water, through the recently constructed new transfer pipeline into Hampshire Southampton East WRZ. This pipeline was specifically sized so that it could accommodate more water for circumstances such as this. There is some uncertainty

around the sustainability of the scheme which Portsmouth Water intends to implement to provide the additional water for this bulk transfer but further work is planned to be undertaken by Portsmouth Water in conjunction with the Environment Agency to understand the availability of the water. We have considered the risks associated with this bulk supply option through inclusion of a scenario whereby this option is not available. This will help us to understand the sensitivity of the strategy to the 9Ml/d bulk supply from Portsmouth Water and whether alternative schemes need to be considered. Further information is contained in Annex 9.

We also plan to **improve our existing transfer pipelines** between Hampshire Southampton West and Hampshire Rural WRZs by replacing valves and making the transfer bi-directional.

Even with the above measures in place, our supplies to customers will remain threatened during the AMP7 period, and into AMP8 until sufficient alternative long term supplies are delivered. On the basis of the environmental conditions we expect to encounter before 2027, we have forecast a need to implement **temporary use bans** in Hampshire, and to apply for **Drought Permits and Orders** under the interim abstraction scheme from the s20 agreement. In all but our least challenging future, we forecast that we may need to apply for Drought Permits / Orders at the Test surface water abstraction (in drought, severe drought and extreme droughts), in relation to a groundwater source in the Candover valley and Isle of Wight sources (in severe and extreme droughts), and Lower Itchen groundwater and surface water abstractions (in severe and extreme droughts) in order to protect supplies to customers. Under the terms of our s20 agreement with the Environment Agency, monitoring, mitigation and compensatory measures are being implemented to address the potential impact from reliance on these Drought Permits and Drought Orders with many measures being implemented irrespective of any actual applications for the Drought Permits and Drought Orders. More detail on the interim abstraction scheme can be found in Annex 3 of our Drought Plan.

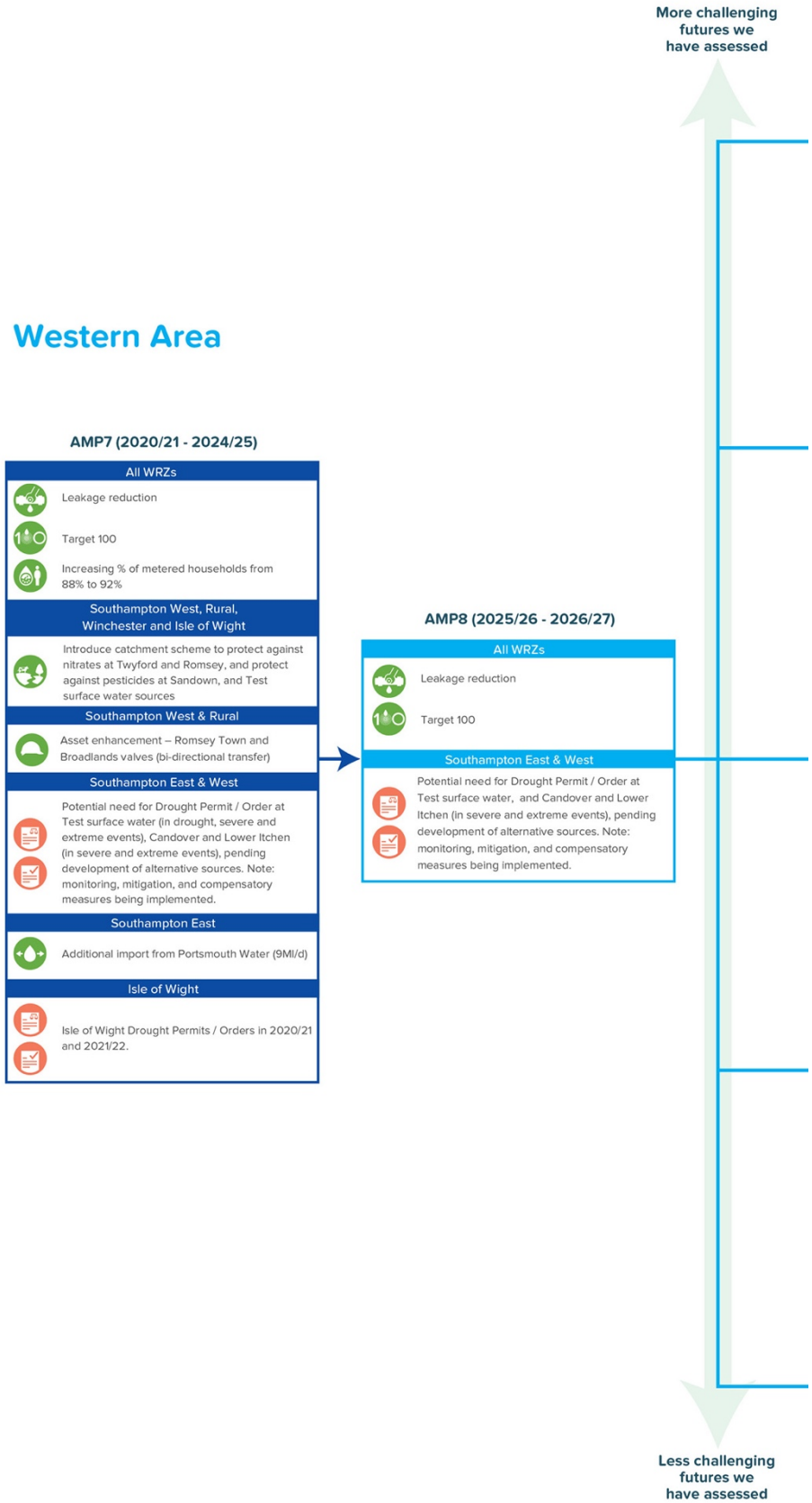
During the **early part of AMP8 (2025-2030)** we plan to continue to implement our **leakage reduction** and **Target 100** measures to reduce demand. In this period we forecast we may continue to need to apply for **Drought Permits and Orders** under the interim abstraction scheme. We forecast that we may need to apply for a Drought Permit / Order at the Test surface water abstraction, in relation to a groundwater source in the Candover valley, and Lower Itchen groundwater and surface water abstractions (all in severe and extreme droughts) in order to protect supplies to customers.

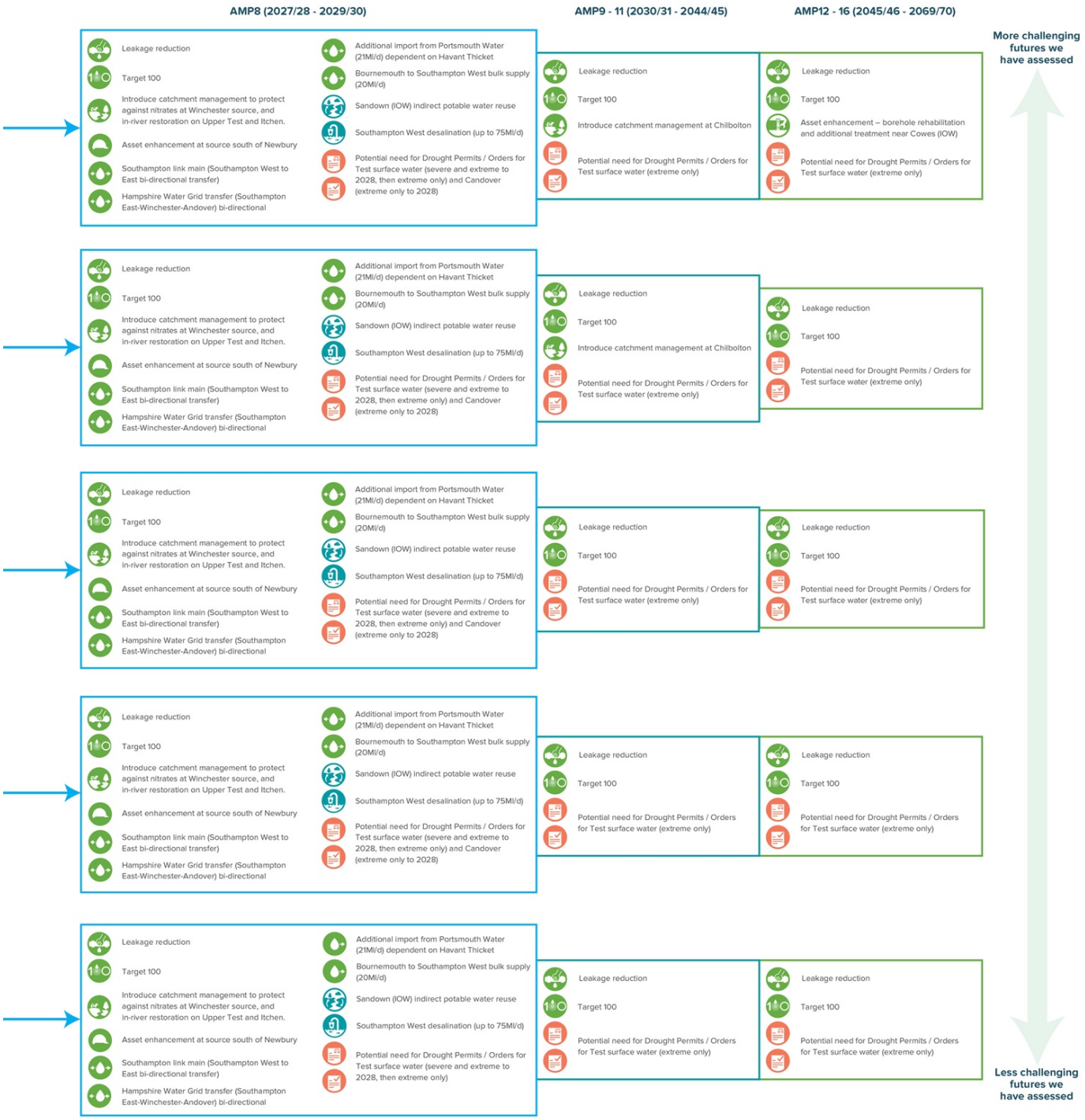
By the **latter part of AMP8** we will need to have delivered significant additional measures to maintain our supply demand balance, and to minimise the threat to supplies in the face of both the licence changes to the Lower Itchen, Test and Candover already agreed, and as a result of the potential additional sustainability reductions that may be implemented by this AMP period. The significance of 2027 is in respect of statutory deadlines for measures required by the Water Framework Directive to be implemented.

We will continue to implement our **leakage reduction** and **Target 100** measures to reduce demand. We plan to also introduce **catchment management and infrastructure solutions** to remove nitrates at our Winchester source, to increase reliability and resilience and to safeguard supplies to customers. We will also have delivered **'in river' restoration measures** to increase environmental resilience in the Upper Test and Itchen.

We will have planned and developed large scale new pipeline transfers within our own supply areas in AMP8, to increase the connectivity between our WRZs so that we can more easily move water from an area potentially in surplus (or where a large scale new resource is planned) to other WRZs. Our plans include **developing the Southampton Link main scheme** (from Southampton West to Southampton East), as a bi-directional transfer. We will also have delivered our planned **water transfer grid** between the Southampton East, Winchester, and Andover WRZs, again as a bi-directional transfer. These schemes will provide better connectivity between our existing supplies, enabling us to transfer water in both directions. We will also

Figure 7.8 - Diagrammatic representation of our WRMP Western area strategy




AMP8 (2027/28 - 2029/30)
AMP9 - 11 (2030/31 - 2044/45)
AMP12 - 16 (2045/46 - 2069/70)
More challenging futures we have assessed
Less challenging futures we have assessed
Leakage reduction
Target 100
Introduce catchment management to protect against nitrates at Winchester source, and in-river restoration on Upper Test and Itchen.
Asset enhancement at source south of Newbury
Southampton link main (Southampton West to East bi-directional transfer)
Hampshire Water Grid transfer (Southampton East-Winchester-Andover) bi-directional
Additional import from Portsmouth Water (21Ml/d) dependent on Havant Thicket
Bournemouth to Southampton West bulk supply (20Ml/d)
Sandown (IOW) indirect potable water reuse
Southampton West desalination (up to 75Ml/d)
Potential need for Drought Permits / Orders for Test surface water (severe and extreme to 2028, then extreme only) and Candover (extreme only to 2028)
Introduce catchment management at Chilbolton
Potential need for Drought Permits / Orders for Test surface water (extreme only)
Asset enhancement – borehole rehabilitation and additional treatment near Cowes (IOW)
Potential need for Drought Permits / Orders for Test surface water (extreme only)

deliver an **asset enhancement scheme** at a source south of Newbury which will increase the resilience of the Hampshire Kingsclere WRZ.

The larger resource schemes that we will plan, develop and deliver over this period include an **indirect potable water reuse scheme** on the Isle of Wight, at Sandown (8.5Ml/d) to provide more secure supplies to customers. We will also need to secure an **additional large scale transfer of water** from Portsmouth Water (21Ml/d), in excess of that which can be transferred through existing pipelines. This scale of supply means that Portsmouth Water would need to develop its Havant Thicket Reservoir, to ensure its customers' own supplies are protected. We may be unlikely to be able to secure any significant transfer from Portsmouth Water until the new reservoir is at least partly operational, although we will work closely with Portsmouth Water to develop the additional resources it needs. This places some risks and uncertainty around the timing of the water becoming available for our use, as Portsmouth Water is indicating its Havant Thicket scheme may not be fully operational until 2029. In the event that any significant transfer cannot take place until 2029 we may have to continue to rely on the interim abstraction scheme until then. This is permitted under the s20 agreement but it is still our intention to reduce reliance on the interim abstraction scheme by 2027 and our continued support to Portsmouth Water on this project will still aim to secure that if possible. Although we have had to plan for this eventuality in this WRMP, the need to rely on drought permits and drought orders past 2027 will be commensurate with what schemes are operational (and to what degree) at that time.

We will also have delivered **a new pipeline transfer of water** from Bournemouth to Southampton West, of up to 20Ml/d. Our current plans are that this would be through a new pipeline routed around the New Forest, although there may be potential for existing transfer pipelines to be used (see 'delivering our strategy' below) in combination with other sources.

The final, and largest element of our preferred strategy is a large **desalination plant** on the Solent, designed to utilise the existing outfall infrastructure that was associated with a former power station. We anticipate that this could be required to be up to 75Ml/d in scale when in full operation, although modular construction could be utilised for this scheme and this has been considered within the real options and futures approach. At other times, the desalination plant would need to operate continuously at a lower level, which would provide approximately 25Ml/d to provide supply to the local area. Large new pipelines would be required with the desalination plant. There is the potential that the scale of the desalination plant could be reduced if we were to develop a **water re-use scheme** to transfer highly treated wastewater to increase flows in the Lower Itchen.

With all of the above measures in place, **Drought Permits / Orders** may still be required for the Test surface water source but in an extreme drought only.

This is a significant amount of new infrastructure required in AMP8 (2025-2030), and we will need to thoroughly investigate and prepare applications for planning and other consents for these schemes over the next few years in AMP7. We have set out in sections below our delivery actions to achieve this.

Looking further ahead to the medium term **(AMP9-11, or 2030-2045)**, the degree of uncertainty in our forecasts increases and we will review these uncertainties in our next WRMP planned for 2023-24, and re-assess the need for further water resources and demand management measures to be implemented at that time. Our medium range forecasts at the current time for the Western area identify that only limited additional measures are likely to be required, following the significant infrastructure investment and delivery in earlier AMPs. We plan to continue to implement our **leakage reduction** and **Target 100** measures to reduce demand in the 2030-2045 period. The risk of us needing to rely on **Drought Permits or Orders** for the Test

surface water source is then limited to the more challenging futures, and then only in extreme events. No other measures are currently identified as being necessary.
Our longer term forecasts at the current time identify that in the **AMP12-16 or 2045-2070 period** we would be likely to need limited further schemes to meet the supply demand balance. At the current time, these are indicatively identified as continuing to implement our **leakage reduction** and **Target 100** measures to reduce demand, and under the most challenging future we would also need to **rehabilitate a borehole** near Cowes on the Isle of Wight, and to introduce catchment management measures at Chilbolton. Our re-assessment of the medium and longer term options in the next WRMP will include considering whether other potential schemes may be preferable in environmental, social or economic terms (and we are already actively developing a Natural Capital type approach to address the specific challenges and identify benefits for future water resources planning). Other options include long distance pipeline transfers, desalination plants, and more intensive (and more expensive) water efficiency or leakage reduction measures.

7.5.4 Summary environmental assessment of the WRMP Western area strategy

The SEA summary of the WRMP for the Western area is presented in Table 7.3 overleaf. Further details are provided in WRMP Annex 14 (Strategic Environmental Assessment). The HRA of this strategy has concluded that there would be no adverse effects on any European site with appropriately agreed mitigation measures in place to address any identified risks during construction and / or operation. Similarly, the WFD assessment has concluded that this strategy would not result in any deterioration of WFD status of any water body, with the exception of the Sandown indirect water reuse scheme where there is currently some uncertainty as to the potential effect on WFD status due to the effects of additional flow discharges to the River Eastern Yar.

The strategy includes six catchment management options (excluding the two in-stream restoration options). The SEA assessment findings for the catchment management options are very similar. The effects of these options are assessed as beneficial in relation to many of the SEA objectives with predominately negligible or no adverse effects, except for minor adverse effects associated with carbon emissions for the extra water treatment necessary for the additional water made available by these schemes.

The in-stream river restoration works for the River Itchen and the upper reaches of the River Test have been included, in particular, to provide increased environmental resilience to the abstraction of water from these rivers in times of drought. These measures are additional to those previously agreed with the Environment Agency and Natural England in connection with the Test drought permit/order and the Candover and Lower Itchen drought orders. The effects of these two options are assessed as beneficial in relation to many of the SEA objectives with only negligible adverse effects.

Demand management measures are a core feature of the strategy. These demand management options have been grouped to summarise the environmental and social effects of these options. The effects are mainly beneficial but with some minor temporary adverse effects in respect of materials required for water leak repairs and metering, as well as the risk of temporary traffic disruption and associated carbon and air quality effects of street works for leak repair activities.

The eleven supply-side options in our strategy includes one water reuse schemes which provide beneficial effects relating to the provision of additional reliable water supplies by reusing treated effluent and thereby increasing resilience to the future effects of climate change. The SEA identified a number of adverse effects for this scheme. The Sandown indirect potable water reuse scheme could result in adverse effects regarding the Isle of Wight Area of Outstanding Natural Beauty (AONB) due to the construction of a pipeline across part of the AONB which cannot be avoided. We will work to minimise effects on landscape and ecology as part of the detailed design of the pipeline. Further investigations are needed to confirm the magnitude of adverse effects on the ecology and geomorphology of the River Eastern Yar from discharges to the river of

highly treated effluent at times of low flows. We will work closely with the Environment Agency to scope the necessary environmental investigations and discuss the need for mitigation measures in light of the findings.

Table 7.3 - Summary environmental assessment of WRMP Western area strategy and alternatives

Option name	Residual Effects Significance	SEA objective																	
		Biodiversity, flora and fauna		Population and human health			Material assets and resource use		Water				Soil, geology and land use	Air and Climate			Archaeology and Cultural Heritage	Land-scape and Visual
Romsey Town and Broadlands valve (HSW-HR reversible)	Adverse																	
	Beneficial																	
Import from Bournemouth Water	Adverse																	
	Beneficial																	
Additional import from Portsmouth Water (additional 9Ml/d)	Adverse																	
	Beneficial																	
Additional import from Portsmouth Water (Havant Thicket reservoir development)	Adverse																	
	Beneficial																	
Hampshire grid (reversible link HSE-HW)	Adverse																	
	Beneficial																	
Hampshire grid (reversible link HW-HA)	Adverse																	
	Beneficial																	
Sandown WwTW Indirect Potable reuse (8.5 Ml/d)	Adverse																	
	Beneficial																	
WSW near Cowes - reinstate & additional treatment	Adverse																	
	Beneficial																	
Newbury WSW asset enhancement	Adverse																	
	Beneficial																	
Southampton link main (reversible link HSW-HSE)	Adverse																	
	Beneficial																	
Fawley desalination (modular to 75Ml/d)	Adverse																	
	Beneficial																	
In-stream river restoration works on the Test (upper reaches)	Adverse																	
	Beneficial																	
In-stream river restoration works on the Itchen	Adverse																	
	Beneficial																	
Pesticide catchment management / treatment – Sandown	Adverse																	
	Beneficial																	
Pesticide catchment management / treatment – Test Surface Water	Adverse																	
	Beneficial																	
Nitrate catchment management / treatment – Twyford	Adverse																	
	Beneficial																	
Nitrate catchment management / treatment – Romsey	Adverse																	
	Beneficial																	
Nitrate catchment management / treatment – Winchester	Adverse																	
	Beneficial																	
Nitrate catchment management / treatment – Chilbottom	Adverse																	
	Beneficial																	
Leakage reduction (15% reduction by 2025; 50% by 2050)	Adverse																	
	Beneficial																	
Installation of AMR meters to take HH meter penetration from 88% to 92%	Adverse																	
	Beneficial																	
Target 100 water efficiency activity	Adverse																	
	Beneficial																	

Key:
- Major adverse
- Moderate adverse
- Minor adverse
- Negligible beneficial or adverse
- Minor beneficial
- Moderate beneficial
- Major beneficial

The HRA of this option concluded there would be no adverse effects on the Solent and Southampton Waters SPA and Ramsar site. No adverse effects are anticipated to the associated Brading Marshes to St. Helen's Ledges SSSI.

The Fawley desalination scheme brings major beneficial effects in respect of provision of a reliable water supply that is very resilient to the future effects of climate change. Some major adverse effects have been identified in relation to the operational use of non-renewable materials and generation of wastes in the treatment process, as well as carbon emissions. Additionally, there are a range of risks to the marine environment which we have considered at a strategic level and the necessary mitigation measures that may be required to protect the marine environment. With careful application of mitigation measures, there should be no adverse effects on the marine European sites on the landward side of the outfall and abstraction pipeline construction activity. Potential major adverse effects relating to biodiversity, fauna and flora as well as landscape and visual amenity may arise from construction of pipelines for the desalination scheme within or near to the New Forest National Park and associated designated European conservation sites. Further route optimisation will be carried out at the detailed planning stage to utilise the existing road network if possible.

The import from Bournemouth Water involves a proposed long-distance pipeline to bring water into our distribution system. The pipeline route avoids the New Forest National Park and associated designated European conservation sites so as to minimise the environmental effects of this scheme. The route avoids Whiteparish Common SSSI (a component of the SAC) and Cranborne Chase and West Wilshire Downs AONB, as well as avoiding potential impacts to offsite habitat use of woodlands by woodlark. Further route optimisation will be carried out at the detailed planning stage to avoid any potential effects on groundwater and flood plain hydrological processes where the pipeline extends through the Avon Valley.

The Southampton Link Main scheme has the potential to result in adverse effects relating to biodiversity, flora and fauna due to the possible adverse effects to a designated European conservation site, but we have sought to minimise these effects through re-routing of the pipeline (including to avoid Ancient Woodland) wherever feasible and, where not feasible, developing mitigation measures. The launch and receptor pits will be set up in the least impactful locations avoiding lowland fens, and wherever possible avoiding coastal and floodplain grazing marsh. A suite of mitigation and compensation measures have been developed to avoid adverse effects of the Southampton Link Main option to the Solent and Southampton Water SPA and Ramsar, and River Test SSSI and Lower Test Valley SSSI. Further detailed assessment, including a hydrology assessment, will be required at the detailed design stage to confirm the mitigation proposed is sufficient to avoid adverse effects.

For the Hampshire Grid Main option, we have routed the pipeline to avoid areas of ancient woodland and other irreplaceable priority habitat (e.g. chalk grassland). However, approximately 10km of pipeline will be required within the North Downs AONB given the destination of the pipeline. Detailed route optimisation will be required at the planning stage to minimise impacts to the character of the area by utilising the local road networks and areas of poorer quality habitat. The pipeline will cross the River Test SSSI between Chilbolton and Wherwell Appropriate mitigation measures will be agreed to minimise any adverse effects of these river crossings.

For all of these pipelines included in our strategy, careful design, planning and site environmental surveys to inform mitigation measures will be needed to minimise environmental effects.
The borehole rehabilitation scheme near Cowes is assessed as having predominantly negligible adverse effects. Minor to moderate adverse effects relate to energy and materials use and associated carbon

emissions for materials for construction activities plus operational water pumping and treatment. Minor beneficial effects arise from making optimal use of existing water sources.

Cumulative effects of the Western area strategy have been identified in relation to:

- Beneficial effects for all the demand management options in relation to these measures acting in combination to increase the overall demand savings, thereby contributing to sustainable abstraction.
- Potential construction related cumulative effects due to the proximity and overlap of likely construction periods between the Hampshire grid system options (2026 and 2027) and the Test to Lower Itchen pipeline (2024-2027). The potential effects are limited to temporary effects to the local population and are considered low risk.
- Potential minor risk of cumulative effects with respect to two options that would be partly constructed within the New Forest National Park (Fawley desalination and Bournemouth Water import). Careful planning, design and mitigation will be needed in relation to the pipeline construction activities to minimise impacts to habitats, heritage features and landscape features that provide the basis for the National Park designation.

Overall, the environmental assessment has concluded that WRMP Strategy for the Western area has predominately minor to moderate adverse effects and negligible to minor beneficial effects. However, given the scale of the schemes required to address the supply deficit, a small number of potential major adverse effects may arise – most are related to construction in or near to sensitive environments, but there are also some permanent effects, notably in respect of high energy use and carbon emissions associated with the large desalination scheme at Fawley.

Where adverse effects have been identified, we have considered a range of mitigation measures to reduce the effects on the environment and these will be explored further as part of the detailed planning and design of the schemes.

Six strategic alternative options are being considered for the Western area. The Fawley desalination (100Ml/d) option is an alternative scheme in case some of the water import schemes could not be delivered to the full volume assumed; Sandown desalination (8.5Ml/d) scheme would be an alternative to the Sandown Wastewater Treatment Works indirect potable water reuse scheme. The Itchen indirect potable reuse schemes (Portsmouth Harbour and Fareham Wastewater Treatment Works indirect potable reuse (90Ml/d) or Woolston and Portswood Wastewater Treatment Works indirect potable reuse (20.5Ml/d)) would be an alternative to a Fawley desalination scheme. The Test Estuary Wastewater Treatment Works Industrial Reuse would be used with the Woodside transfer valve as an alternative to the Portsmouth bulk supply (9Ml/d). These alternative options have been assessed and the SEA (alongside the HRA and WFD assessments) concluded that these schemes have overall slightly greater adverse environmental effects (after consideration of mitigation measures) compared to the schemes that form the WRMP western area strategy.

The Fawley desalination 100 Ml/d scheme has marginally greater adverse effects than those for the 75 Ml/d desalination scheme in respect of the increase in brine discharge to the Solent. Greenhouse gas emissions and the use of materials to operate the scheme would be slightly higher. The pipeline construction would follow the same routes as the 75 Ml/d option and therefore there are no discernible environmental difference to the effects. The same design considerations apply equally to this scheme in respect of protecting the marine environment.

The Itchen Indirect Potable Reuse options would require long-distance pipelines, notably for the Portsmouth Harbour and Fareham Wastewater Treatment Works indirect potable reuse option, and more pumping of water than for the Fawley desalination scheme and therefore greater greenhouse gas emissions and use of

materials. There is a risk of greater adverse effects on the freshwater environment compared to the desalination scheme, but conversely there may be a beneficial effect on the marine environment by removing a significant discharge of treated sewage effluent that is currently high in nutrients.

The Sandown desalination scheme is considerably smaller than the Fawley scheme and consequently has a lower magnitude of adverse environmental effects. Effects on the marine environment are low due to the blending of the brine discharge with the existing treated sewage effluent. There are similar adverse effects associated with the pipeline route crossing an AONB to the Sandown Wastewater Treatment Works indirect potable reuse scheme. Greenhouse gas emissions and material use would be marginally higher than the reuse scheme

The Test Estuary Wastewater Treatment Works industrial use scheme has a lower magnitude of adverse effects on the environment. The pipeline route for this scheme has been optimised to minimise the potential effects on the New Forest National Park and New Forest SAC and SSSI. The route follows an existing power line wayleave within the SAC, SSSI and National Park on dry grassland habitat. There will be no adverse effects on the Test Estuary and associated European sites and SSSIs.

The Woodside transfer valve (HSW to HSE) has limited environmental impacts as it is an existing transfer with the requirement for an additional booster pumping station within the existing boundaries of the working site within a built up area.

There are a substantial range of early actions that are required to progress delivery of our Western Area strategy over the next few years In close dialogue with our regulators and stakeholders. These include detailed environmental investigations which are prioritised for delivery early in the programme to reduce environmental uncertainties and risks. The environmental investigations will inform a detailed and thorough environmental assessment of each option to determine impacts, both alone and in-combination with other plans and projects. The assessments will also consider any necessary mitigation measures to address identified impacts to reduce any adverse effects to an acceptable level. Further details on our programme for environmental investigations, stakeholder dialogue and applications for required environmental permissions are provided In Annex 14 (Strategic Environmental Assessment).

7.6 Environmental and social performance of the WRMP strategies as a whole

We have actively considered environmental and social effects throughout the development of our WRMP and consulted regularly with our regulators, stakeholders and customers to seek their views on the assessed effects. We have complied fully with the statutory requirements for environmental and social appraisal of our WRMP and followed national best practice guidance. Our assessments have been based on a broad range of objective environmental and social criteria to ensure all options were considered on a consistent basis, in line with the meeting the requirements of the SEA Directive.

7.6.1 Habitats Regulations compliance

The HRA Stage 1 Screening assessment concluded that four options included within the WRMP required a Stage 2 Appropriate Assessment. The information to inform the Appropriate Assessments concluded that, with the proposed mitigation measures in place for each scheme, there would be no adverse effects on the integrity of any European site. As these schemes are taken forward for further detailed design, the finer details of the required mitigation measures will need to be developed in dialogue with Natural England and the site operators / owners and secured during the project-stage HRA when a detailed design and construction method statement will be developed. If the mitigation measures described in the assessments

are implemented, then it can be reasonably concluded that the WRMP schemes will not have an adverse effect on the integrity of any SACs, SPAs and Ramsar sites.
The HRA Stage 1 Screening assessment for the remaining options included within WRMP, both individually and in combination, confirmed that there would be no likely significant adverse effects on any European site, thereby meeting "the no likely significant effect" HRA test.

Strategic alternative options to those included in the proposed strategies for the WRMP have also been considered as part of the HRA. The Stage 1 HRA screening concluded that for all but four of these options, there would be no likely significant effects on any European site. The Appropriate Assessments for the remaining four options concluded there would be no adverse effects on site integrity.

A HRA will still need to be carried out as and when each of the schemes is brought forward by Southern Water for promotion and applications are subsequently made for planning permission and environmental permits. At that stage, the HRA will need to be revisited to take account of any changes to scheme design, construction and operational arrangements, as well as the package of mitigation measures proposed at that stage. Cumulative, in-combination effects will also need to be re-assessed to take account of prevailing, updated information on other projects, programmes and plans, including those highlighted in the HRA report.

7.6.2 Water Framework Directive (WFD) compliance

A WFD compliance assessment for all options included in the feasible list was carried out. The demand management, river restoration and catchment management options in the WRMP were screened out of further assessment as there is no risk of temporary or permanent deterioration in WFD status as a result of their implementation.

For the feasible supply-side options, the majority of the screened-out options involved transfers of water by pipeline or abstractions from confined aquifers and therefore posing a negligible risk of deterioration to any WFD water bodies. The remaining options were resource options including groundwater abstraction, surface water abstraction, reservoir capacity increase, indirect potable water reuse and desalination. These options were assessed in more detail for WFD compliance. The majority of the feasible options were assessed as being compliant with WFD objectives, however, there were some uncertainties for a small number of WFD assessments as follows:

- Groundwater resources: uncertainties relating to the hydraulic connectivity between the groundwater sources and groundwater-dependent rivers or wetlands
- Desalination: uncertainties relating to the impact of the brine discharge in certain estuaries
- Indirect potable reuse: uncertainties relating to increased flows in the rivers from the treated effluent discharge during times of low flows.

7.6.3 A sustainable water resources management plan

Through our environmental and social assessment approach, we have developed a long-term, sustainable water resource management plan that:

- maintains water supply reliability for our customers without unacceptable adverse effects on the environment or local communities
- ensures the use of Drought Orders and Drought Permits is restricted to only extreme drought conditions in the longer term (beyond 2027) to minimise the frequency of impact on the water environment at times of prolonged dry weather conditions

As well as protecting the environment, our WRMP provides opportunities for environmental enhancement through various measures, in particular:

- Reducing water abstraction from a number of existing water sources where there is a risk of adverse effects on the water environment
- Actively pursuing further measures to reduce leakage from our water supply system and customer properties, reducing water abstraction from the environment
- Extending water metering to more customers and helping our customers reduce their demand for water to achieve our long term target of reducing water consumption to an average of 100 litres per person per day
- Implementing catchment management measures that will enhance catchment land quality and water quality in local rivers and groundwater
- In-river restoration measures for the River Test and River Itchen

8. Conclusion

This document provides a technical overview of our WRMP. Further detailed information is set out in a series of WRMP Annexes.

We recognise that water is precious. Our WRMP explains how we plan to balance the supply and demand for water over the period to 2070 in a sustainable way, ensuring that we protect and enhance the environment and making sure our bills are affordable for all our customers.

We are facing significant challenges, but also great opportunities. We plan to invest to support a resilient economy in the South East, bringing innovation to our water resources network and improving the quality of the water we provide and the service we give to customers.

There are a significant number of new schemes that we are planning to implement over the coming years. We will work in close partnership with our customers, stakeholders and our environmental and financial regulators to plan, investigate, secure approval for, and then build necessary new infrastructure. Alongside this our exciting plans for implementing greater water efficiency and demand reduction, Target 100, increased leakage reduction to achieve a 50% reduction by 2050, and investment in our existing infrastructure will secure safe and reliable supplies to our customers.

In the Western area we face particularly large challenges as a result of known licence changes to protect and enhance the environment. We are planning to accommodate these changes within our plans, but there are risks associated with this approach, and we will face a period of approximately 10 years when more frequent temporary use bans and Drought Order applications will need to be made, than we or our customers would like, until our investment in new resources can be delivered.

As well as the known sustainability reductions, our WRMP is planning to take account of further as yet unconfirmed sustainability reductions by 2027. The scale of these will not be known until the early 2020s when they will be confirmed by the Environment Agency following the conclusion of investigations we are proposing to undertake in the next few years. Whilst options to resolve these potential future challenges need to be investigated, designs produced and consents secure, we would only implement options following the final confirmation of the sustainability reductions.

Glossary

Acronym	Term	Definition
ADO	Average Deployable Output	Annual average deployable output from a source
AMP	Asset Management Plan	Water company business plan
AMR	Automatic Meter Reading	Type of water meter that can be read remotely using drive-by technology
	Catchment	The area from which precipitation (rainfall) and groundwater would naturally collect and contribute to the flow of a river
	Central area	Supply area comprising the Sussex North, Sussex Brighton and Sussex Worthing Water Resource Zones
CAP	Customer Advisory Panel	Independent panel to ensure Southern Water delivers its customer priorities and promises
Defra	Department of Environment, Food & Rural Affairs	The Government department responsible for setting water policy
DO	Deployable output	The output of a source or bulk supply as constrained by licence (if applicable); pumping plant and / or well / aquifer properties; raw water mains and / or aqueducts; transfer and / or output main; treatment; water quality
	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
	Drought Order	Powers granted by the Secretary of State during drought to modify abstraction / discharge arrangements on a temporary basis
DYAA	Dry year annual average	Represents a period of low rainfall and unrestricted demand and is used as the basis of a WRMP
DYCP	Dry year critical period	The period(s) during the year when water resource zone supply demand balances are at their lowest

Acronym	Term	Definition
DYMDO	Dry year minimum deployable output	This is the autumn period in a dry year when groundwater levels and river flows are at their lowest and sources are constrained to their minimum deployable outputs
	Eastern area	Supply area comprising the Kent Thanet, Kent Medway East, Kent Medway West and Sussex Hastings Water Resource Zones
	Groundwater	Water held underground in the soil or in voids in rock
HRA	Habitat Regulations Assessment	Assessment to consider the potential effects of alternative options and strategies on designated European sites
MDO	Minimum deployable output	Deployable output for the period when groundwater levels are at their lowest
Ml/d	Mega litres per day	Millions of litres per day. Unit of measurement for flow in a river or pipeline.
NEP	National Environment Programme	A list of environment improvement schemes that ensure water companies meet European and national targets related to water
	Non Essential Use (Ban)	A drought order approved by the Secretary of State to restrict specific water uses activities
NYAA	Normal Year Annual Average	This is the demand for water expected under normal conditions
Ofwat	Office of Water Services	The economic regulator of the water sector in England and Wales
	Outage	Temporary loss of deployable output
PCC	Per capita consumption	Amount of water typically used by one person per day
PDO	Peak deployable output	Deployable output for the period in which there is the highest demand
RSA	Restoring Sustainable Abstraction	Environment Agency programme to identify abstractions that are unsustainable or potentially damaging and to restore sustainable abstraction
	Source	A named input to a water resource zone where water is abstracted from a well, spring or borehole, or from a river or reservoir

Acronym	Term	Definition
s20	Section 20 agreement	The agreement signed by Southern Water and the Environment Agency during the Western Inquiry in March 2018.
SEA	Strategic Environmental Assessment	Statutory requirement for the assessment of effects of certain plans and programmes which could have significant environmental implications
	Supply-demand balance	The difference between total water available for use (as supply) and forecast distribution input (as water demand) at any given point in time over the Water Resource Management Plan's planning period / horizon
	Sustainability Reduction	Reductions in deployable output required to meet statutory and / or environmental requirements
TUB	Temporary Use Ban	Drought restriction imposed by water companies on customers. Restrictions include not using water supply for leisure pursuits such as watering a 'garden' using a hosepipe, filling a pool, washing a car, among others
WAFU	Water Available for Use	Combined total of deployable output; future changes to deployable output from sustainability changes, climate change etc.; transfers and any future inputs from a third parties; short term losses of supply and outage; and, operational use or loss of water
	Western Inquiry	An inquiry into proposed changes to Lower Itchen, Test and Candover licences in Hampshire, held in March 2018.
WFD	Water Framework Directive	EU Environmental Legislation committing all EU member states to achieving good quality and good quantitative status of all water bodies
WRMP	Water Resource Management Plan	Statutory plan produced by water companies every five years to plan to meet supplies over 25 to 50-year period
WRSE	Water Resources in the South East	Partnership of water companies and regulators in South East England working together to make best use of available water resources
WRZ	Water Resource Zone	The largest possible zone in which all resources, including external transfers, can be shared and hence the zones in which all customers experience the same risk of supply failure from a resource shortfall

	Western area	Supply area comprising the Hampshire Andover, Hampshire Kingsclere, Hampshire Winchester, Hampshire Rural, Hampshire Southampton East, Hampshire Southampton West and Isle of Wight Water Resource Zones